Applying "Smart Competition" to Performance-Based Logistics

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Table of Contents

Executive Summary

In the late 1990s, a post-Cold War Department of Defense (DoD) entered a period of reduced budgets and increased uncertainty. As a consequence, the DoD was forced to delay many needed modernizations which increased Operations and Maintenance (O&M) costs due to increased maintenance for aging systems. The then Under Secretary of Defense, Dr. Jacques Gansler, warned that unless the trend was reversed quickly, the DoD faced a "death spiral" of reduced equipment readiness at increased costs (Kobren, 2009).

In response, the DoD adopted Performance-Based Logistics (PBL) as its preferred product support strategy in the early 2000s. PBL is an outcome-based, product support strategy designed to optimize system readiness through long-term product support arrangements.

PBL focuses on outcomes as opposed to individual transactions; PBL generally helps to improve product support performance and reduce life-cycle costs, is tailorable to unique program needs, and focuses on delivering best value. PBL also incentivizes contractors to invest in Reliability, Availability, and Maintainability (RAM) improvements, streamlines product support strategy development, and addresses Diminishing Manufacturing Sources and Material Shortages (DMSMS) and Obsolescence issues.

Performance-based logistics agreements are flexible, allowing product support to be provided using a variety of different approaches: agreements with the Original Equipment Manufacturer (OEM), a third-party integrator serving as the execution lead, or organically through the DoD. Regardless of approach, PBL agreements can become very complex, so they must be skillfully structured in order to deliver the desired benefits. To ensure effective management, the DoD has adopted a product support strategy that generally assigns specific roles and responsibilities to its organic personnel, as well as its commercial service providers.

More recently, the DoD entered another period of sustained downward budgetary pressure. And, after extended operational commitments in Iraq and Afghanistan, the Department must find the means to recapitalize and modernize the existing force structure. It is vital that the DoD provide product support as efficiently and effectively as possible, lest the DoD enter a new "death spiral". Despite the success record of PBL agreements in achieving cost savings, such

arrangements have fallen out of favor within the DoD, for a variety of reasons. The DoD must work to reverse this trend.

As with any other procurement, appropriately structured competition for product support can result in many benefits. Potential benefits from competitive PBL agreements include: Innovation, Sustainment Performance Improvements, and Improved Product Quality. However, competing too frequently can dis-incentivize contractors to invest in technology and processes that may produce savings over a longer period, as well as create other program inefficiencies.

Drafting a successful PBL agreement presents other challenges including determining the appropriate character, or scope, of a specific sustainment activity and identifying the appropriate outcome or performance metrics. In some instances, it may make sense to integrate a platform's support requirements into a single activity. In other cases, it may be more appropriate to focus only on sub-systems or components (e.g. aircraft engines, or avionics systems) that have high maintenance requirements and that are critical to the availability and operation of a platform or major system. It is also important for the stakeholder to develop performance criteria and metrics which are straightforward, measurable, achievable, and developed from requirements provided by the warfighter.

We examined several award winning examples of successful PBL sustainment programs that provide lessons for future product support planning:

- Since 2007, Lockheed Martin has provided PBL-based sustainment for the AH-64 Apache Helicopter's Target Acquisition and Designation Sight/Pilot Night Vision Sensor (TADS/PNVS) system. Lockheed Martin has consistently achieved a supply availability rate of approximately 97%, with an initial contract cost avoidance of $504 million.

- The C-17 Globemaster III Integrated Sustainment Program (GISP) is a Public-Private Partnership (PPP) between the United States Air Force and The Boeing Company providing effective PBL support for the C-17 aircraft. Under the arrangement, Boeing fulfills the dual roles of sustainment partner and Product Support Integrator (PSI). The partnership reduced C-17 flight-hour costs by 29% between 2004 and 2011, while achieving 86% operational availability.

- Since 2000, Northrop Grumman has provided PBL support to the Air Force's E-8 Joint Surveillance Target Attack Radar System (JSTARS). The Air Force chose to use a contract structure to develop and maintain an atmosphere of cooperation between Northrop and the Air Force, and to incentivize long-term contractor investment in product support improvements. The resulting partnership achieved a 96% effectiveness rate, a 96% Readiness Spares Packages (RSP) fill rate, and 96.9% stockage effectiveness rate.

Findings

DoD sustainment costs continue to rise as the DoD's weapon systems age and the industrial base continues to shrink. Tightening budgets place additional pressure on the DoD to provide more efficient product support for these systems. Performance-Based Logistics provides a way to increase product support effectiveness, while also achieving significant cost savings. Competitions conducted within the context of a PBL environment need to be conducted smartly, to ensure the DoD is receiving the best overall value, while also promoting cost-reduction efforts for product support services.

Smart competition is performed by maintaining a competitive environment, not by frequently having competitions. The government competes PBL contracts smartly by incorporating contractual elements that: encourage the use of PPPs, provide adequate incentives for contractors to assist with DoD's cost reduction efforts, and provide a sufficient contractual period of performance to encourage long-term commitment from the contractor. Contractors in a public-private partnership are more likely to commit to long-term investments in sustainment efficiency. While contractors are more likely to invest in overall cost-reduction efforts when they are part of a PPP, sufficient financial incentives should be incorporated into contracts in order to get contractors to implement cost reduction efforts which require significant financial resources. And, smart contracts are structured in a way which provides contractors enough time to develop and implement more efficient methods and processes. If a contract period of performance is too short, contractors will not invest in long-term cost cutting processes.

Based on the three award winning PBL program case studies and the results of research, we have identified the following recommendations for using a Performance-Based Logistics approach for sustainment.

Recommendations

Continue to encourage the use of PBL for Weapons Systems

The Defense Department has experienced success with Performance-Based Logistics agreements for weapons systems that require significant life-cycle expenditures. As it continues to evaluate existing weapons systems and field new ones, the DoD should determine the best application of PBL (at the system, subsystem, or component level) and how these strategies can assist with life-cycle cost reduction efforts. While every weapon system could benefit from the appropriate use of PBL, weapon systems with significant life-cycle expenditures should conduct business case analyses to determine the benefits to be gained.

Encourage the Development of PPPs

Public-private partnerships provide a way for the military to leverage private sector resources to improve product support, while enabling the DoD to make the best use of their organic capabilities and reduce resource expenditures. In each of the cases analyzed, the PPP assisted in providing the warfighter with higher performing platforms at a reduced cost.

