DoD Product Support Efficiency:

Opportunities for Improvements

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Executive Summary

"This country is at a strategic turning point after a decade of war and, therefore, we are shaping a Joint Force for the future that will be smaller and leaner, but will be agile, flexible, ready, and technologically advanced."[1] ~ Leon E. Panetta, Jan 5, 2012 (Secretary of Defense)

This report provides an in-depth look at the current state of U.S. Department of Defense (DoD) product support and sustainment, and how DoD could improve the effectiveness and efficiency of its product support to deliver capability in an era of shrinking defense budgets and an aging weapons system portfolio. The report examines private sector best practices in sustainment, and highlights specific cases of successful efficiency improvements within the DoD.

The report begins by reviewing the current state of defense product support. It looks at the impact of the budget crisis, and highlights recent modifications to defense acquisition and contracting procedures aimed at improving performance in this area. These initiatives include Better Buying Power (BBP), which strives to improve affordability, increase the use of should-cost/will-cost management, and eliminate redundancy. It also discusses other acquisition approaches including Lowest Price Technically Acceptable (LPTA) and Best Value. Finally, the section discusses the importance of choosing the optimal contract type for each type of acquisition.

In addition to current regulations, a second section provides an overview of actions the DoD has taken to improve product support. These include implementing performance-based logistics and strategic sourcing, further adopting of lean process controls, and tackling inventory management and visibility challenges.

Strategic sourcing seeks to maximize enterprise-level benefits by supporting the warfighter with the right balance between service levels, quality, innovation, delivery time, price, competition, costs to purchase and administer, and attainment of small business goals. The DoD officially initiated a collaborative and structured strategic sourcing program in 2003, beginning with a spend analysis and opportunity assessment study.[2]

In its inventory initiatives, the DoD set two goals—reducing on-order and on-hand excess inventory—with percentage targets for each, based on the best available data in fiscal year 2009 as part of its *Comprehensive Inventory Management Improvement Plan*. GAO reported that the DoD successfully implemented automated access to inventory, an in-storage visibility program, a review and elimination of no-demand items. Challenges remain, however, including improving demand forecasting and accelerating the use of multi-echelon inventory modeling.

[1] "Sustaining U.S. Global Leadership: Priorities for the 21st Century." U.S. Department of Defense. January 2012. Accessed January 8, 2013. Available at http://www.defense.gov/news/Defense_Strategic_Guidance.pdf.
[2] Department of Defense: Defense Procurement and Acquisition Policy. "DoD-Wide Strategic Sourcing Program: Concept of Operations." June 2013. Available at http://www.acq.osd.mil/dpap/ss/docs/DWSS-CONOPS.pdf. Page 1.

This second section also examines four case studies on successful performance-based logistics programs that DoD has executed. The first case study on the High Mobility Artillery Rocket System (HIMARS) program improved system level performance based logistics and has won two awards in the past decade. *System level* performance-based logistics is particularly vital to product support because it has the highest potential for realizing savings and performance efficiency of the weapon system.

The second case study presents a component level PBL program called "Tip-to-Tail (T2T)," which achieved improved performance and lower ownership costs. The Globemaster III Integrated Sustainment Program (GISP) is a public private agreement designed around the concept of performance-based logistics where the customer pays for readiness, rather than specific parts or services discussed in the previous two cases. Finally, we examine an instance of the Navy implementing a *subsystem level* contract that also harnessed multiple elements of product support efficiency: a public-private partnership, lean six sigma applications, and performance-based logistics.

In the third section of the report, another public-private partnership program is examined as an additional product support improvement option for the DoD to apply more widely than just depot maintenance. This section also examines DoD sustainment cost drivers - fuel and manpower, and look at technologies under consideration to reduce costs and improve effectiveness in these areas. There are a number of goals associated with investigation of these new options, including what new technologies DoD could adopt to reduce fuel consumption, streamline support operations, eliminate waste in both process and assets, and replace humans with machines where most appropriate.

The report includes an examination of DoD efforts to reduce costs and improve outcomes in TRANSCOM's delivery operations. The TRANSCOM project aimed to improve materiel distribution, which GAO has identified as a high-risk area for years. TRANSCOM, in addition to its responsibilities for transporting supplies and equipment in support of military operations, is charged with overseeing the effectiveness, efficiency, and alignment of DoD-wide distribution activities. TRANSCOM's process improvement effort led to better delivery times on 31 (6 percent) of DoD's approximately 500 shipping lanes.

Finally, the report reviews private sector best practices, discusses the opportunities and challenges for DoD application and implementation of best practices, identifies the benefits of changing, and makes recommendations based on lessons learned. Private sector best practices include performance-based product support solutions with different or longer contracts, life cycle product support/outcome-based partnerships (with multi-year contracts), performance-based logistics, lean six sigma, strategic sourcing, inventory optimization, supplier relationship management, and benchmarking with performance metrics. They also include adoption of new fuel-efficient transport and alternative fuel solutions; and the use of robotics in various distribution/supply chain applications.

Organizational Structure of the Report

As a comprehensive examination of public and private sector product support, this report is divided into five sections.

Part I provides an overview of the current state of DoD product support regulations and budget pressures.

Part II examines the DoD's work to improve product support performance-based logistics, public-private partnerships, and strategic sourcing. It offers case studies to illustrate programs where the DoD has successfully applied best practices and to discuss what was achieved. It also identifies the challenges remaining.

Part III discusses alternative fuels, robotics, and process improvement as new approaches to product support efficiency. This section examines private sector best practices and insights on how best practices can be applied and implemented in the DoD.

Part IV examines benefits, issues, and challenges the DoD faces in trying to improve product support efficiency.

Part V concludes with recommendations and overall observations on improving DoD product support.

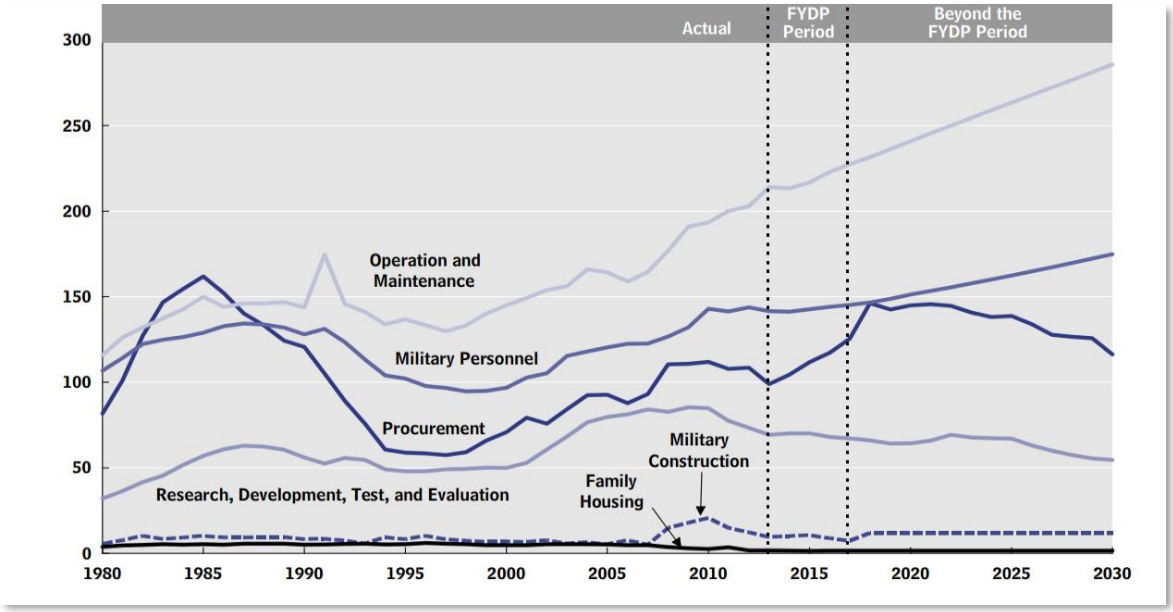
Part I: Current State

"We need to continually move forward with designing an acquisition system that responds more efficiently, effectively and quickly to the needs of troops and commanders in the field. One that rewards cost-effectiveness and efficiency, so that our programs do not continue to take longer, cost more, and deliver less than initially planned and promised." ~Secretary of Defense Chuck Hagel, April 3, 2013

With defense budgets shrinking and weapons systems platforms and equipment aging, the need has never been greater for DoD to manage sustainment costs smarter and more effectively. The DoD must balance between the constantly evolving equipment requirements of the deployed force, and the fiscally constrained and legally bound confines of the DoD.[3]

In this context, this section reviews the current state of sustainment at the DoD, including recent defense contracting regulations and the budget crisis.

Figure 1: CBO projection of base budget costs of DoD's plans, by appropriation category (billions of 2013 dollars)



Source: Congressional Budget Office. "Long-Term Implications of the 2013 Future Years Defense Program." July 2012.

Defense discretionary spending is the largest component of total discretionary spending, which reached $699 billion in 2011. "Defense discretionary" spending is broken into five categories: operation and maintenance, military personnel, procurement, research, development, test and evaluation, and other (such as military construction or family housing). Sustainment costs are included in the operation and maintenance category, consisting of 41 percent of total defense

[3] Whiteson, Anthony K. "Sustaining Equipment and the Rapid Acquisition Process: The Forgotten Phase." February 24, 2012. Accessed February 5, 2013. Page 2

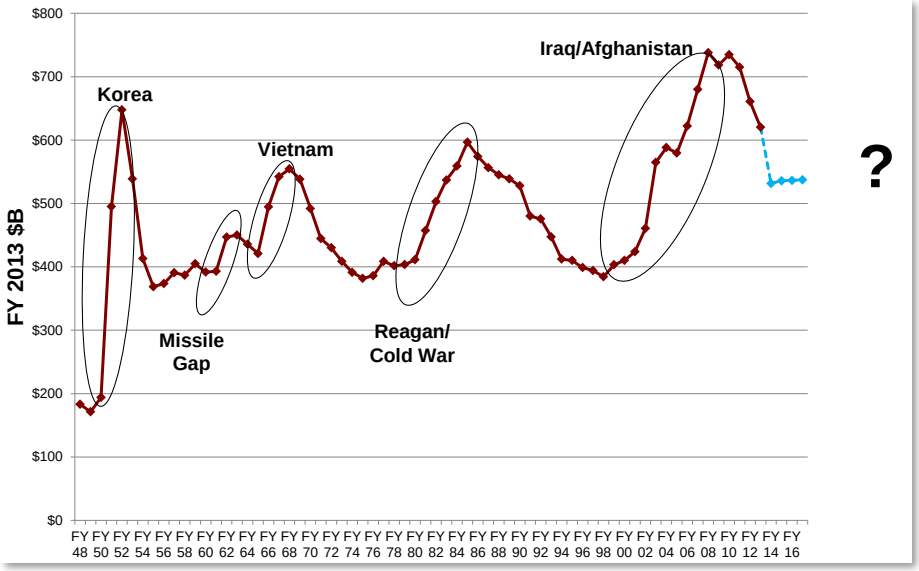
discretionary spending.[4] Figure 1 demonstrates the rise in defense discretionary spending despite shrinking budgets.

Since 1948, the nation spent an average of $478 billion per year in defense as measured in constant Fiscal Year (FY) 2013 dollars. During times of crisis, the nation increased the DoD's spending to defend the nation's interests (see Figure 2). These defense build-ups peaked at:

- $623B in FY 1952 for Korea
- $547B in FY 1968 for Vietnam
- $586B in FY 1986 for the Cold War buildup
- $719B in FY 2009 for the wars in Iraq and Afghanistan

We can anticipate a significant decrease as sequestration plays out, and our involvement in Afghanistan ends (assuming no new extended operations). One fact remains, however: DoD's equipment is worn out.[5]

Figure 2: Trends in Defense Appropriations, 1948-2016



Source: Department of Defense. National Defense Budget Estimates for FY2013: The Greenbook. Office of the Under Secretary of Defense (Comptroller). March 2013.

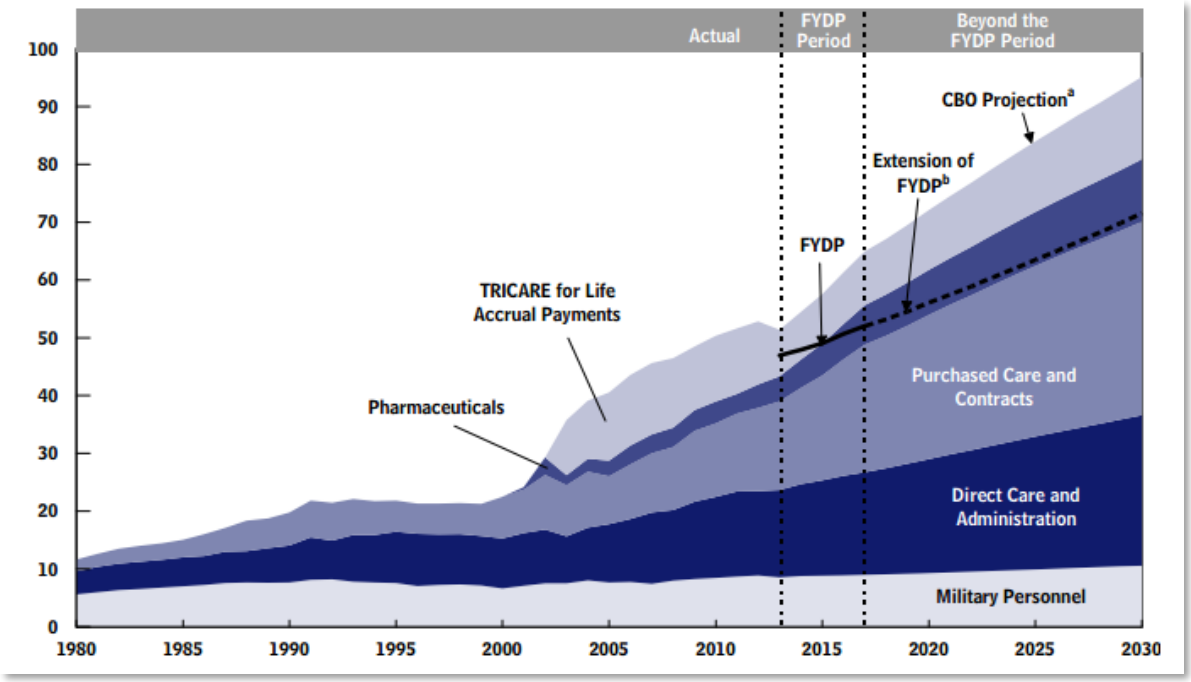
There are other significant forces at work consuming an ever-increasing percentage of DoD's operating budget. These include rising fuel costs and escalating health care expenses (TRICARE). While the latter is not a sustainment cost, per se, it must be funded. As a result, it competes for overall DoD budget dollars.

[4] Schwabish, Jonathon and Courtney Griffith. "A Closer Look at Discretionary Spending." Congressional Budget Office. April 2012.
[5] Department of Defense. National Defense Budget Estimates for FY2013: The Greenbook. Office of the Under Secretary of Defense (Comptroller). March 2013.

Rising Health Care Costs

Low out-of-pocket expenses for TRICARE beneficiaries, combined with increased costs of alternative sources of health insurance coverage, make the TRICARE program relatively more attractive each year. As a result, a larger share of military retirees and their dependents are relying on the program. In addition, low out-of-pocket costs and other factors have led to utilization rates for inpatient and outpatient care that are significantly higher for TRICARE beneficiaries than for people with other insurance.[6]

Figure 3: Cost of DoD's Plan for the Military Health System



Source: Congressional Budget Office. "Long-Term Implications of the 2013 Future Years Defense Program." July 2012. Available at http://www.cbo.gov/sites/default/files/cbofiles/attachments/07-11-12-FYDP_forPosting_0.pdf.

Rising Fuel Costs

In 2010, the armed services used more than five billion gallons of fuel while conducting operations, at an estimated cost of $13.2 billion—a 225% increase from the cost in 1997. The $13.2 billion price tag only accounts for the price of fuel alone and does not consider the associated delivery costs. The cost to deliver fuel in an air-to-air scenario alone was estimated to be between $20 and $25 per gallon. The cost of delivering fuel by air could be as high as 10 times the cost of ground delivery. Additionally, the cost to the Army for delivering fuel in an operational environment was between $100 and $600 per gallon, dependent on the range of the battle space.[7]

[6] Ibid.
[7] National Defense Industrial Association. "National Logistics Forum: Optimizing Support Capabilities in a Resource-Constrained Future." Crystal City, VA. June 13-14, 2013.

DoD has taken a number of steps aimed at managing sustainment cost structures more effectively. We discuss key efforts below.

Total Life Cycle Systems Management

Aware of the need to develop a solution to address runaway equipment sustainment costs, in 2003 the DoD, through the Service Acquisition Executives and Joint Logistics Board, initiated an aggressive effort to reengineer the life cycle management of DoD systems to achieve effective performance and optimum readiness, while reducing operations and support costs. This initiative is called Total Life Cycle Systems Management (TLCSM). TLCSM, as defined in DoD policy, is the implementation, management, and oversight, by the designated program manager (PM), of all activities associated with any acquisition, development, production, fielding, and sustainment of a DoD weapon system across its life cycle.

Although the TLCSM includes all phases of the DoD Acquisition[8] process, the life-cycle sustainment program includes all elements necessary to maintain the readiness and operational capability of deployed systems. The scope of support varies among programs but generally includes supply, maintenance, transportation, sustaining engineering, data management, configuration management, manpower, personnel, training, habitability, survivability, safety, occupational health, protection of critical program information, IT and environmental management functions.[9]

Historically, the DoD has focused on the "first half" of the life cycle (i.e., development and production), which typically only represents 30 percent of a program's budget. “The DoD must refocus on the ‘second half’ of the life cycle - the maintenance, distribution, sustainment, and disposal of equipment,” says United States Army Colonel Anthony Whiteson, in a recent white paper. “Applying the same rigor and attention to the back end of the lifecycle process will ensure that DoD systems are more sustainable, cost effective, and efficient throughout their entire life cycles. This ultimately will ensure the best support to the warfighter.”[10]

Acquisition Reform

President Obama came into office intent on reforming the federal acquisition process and reshaping the relationship between the private sector and the federal government. OMB published guidance to federal acquisition officials in 2009 that identified steps departments and agencies should take to increase competition and improve the structure of contracts. Among the suggestions made were for greater use of performance-based acquisitions and commercial solutions, maximization of competition at the task order level, and limiting the length of contracts.[11]

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[8] “Acquisition” is the process of designing, engineering, constructing, testing, deploying, sustaining, and disposing of a military product, whereas “procurement” only encompasses the purchase of a good or service. (Whiteson, Anthony K. “Sustaining Equipment and the Rapid Acquisition Process: The Forgotten Phase.” February 24, 2012. Page 4)

[9] Whiteson, Anthony K. “Sustaining Equipment and the Rapid Acquisition Process: The Forgotten Phase.” February 24, 2012. Page 6-7.

[10] Ibid, 8-9.

[11] Goure, Daniel Dr. “Competitive Defense Contracting: When It Makes Sense (and When It Doesn’t).” Lexington Institute. June 2013. Page 6.

Also in 2009, Congress passed the Weapons Systems Acquisition Reform Act (WSARA), which directed the Department of Defense to implement a number of measures intended to encourage greater innovation and improved performance on the part of defense contractors.[12]

The Department of Defense responded to this direction with a memo called Better Buying Power (BBP). As described by the then-Under Secretary of Defense for Acquisition, Technology and Logistics (Ashton Carter), the objective of the proposed reforms was to dramatically alter the cost curve with respect to the approximately $400 billion of goods and services the Pentagon acquired each year.

> *. . . we have a continuing responsibility to procure the critical goods and services our forces need in the years ahead, but we will not have ever-increasing budgets to pay for them. We must therefore try to achieve what economists call productivity growth; in simple terms, to do more without more*.[13]

Better Buying Power identified some two dozen specific reforms grouped into five thematic clusters: target affordability and control cost growth, incentivize productivity and innovation in industry, promote real competition, improve tradecraft in services acquisition, and reduce non-productive processes and bureaucracy.[14]

BBP Target Affordability and Cost Growth Initiatives

1. Mandate affordability as a requirement
2. Drive productivity growth through should-cost/will-cost management
3. Eliminate redundancy within Warfighter portfolios
4. Make production rates economical and hold them stable
5. Set shorter timelines and manage to them.[15]

Two years into the acquisition reform effort, DoD published a revised version of its acquisition reform initiatives under the title Better Buying Power 2.0. It is noteworthy that BBP 2.0 revised the earlier definition of its initiative on competition from "promote real competition" to "promote effective competition."

BBP 2.0 sought to soften a number of the rigidities that had arisen in the acquisition community with respect to the effort to increase competition in contracting. The revised guidance encouraged contracting officials to employ the full range of available types of contracts rather than focusing primarily on fixed price arrangements. It required solicitations to better define value in best-value competitions and to ensure that when a competition is based on Lowest Price, Technically Acceptable (LPTA) that the definition of technically acceptable is defined well

[12] Ibid.
[13] Ibid, 6-7.
[14] Ibid,7.
[15] Shyu, Heidi, Acting Assistant Secretary of the Army. Memorandum: "Army Implementation of USD (AT&L) Affordability Initiatives." June 10, 2011. Page 1

enough to ensure needed quality.[16] When using LPTA for source selection, if a company's bid meets the minimum technical qualifications for a piece of work, agency buyers only consider a bidder's price to determine the awardee.[17]

When LPTA is used for source selection, bidders only have to meet a minimum threshold with respect to competence and proposed work programs. Factors traditionally employed in determining "best value" to the government (a bidder's past performance, technical approach, management plan, ability to exceed minimum requirements, etc.) were not being considered. Consequently, according to Dr. Daniel Goure, vice-president of the Lexington Institute, LPTA solicitations became "price shootouts" that allowed minimally qualified bidders to become credible candidates and produced a race to the bottom as bidders focused on cutting capabilities in excess of those needed to meet minimally acceptable performance standards.[18]

Should-Cost/Will-Cost Program

Implemented by Ashton Carter in 2011, the should-cost/will-cost approach was devised in response to anticipated national budgetary constraints identified by Congress. Should-cost/will-cost identifies low-value, high-cost elements of a program and seeks to increase value and/or decrease costs.[19]

In should-cost/will-cost, two separate cost estimates are developed: a non-advocate *will-cost* estimate, which provides the official basis for budgeting and programming and a *should-cost* estimate for program management execution. The should-cost estimate is based on what the program manager believes is possible within "the context of creative, innovative, and disciplined measures to increase productivity."[20]

Specifically, in implementing should-cost/will-cost, the acquisition staff should:[21]

- Scrutinize every element of program cost
- Look for cost reductions in respective activities
- Leverage learning curves
- Examine overhead and indirect costs
- Incentivize contractors to identify and create cost reductions
- Tie savings to specific discrete and measurable items and initiatives that can be quantified and tracked

[16] Goure, Daniel Dr. "Competitive Defense Contracting: When It Makes Sense (and When It Doesn't)." Lexington Institute. June 2013. Page 10-11.
[17] Moore, Jack. "Industry seeks tweaks to DoD Better Buying Power." Federal News Radio. Last modified October 5, 2012.
[18] Goure, Daniel Dr. "Competitive Defense Contracting: When It Makes Sense (and When It Doesn't)." Lexington Institute. June 2013. Page 10.
[19] Gansler, Jacques S. and William Lucyshyn. "Cost as a Military Requirement." University of Maryland, Center for Public Policy and Private Enterprise. January 2013, Revised. Page 12
[20] Ibid, V.
[21] McFarland, Katrina. "Better Buying Power Initiative for 'Target Affordability and Control Cost Growth.'" Defense Acquisition University. Presented at NPS Acquisition Research Symposium May 16, 2012, Fort Belevoir, VA. Slide 8.