Extended Contract Lengths Incentivize Contractor Investment in Cost-Reduction Efforts

Contractors need to be properly incentivized to make investments that improve product support performance and cost-efficiency that extend beyond the life of the basic contract. In the event the Government decides to re-compete the contract after a relatively short period of time, the contractor's primary motivation shifts to winning the new contract, instead of using their resources toward improving the cost-effectiveness of the existing contract. It is more wiser for the government to incentivize contractor investments by awarding longer termed contracts, with option years, so it can evaluate the contractor's efforts and see the benefits that come from the longer termed contract (e.g. reduced cost, investment by contracts, relationship building).

Create Incentives utilizing Share-Ratios to assist with Cost-Reduction Efforts

The government should encourage cost-reduction efforts by contractors through the use of share ratios of cost savings realized in programs as a result of cost-reduction measures put into place by the contractor. Financial incentives, such as share ratios, should motivate contractors to invest in cost-reduction efforts to assist the DoD with its budgetary pressures.

Monitor Industry to ensure Secondary Source Service Provider

PBL product support contracts naturally limit potential sources of competition to well-established contractors that have developed global supply chain sourcing. While an OEM may be initially selected as the sustainment partner, the government should keep in mind that other firms can acquire the necessary expertise and serve to maintain a competitive environment for future requirements that might arise. The Government should be willing to commit to a longer period of performance for PBL contracts, but it should always have a strategy to identify a secondary source, in the event performance by the contractor does not meet the requirements or the expectations for improvement. Contracts should be structured with “off ramps” to maintain the competitive environment, and so that a change can be made, if required.

I. Introduction

In the late 1990's, a post-Cold War United States Department of Defense (DoD) was struggling to modernize equipment in times of reduced budgets and increased uncertainty regarding how the military of the future should be structured. In his June 27, 2000 Congressional testimony, former Under Secretary of Defense for Acquisition, Technology, and Logistics, Jacques Gansler warned that the DoD had aging equipment that could not be replaced in the near future. As a consequence, Operations and Maintenance (O&M) costs would continue to grow. Gansler warned that unless the trend was reversed quickly, the DoD faced a "death spiral" of reduced equipment readiness at increased costs (Kobren, 2009).

In response to the impending O&M "death spiral," the DoD adopted Performance-Based Logistics (PBL) as its preferred strategy for product support in the early 2000's. Performance-Based Logistics is an outcome-based product support strategy designed to optimize system readiness through long-term product support arrangements. With PBL, outcomes are acquired through performance-based agreements targeted to meet the requirements of the warfighter, while incentivizing product support providers to reduce costs through innovation (PBL, 2015).

Performance-Based Logistics is about supporting the warfighter with increased weapon system Reliability, Availability, and Maintainability (RAM). Since PBL focuses on outcomes as opposed to individual transactions, it helps to reduce life-cycle costs, is tailorable to unique program needs, and focuses on delivering best value. PBL also incentivizes desired contractor behavior, streamlines product support strategy development, addresses Diminishing Manufacturing Sources and Material Shortages (DMSMS) and obsolescence issues, and incentivizes the product support integrator to invest in RAM improvements (Kobren, 2009). As a result of these cumulative benefits, PBL became DoD's preferred product support strategy.

Performance-Based Logistics agreements are flexible and the required product support can be provided using a variety of different approaches including agreements with the Original Equipment Manufacturer (OEM), a third-party integrator serving as the execution lead, or organically through the DoD. Regardless of approach, PBL agreements can become complex, and they must be skillfully structured, in order to deliver the desired benefits. To ensure effective

management, the DoD has adopted a product support strategy that generally assigns specific roles and responsibilities to its organic personnel, as well as its commercial service providers.

Despite the DoD's successful record with PBL, Performance-Based Logistics contracting is still not widely accepted within the DoD. While there are several reasons for this reluctance, DoD policies regarding competition, especially if inappropriately applied to PBL contracts, can reduce their effectiveness and make PBL less attractive.

With constrained budgets, the "death spiral" Dr. Gansler spoke of in front of Congress in 2000 is even more of a threat today. Finding effective and efficient approaches for product support is even more important today than it was at the turn of the millennium.

This paper discusses the impact of competition on developing appropriate product support strategies. It also discusses PBL as a partnership, as an alternative to traditional sustainment service agreements, and provides case study examples to illustrate the different strategies used to structure PBL arrangements. We show that the PBL strategy for sustainment is a very valuable tool that the DoD has at its disposal.

We begin by analyzing PBL sustainment strategy and reviewing the nature of PBL contracts, and how they are managed and implemented. In the next section, we discuss the issue of competition, and how it fits into the context of PBL contracting. We then discuss three cases where PBL contracting has been successfully implemented. Finally, we present our findings and recommendations for approaches to competition, within the context of PBL contracting, and other considerations for the use of PBL in light of the current budget situation.

II. PBL as a Sustainment Strategy

The DoD spent approximately $153 Billion on logistics and sustainment in FY 2014 (Peters, 2015). According to the Office of the Secretary of Defense (OSD), sustainment costs have 5 to 10 times more impact on total life-cycle costs than Research, Development, Test and Evaluation (RDT&E) costs, and 2 to 3 times the impact of procurement costs. Figure 2 illustrates the percentage of total life-cycle cost for each segment, as applied to four different types of weapon platforms (Gansler et al., 2010).

Figure 1: Total Life-Cycle Costs by Weapon Platform

Type System	RDT&E	Procurement	Operations & Sustainment
Fixed Wing Fighters	9%	30%	62%
Ground Systems	4%	24%	73%
Rotary Wing	6%	29%	64%
Surface Ships	1%	31%	68%

Source: Office of the Secretary of Defense, *Memorandum for Principal Deputy Under Secretary of Defense, SUBJECT: State of Reliability*, June 2010.

In the March-April 2012 issue of Defense AT&L: Product Support Issue, John Boyce and Allan Banghart argue that full adoption of PBL could, at even the most conservative estimates, save 10–20 percent on the $90 Billion spent annually for sustainment (Boyce and Banghart, 2012).

What is Performance Based Logistics?

Performance-Based Logistics (PBL) is an outcome-based product support strategy designed to optimize system readiness and meet the performance requirements of the warfighter. PBL provides weapon system sustainment through an affordable, integrated package based on output measures, such as weapon system availability, instead of input measures, such as parts and technical services. It focuses on how a system is supported and how success is measured (Boyce and Banghart, 2012).