The U.S. Army achieved savings, which it directly attributes to this portion of BBP. For instance, the Army achieved millions of dollars in savings with the procurement of the Enhanced Performance Round, by lowering the production unit cost of the M855A1/M856A1 lead-free 5.56mm ammunition. The improvement comes from removing the lead and substituting a lower cost material.[22]

Figure 4: Soldiers fire precision-guided Excalibur cannon ammunition

Source: Osborn, Kris. "Army advances Better Buying Power." United States Army. January 28, 2013.

A January 2013 article on www.army.mil described the Army's successes with BBP as follows:[23]

"Finding and executing the proper contracting mechanism for each program is a considerable part of establishing greater efficiency through BBP, [says Tom Mullins, deputy assistant secretary of the Army for Plans, Programs and Resources]. In fact, the Army's multi-year helicopter procurement contracts for the CH-47 Chinook and the UH-60 Black Hawk are expected to result in savings. Multi-year contracts improve acquisition efficiency by allowing vendors to establish a stable supply and production schedule, all while securing a lower unit price, he added.

"...The potential savings there are enormous," Mullins added.

"Other instances of BBP success include millions saved on programs such as Excalibur 155m artillery rounds, modifications to Abrams tank and Stryker combat vehicle procurement contracts designed to reduce costs and competitive acquisition strategies with the Counter Rocket Artillery and Mortar, or CRAM program.

"BBP also plays a role when it comes to the Army's Science and Technology development. S&T influences a number of the tenants of BBP 2.0, specifically achieving affordable programs, controlling costs throughout the product lifecycle and promoting effective competition.

"Much of what the Army does within the S&T community can help achieve system affordability, said Mary Miller, acting deputy assistant Secretary of the Army for Research and Technology. By designing technologies with reliability and

[22] Osborn, Kris. "Army advances Better Buying Power." United States Army. January 28, 2013.
[23] Ibid.

manufacturability in mind, the Army can reduce the cost and time associated with redesign when these technologies transition from the S&T domain into formal programs of record, she said. This results in lower developmental costs and potentially faster acquisition, she explained.

"By engaging program managers early in the technology development process and collaboratively defining technology, performance goals and acceptance testing, the Army can facilitate a more successful insertion of mature technology for emerging capabilities, Miller said."

Risks of Should-cost/Will-cost

Should-cost/will-cost does not provide managers with the incentive to build cost savings into their programs. On the one hand, program managers are required to budget to the historically based, and higher, will-cost figure; on the other hand, they must drive their suppliers to the lower should-cost estimate. Retired Army Colonel Nathanial Sledge writes that the new approach "reduces their management trade space, making it more challenging to demonstrate year-over-year progress." In other words, a program manager who works "to achieve a baseline of should-cost initiatives is shooting himself or herself in the foot."[24]

The will-cost estimate is created early in the program and therefore is prone to inaccuracy for a multitude of reasons, including unstable requirements and unknown sourcing. Because program "savings" under should-cost/will-cost are expressed as the difference between the two estimates, an inaccurate will-cost estimate can make achieving cost savings impossible, or even too easy.[25] Since system requirements are fixed but cost is not, it is virtually impossible to trade higher performance for lower costs.[26]

Shorter Contracts

Another acquisition reform effort, as mentioned earlier, is migration toward shorter-term contracts. The concept or intent is to inject more competition into the buying process, and presumably engender more favorable cost structures. In services, for example, single award contracts were limited (in BBP 1.0) to a three year period, while multiple award indefinite duration/indefinite quantity (ID/IQ) contracts were constrained to a five year maximum period of performance.[27]

The use of shorter contracts may conflict with other DoD practices such as performance based logistics (PBL) contracts. Performance based logistics (PBL), also known as performance based

[24] Gansler, Jacques S. and William Lucyshyn. "Cost as a Military Requirement." University of Maryland, Center for Public Policy and Private Enterprise. January 2013, Revised. Page V
[25] Ibid, 13.
[26] Ibid.
[27] Goure, Daniel Dr. "Competitive Defense Contracting: When It Makes Sense (and When It Doesn't)." Lexington Institute. June 2013. Page 7.

life cycle product support, is an outcome-based support strategy that plans and delivers an integrated, affordable performance solution designed to optimize system readiness.[28]

The success of the PBL approach is ultimately determined by its ability to meet the key performance metrics for materiel availability and materiel reliability, operations and support costs, and other program-specific supportability requirements.[29]

In many PBL contracts, the commercial partners must make major up-front investments in people, systems, equipment, facilities and processes during the first few years of the contract. This means that the commercial firms do not begin to realize a return on investment for several years after the start of contract. It is not uncommon for that return on investment (ROI) period to be five years or more. Short contracts force commercial partners to amortize these investments over just one year. This radically changes the economic structure of these contracts, making them appear more costly to execute from the commercial partners' vantage point.[30]

Shortening the contracting cycle to one year acts as a disincentive for private industry to make significant investments in depot maintenance partnerships. In a worst-case scenario, a shift to one-year contracting terms could drive some commercial firms out of the military weapons system sustainment business entirely; resulting in a loss of invaluable product and service expertise, innovation and capability. [31]

An alternative approach would be a three to five year contract, with the contractor being offered the extension of the contract (through options) if it demonstrated continuous performance improvements at continuously reduced costs; and with the contract being re-competed otherwise.[32]

Procurement Policy

At the highest level, efforts to reform the acquisition process to achieve a better balance between cost, service, performance, contract relationships and other issues are buffeted by conflicting pressures. These include:[33]

1. Declining resources vs. expanding mission needs
2. Oversight vs. agility
3. Risk vs. reward
4. LPTA vs. best value

[28] Boyce, John and Allan Banghart. "Performance Based Logistics and Project Proof Point." *Defense AT&L: Product Support Issue*. March-April 2012: 26-30. Page 28
[29] Ibid.
[30] Gansler, et. al. The Current State of Performance-Based Logistics and Public-Private Partnerships for Depot-Level Maintenance: Models, Outcomes, and Issues. Center for Public Policy and Private Enterprise. October 2010.
[31] Ibid.
[32] Ibid.
[33] Professional Services Council: Acquisition Policy Survey. "The Balancing Act: Acquisition in an Unabated Crisis." December 2012. Page 4.

These conflicting pressures are seen throughout the key challenges identified in a report issued by the Professional Services Council. The report stated that in this environment of unsustainable budget deficits, acquisition officials are being increasingly challenged to make strategic choices, often without adequate training or support. The Council also indicated that intense oversight has created a set of problems and challenges which negatively affect the acquisition process, people and outcomes. [34]

The Issue of Oversight

In the Professional Services Council's Acquisition Policy Survey, respondents cited significant challenges in the area of oversight related to smaller budgets and increased scrutiny on spending despite no increases in staffing.[35]

The additional workload and compliance expectations have affected the acquisition community's ability to take risks and innovate, the survey found. As one survey participant reported, "We have this zero-risk mentality from the oversight community and it has a chilling effect. Contracting officers need to be able to make smart decisions for the taxpayer and this zero-risk/zero-tolerance mentality from the oversight community is coming at the worst possible time. We hear some concerns about what the IG will think; but if it ends up that we are afraid of any kind of risk, we will make government unaffordable." [36]

The report summarized these acquisition challenges as follows.

Declining resources vs. expanding mission needs: Shrinking budgets have forced federal executives to go beyond determining which programs have marginally higher priority than others. Now they must begin to determine whether such requirements will be performed at all. The mantra "doing more with less" that governed recent budget cycles is being replaced with "doing less with less."[37]

Oversight vs. agility: Increased activity of oversight organizations and the expansion of transparency and accountability initiatives have had a cumulative effect on the acquisition community. Maintaining the tempo of acquisition audit inquiries with declining resources has hindered the ability to respond to mission needs.[38]

Risk vs. reward: Providing a means for innovation, flexibility, maintaining momentum and ensuring adequate safeguards is a clear objective of the acquisition lifecycle. Inconsistent application and fear of failure have created a highly risk-averse culture in the acquisition community: "This zero-risk mentality has had a chilling effect on the ability to make smart decisions."[39]

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[34] Ibid.
[35] Ibid, 26.
[36] Ibid.
[37] Ibid, 32.
[38] Ibid.
[39] Ibid.

Lowest price vs. best value: The trade-off between obtaining LPTA goods and services versus best value is a key consideration in the government's buying decisions. The current climate has forced agencies to apply more scrutiny when answering the question of where to pay a premium. Whereas price-based decisions are generally more difficult to challenge, they are not always the most appropriate evaluation criteria when the government needs innovation, technology enhancement or services that directly affect program results.

The restricted budget environment and increased scrutiny of every dollar spent have further challenged acquisition professionals to balance the price versus value trade-off, "We have a tripwire policy now in place, so if you want to pay 10 percent more, it has to go to the highest levels for approval. It shows…a paradigm shift from two years ago when we got drunk on best value."[40]

[40] Ibid.

Part II: DoD's Product Support Improvement Efforts to Date

Beyond acquisition reform, DoD has adopted many efforts to reduce the cost of product support. This section discusses some of these efforts, providing an overview of actions DoD has taken to improve product support and the challenges the DoD has faced in implementation of these efforts. These efforts include:

- Performance-based logistics
- Public Private Partnerships
- Improved inventory management
- Strategic sourcing

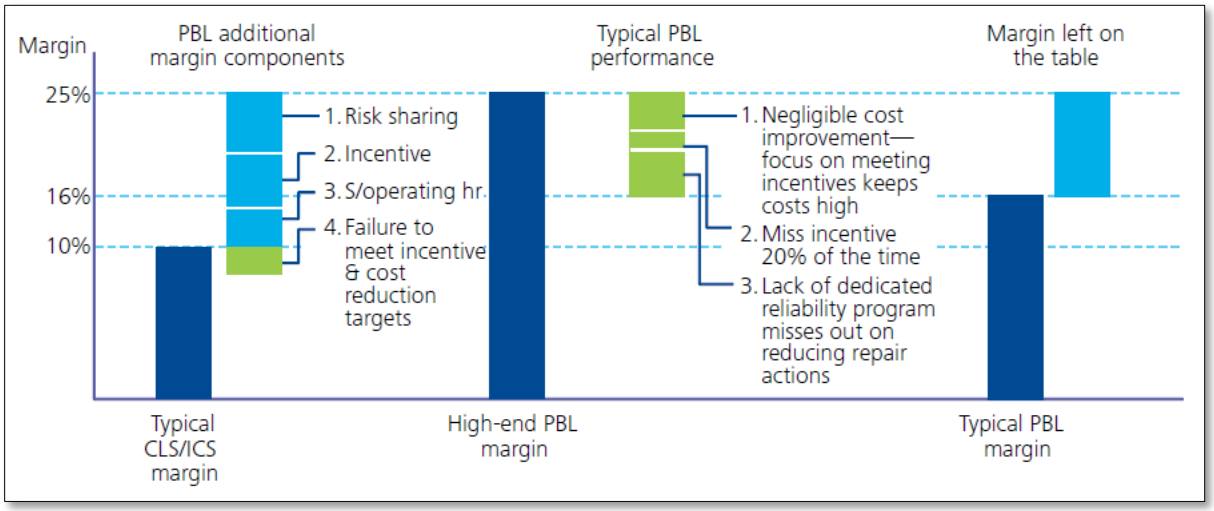
This section also serves to amplify how the private sector is pursuing and applying various supply chain cost management initiatives.

Performance Based Logistics as a Cost Reduction Strategy

> *"Gentleman, we have run out of money. Now we have to start thinking."*
> ~ Winston Churchill[41]

Performance based logistics (PBL), also known as performance based life cycle product support, is an outcome-based support strategy that plans and delivers an integrated, affordable performance solution designed to optimize system readiness.[42]

Figure 5: Typical PBL margins



Source: "Performance Based Logistics in Aerospace & Defense: A rapidly growing market providing lower overall sustainment costs for military equipment and profitable growth opportunities for defense contractors." Deloitte 2010. Page 4.

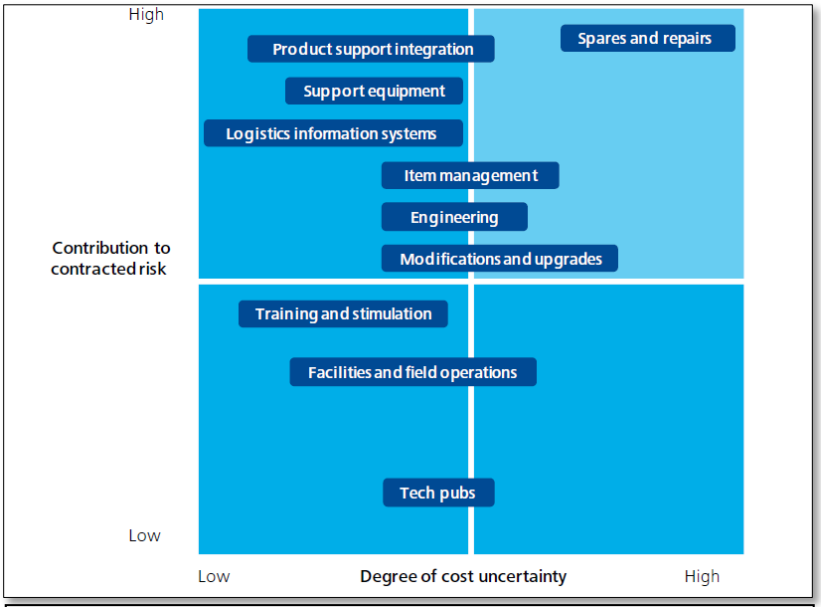
[41] "Meeting the DoD Sequestration Level Cost Cuts Without Cutting Strategy, Programs or Readiness." Lexington Institute. April 2012. Page 2.
[42] Boyce, John and Allan Banghart. "Performance Based Logistics and Project Proof Point." *Defense AT&L: Product Support Issue*. March-April 2012: 28.

Three typical components of PBL contract pricing structure are shown in Figure 5:[43]

1. Share-in-savings to incentivize provider to lower overall sustainment costs.
2. Incentive fee to reward provider for meeting performance expectations.
3. Annual fixed-price or fixed-price per operating hour contract schedule to provide payment to provider regardless of quantity of parts or services consumed.

Increasing costs and narrowing profit margins have caused system operators and original equipment manufacturers (OEMs) to seek strategies for post-production support that moves away from the traditional mentality of purchasing spares and repairs as a series of independent transactions. PBL establishes a metrics-based governance structure where suppliers make more profit when they invest in logistics process improvements, or system redesign, that reduces total cost of ownership. PBL provides a contractual structure that encourages investments that control cost, maintain profit margins, and decrease end-customer price. PBL provides a strategy where the goal is to "design out" logistical demand by reducing the frequency (i.e. improving the reliability) for the need for spares, transportation, and warehousing (see Figure 6).[44]

Figure 6: PBL capability maturity model



Source: "Performance Based Logistics in Aerospace & Defense: A rapidly growing market providing lower overall sustainment costs for military equipment and profitable growth opportunities for defense contractors." Deloitte 2010. Page 8.

PBLs reduce cost per unit-of-performance and improve readiness by focusing on delivery of performance rather than parts.[45,46] However, pricing PBL contracts faces more challenges than a traditional sustainment contract because of the difficulty of predicting demand and consumption as well as component failure rates. With PBL, service providers often contractually guarantee a specific level of performance, which shifts risk from the customer to the

[43] "Performance Based Logistics in Aerospace & Defense: A rapidly growing market providing lower overall sustainment costs for military equipment and profitable growth opportunities for defense contractors." Deloitte 2010. Page 4.
[44] Randall, Wesley S., David R. Nowicki, and Timothy G. Hawkins. "Explaining the Effectiveness of Performance-Based Logistics: A Quantitative Examination." *The International Journal of Logistics Management*. 22(2011): 324-325, 329.
[45] "Performance Based Logistics: Conclusive Evidence Supporting the Impact of PBLs on Life Cycle Costs (Redacted Version)." Logistics Functional IPT. Presented April 20, 2012. Slide 11
[46] Randall, Wesley S., David R. Nowicki, and Timothy G. Hawkins. "Explaining the Effectiveness of Performance-Based Logistics: A Quantitative Examination." *The International Journal of Logistics Management*. 22(2011): 324.

provider.[47] The wide range of support provided under a PBL agreement and the differences in risk among these support elements further contributes to the complexity of pricing fidelity.

Programs that have adopted PBL have experienced "system up time" increases of up to 40 percent, logistics response times cut by 70 percent, all while generating billions of dollars in savings over traditional approaches.[48]

PBL drives behaviors that reduce costs for the operator while providing increased profit potential for the supplier networks. Further, PBL is an inherently resource conscious strategy whose underlying economic model is good for the physical environment. The economic model at the core of PBL creates an incentive for manufacturers and suppliers to innovate and reduce total system and life cycle costs. This means that decisions are made to invest in some type of improvement that leads to an out-year cost savings (typically through improved reliability).[49]

Proving PBL's Efficacy with an Independent Assessment

Weapon system support represents the largest opportunity to accelerate performance increases and simultaneously generate cost savings. The DoD started using PBL contracting in 1997 to enhance accountability for life cycle costs and readiness outcomes across the life of a platform – ultimately to improve weapon system readiness.[50]

Critics of PBL have questioned its effectiveness in reducing total sustainment costs, however. Responding to these concerns, the deputy assistant secretary of defense for logistics and materiel readiness commissioned an independent assessment of PBL product support strategies.[51] Led by Deloitte, the team analyzed PBL arrangements for 21 weapon systems, sub-systems, and components representing all military Services and varied contract structures.[52] The team used a two-tiered, fact-based method to test if PBL results in improved readiness and reduces lifecycle costs.[53]

For six systems, both a financial accounting approach utilizing the OEM's cost structure and the Service's price structure, and an in-depth analysis of the negotiation process and OEM's investment strategies were used to support a suggested linkage between the Performance Based Logistics Strategy and a change in cost.[54]

Thirteen of the 21 programs evaluated began under a non-PBL support strategy. Twelve realized improved operational readiness at a reduced cost, compared with their pre-PBL support. The remaining eight programs were supported from inception by a PBL strategy and had no pre-PBL

[47] "Performance Based Logistics in Aerospace & Defense: A rapidly growing market providing lower overall sustainment costs for military equipment and profitable growth opportunities for defense contractors." Deloitte 2010. Page 8.
[48] Randall, Wesley S., David R. Nowicki, and Timothy G. Hawkins. "Explaining the Effectiveness of Performance-Based Logistics: A Quantitative Examination." *The International Journal of Logistics Management*. 22(2011): 326.
[49] Ibid, 341.
[50] Aerospace Industries Association. "Issue Paper: Affordable Defense Logistics." 2012.
[51] Clements, Joe. "PBL." Life Cycle Logistics Functional IPT (FIPT) Meeting Minutes. Friday April 20, 2012.
[52] Note: This approach indicates whether cost per unit of performance went up or down but does not prove PBLs caused this outcome.
[53] Boyce, John and Allan Banghart. "Performance Based Logistics and Project Proof Point." *Defense AT&L: Product Support Issue*. March-April 2012: 28.
[54] Ibid.

data to evaluate. Overall, 17 programs had improved performance and lowered cost over time. (See Figure 7).

The team found that they reduced DoD's costs per unit of performance, while simultaneously driving up the absolute levels of system, sub-system and component readiness/availability (see Figures 8 and 9).[55] The team also estimated that DoD could save $10 to $20 billion per year through PBL using integrated logistics chains and public/private partnerships to achieve improved system performance and affordable product support. Contracting practices that include longer-term contracts and performance incentives enhance affordability and result in more reliable systems at a lower cost per unit of measure.[56]

Current DoD PBL efforts have shown improvements in material availability (above 95 percent), world-class response times (2-4 days), and reduced inventory and average savings of 16 percent over legacy transactional sustainment approaches. Many of these programs have demonstrated this performance level for five years or more, in response to surge, high operational tempo and wartime needs, without interruption or added costs. This demonstrates that outcome-based contracts can reduce costs and increase performance at any stage of the product lifecycle.

Deloitte concluded that well-crafted PBL arrangements "manufacture competition" by incentivizing companies to compete against internal waste and quality challenges in order to drive up quality (thereby reducing demand) while simultaneously driving down process, labor and material costs. Deloitte also found that PBL provider behavior is directly linked to the incentives embedded in the arrangement; the military Services set the contractual arrangement.[57]

A properly structured PBL arrangement will reduce the Services' cost per unit of performance while driving up absolute levels of readiness. In July 2012, Gartner reported there are 86 PBL contracts in play in DoD, about half the quantity that existed in 2005.[58] There are very few new PBL contracts being let today, despite Deloitte's and other analysts' findings showing that these contracts save money over the long term. According to a Defense Acquisition University study, 12 of 14 PBL programs with cost reduction measure in the contracts actually generated a cost reduction; 17 of 18 programs with performance as objectives, delivered improved performance over the life of the contract. [59]

[55] Ibid.
[56] Aerospace Industries Association. "Issue Paper: Affordable Defense Logistics." 2012.
[57] Boyce, John and Allan Banghart. "Performance Based Logistics and Project Proof Point." *Defense AT&L: Product Support Issue*. March-April 2012: 29.
[58] Feitler, Jane. "PBL 2012 Shows Performance-Based Logistics Moving to the Next Level." July 2012. Gartner.
[59] Clements, Joe. "PBL." Life Cycle Logistics Functional IPT (FIPT) Meeting Minutes. Friday April 20, 2012. Defense Acquisition University (DAU), Fort Belvoir, VA.

Figure 7: Analyses results

Program	Type	Contract Length	Contract Type	Cost	Performance
	Sub-System	5 years	Firm Fixed Price w/ performance incentives	↓	↑
	Sub-System	5 year, one 3 year & one 2 year options	Firm Fixed Price w/ performance incentives	↓	↑
	Component	5 year base, two 5 year options	Firm Fixed Price w/ performance incentives	↓	↑
	Sub-System	5 year base, one 5 year option	Firm Fixed Price w/ performance incentives	↓ n	↑ n
	Sub-System	4 years	Firm Fixed Price w/ performance incentives	↓	↑
	System	5 years	Firm Fixed Price w/ performance incentives	↓	→ *
	Sub-System	1 year, 9 option years	Firm Fixed Price w/ performance incentives	↓	→
	Component	5 month base, 7 option years	Firm Fixed Price w/ performance incentives	↓	↑
	System	5 years	Firm Fixed Price Award Fee	↓	↑
	Sub-System	5 years, one 5 year option	Firm Fixed Price w/ performance incentives	↓	↑
	System	5 years	Firm Fixed Price w/ performance incentives	Indeterminate	↑
	System	—yearly	Cost Plus Incentive Fees	↓	↑
	Sub-System	5 years	Firm Fixed Price	↓	→ *
	System	6 year base, 6 option years	Cost Plus Award Fee	↓	↑
	System	1 base year, 7 option years	Fixed Price Award Fee, Cost Plus Incentive Fee	↓	→
	System	5 years, with option years	Firm Fixed Price w/ performance incentives	↓	↓
	System	1 year base, 7 option years	Fixed Price Incentive Fee	↑	→
	System	1 year	Firm Fixed Price w/ performance incentives	↑	↑
	System	1 year	Cost Plus Incentive Fee/ Cost Plus Award Fee	↑	→ *
	System	1 year	Not Applicable	Indeterminate	→ *
	System	1 year	Cost Plus Fixed Fee	↑	→ *

* No Pre-PBL Support/Performance Exceeding Expectations
n Not Validated
Source: Boyce, John and Allan Banghart. "Performance Based Logistics and Project Proof Point." *Defense AT&L: Product Support Issue*. March-April 2012: 29.