Daniel Gouré of the Lexington Institute describes how PBL is different from other sustainment strategies:

> *Performance-based logistics changes the risk and incentive relationships that exist between the suppliers of services and the government customer. Unlike fixed-price or cost-plus contracts, PBL permits the service provider to realize greater gains the more efficient he becomes and the greater the availability of the products. By tying the supplier's compensation to outputs – measurable increases in value to the customer – PBL serves to improve product availability and reduce the total costs of ownership for the customer. (Gouré, 2009)*

The service provider is responsible for meeting a minimal performance standard that was agreed to by the customer. Here is how PBL could accompany the purchase of a new car:

> *PBL is very similar to acquiring a warranty with the purchase of a new car, but instead of receiving a guarantee for the replacement of any defects, the car dealer either promises the vehicle will be in working order for a certain number of miles or that the car will be available for use a certain percentage of the time. In order to achieve the guarantee, the car dealer provides preventive maintenance and even seeks and implements more reliable parts than the originals. If the car failed to achieve the guaranteed performance metric, the dealer would have to refund part of the warranty price or provide an entirely new vehicle to the customer. This type of arrangement incentivizes the car dealer to reduce maintenance costs and the amount of repair shop time in order to maximize profits. The car purchaser receives the performance he or she wants from the car while the car dealer is able to increase profits from the sale of a vehicle (Gouré, 2009).*

There are several challenges when drafting PBL agreements such as determining the appropriate character, or scope, of a specific sustainment activity and identifying the appropriate outcome or performance metrics. In some instances, it may make sense to integrate a platform's support requirements into a single activity. In other cases, it may be more appropriate to focus only on sub-systems or components (e.g. aircraft engines, or avionics systems) that have high maintenance requirements and are critical to the availability and operation of a platform or major system. It is also important for the stakeholder to develop performance criteria and metrics that are straightforward, measurable, achievable, and developed from requirements provided by the warfighter (Mahon, 2007).

A key to the success of PBL is the altered relationship between the service provider and the customer. According to the DoD Product Support Manager Guidebook, performance-based contracts inherently incentivize service providers to invest in the continual improvement of performance, while optimizing support cost. For the government, the incentives of PBL are improved support to the warfighter and more predictable expenditure of resources, with less of a management burden (PBL Guide, 2015). With PBL, some traditional functions of the

government are shifted to the contractor without sacrificing any of the government's 'core capabilities,' allowing the government to maintain the capability, but relinquishing the performance of the service to the contractor (Gouré, 2009). When this is coupled with an assured, long-term income stream, which is often preferred over higher profit margins with less certainty, providers are further incentivized to invest in process and reliability improvements (ODASD, 2011).

Figure 2: Legacy Product Support Contracts vs. PBL (Whitehead, 2014)

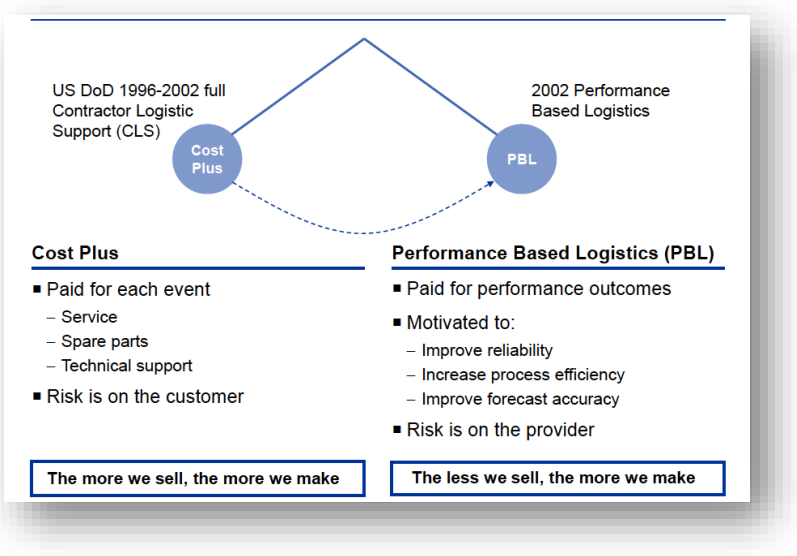


Figure 2 illustrates the key difference between legacy transaction-based logistics support contracts that were frequently structured as Cost-Plus contracts and PBL acquisition models. The chart illustrates that transaction contracts essentially incentivize contractors to sell more in order to make more profit. Conversely, PBL incentivizes the contractor to be more efficient in order to increase its profit (Whitehead, 2014).

PBL Contracting Mechanism

The mechanism by which PBL is implemented for a specific platform, system, or item is through a Performance-Based Agreement (PBA). While traditional sustainment contracts provide parts and/or labor hours at a set price, a PBA stipulates specific outcomes or support metrics the customer seeks, and the manner in which the contractor is to be rewarded for successful

performance, as defined by the Program Manager (PM). The contractor then defines the level of support necessary to achieve those outcomes (PBA, 2015).

The ultimate objective of a PBA is to evolve to a firm-fixed price contract for the desired outcomes. For many PBAs, it is desirable to employ a cost-plus incentive fee approach early in the performance period, while risk reduction occurs. Once sufficient data regarding a system's sustainment requirements has been accumulated and a well-functioning supply chain created, it should be possible to convert a PBA to a fixed-price contract (Gouré, 2009).

In order to justify entering into a PBA, the DoD requires a Business Case Analysis (BCA) to be performed. A BCA is an expanded Cost Benefits Analysis (CBA), which considers factors such as performance, reliability, and supportability of the platform in addition to cost. The BCA should demonstrate that, by entering into a PBA, the government will either save money, in comparison to existing support arrangements, or will realize performance benefits, at little or no additional cost (Mahon, 2007).

Establishing metrics which define the focus of the PBA and judge its outcome is a critical part of the process. Metrics must reflect the needs of the warfighter and be expressed in terms of performance criteria related to desired outcomes. Cost may be a metric, but it is only one of many and NOT the most important (PBA, 2015).

PBAs need to be of a sufficient duration to allow all parties to fully appreciate the costs involved in supporting a platform or system, to identify opportunities for cost reduction, and to implement the necessary changes. The service provider needs time to make the necessary investments in infrastructure, engineering support, and maintenance processes to improve availability and reliability, and see the return on investment (Gouré, 2009). Consequently, **although a competitive environment is critical, frequent competitions are not**.

III. Competition

Current law and DoD acquisition policy are based on the premise that competition is the best way to ensure that contractors deliver the greatest value. In the 2014 *Performance of the Defense Acquisition System* report, the DoD stated that:

> *Competition—or at least creating competitive environments—is a central tenet of our Better Buying Power initiatives. Competition is the single best way to motivate contractors to provide the best value (i.e., the best performance at the lowest price) to the Government. We set a strategic objective to increase the percentage of spending on competed contracts from current levels.*

The Office of the Secretary of Defense Acquisition, Technology, and Logistics says a competitive environment exists when the "incumbent is concerned about maintaining his or her position relative to an alternative product or service provider" (OSD ATL, 2015).

While competition can be a powerful tool for achieving cost-effective acquisition, the additional benefits of competition, such as research and innovation, "depend on a market sufficiently appealing to attract more than one bidder," according to Scott E. Chandler of the Lexington Institute. In spite of the DoD's emphasis on competition, competition rates for all contract obligations declined from 63 percent in 2008 to 57 percent in 2012 (GAO, 2013). National Defense magazine observed, "It is not unusual to see dozens of contractor representatives turn up at an industry day to hear about a new opportunity, but after the actual solicitation is published, very few might end up submitting bids" (Erwin, 2014).

According to Chandler:

> *[Under Secretary of Defense for Acquisition, Technology, and Logistics Frank] Kendall attributes the decline primarily to decreasing defense budgets and fewer competitive opportunities, but it is more clearly DoD's own acquisition policies that too often fail to attract bidders. The Defense Business Board (DBB) observed that "DoD lacks sufficient understanding of business operating models and drivers of innovation." DoD consistently fails to appreciate the connection between policy, DoD buyer behavior, and results. Predictably, competition rates continue to fall. (Chandler, 2014)*

While the DoD correctly makes competition an important part of its acquisition strategy, DoD leaders often fail to realize that buyer behavior has a direct impact on the results of competitions. In order for a competition to be successful, a reasonable buyer with an attractive proposition is required. Requests For Proposals (RFP) with terms and conditions that dissuade multiple bidders, fail to protect creators of innovation and intellectual property, or that require

compliance with burdensome policy and legislative requirements discourage competition (Chandler, 2014).

A RAND report elaborates on the singular nature of competition when applied to the DoD's acquisition of major weapons systems: The basic argument to compete procurement is the perceived cost savings for the purchasing goods and services; however, in some cases, competition actually increases costs and lengthens timelines, making the implementation of an alternative strategy more prudent (Arena and Birkler, 2009).

Benefits of Competition for Product Support Arrangements

As with any other procurement, appropriately structured competition for product support can result in many benefits. Competitive PBL agreements can produce:

- *Innovation*

  The nature of competition encourages innovation in the competitive marketplace. As companies innovate and develop more cost-effective process improvements or more advanced product features that enable them to differentiate their products from those of competitors, they are able to obtain greater competitive advantage over other companies. The DoD benefits from innovation as it seeks to constantly upgrade the capabilities of its weapons systems, while reducing the costs of maintaining these systems.

- *Sustainment Performance Improvements*

  Performance improvements are a natural side effect of competitive marketplaces. As companies enter the market with higher performance standards, consumers expect competitors to match such standards, or they face the potential of being driven from the marketplace. With PBL type contracts, performance improvements are considered necessary to meet the ever-changing requirements of the warfighters. As more contractors become proficient in the execution of PBL-type contracts, it is important for acquisition personnel to identify performance improvements that competitors have implemented in order to see if these improvements could assist with their respective programs, as such improvements may create additional competitive opportunities.

- *Improved Product Quality*

The DoD currently has several aging weapon systems due for replacement, but they cannot be replaced with the current budget and sequestration environment. As such, the DoD could benefit from competing weapon system sustainment programs. By doing so, the DoD could improve the overall product quality of existing weapon system platforms and potentially extend their service lives until another weapon system platform with similar or improved capabilities can be developed and fielded. The absence of PBL competition might not improve product quality enough to ensure new technology incorporation or satisfactory sustainment to keep a capability available to warfighters.

Competition for Product Support can be a Double-Edged Sword

There are also challenges when trying to introduce competition into the process of acquiring product support services. These challenges are partially due to the nature of product support arrangements and partially to defense acquisitions in general. Challenges in competing product support arrangements include: the complex nature of PBL requirements, the disincentive of overly frequent competition, and the time and resources required to transition contractors.

The Complex Nature of PBL Requirements

Product support agreements are not commodity-type in nature, often preventing an adequate development of requirements to cover situations that may arise during the life of the contract. As such, it would be inappropriate to limit the contractor's ability to adapt to different situations that may arise. When a rigid framework is developed in a contract, the acquisition of services outside of the scope of the contract becomes costly and time consuming for the Government. Therefore, the nature of PBL contracts should provide the flexibility the Contractor and the Government need to meet evolving requirements. However, contract flexibility requires complexity, which generally equals time and money.

Competing too frequently can be a Disincentive

The DoD has endeavored to increase competition on service contracts by limiting the Period of Performance (PoP) to as little as a single year; however, short contract lengths can

result in lost proposal value and contract productivity, due to a short PoP before the next competition. Consequently, the contract winners focus on reducing short term costs instead of investing in performance-improving, cost-saving initiatives, which are significant, but would take longer to see a return on investment. By frequently re-competing contracts, the Government is increasing the General and Administrative (G&A) overhead base the contractor could utilize to allocate proposal costs. In addition to increasing contractor costs, the Government is also increasing the overhead base rates that contractors can charge on some cost-type contracts.

It Takes Time and Resources to Effectively Transition Contractors

The government must evaluate the transaction costs associated with transitioning contractors when evaluating how often to compete PBL contracts. PBL contracts can require contractors to develop extensive networks and supply chains, a process which can take significant time and resources. Replacing a contractor has the potential to create inefficiencies and reduce performance outcomes. Additionally, time is required to train replacement contractor personnel on the specific processes and procedures for weapon system support. The lack of proper training or training time can affect performance outcomes and increase overall costs.

Competitor proposals with plans to hire incumbent contractor personnel may not be feasible, reducing the value of the competitor's proposal. While retaining incumbent personnel might assist with bringing the new personnel up to speed, there is no guarantee this will happen. Contractor personnel cannot be forced to switch companies, and there is no guarantee that the previous contractor will agree to subcontract with the new contractor.

While the DoD would like to increase competition for PBL contracts, the transition costs associated with changing contractors does not mean that frequent competitions is prudent. PBL contracts should be subject to competitive environments, but these contracts must be competed smartly. It is in the DoD's best interest to ensure that additional transition costs are considered during period of performance evaluations. All of these factors increase the risk of delays and/or cost overruns. Shorter periods of performance hinder the Government's ability to obtain **best value over the long-term**.