Figure 8: Contract type

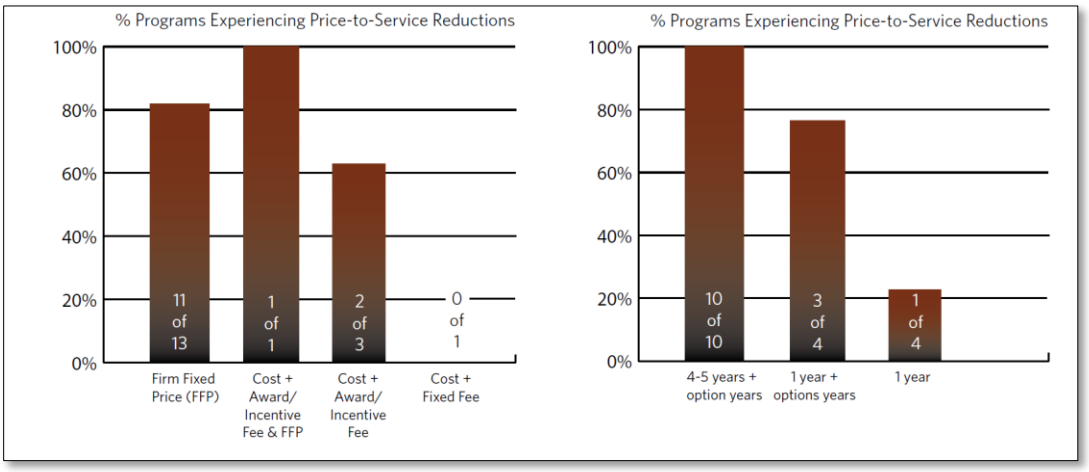


Figure 9: Contract length

Source: Boyce, John and Allan Banghart. "Performance Based Logistics and Project Proof Point." *Defense AT&L: Product Support Issue*. March-April 2012: 26-30.

Without question, PBL arrangements are more difficult to develop and manage than other contract types, but the return is potentially significant. "PBLs are a home run, we just have to make sure we get the deal right," commented Joe Clements, Specialist Leader at Deloitte, during a Defense Acquisition University presentation.[60]

The Department spends more than $90 billion on sustainment every year. A conservative estimate of savings that could result from broadly transitioning to PBL sustainment across the DoD ranges from 10 percent to 20 percent annually. The Aerospace Industries Association recommended, in a separate white paper, that PBL sustainment contracts be expanded across all DoD systems to improve readiness and reduce costs by an estimated $17 to $21 billion per year.[61]

PBL Success Stories

To further describe the potential savings available in PBL contracting, we look at several specific examples.

Case Study: HIMARS

The High Mobility Artillery Rocket System (HIMARS) program improved system level performance-based logistics where there is the highest potential for realizing savings and performance efficiency of the weapon system. HIMARS was designed and produced by the Army to support its Early Entry Contingency forces and its' Light/Airborne/Air Assault Divisions with long-range, general support rocket and missile indirect fires.[62] HIMARS is a wheeled, agile rocket and guided missile system used to engage and defeat artillery, air defense concentrations, trucks, light armor and personnel carriers, as well as support troop and supply

[60] Ibid.
[61] Aerospace Industries Association. "Issue Paper: Affordable Defense Logistics." 2012.
[62] XM142 High Mobility Artillery Rocket System (HIMARS). Global Security. Last modified July 7, 2011. Accessed August 29, 2013. Available at http://www.globalsecurity.org/military/systems/ground/himars.htm.

concentrations.[63] It is a lighter weight C-130 transportable version of the M-270 multiple launch rocket system (MLRS) launcher and is composed of the M142 five-ton chassis vehicle with a launcher pod of six rockets loaded onto the bed.[64] The system provided support for both Operation Iraqi Freedom and Operation Enduring Freedom.[65]

Figure 10: High Mobility Artillery Rocket System (HIMARS)

Source: http://www.lockheedmartin.com/us/products/himars.html

The computer –based or autonomous fire control system allows a single soldier to load and unload the system which fires either up to six MLRS rockets or a single Army tactical missile.[66,67] The onboard land navigation system allows the three- soldier crew to remain safely within the armored cabin while accurately monitoring their position.[68] HIMARS was based on the need for a lighter-weight, more deployable MLRS that can be sent anywhere in the world to provide lethal, long-range fires at the very beginning of a conflict, and is a 24-hour, all-weather system that can aim at a target in 16 seconds.[69,70,71]

[63] "M142 HIMARS Lockheed Martin High Mobility Artillery Rocket System." Army Recognition. Accessed August 29, 2013. Available at http://www.armyrecognition.com/united_states_us_army_artillery_vehicles_system_uk/himars_high_mobility_multiple_artillery_rocket_launcher_system_data_sheet_information_specifications.html.
[64] "High Mobility Artillery Rocket System (HIMARS)." Military Analysis Network. Last modified December 23, 1999. Accessed August 30, 2013. Available at http://www.fas.org/man/dod-101/sys/land/himars.htm.
[65] Hawkins, Kari. "HIMARS Shoots High for Award." U.S. Army. December 16, 2009. Accessed August 29, 2013. Available at http://www.army.mil/article/31909/.
[66] XM142 High Mobility Artillery Rocket System (HIMARS). Global Security. Last modified July 7, 2011. Accessed August 29, 2013. Available at http://www.globalsecurity.org/military/systems/ground/himars.htm.
[67] "High Mobility Artillery Rocket System (HIMARS)." Military Analysis Network. Last modified December 23, 1999. Accessed August 30, 2013. Available at http://www.fas.org/man/dod-101/sys/land/himars.htm.
[68] XM142 High Mobility Artillery Rocket System (HIMARS). Global Security. Last modified July 7, 2011. Accessed August 29, 2013. Available at http://www.globalsecurity.org/military/systems/ground/himars.htm.
[69] "High Mobility Artillery Rocket System (HIMARS)." Military Analysis Network. Last modified December 23, 1999. Accessed August 30, 2013. Available at http://www.fas.org/man/dod-101/sys/land/himars.htm.

Lockheed Martin Missiles and Fire Control developed and fabricated four operational HIMARS prototypes as part the Army's Rapid Force Projection Initiative Advanced Concept Technology Demonstration contract, which was awarded to the company in March of 1996. In December 1999, **Lockheed** Martin Missiles and Fire Control was awarded a $65 million HIMARS engineering and manufacturing development (EMD) program contract for the production of six HIMARS launchers.[72] One year later, Lockheed was awarded an $8.1 million contract for an additional two HIMARS launchers.

In December 2005 the US Army awarded Lockheed Martin the first full rate production contract, and less than 6 months later received a $51.6 million contract modification for delivery of 18 HIMARS to the US Marine Corps. In 2011 the program was scaled down from 425 to 381 units.[73]

The Sixth and Final Full Rate Production (FRP VI) contract was awarded on December 23, 2010, for 44 launchers for the US Army.[74]

Figure 11: Hardware Managed by PBL Team

	Goal	Actual
System Status Readiness	92%	99%
Customer Wait Time (mission capable turnaround time)	96 hours	1 hour
Repair Turnaround Time	5 days	2 days

Source: http://www.dod.mil/pubs/foi/logistics_material_readiness/acq_bud_fin/SARs/DEC%202011%20SAR/HIMARS%20-%20SAR%20-%2031%20DEC%202011.pdf

Awards for High Performance

In November 2006 and then again in 2009, the U.S. Army-Lockheed Martin HIMARS team received the Secretary of Defense's Performance Based Logistics System Level award for outstanding performance. The HIMARS Team won by achieving its sixth consecutive measured calendar quarter that exceeded all five PBL requirements: Life Cycle Contractor Support (LCCS) system status readiness, average response time for critical non-mission capable launcher failures in the continental United States and outside the continental United States, average repair time in the field, and average depot repair turnaround time.[75]

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[70] Bellegarde, Tommy Cpl. "HIMARS Battery Adds Long-Range Fire Support to the Battlefield." Defense Video & Imagery Distribution System. September 22, 2011. Accessed August 30, 2013. Available at http://www.dvidshub.net/news/77419/himars-battery-adds-long-range-fire-support-battlefield#.UiCpO9JQFnA#ixzz2dSkHrdmu.

[71] "HIMARS, High Mobility Artillery Rocket System, United States of America." Army Technology. 2012. Accessed August 29, 2013. Available at http://www.army-technology.com/projects/himars/.

[72] http://www.fas.org/man/dod-101/sys/land/docs/man-la-himars-001220.htm

[73] http://www.deagel.com/Multiple-Launch-Rocket-Systems/M142-HIMARS_a000521001.aspx

[74] http://www.dod.mil/pubs/foi/logistics_material_readiness/acq_bud_fin/SARs/DEC%202011%20SAR/HIMARS%20-%20SAR%20-%2031%20DEC%202011.pdf

[75] "U.S. Army-Lockheed Martin Receives Secretary of Defense Award for HIMARS Performance-Based Logistics Efforts." November 1, 2006. Lockheed Martin. Accessed August 29, 2013. Available at http://www.lockheedmartin.com/us/news/press-releases/2006/november/USArmyLockheedMartinTeamReceivesSec.html.

The PBL award recognizes three categories: the system level (highest award), the sub-system level and the component level. HIMARS received the system level award because its PBL solution maintains performance across the entire weapon system, rather than just for partial subsystems or components. It is at the system level that the customers recognize the highest potential for realizing savings and performance efficiency of the weapon system.[76]

In 2009, the U.S. Army-Lockheed Martin HIMARS team won the PBL award again after achieving a readiness rate of 98 percent for HIMARS, a U.S. Army readiness maintained at greater than 90 percent, and total cost avoidance of almost 25 percent ($8.6M).[77] The team achieved success through public-private partnership, obsolescence management, and reliability, maintainability, and supportability improvements. The team also focused their attention on the supply pipeline, to improve the customer wait time, turnaround time, and maintenance ratio. Additionally, the team had a 29 percent reduction in the number of maintenance actions.[78]

Case Study: Tip-to-Tail H-60 Helicopter Fleet

The Tip-to-Tail (T2T) is another example of a successful performance-based logistics (PBL) program in which the program achieved improved performance and lower ownership costs. This component parts PBL program between the U.S. Navy and the Maritime Helicopter Support Company is a joint venture between Lockheed Martin and Sikorsky

Public-Private Partnering in PBL

Dividing roles and responsibilities is key to partnering.

Example A: In-theater maintenance work is performed by the Warfighter with the technical assistance of Lockheed Martin employed field service representatives. These warfighters receive their initial training at the Ordnance Munitions and Electronics Maintenance School.

Example B: Lockheed Martin's supply chain management system is fully integrated with the standard Army system so that repair parts and other supplies can be quickly ordered and replaced.

The partnering contract was written to remain flexible to the demands of the theater.

- Modified alpha contracting
- MOAs or Performance Based Agreements (PBAs)
- Execution of Life Cycle Contractor Support (LCCS) contract

Hawkins, Kari. "HIMARS Shoots High for Award." U.S. Army. December 16, 2009. Accessed August 29, 2013. Available at http://www.army.mil/article/31909/.

"The Secretary of Defense Performance Based Logistics Awards Program for Excellence in Performance Based Logistics in Life Cycle Product Support." 2009. Accessed August 29, 2013. Available at https://acc.dau.mil/adl/en-US/350376/file/49138/HIMARS%20System%20level.pdf.

[76] Ibid.
[77] "The Secretary of Defense Performance Based Logistics Awards Program for Excellence in Performance Based Logistics in Life Cycle Product Support." 2009. Accessed August 29, 2013. Available at https://acc.dau.mil/adl/en-US/350376/file/49138/HIMARS%20System%20level.pdf.
[78] Ibid.

Aircraft. The T2T program supports and sustains about 1,200 helicopter parts used by the Navy's H-60 helicopter fleet. The central function of the T2T is fulfilling requisitions for covered parts by managing sustainment information and the supply chain.

The T2T uses a fixed-price plus incentive fee contract. The fixed-price is per flight hour of the helicopters, not per repair part. The incentive fee is based on delivering requisitions on time. This fixed-price per flight hour structure creates the incentive for the Maritime Helicopter Support Company, or MHSCo, to lower its costs through improving the effectiveness of the support system, and lowering demand for parts.

The two key measures of PBL success are improved performance and lower ownership costs. The T2T succeeded on both measures, lowering ownership costs and continuously achieving a superior supply response time compared to the Navy's pre-PBL operations.

Four lessons learned about the T2T are highlighted below and represent PBL best practices.

- **PBLs work**. The T2T is a 'PBL' that actually *is* a PBL. The T2T is evidence that a PBL, when designed properly, works as expected by improving performance and lowering cost.
- **Communication is essential**. The T2T has many stakeholders who have a vote in how well or how poorly the program operates. The success of the T2T is due, in part, to the strong communications across the stakeholders. When communications were not working well, MHSCo creatively improved them; which is a lesson in creative problem solving.
- **Partnership with the government is essential**. In a long-term contract, where neither party has a reasonable alternative, the outcomes of the contract for both parties depend more on their cooperation than on the underlying economics. Ensuring that both parties get a satisfactory outcome over the long term, even if this additional action has a cost in the short term, is the essence of cooperation. MHSCo has worked hard to establish and maintain a partnership with the government, and it has paid off; as demonstrated during its lengthy negotiation for the follow-on T2T contract.
- **Align incentives through the contract structure**. The right program structure will align the incentives of the customer (the government) and the support provider; and can lead to a win-win scenario. Using fixed-price per flight hour, plus incentive fee on requisition responsiveness, is a contract structure that aligns the incentives of both the Navy and MHSCo. In the T2T, they both seek improved performance and lower cost.

Case Study: Globemaster III Integrated Sustainment Program (GISP) PBL[79]

The C-17 GISP is a public private agreement designed around the concept of performance-based logistics where the customer pays for readiness, rather than specific parts or services discussed in

[79] Ibid.

the previous two cases. Under the agreement, Boeing is responsible for all C-17 sustainment activities, including material management and depot maintenance support.

Boeing is responsible for supply support, supplier management, technical manual support, maintenance, modifications and upgrades, logistics engineering services and field support services. Boeing personnel work alongside Air Force personnel to keep the C-17 fleet flying with the best availability in airlift history. Boeing is held accountable to achieve sustainment performance metrics and is the "contractor inventory control point" for more than 95 percent of the reparable parts on the C-17. For the period of fiscal year 2004-2011, GISP supply chain management achieved an average of 90 percent delivery rate for these assigned reparable items.

The U.S. Air Force recently approved a request for Boeing to provide continued, sole-source lifecycle support to the C-17 from fiscal year 2012-2021. The current GISP agreement is a one-year contract (fiscal year 2012) followed by a five-year (fiscal year 2013-2017) contract; fiscal years 2018-2021 remain as four, one-year options.

Figure 12: C-17 Globemaster III

Source: http://www.fas.org/man/DoD-101/sys/ac/20000112-f-2171a-005.jpg

Much of the Globemaster is designated core workload under Title 10 U.S.C., which requires the government to maintain repair capability on items deemed critical for national defense. As part of the GISP, Boeing partners with the Air Force Air Logistics Centers (ALC) for C-17 core items. Under terms of the agreement, ALCs received more than $60 million in investments from Boeing between 2004 and 2008. In the end, the ALCs will become Boeing-qualified repair centers for the items requiring depot capability.

In an affordability-focused partnership with the U.S. Air Force, GISP has reduced C-17 dollar-per-flight-hour by 29 percent over seven years (2004 to 2011), saving more than $1 billion in total. On-site Boeing engineering operational cost avoidance was estimated at $60 million from fiscal year 2004 through fiscal year 2010. In fiscal year 2011 this was estimated at an additional $4 million. The C-17 GISP Program achieved a mission capability rate of 86.1 percent in fiscal year 2011. The mission capable rate fiscal year 2012 to-date is 86 percent.

Case Study: H-60 Forward Looking Infra-Red (FLIR) PBL[80]

As another example of successful PBL implementation, the Navy's H-60 program office reversed a negative trend in FLIR system availability through the implementation of a subsystem PBL contract with Raytheon that included a public-private partnership (PPP) with Fleet Readiness Center Southeast (FRCSE). Through the use of an outcome-based strategy and the rigorous application of Six Sigma principles, average material availability went up from 33 percent to 100 percent in less than two years, along with the elimination of all backorders. More significantly, all of this was done at a cost savings of more than $31 million over the pre-PBL sustainment cost. As an additional benefit to the Navy, the PPP between Raytheon and FRCSE resulted in significant increases in both the technical capability of FRCSE and the amount of their total workload.

Figure 13: AN/AAS-44(V) Infrared Laser Detecting-Ranging-Tracking Set

Source: http://www.raytheon.com/capabilities/products/aas44_v/

The performance improvements and efficiency initiatives make an estimated $20 - $25 billion per year available by reducing logistics costs, improving logistics performance for the warfighter and increasing jobs at depot locations.

Depot Maintenance

The DoD has also made limited use of the combined powers of PBLs and public-private partnerships to improve depot maintenance operations and maximize its product support efficiencies. Their use has streamlined repairs and services, saving time and money, as well as improving the overall quality of the work.

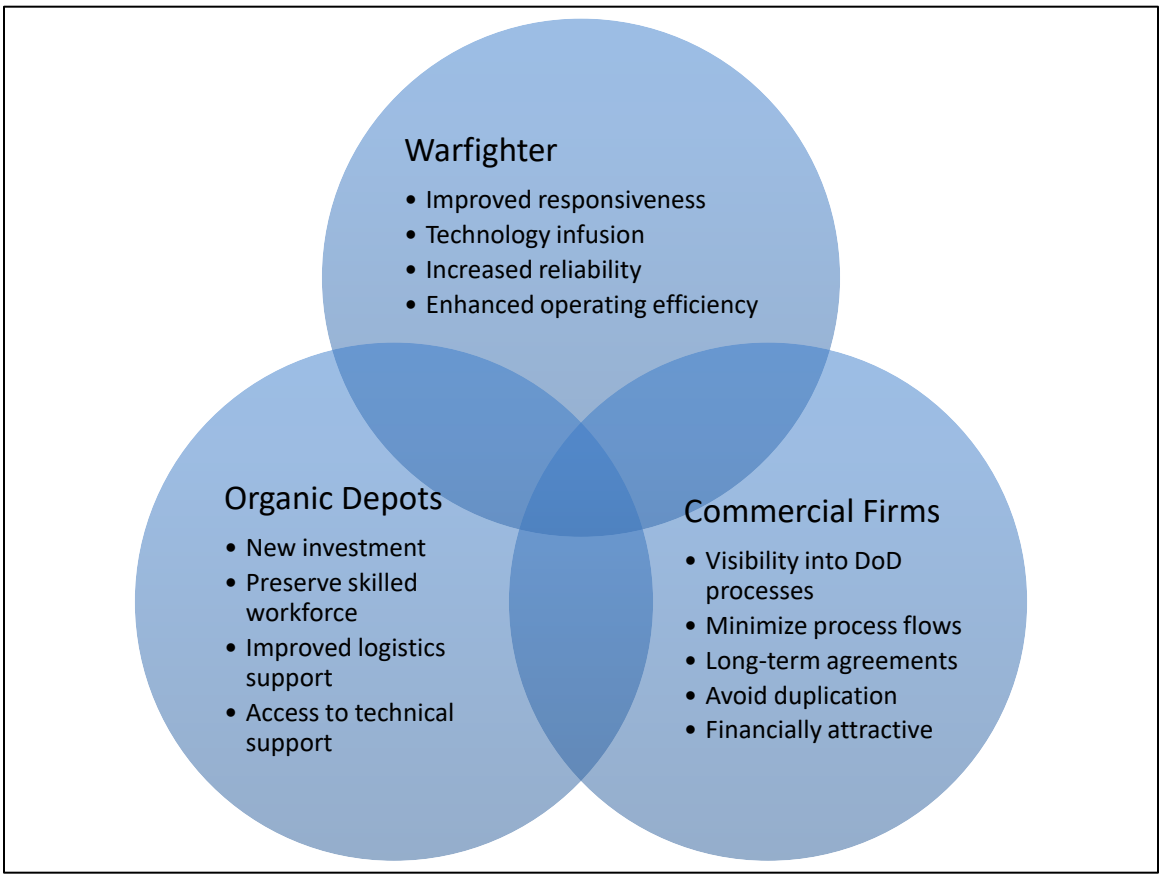
[80] Ibid.

A public-private partnership (PPP) for depot maintenance is an agreement between an organic depot maintenance activity and one or more private firms to perform work or utilize facilities and equipment. Depot capabilities that can be covered by such agreements include:

- manufacturing (e.g., fabrication of parts, assembly of components, and final assembly and painting of end-use items);
- repair (e.g., diagnostics, refurbishment, overhaul and rebuild); and
- technical services (e.g., testing and analysis, and repair process design, and in-service engineering).[81]

Three different parties stand to benefit from this type of partnership. The parties may be represented as the depot itself, the commercial partner, and the ultimate end user or 'warfighter.' Figure 14 displays the potential benefits each of the three parties may realize in the partnership.[82]

Figure 14: Three-way benefits with public-private partnerships



Source: Erickson, Steven R. *Public Private Partnerships for Depot-Level Maintenance*, Logistics Management Institute, March 2002.

[81] Office of the Secretary of Defense, *"Depot Maintenance Long-Term Strategy" Report to Congress*.
[82] Erickson, *Public-Private Partnerships for Depot-Level Maintenance*, 15-16.

From the perspective of the organic depots, partnerships can have a number of positive effects. Commercial partners may bring in capital investment that would otherwise be unavailable. When partnerships involve facility and base operating support leases, they spread overhead across a broader base and reduce the incremental cost of production for all of a depot's workloads. When partnerships involve the production of goods or services, the added workload helps preserve the depot's skilled labor base and again, broaden the cost base for overhead allocations. Direct access to commercial expertise and management methods help improve overall logistics support. When the commercial partner is also the OEM, a depot can obtain improved access to technical support for depot maintenance production and process issues.[83]

Partnerships provide built-in surge capability that might not be readily available in the commercial sector. Most importantly, partnerships improve day-to-day support responsiveness by applying the best of organic and commercial capabilities to the support requirement.[84]

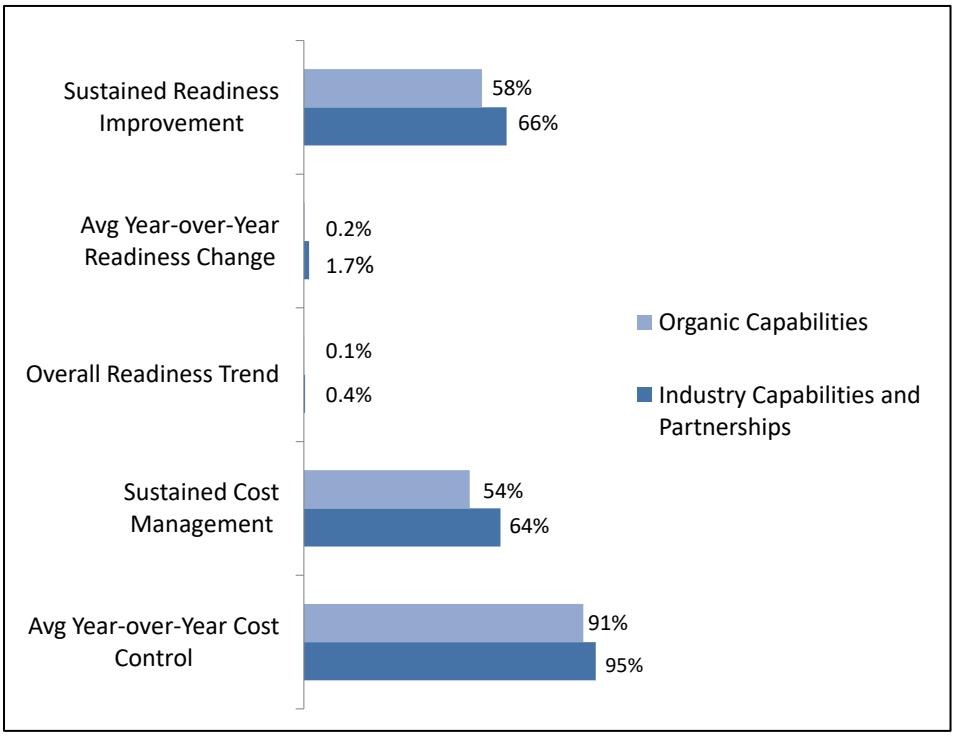
In December 2004, the DoD established a Logistics Transformation Strategy, which included new depot maintenance partnerships. Later, in a 2009 report study, Office of the Secretary of Defense reported that, according to a recent study, 99 of the 348 depot maintenance partnerships demonstrate "explicit product support performance improvement". (The other 249 partnerships were not classified in the "explicit product support improvement" category).