Longer Contracts Incentivize Partnerships

While the DoD values competition, the DoD must recognize that contractor behavior is influenced by the agreements into which they enter. While a contract to clean a local office's carpets will not produce any benefits for the DoD by agreeing to a ten year PoP, contracts for aircraft requiring worldwide sustainment efforts would benefit from ten year PoP. The DoD has somewhat handcuffed its ability to implement effective PoP for large scale sustainment efforts. Initiatives limiting contract length to maximize competition don't always produced effective results. Other government restrictions, such as the "color of money," also limit the ability of acquisition teams to always find the best solution. The DoD must incentivize contractors to form partnerships where necessary long-term investments are more likely to occur.

The DoD's Revised Guidance for Service Contract Length

The DoD originally advocated in the Better Buying Power 1.0 initiative for service contracts to be re-competed every three years. In Better Buying Power 2.0, the DoD revised this guidance preferring for contracts to have a three year PoP extended by option years. By revising its preference, the DoD recognizes that some contracts require significant investment by the contractor. When a contract is awarded for only three years, the incentive for the contractor to make large scale investments is minimal. Designing contracts with a three year PoP extended by option years provides the government with the best of both worlds. The government benefits from competition while providing contractors incentive to invest in large scale improvements.

PBL Arrangements Benefit from Long Term Contracts

The DoD PBL Guidebook properly identifies that contractors have preferences for contract lengths. This preferred length is dependent on the complexity of the system under contract. Simple systems may only need a three or four year PoP in order for the contractor to make necessary investments, while very complex weapons systems generally need five- to seven-year contracts for contractors to invest in large cost reductions (DoD 2014b). One and two year PoP do not provide adequate incentive for the contractor to invest in performance improvements for even the least complex systems. Therefore, long-term PBL contracts offer more benefits for the DoD than short termed, frequently competed contracts.

The PBL guidebook anticipates contractors of complex systems or subsystems need a seven year PoP in order to be incentivized enough to make significant investments (DoD 2014b):

- Years 1 & 2 – Identify issues impacting reliability and cost;
- Years 3 & 4 – Design fixes to systems and processes;
- Years 4 & 5 – Field improved system; and
- Years 6 & 7 – Recover the investment

The Impact the Color of Money plays in Determining Contract Length

The color of money plays a significant role in determining contract PoP. While very long-term PBL contracts are attractive, program offices subject to annual appropriations, such as Operations and Maintenance accounts, are limited in the number of base contract year(s) it can contract, resulting in the use of additional option years. Agreeing to longer termed contracts incentivizes contractors more than three year contracts with option years. A contractor is more willing to invest in cost reduction efforts when contract years are guaranteed. Some program offices are able to leverage working capital funds to provide long-term arrangements. The method not chosen enough is requesting multi-year contract authority through congressional appropriation. This method of funding long-term contracts reduces the need to implement option years in contracts or reassign capital funds.

Investment in Innovation takes time to Implement

While contractors can make innovation investments on a voluntary basis to their own facilities and processes, contractors require special approval to make similar improvements to facilities, equipment, and other processes controlled by the Government. Such approval requires a significant investment of time. A short period of performance does not provide the contractor with enough time to obtain the necessary approvals, make the required investments, and to integrate innovations. The Government needs to enable a realistic time frame to allow contractors to fully implement innovative approaches and see a return on their investment, or these investments are unlikely to occur.

United Kingdom's Ministry of Defence (MoD) embraces an alternative strategy

In a period of shrinking defense budgets, the MoD shifted to an approach to weapons systems sustainment that closely parallels PBL. This approach, called through-life support (TLS) and through-life capability management (TLCM), is based on acquiring "outcomes" and capability over the life of a platform in order to reduce cost and improve performance. TLS refers to supporting a weapons system platform throughout its entire life-cycle. TLCM represents a still further evolution of the through life concept to delivering not just weapons system availability, but delivering capability – e.g., the capability to blow up a target (Gansler, et al, 2012).

The UK MoD believed that paying for a given level of availability over long-term contracts would provide industry with incentives to reduce support chain costs while also making weapons systems more reliable and efficient. TLS-TLCM constitutes a new approach to acquisition that is based on partnering with industry to achieve better outcomes and deliver defense capability, while providing better value for money and greater control of defense acquisition expenditures (Gansler, et al, 2012).

TLS-TLCM represents a fundamental change in the relationships between, as well as in, the roles of, the decider (MoD) and the provider (the supplier). The MoD's new role involves deciding what capability or output it wants and then contracting for it—usually over an extended contract term of several decades. Suppliers, in this paradigm, become the capability provider, guaranteeing the MoD the capability for flying a given number of hours, for example (Gansler, et al, 2012).

This new acquisition approach represents a move up the business relationship evolutionary ladder—from a purchasing/transactional attitude with a short-term focus, to a partnership relationship with a long-term commitment (Gansler, et al, 2012). And, longer-term contracts, rather than stifle competition, actually generate it – albeit in an untraditional form. The provider-supplier relationship with ample incentive to make ongoing investments in improvement is important to the overall success of the effort. Such an incentive does not exist in the short-term, transaction-focused contract approach currently favored by many in DoD.

In its shift to a through-life approach, the MoD adopted a model for guiding the teams managing major sustainment programs to deliver whole-life cost savings, through incentivized contracting. This process, known as the Defence Logistic Transformation Staircase, now is a central component of the MoD's Defence Logistic Transformation Programme.

The goal of the Transformation Staircase is to move integrated project teams from traditional contracting through a series of steps to the ultimate goal of transferring all of the risk to industry by paying suppliers to deliver a capability. By incentivizing contractors (via long-term contracts) to achieve a high level of performance and availability, the MoD encourages the contractor to improve the reliability of the equipment through modification over time as well as through improved maintenance solutions, and thereby reduce the overall cost to operate.

The MoD's gamble on incentivized contracting is paying off. On the projects in which TLS-TLCM was adopted and implemented, the benefits it generated were impressive. Between 2005 and 2008, these TLS-TLCM programs had generated cumulative savings of about £1.4 billion, according to the 2007–2008 Ministry of Defence Annual Report and Accounts, while simultaneously achieving performance improvements (Gansler, et al, 2012).

The success of the MoD's Programme is partially attributable to the fundamental concept of the importance of business investment to the overall success of through-life costs. Businesses need to be able to recoup their initial investment and to profit from such investments in cost-reduction strategies to be able to justify their investment. Otherwise, defense contractors will be better off pursuing investment opportunities earning minimal return than to support DoD's cost-reduction efforts for product support services. In general, when considering the allowable period of performance for a contract effort that has higher technological and capital requirements; longer periods of performance need to be if the business case makes sense for anyone other than an incumbent contractor (Chandler, 2014). For anyone submitting a proposal, the longer the period of performance, the more risk a potential bidder can take in providing a low-cost bid because time and the contractor's independent investment can be employed to enable the lowest competitive price (Chandler, 2014).

Contractor Investment Payback Period Example

The DoD departed from its traditional product support practices when it contracted with Boeing for sustainment of the C-17[1]. The company made an investment of $62 million over five years to enhance the organic maintenance capabilities at three Air Logistics Centers (DoD IG 06-101, 2006). These investments were primarily capital expenditures in the form of material, labor, and data and were the exclusive possession of the government. In exchange, Boeing was allowed to charge depreciation on the investments. Once the equipment was fully depreciated, the title for the equipment passed to the government (DoD IG 06-101, 2006).

Investment by contractors into government facilities was and still remains a controversial matter by individuals both in and out of the Government. The investment Boeing made in the three ALCs was most heavily scrutinized by the office of the DoD Inspector General (IG). The DoD IG accused the Air Force of improperly augmenting its appropriations and potentially obscuring true program costs by receiving outside investments. The General Counsel of the Air Force and the Deputy General Counsel of the DoD disagreed with the IG's finding, since the investment directly benefitted Boeing by aiding its ability to meet contract performance requirements (DoD IG 06-101, 2006). Also, the investments were intended to improve efficiency at the facilities for government and contractor personnel and eventually increase profit margins for the contractor. While the government could have made the facility upgrades itself, the upgrades were implemented more quickly and cost effectively by the contractor. Contractor investment in cost-reduction efforts should be encouraged as it is mutually beneficial.

The Discounted Payback Period Analysis

A discounted payback period analysis was conducted to illustrate the effects of contractor investment on cost reduction benefits realized by the government. The information was found in research sources and was not provided by Boeing. It does not reflect any management decisions made by Boeing. This example is for illustrative purposes only and does not reflect actual cost-reduction benefits realized under the C-17 Globemaster III Integrated Support Program (GISP). The analysis also shows the time required for Boeing to recover its investment.

[1] The C-17 PBL is the 2nd example case, and it is fully described in Section IV of this report.

As part of the GISP contract, Boeing provided an investment of $62 million into ALCs located in Warner Robins, GA, Oklahoma City, OK and Ogden, UT (DoD IG, 2006). Under GISP contract clause H-029, Boeing was required to make investments targeted at increasing ALC capabilities related to C-17 sustainment (DoD IG 2006). In addition to the contractually required investment, Boeing later agreed to perform Product Support Integration (PSI) for aircraft sustainment. As PSI, Boeing proposed strategies aimed at achieving $12.4 billion in life-cycle savings over a 30-year period (SECDEF PBL AWD, 2012).

This analysis shows the amount of time required for Boeing to re-coup its investment under a certain set of assumptions. While the initial investment, the total projected cost savings over a 30-year period, the time period of the investment, and the locations benefitting from the investment are known, some assumptions were made to illustrate the importance of contract performance periods.

Additional Assumptions made for the Discounted Payback Period Analysis Include:

- Boeing's $62 million investment completed over a 5-yr period as stated in contract and the assets are placed in service at the end of the five-year investment time horizon.
- Projected cost savings over 30-year period ($12.4 billion) substantially realized to the point where Boeing is able to share in the cost savings through increased profitability.
- Assume that cost reduction efforts begin to materialize year after equipment purchases placed into service.
- To smooth out potential cost reduction peaks and troughs, assume that additional cash flows realized evenly over the remaining life of the contract.
- For purposes of this illustration, assume that Boeing only purchases equipment that can be depreciated over its useful life.
- For purposes of this illustration, assume that equipment placed in service at end of 5-year investment period and depreciated over 7 years after placed in service. Per contract terms, equipment transfers title to the Government once fully depreciated. Assume that Boeing utilizes a Modified Accelerated Cost Recovery System (MACRS) 7-yr depreciable mid-year convention to depreciate its equipment investments.
- Assume that Boeing is able to share approximately 5% of projected cost savings with the

Government in the form of additional cash flows to Boeing. While the annual cash flows would continue beyond the 10-year period used in the example, the purpose of this example is to illustrate an approximation of how long it would take the contractor to recover the initial investment and begin to realize a return on its investment.

- Boeing's corporate tax rate from financial statements (27.72%) (Accessed June 2015) is approximately consistent over the 10-year period.
- Boeing's Weighted Average Cost of Capital from financial statements (8.22%) (Accessed June 2015) does not change significantly over the 10-year period.
- Depreciation cash tax savings consists of annual depreciable expense multiplied by corporate tax rate.

The discounted payback period calculation in Exhibit 1 shows that, based on the underlying assumptions, the minimum period is approximately 8 years and 8 months. Of course, this assumes that Boeing is able to receive annual cash flows ($20.67 million) that total at least 5% of the total projected cost savings efforts ($12.4B over 30 years). In the event Boeing realizes a lower percentage of cost reduction efforts, the required discounted payback period would increase. Consequently, Boeing needed to be incentivized to make such an investment so it could recoup the cost of its investment and realize additional cash flow. Without additional incentive, Boeing would have been better off seeking other investment opportunities.

This example shows that longer PoP are required to incentivize contractors to make investments in government facilities and to search for other ways to create more cost-saving measures without sacrificing performance quality.

Another Argument for Longer Periods of Performance

A study conducted by John Boyce and Allan Banghart in 2012 for Defense AT&L Magazine showed that contracts with fewer PoP years often had higher costs and poorer contractor performance than contracts with longer PoP (Boyce and Banghart, 2012). In general, contracts for non-commodity-type acquisitions have a direct negative correlation between PoP years and cost and a positive correlation between PoP and contractor performance. Acquisition teams must evaluate the potential impacts of different PoP on their program.

IV. Performance Based Logistic Case Studies

This section of the report highlights three case studies of successful PBL sustainment efforts by three different companies. The cases describe the programs and summarize the results of the PBL contracting approach.

A. Performance Based Logistics for the "Eye of the Apache"

Since 2007, Lockheed Martin has provided sustainment for the AH-64 Apache Helicopter's Target Acquisition and Designation Sight/Pilot Night Vision Sensor (TADS/PNVS) system. This sustainment effort is performed under a PBL contract with the United States Army. Lockheed Martin has consistently achieved a supply availability rate of approximately 97%, with an initial contract cost avoidance of $504 million. In recognition of the increased reliability and reduced costs, the Apache Sensors PBL contract won the Secretary of Defense Performance-Based Logistics Award for Excellence, in Performance-Based Logistics in Life-Cycle Product Support, for the sub-system category in 2013. The Public-Private Partnership (PPP) between the Apache Program Management Office and Lockheed Martin for the sustainment of the TADS/PNVS and upgraded M-TADS/PNVS systems illuminates **the benefits of smart contracting**.