Additionally, in that study, 48 arrangements reported some form of improved business practice or updated technology to the depot-level maintenance activities (DMAs) as a result of the partnering. The most common category reported was exposure to or implementation of a commercial best business practice. In most cases best business practices led to an improvement on the depot floor such as increased efficiency, improved schedule conformance, or quicker turner. In that same study, cost avoidances totaling $158.3 million were reported in 22 arrangements; 84 of the maintenance public-private partnering arrangements increased facility utilization at the DMA.[85]

The 2009 study data show that strategies involving partnering with industry yield an **8 percent higher sustained readiness** than pure organic approaches. They also yield a **10 percent higher sustained cost management** (cost management translates into reduced costs of services, with increased value being delivered to the customer), as shown in Figure 15.[86]

[83] Erickson, *Public-Private Partnerships for Depot-Level Maintenance*, 16-17.
[84] Ibid, 17-18.
[85] Office of the Secretary of Defense, *Public-Private Partnerships for Depot-Level Maintenance through the End of Fiscal Year 2006,* II-27-II-28.
[86] Department of Defense. *DoD Weapon System Acquisition Reform Product Support Assessment,* 45-46.

Figure 15: Industry partnerships yield better readiness improvement and cost management than organic-only depot operation



Source: Department of Defense, *DoD Weapon System Acquisition Reform Product Support Assessment,* November 2009, 46.

Honeywell: A PPP Success Story using PBL

In 2000, the U.S. Navy signed a contract with Honeywell International Inc. and Caterpillar Logistics Services Inc., as a subcontractor, to undertake a public-private partnership (PPP) for maintenance of the F/A-18 Fighter Auxiliary Power Unit (APU)[87] at the Fleet Readiness Center-East (FRC-EAST), located at Cherry Point, NC (formerly known as the Naval Aviation Depot, or NADEP, Cherry Point). Today, more than 10 years later, the partnership, which involves the depot, Honeywell, and Caterpillar Logistics, is still going strong. This performance-based logistics (PBL) contract is considered a true win-win by all parties involved. It has produced a 91 percent improvement in logistics response time as compared to pre-partnership performance, and reduced average production turnaround time from 73 days in 2004 to 24 days in 2009. Quantitative data shows clearly measurable, dramatic improvements in reliability and cost management for the Cherry Point APU program.

Naval aviation depots, such as the Fleet Readiness Center (FRC)-East, maintain responsibility for the maintenance, repair, and overhaul of major aircraft weapons systems. These depots seek

[87] An APU is a self-contained generator used to start aircraft engines and provide power to the aircraft while on the ground. APU availability ultimately impacts aircraft availability, making it a vital piece of equipment to maintain as "fully operational."

to maximize aircraft operational availability, reduce the length of maintenance operations, reduce costs, and increase reliability for aircraft and inventory within established budget parameters. [88]

The public-private partnership dedicated to maintaining the F/A-18 APU is the oldest such arrangement in place at FRC-East. Because of its success, the FRC-East-Honeywell-Caterpillar Logistics program has been expanded to include other maintenance components and an additional location (FRC-Southeast in Jacksonville).

During the late 1990s there were significant readiness problems with the APU common to the FA-18/S-3/P-3/C-2 aircraft. Aircraft availability suffered because of backlogged APU maintenance. Depot overhaul turnaround time averaged more than 60 days and shortages of piece parts required for the overhaul were commonplace. Availability hovered at 65 percent, and on-time deliveries to the field were at 25 percent.[89]

Under the PBL contract, Honeywell provides program management, engineering expertise and process infrastructure, while subcontracting with FRC-East for the repair and overhaul "touch labor" on a cost-reimbursable basis, and with Caterpillar Logistics to provide supply chain-related services that include demand forecasting, as well as inventory and transportation management.[90] In 2007, the Navy identified that the cost savings were greater than $50 million.[91] Figure 16 outlines the distribution of responsibilities among the three contracting parties:

Figure 16: APU TLS program team responsibilities

Honeywell	Caterpillar Logistics	FRC-East
Overall program execution	Inventory management	Repair and overhaul
Customer support	Warehousing	Engineering support
Engineering support	Packaging, handling,	Technical publications
Fleet reps	Storage, and transportation	Logistics support
Reliability engineering	Total asset visibility	Continuous improvement
Quality assurance	Customer support	
Repair and overhaul	Service delivery	
Configuration management	Continuous improvement	
Original equipment manufacturer (OEM) Parts	Electronic data interchange/electronic commerce (EDI/EC)	
Continuous improvement		

Source: Government Accountability Office, *Depot Maintenance: Public-Private Partnerships Have Increased, but Long-Term Growth and Results Are Uncertain*, 53, and Lucyshyn et. al., *Improving Readiness with a Public-Private Partnership: NAVAIR's Auxiliary Power Unit Total Logistics Support Program*, 28.

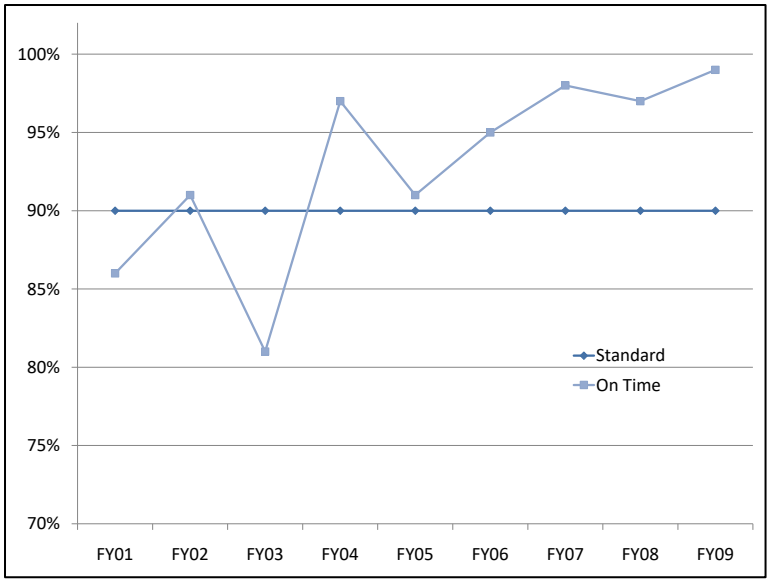
[88] NOTE: The SOW (2000) defines availability as: "the number of requisitions delivered within specified timeframes divided by the total number of requisitions received by the contractor, expressed as a percent". The contractor is expected to maintain at least 90 percent availability and is monetarily penalized for each percentage point below 90 percent. The penalty amount increases for availability equal to or less than 82 percent.
[89] Landreth, Clifford J., Richard H. Wilhelm II, and Laura L. Corporon. *Performance-Based Logistics (PBL) for the F/A-18/S-3/P-3/C-2 Auxiliary Power Unit (APU) at Honeywell: An Applied Analysis.*
[90] Ibid.
[91] Heron, Jeff. "Performance-Based Logistics." *Presentation at 2007 SOLE/DAU/LOGSA.* Slide 28.

By May 2004, NAVAIR credited the TLS partnership with more than 30 reliability improvements, which it estimated would produce upwards of $50 million in cost avoidance and savings.[92] These cost avoidance/savings items included reducing inventory investment required to support the APU repair program. By making engineering and parts upgrades, Honeywell improved the reliability of the APUs significantly. It enabled the Navy to redeploy 24 of the APU mechanics to other lines, thereby improving labor utilization and productivity.

By 2009, fleet availability—i.e., the percentage of APU up time—jumped from 86 percent in 2001 to 99 percent. The decrease in fleet availability experienced in FY03 was due to the addition of a fuel control platform to the program, and the resulting 'learning curve' experienced by the PPP in managing inventory and repairs.

From FY 2001 to FY 2009, the single time that delivery performance dropped below the 90 percent required standard was in 2003. This decline was attributable to the inclusion of a new item—fuel control platforms—in the yearly renewal of the contract.[93] Figure 17 illustrates Caterpillar Logistics' delivery performance over the course of the entire FRC-East contract—starting in 2001. These delivery performance numbers mirror Honeywell's data on fleet availability, demonstrating that optimum logistics performance translates directly to significant improvements in fleet availability.

Figure 17: Caterpillar Logistics' delivery performance



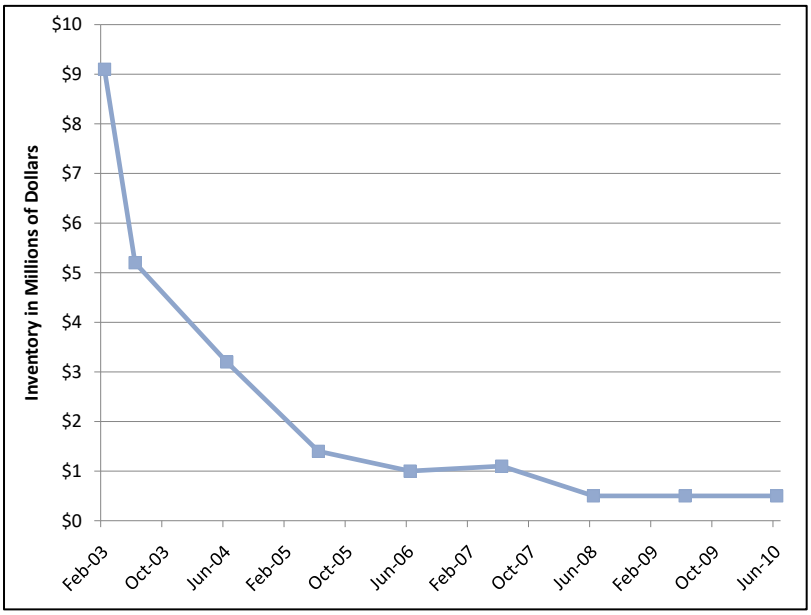
Source: Honeywell, *Total Logistics Support Program Management Review*, PowerPoint Presentation, Slide 23, November 3, 2009.

[92] Government Accountability Office, *Depot Maintenance: Public-Private Partnerships Have Increased, but Long-Term Growth and Results Are Uncertain*, 53, and Lucyshyn et. al., *Improving Readiness with a Public-Private Partnership: NAVAIR's Auxiliary Power Unit Total Logistics Support Program*, 28.
[93] Cusack, *Interview*, 26-May.

Inventory reduction was not established as a performance metric in the Honeywell-Caterpillar Logistics-FRC-East partnership. However, thanks to better forecasting and the other innovations, inventory dropped from $9 million in 2003 to $450,000 in 2010, a 95 percent decrease (Figure 18).

One of the biggest reasons the Honeywell-Caterpillar Logistics partnership succeeded in reducing inventory so significantly is Caterpillar Logistics' proprietary inventory forecasting system. Caterpillar's forecasting solution analyzes individual part failure rates and combines this information with data on APU age, usage history, and upcoming monthly usage forecasts supplied by the Navy. Each month, the Navy feeds Honeywell-Caterpillar Logistics a forecast of flying hours. Caterpillar Logistics loads this information into its forecasting engine. The system analyzes the data and develops a forecast as to repair demand. This forecast is broken down to the piece-part level. It serves as the basis for determining exactly what parts to hold in inventory, in what quantity.

Figure 18: Inventory owned by Honeywell at FRC-East



Source: Caterpillar Logistics, 2010.

The public-private partnership at FRC-East offers a clear example of what can be accomplished under a well-managed PBL program. All three parties—the FRC-East, Honeywell and Caterpillar Logistics—benefit from the 10-year relationship by all measures.

- The FRC-East APU public-private partnership has captured a total of $35 million in benefits for the Navy to date.

- The depot repair production lines operate far more efficiently, thanks to having synchronized availability of parts.
- Backorders are non-existent and have been that way for years.
- Inventory availability is 99 percent.
- On-time delivery is at 99 percent.
- Fleet availability across all platforms is at 95 percent to 100 percent.
- Mean flight hours between unscheduled APU removals (MFHBUR) improved significantly as a result of both the PBL activities as well as a complete revamping of maintenance plans.
- The depot can handle surge capacity without problems.
- Inventory costs were slashed dramatically—from $9 million to $450,000 a year.

Most importantly, these improvements ensure that the warfighter—at least when it comes to APUs—has the equipment needed to fly.

Better Management of DoD's Lifecycle Support Inventory

Inventory management plays a vital role in DoD product support, especially related to improving cost savings. Inventory management has been a chronic challenge for the DoD for years, particularly in sustainment of weapons systems platforms, and other maintenance and repair activities. This issue remains despite recent DoD efforts to reduce inventory.

The DoD spends billions of dollars to purchase, manage, store, track, and deliver spare parts and other supplies needed to keep military equipment ready and operating. DoD manages more than four million secondary items in an inventory valued at $95.6 billion in 2010. However, DoD identified $8.4 billion (8.3 percent) of its secondary inventory as excess and categorized it for potential reuse or disposal (i.e., potential reutilization stock or on-hand excess).[94]

In a May 2013 report on inventory management efforts at DoD, GAO recommended the agency take steps to improve demand forecasting, ensure proper reviews are conducted and documented, validate methodologies for making retention decisions, and establish goals and metrics for assessing the efficiency of inventory management.[95]

DoD has been working on the inventory issue for some time. In October 2010, it established the Comprehensive Inventory Management Plan, required by the National Defense Authorization Act for FY2010. The plan had two overarching goals:

- Reduce total on-order excess inventory from 8.5 percent of total obligated on-order dollars in fiscal year 2009 to a target of 6 percent by the end of fiscal year 2014 and 4 percent by the end of fiscal year 2016, and

[94] United States Government Accountability Office. "Actions Underway to Implement Improvement Plan, but Steps Needed to Enhance Efforts." GAO-12-493, May 3, 2012. Page 3.
[95] Ibid.

- Reduce on-hand excess inventory from 11.3 percent of the total value of inventory in fiscal year 2009 to a target of 10 percent by the end of fiscal year 2012. Reducing the percentage of on-order excess inventory would result in less economic or contingency retention stock being held by the department and/or less potential on-hand excess inventory that must be disposed of by the department since there is not a need for the item.

As part of this effort, the department developed nine sub-plans designed to help reduce excess inventory and improve inventory management practices.[96]

GAO reported in 2012 that DoD had made progress in implementing its inventory improvement plan and was tracking reductions to its excess inventory. The DoD was 18 months into a four-year implementation period with many planned activities incomplete (see Figure 19). DoD reported that from fiscal years 2009 to 2011 it had reduced on-order excess inventory by approximately $632 million—a reduction that achieved its initial target four years early. DoD has maintained less than ten percent on-hand excess inventory since 2009. Since DoD exceeded its initial targets, GAO recommended the DoD periodically reexamine and update its targets. In response, DoD reexamined its on-order and on-hand targets and revised its on-hand excess inventory target to 8 percent by fiscal year 2016. DoD made no changes to its on-order excess inventory targets.[97]

Figure 19: Summary of implementation status of actions for comprehensive inventory management plan as of January 1, 2012

Sub-plan	Completed	Started, on schedule	Started, completion delayed
Demand forecasting (appendix IV)	0	0	5
Total asset visibility and multi-echelon modeling (appendix V)	0	3	0
On-order excess (appendix VI)	0	0	2
Economic retention stock (appendix VII)	0	3	0
Contingency retention stock (appendix VIII)	1	1	1
Storage and direct vendor delivery (appendix IX)	2	1	1
No demand items (appendix X)	0	1	1
Potential reutilization stock (appendix XI)	0	3	0
Other inventory improvements (appendix XII)	0	2	2
Total	**3**	**14**	**12**

Source: United States Government Accountability Office. "Actions Underway to Implement Improvement Plan, but Steps Needed to Enhance Efforts." GAO-12-493, May 3, 2012.

[96] Ibid, 8.
[97] United States Government Accountability Office. "High Risk Series: An Update." GAO-13-283, February 2013.

OSD, the Services, and DLA have demonstrated progress in other areas of the *Plan*'s implementation:[98],[99]

- **Automated access to inventory.** OSD, the Services, and DLA determined that 95 percent of DoD's inventory is accessible by automated means to the Services and DLA, which exceeded the *Plan*'s goal of achieving automated accessibility to 90 percent of its inventory within five years. Basic inventory visibility was achieved through investment in enterprise resource planning and other information management systems.
- **DLA's in-storage visibility program.** OSD, the Services, and DLA have increased participation in the in-storage visibility program, which allows Services and DLA to obtain consumable items from another Service or DLA through established business rules. For example, the Air Force had 145 sites participating in fiscal year 2010 and increased the number to 190 sites.
- **No demand items.** OSD, the Services, and DLA have begun reviewing their inventories for items that have not had any orders for five or more years, to reevaluate the justification for retaining these items; even if the items are within the approved acquisition objective.

As part of the Plan, DoD is developing a set of metrics (see Figure 20) to assess the effectiveness and efficiency of its inventory management. The Office of the Secretary of Defense is leading the development of a supply chain metrics strategy designed to identify key department-wide metrics to monitor the performance of the supply chain and serve as a basis for making supply chain guidance and resource decisions.[100]

The portfolio of metrics fall under five key areas: readiness, responsiveness, reliability, cost, and planning and precision. Some metrics that have been identified—such as customer wait time—are currently reported by DoD, while other new metrics would require establishing a data source and methodology. However, the Plan does not include steps to incorporate the metrics into DoD guidance. Without guidance specifying standardized definitions, methodologies, and procedures for data collection, DoD's efforts to employ metrics to monitor and evaluate inventory management performance may be hindered.

[98] United States Government Accountability Office. "Actions Underway to Implement Improvement Plan, but Steps Needed to Enhance Efforts." GAO-12-493, May 3, 2012. Page 19.
[99] United States Government Accountability Office. "High Risk Series: An Update." GAO-13-283, February 2013.
[100] Ibid.

Figure 20: Supply chain outcome and attributes

Outcome of supply chain	Definition of outcome	Example of a potential metric	Definition of potential metric
Readiness	The ability of the supply chain to support weapon systems in undertaking and sustaining their assigned missions at planned peacetime and wartime utilization rates.	Not mission capable rate for maintenance or supply	Materiel condition indicating that systems and equipment are not capable of performing any of their assigned missions because of maintenance requirements or a maintenance work stoppage due to a supply shortage.
Attributes of supply chain	**Definition of attribute**	**Examples of a potential metric**	**Definition of potential metric**
Responsiveness	The ability of the supply chain to respond to customer materiel requests according to priority by providing the right support when it is needed and where needed.	Customer wait time	A measurement of the total elapsed time between the issuance of a customer order from organizational maintenance and the satisfaction of the customer order.
		Acquisition lead time	The sum of administrative lead time plus production lead time.[a]
Cost	The amount of supply chain resources required to deliver a specific performance outcome.	Total supply chain costs	The total cost of the DOD supply chain including operating and materiel costs.
		Tiered inventory turns	The number of times that the inventory cycles or turns over in a year. A tiered approach looks at specific layers of inventory and their turn cycles.
		Inventory dollars with five or more years of no demand	Inventory dollars for items with five or more years of no demand segmented by the approved acquisition objective, economic retention stock, contingency retention stock, and potential reutilization stock.
Reliability	The dependability and consistency of the supply chain providers to deliver required materiel support at a time and destination specified by the customer.	Denial rates	The percent of items directed for shipment that distribution depots reported a failure to ship all or part of the quantity originally directed for shipment.
		Wholesale supply availability	The percent of demands that are not backordered, excluding future materiel obligations.
Planning and precision	The ability of the supply chain to accurately anticipate customer requirements and plan, coordinate, and execute accordingly.	Demand forecast error	The difference between actual demand and forecasted demand, stated in a manner that quantifies any bias towards over or under forecasting.
		On-hand excess inventory	The dollar amount and the percentage of the total value of the inventory considered potential reutilization stock (or on-hand excess).
		On-order excess inventory	The dollar amount and the percentage of total obligated on-order dollars above the approved acquisition objective.

Source: United States Government Accountability Office. "Actions Underway to Implement Improvement Plan, but Steps Needed to Enhance Efforts." GAO-12-493, May 3, 2012. Page 25.

Strategic Sourcing

The application of strategic sourcing offers another opportunity for cost savings in DoD's product support improvement efforts. Strategic sourcing is defined as a method to optimize supply base and reduce total cost of ownership.[101] Strategic sourcing is not new to DoD. The DoD officially initiated a collaborative and structured strategic sourcing process in 2003. However, its definition and practice is not consistent across the Department.[102] With the amount of funding that DoD spends on product support, even 1 percent in cost savings would yield significant savings. Equally important would be the enhanced mission delivery, achieved through re-design of business processes and components to enhance operational effectiveness and competitiveness.[103]

[101] General Services Administration. "Strategic Sourcing Process." Accessed November 13, 2013. Available at https://strategicsourcing.gov/strategic-sourcing-process.
[102] Department of Defense: Defense Procurement and Acquisition Policy. "DoD-Wide Strategic Sourcing Program: Concept of Operations." June 2013. Page 1.
[103] Defense Business Board Report to the Secretary of Defense. "Strategic Sourcing." January 2011. Page 3.

On May 20, 2005, OMB defined strategic sourcing as "the collaborative and structured process of critically analyzing an organization's spending and using this information to make business decisions about acquiring commodities and services more effectively and efficiently."[104]

> ***Strategic sourcing commercial sector results***
>
> Examples of private sector successes with strategic sourcing:
>
> - Tyco used 18 global strategic sourcing teams to transform acquisition practices and deliver $1B savings, a 14% cost reduction.
> - At IBM, global costs were driven down 21% even with 30% logistics volume growth
> - Best Buy cut inventory costs by $600M
> - Wal-Mart's ongoing strategic sourcing initiatives drive 5% year over year cost savings
>
> (Defense Business Board Report to the Secretary of Defense. "Strategic Sourcing." January 2011. Appendix.)