Photo Courtesy of U.S. Army

The AH-64 Apache Helicopter

Designed as a replacement for the AH-1 Cobra Helicopter, the AH-64 Apache Helicopter was conceptualized as a high-powered, tank-killing attack helicopter, capable of repelling conventional ground forces during a Soviet invasion of Europe. Although the first AH-64 was delivered to the Army five years before the fall of the Berlin Wall, the Apache remains the Army's primary and most advanced attack helicopter. The primary mission of the AH-64 is to perform armed reconnaissance and conduct rear, close, and shaping missions, including deep

precision strikes (Army, 2015). The AH-64 has accumulated over 3.9 million flight hours since its introduction into service, with operational deployments during Desert Storm, Operation Iraqi Freedom, and Operation Enduring Freedom, and it is currently deployed in support of Operation Inherent Resolve in Iraq. The AH-64 is expected to have a continued service life beyond 2030, with a total production run of 2,100 Apaches, delivered to twelve international buyers (Boeing, 2015c).

The TADS/PNVS System

Central to the Apache's mission is the Target Acquisition and Designation Sight/Pilot Night Vision Sensor (TADS/PNVS) system, nicknamed the "eye of the Apache." The first generation of the TADS/PNVS system was fielded by the Army in 1983. The system, comprised of two sub-systems, enables Apache pilots to fly at low altitudes in total darkness and poor weather. The TADS/PNVS system also provides the capability for the co-pilot to identify and engage hostile targets (Yenne, 2005).

In 2003, Lockheed Martin was awarded a production contract for an upgraded, modernized version of TADS/PNVS. The M-TADS/PNVS, also known as the "Arrowhead," is an "advanced electro-optical fire control system that AH-64D/E Apache helicopter pilots use for targeting and pilotage in day, night and/or adverse-weather missions". The updated version is projected to lower sustainment costs by 50%, over the system's expected 40-year life span (Lockheed, 2015).

Product Support Prior to PBL

Prior to the initial TADS/PNVS PBL contract, the sustainment cost for the Apache's sensors systems averaged $218 million per year. Product support functions were performed organically, with Lockheed Martin providing 'repair and return' services on a transactional basis (SECDEF PBL AWD, 2011).

The original TADS/PNVS uses a Line Replaceable Module[2] (LRM) design that consists of 26 LRMs. The LRM design allowed technicians to remove and replace faulty equipment on

[2] A Line Replaceable Module is an essential support item removed and replaced at field level to restore an end item to an operationally ready condition.

the flight line. The removed units were then sent to intermediate-level maintenance at the division or corps level for repair. Depot level maintenance was handled either at the then, Martin Marietta depot facility in Orlando, Florida or, at rework facilities handled by subcontractors (Robbins and McIver, 1994). A 1994 RAND report analyzing logistics support for the Army's high-tech weapons found that the Army overstocked several LRMs for the TADS/PNVS system while other units were in short supply (Robbins and McIver, 1994). This report concluded that the inefficiencies in intermediate level maintenance would have allowed for only 25% of the Apache carcasses received during a large scale operation, like Desert Storm, to be repaired and returned to serviceable status, due to a lack of capability at critical repair facilities.

PBL Contracting for the TADS/PNVS

In 2007, Lockheed Martin was awarded a sole-source PBL contract for sustainment of both the TADS/PNVS and M-TADS/PNVS systems. The contract was Firm Fixed-Price (FFP), with a maximum potential length of four years (one base-year and three one-year options), with a total potential value of $380 million. The contract established a system of continuous improvements supporting the Apache sensors and covered complete post-production supply chain management, including inventory management, maintenance, modifications, procurement, repairs, and spares planning of fielded systems (Cothran, 2012). During the initial contract, Lockheed slashed sustainment costs for both sensor systems and improved supply availability. In 2012, the Army awarded Lockheed a follow-on contract for sustainment of the TADS/PNVS and M-TADS/PNVS systems with a potential value of $375 million over a four year period of performance; and it is structured in the same way as the initial contract (Lockheed, 2012).

With the PBL contract, sustainment of the Apache sensors systems is performed using a two-level maintenance strategy. Field units perform Level I maintenance, to include the removal and replacement of LRM units. Any hardware requiring further maintenance is shipped to a depot for additional work, repair, etc. In 2007, Lockheed formed a Public-Private Partnership (PPP) with Letterkenny Army Depot (LEAD) to handle the Apache sensors' depot level maintenance. As of 2013, 29 of the 53 LRMs for the M-TADS/PNVS system were repaired at LEAD. The remainder of depot-level maintenance is performed by Lockheed at various locations near Army installations around the globe (SECDEF PBL AWD, 2011).