The current DoD management approach has been to allow each of the Military Services and Defense Agencies to independently evolve their own strategic sourcing programs. The Air Force is the furthest ahead in this, according to the Defense Business Board, with the establishment of commodity councils and a management philosophy that embraces the principles of strategic sourcing as commonly applied in the commercial sector. The Defense Logistics Agency (DLA) has the most mature strategic sourcing effort underway, but this effort represents only 10 percent of the total DoD spend and is focused primarily on high volume consumables.[105]

Strategic sourcing is widely used in the private sector. Private sector strategic sourcing is about buying in a more focused way to save money—based first on detailed requirements gathering and market analysis to better understand genuine business needs, and then on standardized sourcing and supplier management processes at a state- or province-wide level. Aligning these practices with current marketplace practices allows the government to leverage its considerable buying power for better prices and better service.[106]

Strategic sourcing includes longer-term initiatives, such as capability building and organizational restructuring; addresses the typically decentralized structure of buying and the resulting inability to carry common requirements across agencies, and rationalizes the sourcing process from a holistic total cost perspective, versus just pursuing a series of low-cost bids. Whereas historically government (as well as private) organizations have tended to handle buying as a transaction, strategic sourcing is grounded in getting greater value for a dollar. Strategic sourcing can bring returns on investments that are 10 times the cost of initial implementation.[107]

[104] Department of Defense: Defense Procurement and Acquisition Policy. "DoD-Wide Strategic Sourcing Program: Concept of Operations." June 2013. Page 2.
[105] Defense Business Board Report to the Secretary of Defense. "Strategic Sourcing." January 2011. Page 3.
[106] "Strategic Sourcing: A Powerful Tool for High Performance in Difficult Times." Accenture. 2012. Page 1.
[107] Ibid, 2.

Strategic sourcing begins with data collection and analysis to develop a deeper understanding of where and how government spends money and to develop profiles of different categories of spend and a business case for the savings to be realized by pursuing strategic sourcing. After assessment, strategic sourcing moves into implementation: harmonizing or normalizing requirements and service levels that take into account the bigger picture (including elements such as total cost of ownership and value through customer service); evaluating supplier markets; developing strategies and tactics for sourcing of different categories; evaluating suppliers through competitive bids; and then moving into negotiations for awarding new contracts.[108]

The Defense Business Board recommended that DoD establish a sourcing vision that incorporates "Better Buying Power" and drive the DoD enterprise toward it. This would include the use of a new definition of strategic sourcing. The current OMB definition employed by DoD is focused on spend analysis rather than a more robust characterization of strategic sourcing that emphasizes process improvement. This recommendation was offered by the Defense Business Board as part of a strategic sourcing innovation framework based on those best practices of private sector corporations it considers appropriate for the Department.[109]

The DoD has been working on the issue of strategic sourcing for a number of years. It officially initiated a collaborative and structured strategic sourcing process by establishing the DoD-Wide Strategic Sourcing (DWSS) Program in 2003 to ensure "improved efficiencies and economics in [DoD's] acquisitions resulting in reduced costs and improved effectiveness." The program began with a spend analysis and opportunity assessment study.[110]

The DWSS Program aimed to improve mission responsiveness by continually aligning DoD's acquisition processes to strategically driven functions (such as sourcing teams, integrated technologies, improved collaboration across services, and a cost-sensitive culture that is understanding of DoD's enterprise-wide procurement and cost structure) that will obtain the efficiencies necessary.[111]

Core objectives of the DWSS program include: [112]

- Establish department-wide, cross-functional sourcing strategies which target science and engineering (S&E) and services, where mission appropriate
- Reduce the total cost of ownership (TCO) for acquired S&E and services. The DWSS Program focuses on TCO, which means taking into account all costs related with the acquisition, use and disposal of the acquired product or service
- Transform acquisition business processes from transactional to strategic, which includes implementing standardized collaborative acquisition business processes.

[108] Ibid.
[109] Defense Business Board Report to the Secretary of Defense. "Strategic Sourcing." January 2011. Page 7-8.
[110] Department of Defense: Defense Procurement and Acquisition Policy. "DoD-Wide Strategic Sourcing Program: Concept of Operations." June 2013. Page 1.
[111] Ibid, 5.
[112] Ibid, 6.

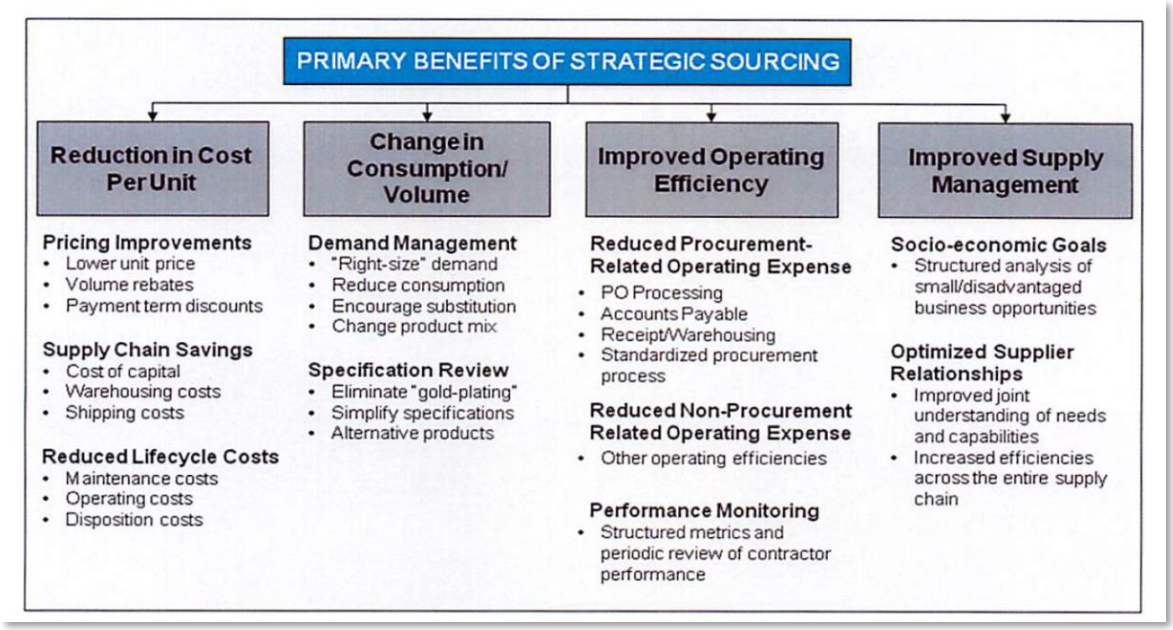
- Improve skills of DoD acquisition community by encouraging acquisition professionals to think like "business managers," broadening the current focus on compliance with the Federal Acquisition Regulation (FAR) to incorporate more innovative sourcing processes.

Strategic Sourcing Benefits

Strategic sourcing promotes an efficient acquisition system that fulfills DoD requirements and ensures effective use of taxpayer dollars, while producing benefits that go far beyond leveraging the government's spend to negotiate lower prices (See Figure 21). [113]

Overall, strategic sourcing as outlined would help DoD control costs more effectively. Strategic sourcing controls cost growth by increasing acquisition productivity growth through will cost/should cost management in both contract negotiation and contract administration. It also eliminates inconsistent approaches to or redundant business arrangements of acquiring similar S&E and services and leverages buying power to obtain better prices. More than just unit price reductions, total cost of ownership savings can be achieved through reduced volume and consumption (demand management), improved process efficiencies, and better supplier management.[114]

Figure 21: Benefits of strategic sourcing



Source: Department of Defense: Defense Procurement and Acquisition Policy. "DoD-Wide Strategic Sourcing Program: Concept of Operations." June 2013.

Strategic sourcing is not about simply reducing the number of contracts, leveraging buying, or saving money. It instead seeks to maximize enterprise-level benefits by achieving for the

[113] Ibid, 12.
[114] Ibid, 7.

Warfighter the right balance between service levels, quality, innovation, delivery time, price, competition, costs to purchase and administer, and attainment of small business goals.[115]

Strategic sourcing, according to the Office of the Secretary of Defense, offers far-reaching and numerous benefits to DoD customers (i.e., requesting offices), buyers (i.e., contracting offices), and suppliers (i.e., prime contractors). These benefits provide needed improvements in capabilities for setting strategic direction, defining requirements, executing purchases, and encouraging participation from essential customers, buyers, and industry. [116]

[115] Ibid, 12.
[116] Ibid.

Part III: Improving Product Support

In the previous section, we discussed examples of PBL success stories and other improvement efforts relating to inventory management and sourcing practices. This section discusses opportunities for continued improvement to DoD's product support by leveraging technical advances with alternative fuels and robotics. Additionally, we examine the use of Lean Six Sigma, strategic sourcing, and economic order quantity authority to reduce costs and optimize limited resources.

Leveraging Available Technology

The public and private sector are pursuing innovative technologies for reducing supply chain risk, driving out cost, improving safety and efficiency. In this section we discuss two, which we believe can have significant impact: alternative fuels and robotics.

Alternative Fuels

Alternative fuels – particularly for transportation vehicles – are a significant area of interest for both DoD and private sector distribution and delivery operations. The private sector has already begun experimenting with a number of non-petroleum-based fuel types for several key reasons:

- Reduce dependence on foreign oil
- Reduce carbon footprint
- Reduce risk associated with supply disruption
- Reduce risk associated with oil price volatility
- Insulate supply chains from geopolitical volatility

As one example, ground transportation companies are turning to liquefied natural gas, which is cheaper and burns more cleanly, making it easier to meet government emissions standards. LNG fuel system technology has made rapid advances in the past five years. For example, Cummins, a leading engine manufacturer, has developed a 12-liter LNG engine that makes long-distance runs possible, delivering 400 horsepower and 1450 ft-lb of torque.[117]

Major shippers like Procter & Gamble, mindful of both fuel costs and green credentials, are turning to companies with natural gas trucks in their fleets. However, the number of natural gas vehicles remains limited because these vehicles are more expensive than conventional trucks and natural gas fueling stations are few, and far between. [118] Even so, in April 2013, UPS announced a plan to construct four liquefied natural gas refueling stations and expand its fleet of natural gas-powered vehicles to over 800 by 2014.[119]

UPS has taken efficiency to another level in its sustainability efforts. In 2011, UPS Vice President of Automotive Engineering and Operations, Mike Hance, discussed the use of UPS

[117] Fitzsimmons, Michael. "Cummins' New 12-Liter Natural Gas Engine Is Game Changer for Clean Energy." Seeking Alpha. November 6, 2013.
[118] Cardwell, Diane, and Clifford Krauss. "Trucking Industry Is Set to Expand Its Use of Natural Gas." *The New York Times*. April 22, 2013.
[119] Williams, Justin. "UPS Natural Gas Vehicle Fleet." Energy & Capital. April 26, 2013.

delivery trucks as "rolling laboratories." These trucks or "labs" contain an advanced telematics system that monitors and records engineering data, including emissions and fuel outputs within package cars. Sensors within the vehicles provide data about the behavioral and mechanical variables that affect fuel efficiency. Those variables include speed, acceleration, braking, routing information and the performance of specific parts and components in the engine and drive train. This data is then analyzed by UPS maintenance teams against other key data such as GPS-based location tracking information and package delivery data. Over 44,000 of UPS vehicles are equipped with this advanced telematics system, and has resulted in reducing the amount of time spent idling by up to 15 minutes per driver per day, or 25 gallons of fuel per driver per year. When fully deployed in the small package car fleet in the United States, the reduction of idling time by 15 minutes per day per driver would save 1.4 million gallons of fuel.[120]

In the rail sector, BNSF and other major U.S. railroads are experimenting with alternative fuel-powered locomotives. BNSF, for instance, has been testing low-emissions LNG-switch locomotives - one of the cleanest-burning locomotive technologies in existence. They're also working with a partner and the U.S. Department of Defense to develop an experimental hydrogen fuel cell switch locomotive. This experimental technology has the potential to reduce air pollution and is not dependent on oil for fuel.

The DoD has begun to examine alternative fuels as evidenced by the hundreds of millions of dollars on the development, testing, and certification of alternative fuels that can substitute for petroleum-derived fuels used by the Army, Navy and Marine Corps, and Air Force in their tactical weapon systems.[121]

In 2009, Secretary of the Navy Ray Mabus announced five aggressive energy goals to reduce the Department of Navy's consumption of energy, decrease its reliance on foreign sources of oil, and significantly increase its use of alternative energy. The purpose of these energy goals is to improve combat capability and to increase energy security by addressing a significant military vulnerability: dependence on foreign oil. As part of this effort, the Navy, in collaboration with the U.S. Department of Agriculture and the U.S. Department of Energy, is collaborating on a three-year, $510 million program to develop and test alternatives fuels with its' "Great Green Fleet,"[122] a carrier strike group fueled by alternative sources of energy, including nuclear power.

Although accounting for less than 1 percent of all domestic energy use, the Defense Department remains the single largest consumer of energy in the nation.

"[In 2011], our energy bills totaled $20 billion and we consumed about 5 billion gallons of petroleum," said Sharon Burke, assistant secretary of defense for operational energy plans and programs, in a speech at a 2012 alternative energy conference. Burke called biofuels and alternative fuels "sustainable and reliable" ways the United States can accomplish the defense

[120] Hance, Mike. "A Rolling Laboratory: UPS Trucks Delivering More Than Packages." December 2, 2011.
[121] Bartis, James T. and Lawrence Van Bibber. "Alternative Fuels for Military Applications." RAND Corporation. 2011. page iii
[122] Cardwell, Diane. "Military Spending on Biofuels Draws Fire." The New York Times. August 27, 2012.

mission she explained, adding that 75 percent of DOD's consumption is operational energy required for training, moving and sustaining military equipment and weapons.

"The department is going to have ships, planes and vehicles that were designed to use petroleum fuels for a very long time to come," Burke said. "[Alternative fuels] investment ensures our equipment can operate on a wide range of fuels, and that's important for our readiness over the long term." Burke also noted the DOD's long history of innovation and the role bioenergy will play in future missions.

"Hydrogen-powered unmanned aerial vehicles have the potential to achieve much longer mission durations than those that are powered by traditional petroleum-based products …and the department is interested in technologies that can generate fuel or energy at a tactical location."

"The Army, Navy, Air Force and the Marines have all recognized the vulnerability of our singular dependence on petroleum," Burke said. "They've all taken a first step toward a different future by certifying their equipment to operate on a range of alternative fuels…and that certification activity is really important."[123] Alternative fuels require a substantial investment in infrastructure in order to become a viable replacement for petroleum-based fuels. This infrastructure includes fueling stations, production facilities and the like. Such investment, at least domestically, will require some cost -sharing from industry to be successful.[124]

Alternative fuel vehicles and facility technologies also typically cost substantially more than traditional vehicles and facility solutions. Over time, costs will come down thanks to advancements in technology and widening use in the private sector. But in the short term, DoD must bear the incremental cost burden if it chooses to proceed with adoption. The DoD should continue to examine alternative fuels options and take further steps to implement a long-term plan to establish improved product support capabilities.

Robotics and Autonomous Systems

Another option available to improve product support efficiency is robotics, which has the opportunity to enhance logistics by replacing high-cost labor and, in some cases, removing humans from dangerous jobs. Long used in manufacturing, robotics is being introduced into certain types of distribution and transportation environments. Robotics can streamline processes and introduce long-term savings. The private sector has embraced autonomous systems for a variety of application, to include warehouse robots, such as the Kiva Systems solution, and autonomous trucks and cars.[125]

[123] Lyle, Amaani. "DOD Must Have Petroleum Fuel Alternatives, Official Says." American Forces Press Service. Washington, DC. July 11, 2012.
[124] Blakeley, Katherine. "DOD Alternative Fuels: Policy, Initiatives and Legislative Activity." Congressional Research Service. December 14, 2012. Page ii.
[125] Gansler et. al. Center for Public Policy and Private Enterprise. "Improving DoD's Product Support Efficiency." Presented at National Defense Industrial Logistics Forum. Arlington, VA. June 14, 2013.

Unlike conveyor, carousel and traditional automated storage and retrieval systems, Kiva robots bring product to the warehouse worker for order selecting. The warehouse worker stands at stations, and the Kiva robots do all the traveling. This eliminates the wasted time and effort – and cost – of having the warehouse employee travel to pick orders (see Figure 22).

Amazon was so impressed with the Kiva system that in March 2012, it purchased the company.[126] Amazon expects to have 69 warehouses up and running and an estimated $15 to $20 million dollars invested in a system with 1000 robots.[127]

Staples also has deployed Kiva robots in two of its e-commerce fulfillment centers. Traditional warehouse solutions failed to provide the flexibility, speed and cost profile that Staples needed to continue its exploration into high-efficiency supply chain configurations.[128]

Figure 22: Kiva Systems robots with picking racks

Source: Kiva Systems 2013

Staples' fulfillment system solution relies on mobile inventory delivered to operators at inventory stations around the perimeter of the facility.[129] This reduces employee walking and injuries, increases order fulfillments, and reduces costs while maintaining operational flexibility. "We lowered our supply chain costs significantly," reports Staples' supply chain vice president. "We've seen double digit increases in productivity for four straight years. The material handling and warehouse management systems allow us to prevent and, to some degree, predict where errors will occur so we can fix them before shipping the order to the customer. The key here is that we can prevent errors from occurring."[130]

The U.S. DoD research and development in robotics and autonomous systems research has begun to examine four main categories of robotics and autonomous systems: unmanned aerial vehicles, unmanned ground systems, unmanned maritime vehicles, and unmanned space systems.[131] Current research focuses on developing robotics and autonomous systems that increase warfighter capabilities, decrease exposure to life-threatening tasks, and reduce costs.[132]

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[126] Kucera, Danielle. "Amazon Acquires Kiva Systems in Second Biggest Takeover." March 19, 2012. Bloomberg.
[127] Wagstaff, Keith. "Amazon's $775 Million Acquisition of Kiva Systems Could Shift How Businesses See Robots." TIME Tech. March 21, 2012.
[128] Karl Manrodt, Michael Ogle and Lisa Harrington. "The Case for Infrastructure Investment: Lessons from Medco and Staples." Supply Chain Management Review. September 13, 2011.
[129] Ibid.
[130] Ibid.
[131] "Task Force Report: The Role of Autonomy in DoD Systems." Department of Defense: Defense Science Board. July 2012. (whole report)
[132] Ibid.

Unmanned Aerial Vehicles

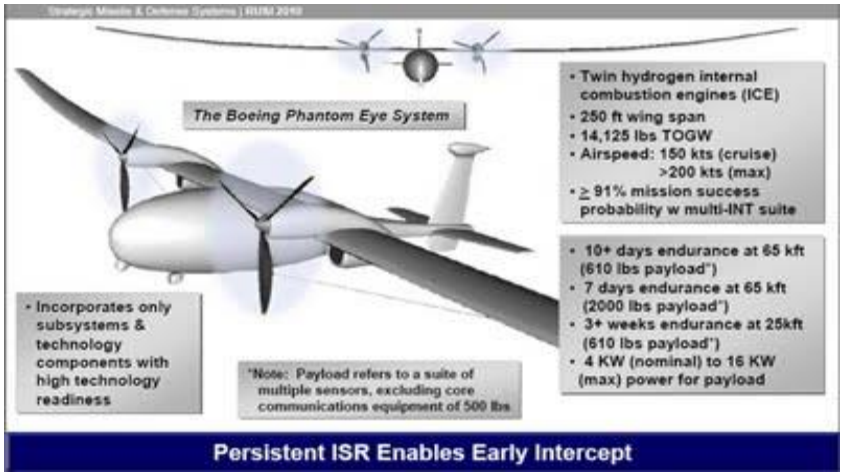
Figure 23: Northrop Grumman 37 RQ-4 Global Hawk UAV

Source: http://www.4thmedia.org/wp-content/uploads/2012/12/global-hawk-rq-4.n.jpg

In November 2010, UAVs passed one million combat hours.[133] Unmanned aerial vehicles can increase flying times, by removing the 12-hour flying time limitation of the pilot, and harnessing advances in power and propulsion technology.[134],[135] Unmanned aerial vehicles allow for longer missions and better situational awareness by eliminating human tiredness and adding sensors that send messages and video feed back to command.[136] UAVs also decrease reaction time, saving lives of ground troops.[137] UAV missions previously focused on tactical reconnaissance but have expanded to intelligence, surveillance and reconnaissance (ISR), battlespace awareness, strike missions, and logistics.[138] The Marine's Cargo Resupply Unmanned Aerial System's (CRUAS) unmanned Kaman K-MAX helicopter has proven capable of moving 1.76 million pounds of cargo using midflight hookups or "hot hookups," providing further evidence of UAV's logistics utility.[139]

[133] Department of Defense. Unmanned Systems Integrated Roadmap FY2011-2036. James Winnefield Jr, Admiral, USN Vice Chairman of the Joint Chiefs of Staff and Frank Kendall, Acting Under Secretary of Defense for Acquisition, Technology and Logistics. Reference Number: 11-S-3613. P 22
[134] "Task Force Report: The Role of Autonomy in DoD Systems." Department of Defense: Defense Science Board. July 2012. P 15
[135] Department of Defense. Unmanned Systems Integrated Roadmap FY2011-2036. James Winnefield Jr, Admiral, USN Vice Chairman of the Joint Chiefs of Staff and Frank Kendall, Acting Under Secretary of Defense for Acquisition, Technology and Logistics. Reference Number: 11-S-3613. P 77
[136] "Task Force Report: The Role of Autonomy in DoD Systems." Department of Defense: Defense Science Board. July 2012. P 15
[137] Ibid.
[138] Department of Defense. Unmanned Systems Integrated Roadmap FY2011-2036. James Winnefield Jr, Admiral, USN Vice Chairman of the Joint Chiefs of Staff and Frank Kendall, Acting Under Secretary of Defense for Acquisition, Technology and Logistics. Reference Number: 11-S-3613. P 21
[139] Wilson, J.R. "Unmanned Logistics Support: 21st Century Robotic Beasts of Burden." Defense Media Network. December 10, 2012.

Figure 24: Boeing Phantom Eye



Source: http://2.bp.blogspot.com/-Ws_Av6gZnEs/TjubBHa4PuI/AAAAAAAAAec/uKFBStfzvNo/s400/phanto%2Beye-2.jpg

Figure 25: Lockheed Martin Convoy Active Safety Technology (CAST)

Source: http://www.lockheedmartin.com/content/lockheed/us/100years/stories/alv/_jcr_content/right_column/image_1.img.jpg/1357244660353.jpg

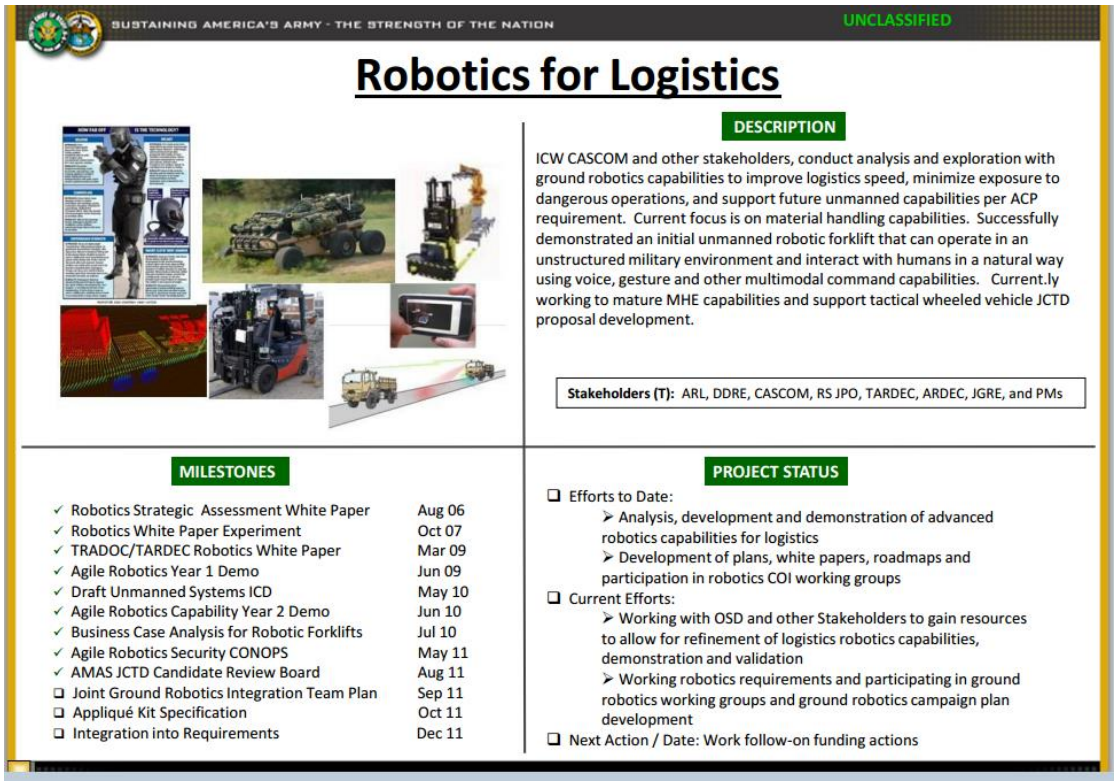
Unmanned Ground Systems

The DoD also continues to explore unmanned ground systems, such as reconnaissance robots and robotic cargo delivery systems, used for three main mission areas: maneuver, maneuver support, and sustainment.[140] Unmanned systems can be used to deploy, distribute, and supply forces to increase safety and decrease costs.[141] These robotics and autonomous systems reduce manpower needs and increase warfighter safety by freeing and removing the warfighter from the site.[142] Ground vehicle logistics convoys contain important supplies to support warfighter capabilities and remain major targets for enemy attacks.[143] Lockheed Martin is working on an expansion of the Convoy Active Safety Technology (CAST) (Figure 25) to achieve the operation of a semi- autonomous logistics convoy with no human drivers.[144]

[140] Department of Defense. Unmanned Systems Integrated Roadmap FY2011-2036. James Winnefield Jr, Admiral, USN Vice Chairman of the Joint Chiefs of Staff and Frank Kendall, Acting Under Secretary of Defense for Acquisition, Technology and Logistics. Reference Number: 11-S-3613. P 24
[141] Ibid.
[142] Wilson, J.R. "Unmanned Logistics Support: 21st Century Robotic Beasts of Burden." Defense Media Network. December 10, 2012.
[143] "AutoMate Convoy Module." Lockheed Martin. 2013. Accessed March 3, 2013.
[144] Ibid.

Figure 26 provides an overview of robotics projects in the U.S. Army. One of the innovations tested was an unmanned robotic forklift

Figure 26: Overview of Army robotics projects



Source: https://lia.army.mil/robotics%20quad%20chart.pdf

Unmanned systems and robotics may enhance the warfighter's ability to survive and adapt to the changing battlefield. Autonomous robots, for example, conduct tasks in unstructured environments without continuous guidance from an operator. Autonomy reduces operator workload and increases performance when communication is limited or unreliable. However, non-autonomous solutions may simply shift the task from direct control by the warfighter, to remote control by teams of operators.

Industry has demonstrated applications of autonomous driving over thousands of miles of highway, and during open-pit mining operations. However, safety is a critical concern and one of the most significant issues autonomous vehicles must overcome before they can be widely accepted and fielded.[145]

Robotics or automation present challenges for organizational culture and cost. Robotics-related challenges include cultural resistance within the DoD because of jobs displacement; capital

[145] Unmanned Ground Systems Roadmap, Robotics Systems Joint Project Office, July 2011, 20-24

needs to finance the replacement of parts or other modifications for alignment with the new technologies; the development of technology, and the training of staff and users.[146] The DoD must take these challenges into consideration when evaluating the cost-effectiveness and cost-benefits of implementing and utilizing these new technologies.

Process Improvement

Best of breed commercial firms use a strategy to continuously examine and improve their processes. The DoD has adopted Lean Six Sigma as its preferred strategy for continuous process improvement (see DoDI 5010.43), but it has yet to be fully embraced.

Lean Six Sigma is a business improvement methodology aimed to improve the quality, efficiency, customer satisfaction, and lower costs while maximizing shareholder value. Using lean practices address the hidden costs of quality issues such as long cycle times, downtime, expediting costs, overtime and lost sales. Companies can identify non-value added activities in a process using tools provided in Lean Six Sigma. Using lean achieves cost-efficiency that lowers business process costs as well as inventory reduction that reduces inventory costs and size. Lean practices also achieve shorter cycle times through reduction in waste in production.[147]

Best practices include developing metrics to track ROI while implementing Lean Six Sigma, and getting commitment from all levels of the organization, especially the senior leadership. Training of employees of all levels on the concept and implementation of Lean Six Sigma, and increasing visibility at all levels in order to ensure that corporate and operational goals are aligned to help achieve maximum value from Lean Six Sigma, are other best practices that have been implemented in the private sector. Additionally, understanding customer needs in order to successfully identify where Lean Six Sigma can help improve the business process.[148]

Ford and IBM serve as two examples of private sector success implementing Lean Six Sigma methodology. Ford Motor co. implemented Six Sigma, and saved $300 million dollars. They utilized the DMAIC methodology and attributed their success to two factors: committed senior leadership and understanding customer needs. IBM Global Business Services helped leverage Lean Six Sigma methodology for a healthcare client resulting in savings of $236,000/year in administrative tasks involving data entry and archiving alone an overall 23% savings on costs per year, as opposed to the original approach the client was using.[149]Implementing Lean Six Sigma begins by assessing the current state of the business. The current state is assessed using Value Stream Mapping, a Lean tool that identifies non-value added activities in a process. The Value Stream Map shows where the bottlenecks are; then you can use waste-cutting Lean tools to

[146] Gansler et. al. Center for Public Policy and Private Enterprise. "Improving DoD's Product Support Efficiency." Presented at National Defense Industrial Logistics Forum. Arlington, VA. June 14, 2013.
[147] Ibid.
[148] Ibid.
[149] Ibid.

attack low-hanging fruit and Six Sigma analytical tools to drill deeper and find the root causes of tougher problems.[150]

Individual problems are solved using DMAIC, which consists of five steps:[151]

- Define the problem
- Measure current performance
- Analyze the problem to determine the root cause of the poor performance
- Improve the situation by addressing the root cause
- Control the process so that improvements are sustained

Using these tools in combination with other process improvement strategies, the DoD has an opportunity to take great strides in product support.

One example where the DoD has used LSS process improvement methods to streamline DoD logistics, particularly in the transportation area, is the TRANSCOM case below.

Streamlining Transportation at TRANSCOM

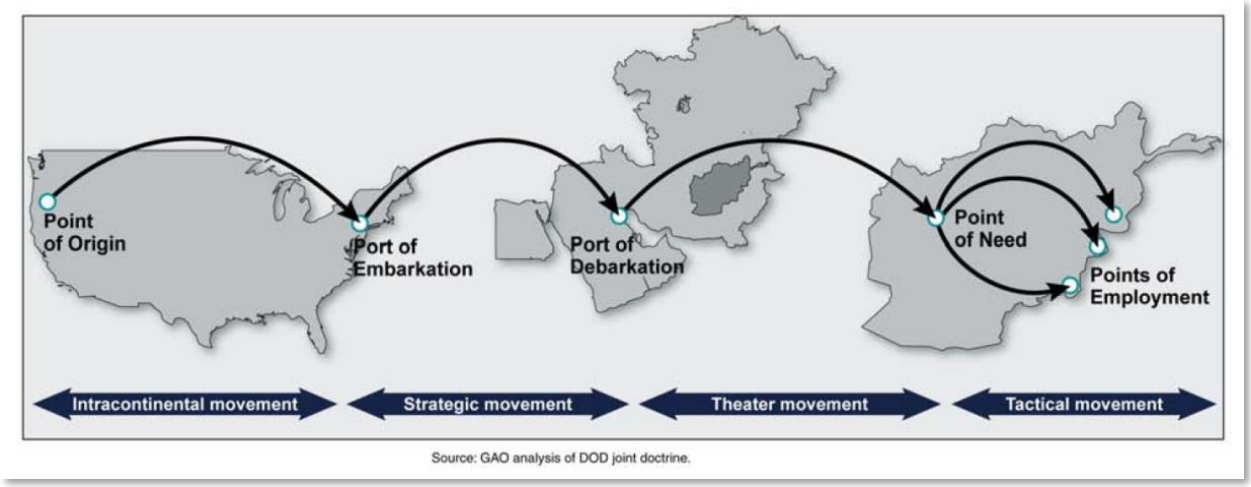
This case examines the U.S. Transportation Command (TRANSCOM)'s efforts to improve DoD's logistics by streamlining the support sustainment supply chain to reduce costs and improve delivery times. DoD's materiel distribution system includes four segments—intra-continental movement, strategic movement, theater movement, and tactical movement with TRANSCOM in charge of the first three. [152,153] (See Figure 27).

As the DoD's Distribution Process Owner or global defense transportation system, TRANSCOM directs and supervises execution of the strategic distribution system, providing transportation, sustainment and distribution to our nation's warfighters across the globe. TRANSCOM has annual operating expenses of over $13 billion and delivers supplies and equipment to major hubs across the globe.

In fiscal year 2011, TRANSCOM shipped more than 700,000 tons of cargo by air and nearly 800 million cubic feet of cargo by sea.[154] GAO identified DOD supply chain management as a high-risk area, with materiel distribution as one focus area for improvement.[155] The current fiscal climate combined with far-reaching Warfighter needs increase the need for DOD to implement efficiency improvements to materiel distribution.

[150] "Lean Six Sigma Cuts Waste, Tackles Tough Manufacturing Problems." Wisconsin Manufacturing Extension Partnership.
[151] Ibid.
[152] Russell, Cary B. "Defense Logistics: DoD Has Taken Actions to Improve Some Segments of the Materiel Distribution System." United States Government Accountability Office. GAO-12-883R Defense Logistics, August 3, 2012. Page 5
[153] Ibid, 7.
[154] Ibid, 5.
[155] Ibid, 1.

Figure 27: Four segments of DoD's materiel distribution system



Source: Russell, Cary B. "Defense Logistics: DoD Has Taken Actions to Improve Some Segments of the Materiel Distribution System." United States Government Accountability Office. GAO-12-883R Defense Logistics, August 3, 2012. Page 6.

To improve materiel distribution efficiency, TRANSCOM used results-oriented management practices to identify performance gaps and analyze potential cost avoidances. The main goals were (1) to achieve $500 million in cost avoidances and (2) to improve shipment delivery times by 25 percent by 2012. TRANSCOM identified over 38 possible opportunities for cost savings and efficiency, and by September 2008 had narrowed the list down to five actionable efforts (See Figure 28).[156]

As the chart illustrates, the TRANSCOM team identified several key problems:

- Excessive wait time throughout the distribution process
- Inefficient use of shipping containers and poor shipment consolidation
- Underuse of commercial air cargo options
- Lack of effective forward inventory positioning and optimization

TRANSCOM implemented changes to address the problems:[157] It shifted warehouse order processing to a fast-flow system, whereby orders are fulfilled as they come in – rather than being held for batch-order consolidation. TRANSCOM shifted to using 40-foot containers (rather than 20-ft.) thereby improving cube and weight efficiency and reducing cost. Finally, it focused on building fuller pallets.

[156] Ibid, 4,7.
[157] Ibid, 10-14.

Figure 28: DOD's five improvement efforts

Effort	Description	Status
Process improvement	Removing unnecessary wait time from distribution processes across the supply chain	Ongoing
Strategic surface optimization	Increasing container utilization and appropriately shifting cargo from 20-foot containers to 40-foot containers	Ongoing
Strategic air optimization	Increasing aircraft utilization and optimizing use of lift options, such as using commercial (rather than military) aircraft when appropriate	Ongoing
Supply alignment	Properly configuring inventory levels at forward supply depots located nearer to the customer	Ongoing
Strategic network optimization[a]	Designing the optimal number, location, and function of supply chain sites	In development

Source: TRANSCOM and DLA.

[a]Strategic network optimization began under DSO and is currently being managed as a stand-alone effort.

Source: Russell, Cary B. "Defense Logistics: DOD Has Taken Actions to Improve Some Segments of the Materiel Distribution System." United States Government Accountability Office. GAO-12-883R Defense Logistics, August 3, 2012. Page 7.

Results

Thanks to these simple process changes, TRANSCOM reported the following improvements from the processing and consolidation changes: [158]

1. The time it takes to process, pack, and ship hazardous materials from the facility to Afghanistan dropped from 36 days in June 2011 to 11 days in April 2012, almost a 70% reduction
2. Since January 2009, the percentage of 40-foot containers shipped to U.S. Central Command has increased between 22 and 100 percent for shipments, resulting in approximately $197 million in cost avoidances
3. 3,200 more tons being shipped on 121 fewer aircraft missions and reduced the average cost per pound for air cargo, resulting in approximately $284 million in cost avoidances.

Overall, DOD reported over $490 million in cost avoidances by improving use of containers, pallets, and aircraft and positioning supplies closer to overseas customers. DOD also reported better shipment delivery times for a limited number of customers. For example, TRANSCOM's process improvement effort led to better delivery times on 31 (6 percent) of DOD's approximately 500 shipping lanes.[159]

TRANSCOM set a new goal in February 2012 to achieve another $500 million in cost avoidances by the end of fiscal year 2015. TRANSCOM is pursuing new initiatives to meet this

[158] Ibid.
[159] Ibid, 4.

updated goal, such as minimizing the number of aircraft flights to locations outside of the United States by consolidating cargo from multiple locations within the United States.[160]

TRANSCOM attributes most of its cost avoidances to improved container and pallet use and positioning supplies closer to overseas customers.[161] TRANSCOM leaders developed a methodology to assess actual costs and determine logistics options to improve efficiency and allow customers to make informed decisions about fuel costs, delivery dates and mode of transport. Finding flexibility in those areas as well as seeking cost-avoidance solutions, such as identifying loads to do backhaul for cargo jets, helped analysts achieve the best value for limited assets.[162] The DoD should expand on the lessons learned here in order to further improve its product support efficiency.

[160] Ibid, 4-5, 16.
[161] Ibid, 14.
[162] Lyle, Amaani. "Partnerships, Innovation Provide Keys to Mission Success, Transcom Official Says." American Forces Press Service. December 6, 2012.

Part IV: Benefits, Issues and Challenges

As discussed earlier in this paper, many benefits are derived by implementing best practices such as performance-based logistics, supplier relationship management, inventory optimization, automation, and technologies in fuel efficiency, robotics and autonomous systems, that range, from reducing costs, and improving efficiency, to saving lives.

The DoD faces a number of challenges in implementing the actions outlined in this paper. These challenges fall into several categories:

- Organizational change
- Supplier relationship changes
- Information systems
- Technology changes
- Regulatory restrictions
- Contracting changes

The following paragraphs highlight some of the specific issues within each of these categories of challenges.

Organizational

In the case of PBL, implementing this approach requires significant process change, which can meet resistance within the organization. Organizational barriers include acceptance and trust in sharing the workload with the private sector, job security concerns, and education of leadership on the values of PBL. In order to overcome resistance to change, "buy-in" from process users and implementers is required in addition to leadership "buy-in."

Most of the personnel and organizations in both the public and private sector have years of experience developing requirements-driven, specification-constrained, custom-designed and built, components and systems. For many of the DoD's logistics and acquisitions employees, implementing PPPs changes the nature of their work. In many cases, they shift from being the "the doers" to becoming "the managers of doers." Contractors become the "doers", performing myriad jobs that range from transportation management and inventory control, to product re-engineering for better and low-cost maintainability. This shift is particularly pronounced for those DoD employees involved in PBL contract management. This culture as to what constitutes "the proper role of government" can be deeply rooted and resistant to change, especially as most government employees prefer to think of themselves as "core."

Institutionalized cultural inertia can cause resistance to the changes in the nature of work of PBL and PPPs, especially in the area of contracting and contract management. For example, legacy sustainment processes generally involve writing lengthy, detailed design specifications and statements of work, which reference many military specifications, as well as contract terms and

conditions. The intent in crafting these specifications and statements of work is to be so comprehensive as to cover every possible contingency.

With PBL contracts, defense organizations no longer write these detailed specifications. Instead, they have had to learn how to write performance requirements and develop appropriate metrics—a much more difficult task.[163]

Buying a performance outcome is significantly different from buying specific items, and may also require changes in organizational processes and manpower requirements (and of course, there is a natural desire to protect jobs—government, civilian and military). Additionally, legacy processes often keep government personnel, such as the contract administrator, and the supporting contractor in an arms-length relationship, with little trust. With a PBL, on the other hand, the two parties become active partners. In some cases, the government may in fact be selling services to the contractor.

PBL shifts the focus of sustainment practice from acquiring, tracking and using physical materials to managing a service. The implied cultural change necessitated by this shift cannot be underestimated. Long-term success in PBL, therefore, will depend on a sustained and successful educational process. DoD has made considerable progress on designing and implementing appropriate educational and training programs, but there is still much more progress needed.

In the area of inventory management, DoD faces challenges in implementing systems and processes to improve total asset visibility. The primary challenges include developing business rules and financial processes that allow for the visibility and redistribution of assets among the Services and DLA in order to avoid or minimize future purchases. GAO previously reported that DoD did not have total asset visibility, which includes visibility over assets in transit to and from a theater of operations.[164]

Other inventory-related challenges relate to DoD's outdated approach to segmenting inventory. DoD officials stated that current inventory segmentation is outdated and does not reflect changes in inventory management, such as multi-echelon modeling and direct vendor delivery strategies. However, reaching agreement among the Services and DLA on a new method for segmenting the inventory could be difficult.

Additionally, automated capabilities for revised processes, such as demand forecasting, requirements determination, and asset visibility are essential to improvements targeted by this *Plan*. Implementation of the ERPs is critical to institutionalizing needed processes and business practice upgrades, but the Services and DLA are at varying stages of implementation.[165]

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[163] Gansler and Lucyshyn. *Evaluation of Performance-Based Logistics*, 2006, 37.
[164] United States Government Accountability Office. "DoD's 2010 Comprehensive Inventory Management Improvement Plan Addressed Statutory Requirements, But Faces Implementation Challenges." GAO-11-240R, January 7, 2011. Page 12.
[165] Ibid, 19.

When DoD began to implement the priorities outlined in Better Buying Power, several challenges related to the skills base arose. In many cases, the current DoD acquisition workforce lacks the critical skills to fully implement will-cost and should-cost management, and there is a shortage of experienced personnel to assist the DoD project managers to fully implement will-cost and should-cost management. The use of incentives only for DoD program managers to drive cost reductions may result in negative impacts to the DoD acquisitions team. Additionally, inappropriate use of fixed-price contracts on research and development programs could have negative impacts on the U.S. defense industrial base.[166]

Supplier/Industry Relationships

The private sector has found that migration to a collaborative supplier relationship strategy produces significant benefits in terms or lowering costs and improving service over the long term. A supplier relationship management approach such as that outlined in this report comes into direct conflict with many tenets of the DoD's acquisitions rules and approaches to sustainment, however - especially the emphasis on short-term sustainment contracts.

Also, the increasing oversight burden in DoD acquisitions and contracting often creates more adversarial relationships in worst cases. This increasing oversight burden significantly increases supplier cost of doing business with the DoD and may eventually force some suppliers to opt out of supporting DoD sustainment.

Information Systems

In the performance of its complex worldwide mission, DoD still depends on thousands of non-integrated systems to support the management of DoD logistics; total asset visibility is still not available. Until DoD can successfully transform these into a more integrated system, it will continue to confront management inefficiencies. Consequently, transformation of these systems is integral to improving its logistics management.

For example, in efforts to improve inventory management systems, the DoD faces an implementation challenge related to data availability. Some of the data required for the successful operation of multi-echelon inventory modeling programs, such as configuration data that identifies the relationships among items, are not available and need to be developed for multi-echelon modeling systems to fully function.[167] See Appendix 4 for more information on GAO's analysis of DLA's spare parts management.

DoD did set a target to use multi-echelon modeling on 90 percent of targeted inventories by the end of fiscal year 2015. As part of its analysis, the Office of the Secretary of Defense (OSD), the Services, and DLA determined that its targeted inventory is defined as that portion of the total inventory that includes inventory levels already set using multi-echelon modeling plus

[166] Garrett, Gregory and Frank J. Beatty. "DOD Moves to Implement Will-Cost and Should-Cost Management." Journal of Contract Management. July 2011. Page 14.
[167] United States Government Accountability Office. "DoD's 2010 Comprehensive Inventory Management Improvement Plan Addressed Statutory Requirements, But Faces Implementation Challenges." GAO-11-240R, January 7, 2011. Page 12.

opportunities for additional application. The targeted inventory is approximately 65 percent of DoD's inventory, or about $61 billion of DoD's $95 billion in inventory, for fiscal year 2010.

OSD, the Services, and DLA are currently working to identify criteria and business rules for the targeted inventory that currently uses multi-echelon modeling to be able to develop opportunities for additional application to accelerate the use of multi-echelon modeling.[168] NOTE: Section IV discusses multi-echelon inventory management in detail.

Forecasting is another issue hampering better inventory management across the DoD. In Section II, we discussed the DoD's attempts to improve, specifically with demand forecasting. One such challenge to achieving demand-forecasting accuracy is the fact that demand patterns for many items are highly variable and intermittent. In addition, the ability to forecast demand for weapon systems varies based on where a weapon system is in its lifecycle.

Improving demand forecasting is difficult because it involves materiel managers having the most up-to-date operational planning information to adequately plan the stocking of materiel for the customer. The demand forecasting sub-plan focuses on putting in place more automated methods for exchanging information that can be used to improve forecasts between inventory managers and customers, but these efforts are only in the initial stages. [169]

Together, these factors make it difficult to forecast demand accurately. For example, in a current effort to improve demand forecasting, the Air Force was able to improve its demand forecast accuracy from 29 percent in 2008 to 40 percent in 2009. The Air Force established a stretch goal of 70 percent demand forecast accuracy for 2011, but continues to work toward accomplishing this task.[170]

Technology Changes

On the matter of alternative fuels, cost of the technology as well as the infrastructure to support it is a significant challenge. Alternative fuels vehicles carry a premium in purchase price; and must have a distributed fueling network capable of supporting them in the field. To date, land-based vehicles are restricted in range by this network, as well as by the technology itself in the case of fuel cells/batteries.

Similar challenges exist for air and ocean transport vehicles. These must be resolved in an appropriate, cost effective manner, to enable broader application of alternative fuels. Also, long system (ships and planes) service lives means that the inventory changes slowly. The lack of reliable data on energy use provides a limitation to the reduced costs that alternative fuels may produce. Current efforts by the Services to test and certify alternative fuels are far outpacing

[168] United States Government Accountability Office. "Actions Underway to Implement Improvement Plan, but Steps Needed to Enhance Efforts." GAO-12-493, May 3, 2012. Page 22-25.
[169] Ibid, 22-25.
[170] United States Government Accountability Office. "DoD's 2010 Comprehensive Inventory Management Improvement Plan Addressed Statutory Requirements, But Faces Implementation Challenges." GAO-11-240R, January 7, 2011. Page 11.

commercial availability, which will limit the cost-savings. The DoD needs to develop more rapid fielding of fuel-efficient systems and alternative fuel sources.[171]

Robotics and autonomous systems carry affordability challenges. Additionally, there are issues relating to integration of manned and unmanned systems throughout the Services. Such integration is needed to achieve life cycle cost savings by reducing sustainment costs.[172]

Each unmanned system interacts only with a single controller or communication signal, and data cannot be exchanged between unmanned systems and between unmanned systems and other forces.[173] An interoperable system that allows exchange of data between systems, warfighters, and ally countries would create an interface with ease of communication and increased mission capabilities.[174] Open architecture can facilitate interoperability and minimize total ownership cost by producing more competition and innovation and affordable systems.[175] With the rapid improvements in technologies, updates and refitting systems outside of open architecture will be expensive. Sustainment costs must be kept down by addressing interoperability and interface communications now.[176]

And because autonomous systems and robotics replace humans in some instances, there may be institutional resistance to broad scale adoption.

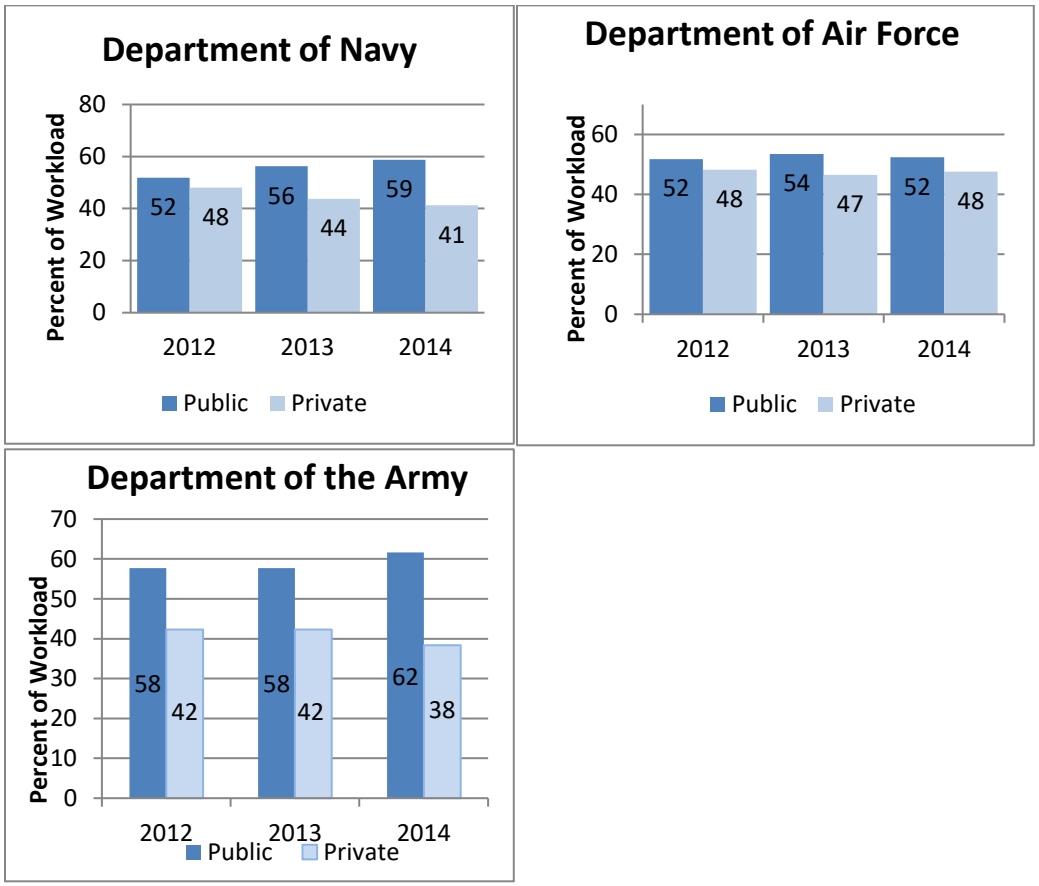
Regulatory Restrictions

Depot maintenance is one example of a DoD logistics area with an opportunity for savings through increased public-private partnerships and PBLs. Depot maintenance consists of all repairs beyond the capabilities of the operating units, including rebuild, overhaul, and extensive modification of equipment platforms, systems, and subsystems.[177]

According to a July 2013 DoD report to Congress on the "Distribution of DoD Depot Maintenance Workloads," the public portion for the Department of Navy and Army are expected to rise from 51.9 and 57.7 percent in fiscal year 2012 up to 58.7 and 58.6 percent, respectively, in fiscal year 2014. The Marine Corp expects a rise from 76.1 percent public workload to 86.5 percent in fiscal year 2014. See Figure 29.

[171] CPPPE presentation
[172] Department of Defense. Unmanned Systems Integrated Roadmap FY2011-2036. James Winnefield Jr, Admiral, USN Vice Chairman of the Joint Chiefs of Staff and Frank Kendall, Acting Under Secretary of Defense for Acquisition, Technology and Logistics. Reference Number: 11-S-3613. Page v.
[173] Ibid, 31.
[174] Robotic Systems Joint Project Office. "Unmanned Ground Systems Roadmap." July 2011. Page 32.
[175] Department of Defense. Unmanned Systems Integrated Roadmap FY2011-2036. James Winnefield Jr, Admiral, USN Vice Chairman of the Joint Chiefs of Staff and Frank Kendall, Acting Under Secretary of Defense for Acquisition, Technology and Logistics. Reference Number: 11-S-3613. Page 32.
[176] Robotic Systems Joint Project Office. "Unmanned Ground Systems Roadmap." July 2011. Page 52.
[177] Department of Defense, *Depot Maintenance Strategic Plan, Executive Summary*, Part I-4 to I-5.

Figure 29: Depot Maintenance Percent of Public and Private Workload, FY 2012-2014



Source: Department of Defense. "Distribution of DoD Depot Maintenance Workloads." July 2013. Accessed March 24, 2014. Available at http://www.acq.osd.mil/log/mpp/plans_reports/Distribution_of_DoD_Depot_Maintenance_Workloads.pdf.

Given this expected rise in the public workload, the DoD has an opportunity to further form public-private partnerships with PBLs. However, legislative initiatives, such as Title 10 of the US Code[178], have created several barriers to the efficient management of the DoD's depot operations (see the inset on the next page). These barriers revolve around maintaining inefficient but politically important legacy DoD depots, and must be overcome.

Furthermore, military depots that are funded by the Defense Working Capital Fund (WCF) rely on revenues from sale of their products or services to recover the cost of their operation. The WCF was established to help the government account for costs and budget outlays, and is intended to (1) generate sufficient resources to cover the full costs of its operations and (2) operate on a break-even basis over time—that is, neither make a gain nor incur a loss.

[178] The major themes of Title 10 of the U.S. Code are defining what depot maintenance activities are; ensuring that a wartime depot maintenance capability under the control of DoD will be available; maintaining a robust organic capability (called a "core logistics capability") that could expand to meet wartime requirements; and providing depot maintenance services efficiently to military customers through the use of competition, when appropriate. The box summarizes three major aspects of Title 10. See Appendix 4 for more legislative details of the U.S. Code.

Customers primarily use operations and maintenance appropriations to finance orders placed with the working capital fund.

WCF funded depots face several challenges that include: instability in projected future budgets; instability in projected future prices; and instability in projected future operational requirements; and the difficulty in valuing investment decisions. Moreover, existing WCF rules provide users with poor incentives to improve performance by rewarding sales as opposed performance or cost.[179] The DoD should establish additional steps to increase supply chain visibility and minimize counterfeits, and ultimately, to improve product support.

Contracts

Finally, in the area of contracting strategies, poorly structured, or too frequent competitions, can create perverse disincentives for suppliers to compete. Shortened contract periods increase opportunities for competition, but may be too short for contractors to recoup investment in program improvements and innovations. Frequent competitions can especially limit the benefit of performance based logistics (PBL) contracts, since the objective is for the contractor to make process and product improvements, that lead to

Depot Maintenance Legislation

Title 10 USC 2464 Core Logistics Capabilities Requirements. Section 2464 of Title 10 identifies core logistics capabilities deemed inherently governmental. This statute commits the government "to ensure a ready and controlled source of technical competence and resources necessary to ensure effective and timely response to a mobilization, national defense contingency situations, and other emergency requirements." This often conflicts with the idea of using commercial best practices and contracting to advance the logistical transformation.

Title 10 USC 2466 50/50 Depot Rule Requirements. The law that most often stymies efforts to improve logistics transformation is Section 2466, Title 10, Limitations on the performance of depot-level maintenance of materiel, commonly known as the "50/50 rule." Under this law, "not more than 50 percent of the funds made available in a fiscal year to a military department or defense agency for depot-level maintenance and repair workload may be used to contract for performance by non-Federal Government personnel…." This rule undermined efforts to improve transform logistics through competitive pressure with the private market.

Title 10 USC 2469 A-76 Restrictions. Section 2469 requires the use of competitive sourcing procedures for depot work valued over $3 million but maintains the 50/50 requirement set by Section 2466.

(Gansler, J. & W. Lucyshyn. Logistics Modernization in the Twenty-First Century. March 2009. Center for Public Policy and Private Enterprise.)

[179] Gansler, J. & W. Lucyshyn. Logistics Modernization in the Twenty-First Century. March 2009. Center for Public Policy and Private Enterprise.

improved performance and result in reduced costs. Short-term contracts limit the incentives for contractors to make these improvements. Although the Better Buying Power guidelines indicate that there is some latitude in contract length; clearly, longer contracts are discouraged. As a result, most U.S. PBL contracts have been restricted to a range of three to five years.

As the studies on PBL indicate, longer contracts, that are outcome-focused, have the potential to produce greater long-term sustainment savings. They also incentivize the private sector to make investments in innovation and new technology. Such incentives do not exist in short-term contracts. The United Kingdom, on the other hand, has committed to longer-term contracts. For example, the Ministry of Defence is currently more than 6 years into a 34-year PBL contract for their Chinook helicopters. The contract has price breakpoints every five years. The results, to date, have been impressive: costs have declined 13 %, availability has increased more than 12 percent, and flying hours have increased by 50 %, while the major maintenance cycle time has decreased by 58 %.[180] The acquisition professional must use sound judgment to balance contract length and competition within the bounds to create the appropriate incentives.

Section II describes strategic sourcing and how the DoD has applied strategic souring to control costs. Strategic sourcing controls cost growth by increasing acquisition productivity growth through will cost/should cost management in both contract negotiation and contract administration. The DoD-Wide Strategic Sourcing (DWSS) Program includes applying these controls throughout the acquisition process, but the DoD must align the department's definition of strategic sourcing, which has been inconsistent across the Services.

[180] Bacon, Lance, M., 2013. Turning Acquisition on its Head. Armed Forces Journal. January 2013 Available at http://www.armedforcesjournal.com/2013/01/12842321

Part V: Recommendations & Conclusion

This paper has explored a wide variety of issues, options, strategies and tactics relating to improving the DoD's cost of equipment and platform sustainment. The ideas and solutions range from small, quick fixes to much larger, long-term cost-reduction strategies that require substantial investment, resources and time. The good news is that improvement is possible.

DoD must expand efforts already underway in areas of lean, supply chain optimization, and performance-based logistics to achieve savings and cost avoidance. In nearly all cases, improvement efforts also have a technology component to them – be it information systems upgrades or physical asset investment. Thus, DoD must adopt enabling technologies that reduce asset and resource consumption – e.g., human, financial, fuel - and risk to the warfighter and to DOD's mission. Furthermore, the private sector initiatives discussed in Appendix 1, have similarly produced impressive savings and improvements in efficiency and effectiveness. DoD efforts can also model those efforts and achieve further improvements.

To summarize, improved product support efficiency and effectiveness includes a portfolio of strategies, tactics and technologies:

- Performance-based product support solutions with different/longer contracts
- Lean six sigma
- Strategic sourcing (e.g., public/private competitions for non-inherently-governmental work)
- Inventory optimization
- Integrated logistics systems to improve supply chain visibility that consolidate and streamline IT requirements and push them to the cloud
- Benchmarking and performance metrics – better use of benchmarking against private and public sector enterprises; adoption of suitable best practices identified through benchmarking
- Appropriate productivity incentives for industry
- Continued development and deployment of alternative fuels technologies and robotics.

Overall, to reduce sustainment costs, DoD must find ways to ensure that it uses the most effective and efficient service providers. These are not necessarily the lowest cost bidders. To this end, the DoD should also reintroduce "competitive sourcing" for non-inherently-governmental work, replace the depot 50/50 rule with strategic sourcing. And finally, it should adopt new technologies that reduce fuel consumption, streamline support operations, eliminate waste in both process and assets, and replace humans with machines in a manner that generates the most benefit toward achieving the mission.

For the DoD, the issue of better managing sustainment costs has never been more important. As the examples in this report indicate, however, it can be done. In fact, there are plenty of

opportunities for improvement – for the DoD to do more with less while not jeopardizing capabilities or the warfighter.

Appendix 1: Private Sector: Best Practices, Opportunities for Improvement.

> *"Driving costs out of private sector supply chains has been a priority for a generation of supply chain professionals. The reality for public sector supply chain managers is that they, too, need to eliminate costs from the supply chain to ensure their organizations' long-term viability."* ~ Gary A. Smith, CPIM, CSCP, CPSM, Director of Supply Chain Operations, New York City Housing Authority.

In this appendix, we examine specific best practices found in the private sector. These practices include private sector only efforts as well as public-private partnerships. Private sector best practices include managing suppliers more effectively with supplier relationship management, inventory management, inventory optimization, and Lean Six Sigma.

Managing Suppliers More Effectively

Supplier relationship management (SRM) is the systematic management of supplier relationships to optimize value through cost reduction, innovation, risk mitigation and growth throughout the relationship life cycle.[181] SRM is a holistic view toward managing suppliers to achieve optimal outcomes – including cost reduction and supply chain service improvement. Strategic sourcing, which is in wide use in the private sector, is related to SRM but occurs at a higher level – i.e., at the level of choosing strategic suppliers with which to partner, consolidate buys and grow value and profitability. Strategic sourcing, notes Smith, is a series of processes within supply chain management that are focused on developing long-term sources of supply and relationships with the most appropriate suppliers so that lifetime costs are minimized.[182]

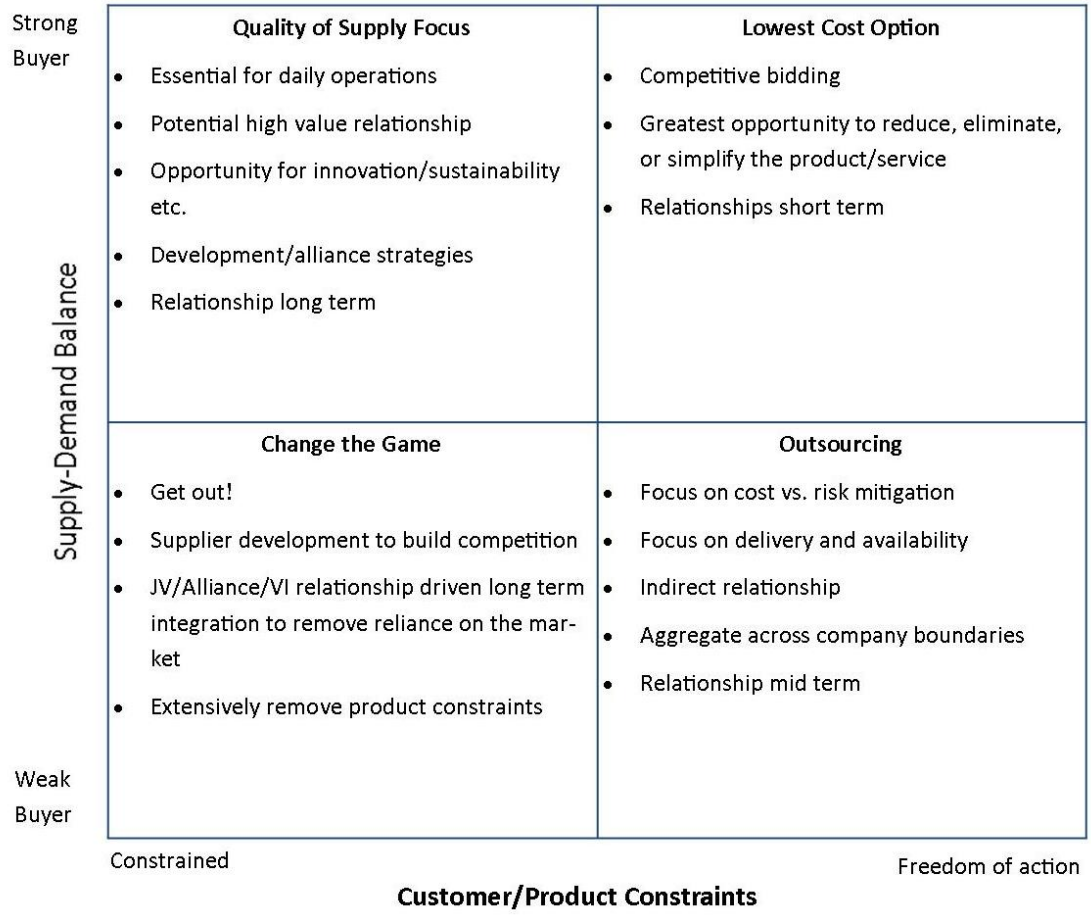
For SRM, traditional segmentation approaches tend to be inward looking, prioritizing suppliers or categories based on the amount of spend and perceived product or service criticality, as a recent report from Accenture explains. While spend/ criticality segmentation adds rigor, it can ignore market dynamics, constraints and realities. For example, tight supply conditions, complex value chains and other structural and supply risks that can have a material impact on business continuity and value delivery.[183]

Some SRM leaders have therefore sought to incorporate a market perspective when segmenting their supply base and defining the SRM approach. The goal of SRM is to drive the greatest value for the business.

[181] "Supplier Relationships: Cracking the Value Code." Accenture. 2011. Page 3.
[182] Smith, Gary. "Leveraging Private Sector Practices in the Public Sector." CSCMP's Supply Chain Quarterly. Quarter 3, 2011.
[183] "Supplier Relationships: Cracking the Value Code." Accenture. 2011. Page 3.

The SRM Approach Matrix (Figure 30) guides decisions on how categories and suppliers should be managed, considering the balance of power in the market between buyers and suppliers, and the customer/ product constrains that may exist.[184]

Figure 30: Determining the SRM approach



Source: "Supplier Relationships: Cracking the Value Code." Accenture. 2011. Page 3.

Leaders typically prioritize their suppliers by organizing them into `tiers'. They will apply differentiated supplier management approaches by tier in order to maximize value and ensure appropriate resource allocation.[185]

Suppliers that engage in SRM activity will likely fall into the two left hand quadrants of the matrix, with very different SRM approaches in each case. Leaders typically document the supplier management approach for their key suppliers, building on the agreed generic approach for the tier and segment. This clearly maps out roles, expectations and resources allocation.[186]

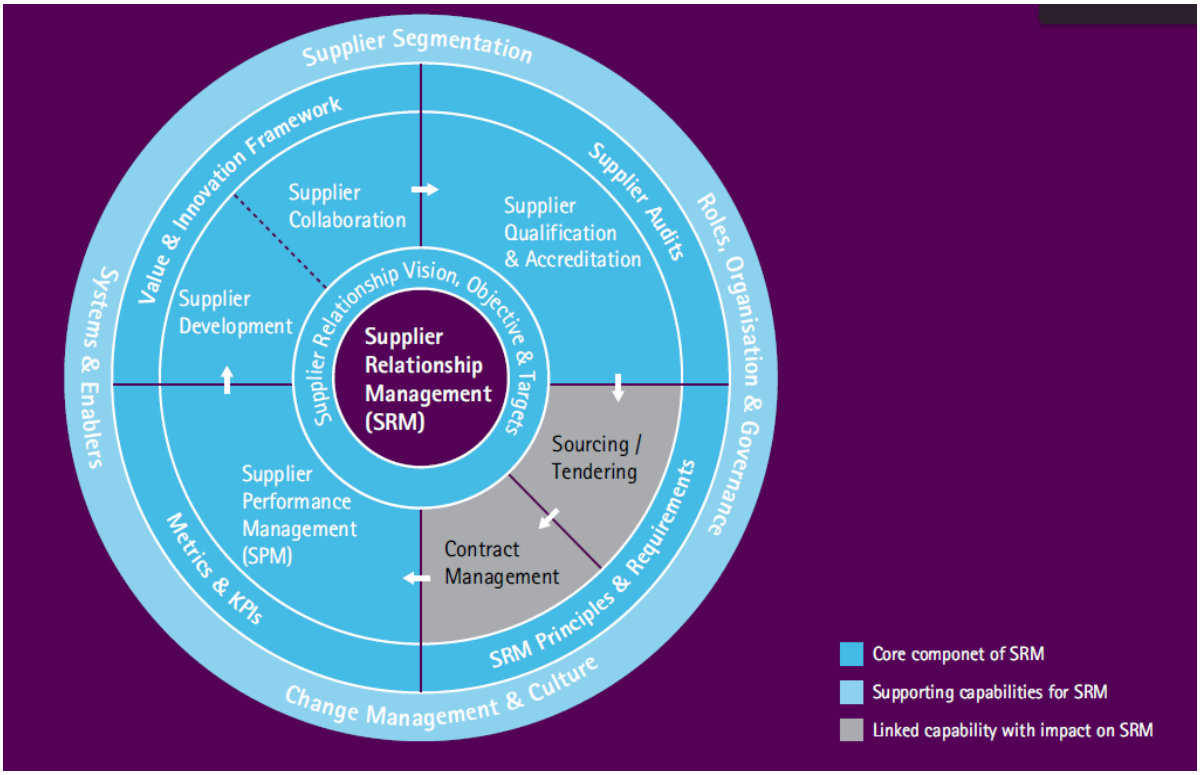
In order for SRM to succeed, it must embrace certain critical success factors. These include:

[184] Ibid.
[185] Ibid, 5.
[186] Ibid.

- Developing a common SRM framework (see Figure 31) and set of value drivers (such as cost, quality, innovation) to guide and align teams in measuring performance
- Developing a common process and set of templates used to drive consistency and rigor.
- Designing and implementing incentives and rewards that line up with SRM goals (for the internal staff). These rewards must be based on shared growth versus just cost reduction. The latter actually deters collaborative supplier relationships.[187]

Relatively few companies have a truly mature and fully functioning SRM capability. However, companies that progress toward more collaborative relationships report incremental performance improvements that would have not been possible with a traditional approach. Such improvements include reduced costs, product and service innovations, improved operational performance and mitigation of market, availability and other risks.[188]

Figure 31: Supplier relationship management framework



Source: "Supplier Relationships: Cracking the Value Code." Accenture. 2011. Page 11.

Inventory management[189]

Effective inventory management is another private sector best practice that can be implemented in the public sector with very positive results. "Many public sector supply operations utilize a "buy and hold" strategy, where material is purchased in large quantities and held until needed," says Smith. "The private sector abandoned this strategy long ago when managers recognized the

[187] Ibid.
[188] Ibid, 11.
[189] Ibid.

considerable cost of carrying inventory, including the costs of obsolescence, damage, shrinkage, taxes, and so forth. The public sector, on the other hand, has tended to ignore carrying costs. That's because funds for the purchase of inventory usually are included in annual budgets, and the organizations do not pay interest on that money."

In the current environment of extreme cost pressures, companies must turn inventory faster because every dollar tied up in inventory is no longer available for use. The most effective way to accomplish this is through a comprehensive inventory management program

While the reasons for carrying inventory in the private and public sectors may differ, inventory management techniques need not differ greatly, although some adjustments may be required. The most important of these is inventory visibility. Visibility includes knowledge of "available to promise," allocated, in transit, and shipped inventories. It should also include knowledge of inventory levels of critical material purchased from primary suppliers. To achieve these results, inventory is best managed using robust inventory management software.[190]

Inventory Optimization

Inventory has a cost. Research reveals that cost to hold an inventory item for one year is 20 to 60 percent of the original item cost. Costs include storage costs, obsolescence, capital costs, insurance, and taxes. Figure 32 describes cost containment best practices related to these costs.[191]

Figure 32: Types of cost containment initiatives (supply chain management)

Initiative	Timeframe	Cost Factors	Benefits	Payback
Strategic Sourcing – (Indirect Materials, Direct Materials, IT /Telecom, Services)	2-6 months	Consultant costs; internal time	Purchase price savings , maintenance savings, efficiencies (5-20%)	6-15 months
Cycle Count Process / Inventory Utilization	4 months	Consultant costs, inventory write-offs, internal costs, lease termination costs	Inventory accuracy; Increase in available cash; inventory carrying costs reduced (ISM research: to hold one year carrying cost is 20-48% of purchase price)	1 year
Demand Planning / Forecasting	8-12 months	Consultant costs; technology integration; internal costs, lease termination	Inventory reduction; inventory carrying costs reduction (better planning results in reduced inventory)	>1 year
Distribution Network Design	6-12 months	Consultant costs; technology costs; lease termination; moving costs; build-out cost	Inventory reduction; improved service levels and lead times	> 1 year

Source: Engel, Bob. "Best Practices in Cost Containment." Resources Global Professionals. Presented during webinar June 16, 2009. Slide 32.

[190] "Supplier Relationships: Cracking the Value Code." Accenture. 2011. Page 3.
[191] Engel, Bob. "Best Practices in Cost Containment." Resources Global Professionals. Presented during webinar June 16, 2009. Slide 12.

How smart inventory planning and management solutions can help

Smart inventory optimization software, in particular, can look across multiple levels, or echelons, of a supply chain to detect changing conditions early on and suggest responses to them, thereby enabling fast decisions that anticipate rather than simply react. Multi-echelon inventory optimization solutions are designed to assure the right amount of inventory for every SKU and raw material, at every location, at all times, across the extended supply chain.[192]

Before multi-echelon inventory optimization, inventory planning typically was not centralized, and service-level commitments were managed and measured at the warehouse and DC level based on individual or location-based metrics. As a result, inventory was optimized with no view into total supply chain stock levels, resulting in low inventory turns, inconsistent service levels, expediting of products, and a lack of understanding of supply chain-wide inventory drivers.[193]

Inventory target setting often was a once- or twice-yearly undertaking, notes Ronan O'Donovan, Product Manager, IBM Supply Chain Applications. "A company might have had the bandwidth to manually collect data once or twice yearly, and then it would take days and weeks, possibly months, to gather and analyze." Targeting individual SKUs was rarely done because of the difficulty in collecting and analyzing the data and performing the necessary calculations. As a result, CP companies could not readily adjust inventory to respond to change.[194]

Multi-echelon inventory optimization technology can eliminate those shortcomings. Smart optimization tools can set inventory and safety-stock levels down to the individual SKU and location level. They take into account, and understand, the variability of such factors as demand levels and variability, demand forecast, lead time, transit time, order and shipment frequency, order size, order and production cycles, and service-level requirements.[195]

This technology can identify the lowest-cost inventory strategy for each SKU, channel, and geographic region and model the trade-offs between inventory and such factors as desired service level, forecast error, holding costs, transportation costs, and picking costs. The tools constantly monitor demand signals and available inventory on hand, in process, and in transit, and then dynamically adjust allocations to accommodate those changes.[196]

Multi-echelon inventory optimization tools also enable dynamic what-if scenario modeling. By generating what-if scenarios and analyzing the results, this technology can address key questions relating to inventory at all levels of the supply chain – the supply base, manufacturing, packaging and distribution, and customers.[197]

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[192] Harrington, Lisa. "Managing Volatility Through Smart Inventory Planning."
[193] Ibid.
[194] Ibid.
[195] Ibid.
[196] Ibid.
[197] Ibid.

Inventory Optimization at Work

This subsection examines two major U.S. CP manufacturers and their experiences with implementing the IBM ILOG Inventory and Product Flow Analyst solution.

The optimization solution has helped planners build a more robust inventory budget. In the past, management would mandate a certain aggregate or percentage budgeted sales increase for an entire product line. "It was impossible to slice that down to the SKU level," one VP recalled. "The optimization tool allows us not only to do a SKU-by-SKU analysis, but actually makes a recommendation of what the numbers should be, based on facts and hard data rather than conjecture."[198]

Consumer Health & Pharmaceutical Company

Until recently, a North American consumer nutritional products company, like most firms, managed inventory on a node-by-node basis across its global supply chain. The company, well known as a pharmaceuticals manufacturer, used an in-house modeling tool to determine optimal inventory at each discrete location.[199]

The company realized it needed a robust inventory optimization tool to accomplish these dual goals of service and cost control. "Our top 15 products make up 50 percent to 60 percent of our total inventory," explains one of the company's manufacturing and supply chain information systems leads. "We knew if we could model those products effectively, we could reduce inventory throughout the entire supply chain."[200]

The manufacturer also wanted a tool that could perform 'what if' scenario analyses. "For example, if we want to provide 99.5 percent customer service, what does that imply for our inventory levels?" the manager asks. "If we improve forecast accuracy by 1 percent, what does that mean for inventory levels by product? Is it worth our time? Or what are the implications of taking a node out of our supply chain?"[201]

"Using the inventory tool across our supply chain helps us streamline inventories while at the same time improving agility," the systems lead concludes. "It helps us reduce the amount of working capital we have tied up in inventory globally, thereby improving our margins. Our analyses tell us that we can reduce inventory anywhere from 5 percent to 20 percent across the supply chain, depending on the product. That's a huge savings."[202]

Major U.S. Food Manufacturer

Unpredictable U.S. consumer buying behavior is reshaping how one major U.S. food producer manages inventory in North America. "Consumers have become highly price sensitive at the

[198] Ibid.
[199] Ibid.
[200] Ibid.
[201] Ibid.
[202] Ibid.

expense of brand loyalty," says the company's strategic technology manager. "We're seeing consumers bounce around from retail chain to retail chain depending on which has the best price. This makes it more challenging for us in deciding where and how much inventory to deploy to our customers."[203]

In the past, when consumers were predictable, the company produced product and pushed it downstream close to the customer. Now, with freight costs so high and consumer behavior so unpredictable, the company has begun to hold product upstream as long as possible. One manager noted, "This is not an inventory reduction strategy. We actually may increase safety stock, but we spend far less repositioning product. So it's a net advantage."[204]

Today, the food-maker runs inventory optimizations monthly. In doing so, it can identify cycle changes in manufacturing, sourcing changes, or forecasting error rate reductions and react more quickly. "We can update our inventory and safety stock in a timely fashion – as opposed to waiting 18 months," the manager says.[205]

The food company also uses the optimization tool to perform "backward engineering" on its supply chain. For instance, it can quantify the risk-reward trade-offs of changing service levels from 99 percent to 98 percent, and make more informed decisions.[206]

Benefits of smart inventory optimization and planning

As the companies profiled here and many others have found, smart, multi-echelon inventory optimization and planning provides major bottom line benefits.

Smart inventory optimization analyzes demand and sets inventory targets for each SKU more accurately. Reduced out-of-stocks across the supply chain anticipate problems like stock-outs and recommend actions to prevent them and improve on-shelf availability. Dynamic optimization constantly assesses buffer stocks and locations correlated to demand to permanently streamline supply chain inventory levels and to optimize by SKU, enabling companies to meet service, cost, and operational requirements with the least amount of inventory.[207]

Multi-echelon inventory optimization technology also can free up cash and reduce working capital requirements, reducing working capital requirements of 10-25 percent. By considering all locations in every echelon, smart inventory optimization tools have the numbers-crunching and analytics capabilities to handle this complexity. They minimize the chance of making decisions that benefit one channel (retail, catalog, online, direct, or indirect) to the detriment of another, or to the entire supply chain.[208]

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[203] Ibid.
[204] Ibid.
[205] Ibid.
[206] Ibid.
[207] Ibid.
[208] Ibid.

Multi-echelon inventory optimization enables organizations to gain "huge process-level efficiencies across the enterprise in a holistic manner." Companies frequently can reduce expedited transportation costs 20 to 50 percent, trim millions of dollars from global inventory pools, and realize other cost savings related to supply, production, distribution and service.[209]

Inventory management is a constant challenge for DoD. Issues include excessive inventory, obsolescence, inventory in the wrong place, over-stock and under-stock, high cost, and poor visibility across inventories. Inventory optimization is about "right sizing" rather than reducing. The ultimate outcome may be a reduction in money tied up with inventory, but the main focus should be meeting customer satisfaction by having the right inventory in the right place at the right time.[210]

Benefits include better inventory tracking, traceability, and visibility strategies for inventory optimization, ability to respond quickly to market events while carrying out inventory requirements, and better visibility to upstream inventory allows for firms to provide more accurate deliver dates. Inventory optimization also establishes metrics to measure customer satisfaction from the planning to execution phases of their business.

Within the private sector, finished goods inventory averaged 15.1 turns per year and a change in perfect order increased a firm's perfect order rate by 3.1 percent.[211]

[209] Ibid.
[210] Gansler et. al. Center for Public Policy and Private Enterprise. "Improving DoD's Product Support Efficiency." Presented at National Defense Industrial Logistics Forum. Arlington, VA. June 14, 2013.
[211] Ibid.

Appendix 2: Continuous Competition

Contracting approaches and strategies designed to foster competition

Commercial Competitive Development Model. This open-market strategy encourages all contractors to develop products at their own cost. The government has the option to buy these products at a per-unit cost once the items are fully developed and ready for production. Firms are willing to fund the development if they believe the government will choose to buy their products at a price and quantity that enables them to recoup costs and earn a reasonable profit in the production phase. This approach is best suited to information technology systems that allow contractors to develop applications on an existing infrastructure. However, it can also be used in developing components on top of open hardware platforms. For instance, airframes, ships, and vehicle classes present a standard platform, but competition could occur for the various subsystems (e.g., avionics, navigation, and fire control systems).[212]

Competitive Orders (Indefinite Delivery/Indefinite Quantity). The government awards contracts to multiple, qualified contractors to meet a broad set of requirements. The government negotiates pricing, terms, and conditions with each vendor. The multiple awardees vie for task/delivery orders in a post-award competitive environment, keeping competitive pressures in play throughout the life of a contract. This strategy works best when requirements can be broken into several manageable tasks that different contractors can perform independently over a period of time.[213]

Competitive Dual Sources. The government fully funds two contractors to execute their designs or solutions to meet a need. The contractors fully develop and produce their designs, thus providing the government with two viable solutions. The two sources continuously drive down prices while also improving the performance and reliability of their products over time. Of the continuous competition strategies, this approach requires the greatest upfront investment by the government, but it also creates the most competition and the highest probability of meeting program mission needs on schedule.[214]

Competitive Multi-Sourcing with Distributed Awards. Under this new approach, the government awards contracts to two (or more) sources, with a primary contractor receiving the majority of funding. A second contractor is selected to create a continuous competitive environment and to provide a viable back up should the primary contractor fail to meet program objectives. The next section of this paper explores this approach in greater detail.[215]

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[212] Wydler, Ginny, Su Chang, and Erin M. Schultz. "Continuous Competition as an Approach to Maximize Performance." Defense Acquisition University. September 2012. Page 10.
[213] Ibid.
[214] Ibid, 10-11.
[215] Ibid, 11.

Competitive Multi-sourcing with Distributed Awards

Competitive Multi-sourcing with Distributed Awards offers an alternative to full dual sourcing, enabling the government to maintain multiple viable sources without having to "fully" fund or "share" work among competitors. Under this approach, the second contractor does not deliver an equal share, but receives sufficient funds to mature an alternative design, and bring competitive pressure into the environment. This can provide the government with a viable alternative contractor if the prime underperforms.[216]

Definition

Under this model, the government awards the majority of funding to a prime contractor, and at the same time provides a smaller amount of funding to a secondary source. Keeping a second source under contract at even a low level (e.g., 5–10 percent of prime contract costs) maintains significant competitive pressure on the prime contractor by greatly reducing the barriers of entry into the program (i.e., it lowers the costs of switching if the prime does not perform satisfactorily). It also allows the second source to refine and mature its technical approach and gain familiarity with the program's operations. The cost of implementing this competitive multi-sourcing approach can be relatively small compared to the benefits of competition that it provides.[217]

The DoD can apply this approach in several ways to maintain continuous competition in all stages of the acquisition lifecycle.

Percentage-based Distributions. Under this strategy, a set percentage of funding is allocated to each source. For example, Vendor A submits the best offer and receives the majority of funding (e.g., 90 percent) as the primary source. Vendor B submits the second-best offer and receives a smaller percentage of funding (e.g., 10 percent) to partially develop its design or to work on a particular subset of the contract requirements. This strategy keeps a second viable source in play during the prototyping, development, production, and sustainment phases, which will provide competitive pressure to motivate the primary contractor.[218]

Full Development with Scaled Production. Under this strategy, two or more contractors are fully funded to develop prototype products. After the two prototypes have been delivered, the government selects one contractor for full-scale production and awards a contract for limited production to the second source. This strategy can work best for products to minimize risk during the design phase of the program.[219]

[216] Ibid.
[217] Ibid, 11-12.
[218] Ibid, 12.
[219] Ibid.

Next Increment Prototype Model. Under this strategy, the DoD uses a primary source to maintain engineering capability for the current production unit. A lesser amount of funding is provided to a secondary source to build a prototype for the next program increment. In addition to getting a head start on the next spiral of development, this mechanism allows the DoD to introduce a second capable source and position it to compete with the prime for the next program increment.[220]

Partial Contractor-funded Development Model. Under this strategy, the DoD caps the amount of development funding to a second contractor (e.g., 30 percent of proposed costs). The contractor has the option to fully fund the development of the proposed design. This gives the contractor the potential to recapture these development costs during the production phase if the government selects the second contractor's design for production.[221]

Conditions for Use of Competitive Multi-sourcing with Distributed Awards

Certain conditions favor the successful application of Competitive Multi-sourcing with Distributed Awards during development of contracting strategies for acquisition programs. These conditions are derived from the historical perspective and lessons learned addressed earlier in this paper.

- High quantities with economic production rates. This condition can apply in both development and production phases of the acquisition. Competition can be maintained in the production phase in situations where investment costs are low, production accounts for the majority of the costs, and contractors go head-to-head for high-volume returns. Maintaining a second source in the development phase will work best when the government declares the intent to maintain dual sources in production.
- Credible competition. The second source must represent effective leverage and alternatives to the single-source environment. This situation can occur in an environment where industry competes on a regular basis, and the prime contractor recognizes the second source as a peer competitor. The contracting arrangement must also facilitate alternating from one source to the other.
- Sufficient technical knowledge in industry. Both the prime and secondary source must already have enough knowledge and intellectual property to offer credible competitive. At the very least, the secondary source must have adequate technical and manufacturing readiness to be viewed as legitimate competition. The contract and program reporting mechanism must track the costs of both competitors in order to close the design maturity gap and improve the Technology Readiness Level (TRL).
- Effective cost-benefit analysis. While it may cost 5–10 percent of the program budget in the short term, in depth cost-benefit analysis has the potential to save far more over the long term. The analysis can consider items such as reduced barriers to program entry,

[220] Ibid.
[221] Ibid, 13.

lower costs for switching between contractors, and the benefits of technology development and design maturity. The business case must also include budget and schedule considerations. Executing an acquisition strategy and keeping a second source in the competition increases the likelihood that the prime contractor will perform closer to budget and schedule.[222]

[222] Ibid, 13-14.

Appendix 3: Contract Types

Definitions of contract types. Data on contract types is generally grouped into one of the following four categories: (i) cost-reimbursement contracts, (ii) fixed-price contracts, (iii) time-and-materials and labor-hour contracts, and (iv) other contracts. The following definitions are provided to clarify what figures reported in each of these categories represent.

a. **Cost-reimbursement contracts**. These include contracts where contractors are reimbursed based on the incurrence of allowable costs.
b. **Fixed-price contracts**. These include contracts that provide for a firm price or, in appropriate cases, an adjustable price.
c. **Time and materials (T&M) and labor-hours (LH) contracts**. T&M contracts provide for acquiring supplies or services on the basis of direct labor hours at specified fixed hourly rates that include wages, overhead, general and administrative expenses, and profit, and actual cost for materials (with certain exceptions). LH contracts are a variation of T&M contracts where the contractor does not supply materials.
d. **Other**. These contracts and orders (i) are order dependent or (ii) were not coded with a contract type by the agency.[223]

[223] Gordon, Daniel I., Administrator. Office of Management and Budget. Letter to Joseph I. Lieberman, Honorable, Chairman, Committee on Homeland Security and Governmental Affairs, July 8, 2011. Page 6.

Appendix 4: Depots

These sections of U.S. Code provide complete details. This section is excerpted from *Contractor Logistics in the U.S. Air Force* by Boito, Cook and Graser.[224]

10 USC 2208(j), Working Capital Funds

This section permits DoD industrial facilities funded by a working capital fund to manufacture or remanufacture articles, as well as to provide manufacturing and engineering services and sell them to customers outside DoD.

10 USC 2320, Rights in Technical Data (as amended by the National Defense Authorization Act for Fiscal Year 2007)

This section addresses the government's rights to technical data for items and processes. The 2007 amendment requires program managers for major weapon systems and subsystems of major weapon systems to assess the long-term technical data needs of such systems and subsystems and establish corresponding acquisition strategies that provide for technical data rights needed to sustain such systems and subsystems over their life cycle. The assessment is to be done before contract award and is to consider priced contract options for the future delivery of technical data.

10 USC 2460, Definition of Depot-Level Maintenance and Repair

This section defines depot-level maintenance and repair as activities requiring the overhaul, upgrading, or rebuilding of parts, assemblies, or subassemblies, and the testing and reclamation of equipment as necessary, regardless of the source of funds for the maintenance or repair or the location at which the maintenance or repair is performed. The term includes (1) all aspects of software maintenance classified by DoD as of July 1, 1995, as depot-level maintenance and repair, and (2) ICS or CLS (or any similar contractor support), to the extent that such support is for the performance of services described in the preceding sentence.

Depot-level maintenance and repair does not include major modifications or upgrades of weapon systems that improve program performance or the nuclear refueling of an aircraft carrier. Private or public sector activities would continue to perform major upgrade programs covered by this exception. The term also excludes the procurement of parts for safety modifications but does include their installation.

10 USC 2462, Contracting for Certain Supplies and Services Required When Cost Is Lower

This section directs the Secretary of Defense to procure each supply or service necessary to accomplish the authorized functions from a source Laws, Directives, Regulations, Instructions, and Reports That Affect CLS Use 101 in the private sector if it can provide the supply or service

[224] Boito et al., *Contractor Logistics in the U.S. Air Force*, 99.

at a lower cost than DoD can provide it, unless the Secretary of Defense determines the function must be performed by military or government personnel.

10 USC 2464, Core Logistics Capabilities

This section, originally enacted in 1984, includes a number of relevant provisions. It discusses the necessity for core, government:

1. Owned and –operated logistics capabilities (employing government personnel and equipment)
2. Directs the Secretary of Defense to identify core logistics capabilities
3. Defines core logistics capabilities as those necessary to maintain and repair weapon systems and other military equipment (including mission-essential weapon systems or materiel, no later than four years after achieving IOC, but excluding systems and equipment under special access programs, nuclear aircraft carriers, and certain commercial items)
4. Requires the secretary to ensure that the core logistics workloads necessary to maintain core logistics capabilities are performed at government-owned and -operated DoD facilities of DoD (including those belonging to a military department)
5. Requires the secretary to assign such facilities sufficient workload to ensure cost efficiency and technical competence in peacetime while preserving the surge capacity and reconstitution capabilities necessary to support strategic and contingency plans
6. Precludes this workload from being competed with nongovernment personnel under Office of Management and Budget (OMB) Circular A-76 procedures
7. Gives the secretary waiver authority and procedures for implementing it for certain workloads not required for national defense reasons
8. Contains restrictions on DoD entering into a prime vendor contract for depot-level maintenance and repair.

10 USC 2466, Limitations on the Performance of Depot-Level Maintenance of Materiel

This section discusses limitations on the amount of depot-level maintenance and repair workload that contractors, as opposed to government facilities, can perform. The current limit is 50 percent of the funds for depot-level maintenance and repair workload per military department or defense agency. This workload restriction was originally established in 1988. The Secretary of Defense is allowed to waive this limitation for a fiscal year if he or she determines that the waiver is necessary for reasons of national security and if he or she submits to Congress a notification of the waiver together with the reasons for it. This section also requires an annual report that identifies the total amount expended for depot-level maintenance and repair, as well as how much is spent or is planned to be spent on public as opposed to private-sector activities in the prior, current, and ensuing fiscal years. In addition, it requires the Comptroller General to complete a review of this report within 90 days of its submission.

10 USC 2469, Contracts to Perform Workloads Previously Performed by Depot-Level Activities of the Department of Defense: Requirement of Competition

This section requires the Secretary of Defense to ensure that depot-level maintenance and repair workload is not transferred to a contractor or another depot-level DoD activity unless the change is made using (1) merit-based selection procedures for competitions among all DoD depot-level activities or (2) procedures for competitions among private and public-sector entities. This restriction applies to any workload greater than $3 million that is being performed by a DoD activity. A waiver provision addresses public-private depot partnerships.

10 USC 2470, Depot-Level Activities of the Department of Defense: Authority to Compete for Maintenance and Repair Workloads of Other Federal Agencies

This section, enacted in 1994, allows DoD depot-level activities to compete for the performance of any depot-level maintenance and repair workload of a federal agency that uses competitive procedures to select the performer.

10 USC 2472, Prohibition on Management of Depot Employees by End Strength

This section mandates that civilian employees of DoD who perform, or are involved in the performance of, depot-level maintenance and repair workloads must be managed solely on the basis of the available workload and the funds available for depot-level maintenance and repair.

These government employees cannot be managed on the basis of any constraint or limitation in terms of man-years, end strength, full-time equivalent positions, or maximum number of employees.

10 USC 2474, Centers of Industrial and Technical Excellence: Designation; Public Private Partnerships

This section directs the Secretary of Defense to designate each DoD depot-level activity (other than facilities approved for closure or major realignment under the Defense Base Closure and Realignment Act of 1990) as a Center of Industrial and Technical Excellence in its recognized core competencies. It also directs the secretary to establish a policy to encourage each military department and defense agency to reengineer industrial processes and adopt best business practices at its Centers of Industrial and Technical Excellence.

10 USC 2474 allows the military departments to conduct pilot programs to test any practices that could improve the efficiency and effectiveness of operations at the Centers of Industrial and Technical Excellence, improve the support these centers provide, and enhance readiness by reducing the time it takes to repair equipment. The section authorizes the head of each center to enter into public-private cooperative arrangements to conduct depot-level maintenance and repair

activities related to its core competencies, and establishes procedures for doing this. The amounts expended for nongovernment employees during fiscal years 2003–2009 do not count for 50-50 law compliance purposes if the personnel are provided by private industry or other entities outside DoD pursuant to a public-private partnership. These amounts are reported as a separate item in the annual report to Congress.

10 USC 2563, Articles and Services of Industrial Facilities: Sale to Persons Outside the Department of Defense

Under special conditions, this statute allows a working capital–funded industrial facility to sell articles that are not available commercially in the United States to a purchaser other than DoD.

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