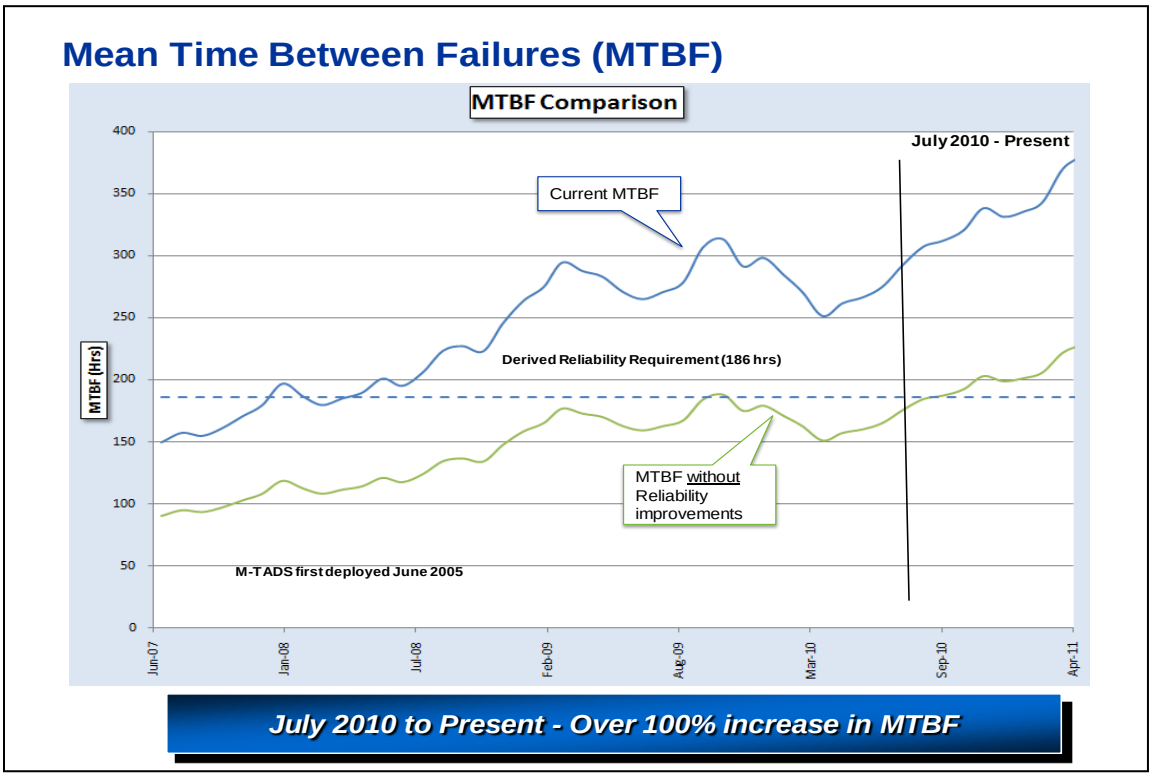
Lockheed Martin performs sustainment on the Apache sensor systems for much less money than the Army could by achieving significant cost avoidance through improvements in supply chain and obsolescence management. Lockheed lowered logistics and maintenance costs by leveraging data tracking for a number of health and maintenance indicators to improve demand forecasting, determining appropriate inventory levels, and by ensuring Contractor Support Supply Activity (CSSA) locations are optimally located (Cothran, 2012). Supply chain adjustments, to increase equipment reliability, have also helped to reduce cost. Additionally, Lockheed's focus on obsolescence management proved pivotal in improving system performance and reducing sustainment costs (SECDEF PBL AWD, 2011).

The Apache sensors PBL contract with Lockheed Martin created a mechanism to provide the Army with the technical and mechanical support needed to consistently meet, and often to exceed, the requirements of the Apache warfighter. Seven major achievements of the Apache sensors contract were acknowledged in the 2013 Secretary of Defense Performance-Based Logistics Awards Program:

(1) A minimum **supply availability rate of 96%** each month, 12 months rolling
(2) A **99% availability rate for depot repair parts**
(3) Materiel reliability improvement increasing **Mean Time Between Failures (MTBF) over 70% above the Apache derived requirement resulting in $18.9 million in cost avoidance**
(4) A drop in sustainment costs for spare and repair parts resulting in **a cost avoidance of $126 million**
(5) A PPP with Letterkenny Army Depot (LEAD) repairing 29 of 53 LRMs on the M-TADS/PNVS system
(6) Implementation of a systems engineering approach to supply chain management resulting in early trend identification, fast shock posture, and increased mission capability levels
(7) Closure of 91 obsolescence cases resulting in **$18.7 million in cost avoidance**

The Secretary's award also credits the PBL contract with improving fleet readiness, reducing average flying hour cost and reducing the Army's long-term inventory investment. Over the course of the initial PBL contract, depot level repairable costs were reduced by 18%, supply inventory replenishment costs were reduced by 40%, and mean-time between Organizational Maintenance (O-level) actions reduced by 9.6%. Mean-Time Between Failures (MTBF) also increased significantly and far exceeded the derived MTBF requirement based on the Supply Availability (SA) performance metric (Cothran, 2012).

Table 1: MTBF under first PBL Contract



While the accomplishments of the PBL contract listed in the Secretary's award are noteworthy, the most impressive accomplishment of the PBL contract is its reduction of total ownership costs. Annual sustainment costs before the PBL were $218 million per year, with sustainment costs for FY2013 at $92 million, **a drop of 58%**. Other accomplishments include the mitigation of 759 obsolescence and diminishing manufacturing cases since 2007 resulting in $104.2 million in cost avoidance, the reduction of the maintenance support footprint to produce a retrograde return rate of 96% between July 2012 and June 2013, and a decrease of over 1,000 maintenance man hours per year through increased materiel reliability (SECDEF PBL AWD, 2011).

The Apache sensors PBL relies on an innovative contracting structure consisting of a firm fixed-price contract that is tied to the number of flight hours. This structure is ideally suited to heavily-deployed systems, such as the Apache, in that it provides the contractor with the traditional incentives associated with fixed-price contracts, translating to higher levels of innovation, reliability, and availability; at the same time, the contract is flexible, which ensures

that the system is capable of supporting changes in operational tempo without unduly impacting tactics and strategy, either by limiting its deployment or increasing its use….

Main Apache Case Takeaways

The Lockheed Martin sustainment program for the Apache sensors illustrates how PBL agreements can benefit all parties. The Army has lowered its sustainment costs for the sensors to a firm fixed-price and provided the warfighter with a better performing system at higher availability rates. The number of reliability repairs has been reduced in both the field and at the depot-level, while the inventory of spare parts has also diminished. In return for its services, Lockheed increased corporate revenue and solidified a strong relationship with the Army.

A fixed-price contract was appropriate for the Apache sensors sustainment because Lockheed was the Original Equipment Manufacturer (OEM), served as the national inventory control point, and could calculate sustainment costs fairly accurately. The length of the contract properly incentivized Lockheed to invest the necessary resources in order to achieve contract performance metrics and reduce sustainment costs.

The successes of the Apache sensors PBL (the program met all the Army's required performance standards) were achieved by Lockheed, even though there was no formal competition for the award.

The Apache sensors program highlights the benefits of smart contracting, and it should serve as model to follow in the future.

B. The C-17 Globemaster III Integrated Sustainment Program

The C-17 Globemaster III Integrated Sustainment Program (GISP) provides a successful example of a Public-Private Partnership (PPP) between the United States Air Force and The Boeing Company to provide effective product support for the C-17 aircraft. Under the arrangement, Boeing fulfills the dual roles of sustainment partner and Product Support Integrator (PSI), allowing for increased flexibility in the management of maintenance, repairs, and upgrades of the C-17. The partnership has also reduced C-17 operating costs and increased the performance and reliability of the aircraft, through system upgrades.

The C-17

In the early 1980's, McDonnell Douglas developed the C-17 Globemaster III for the Air Force to replace the aging Lockheed C-141 Starlifter, which was first fielded in 1965. The Air Force's major requirement for the new aircraft was that it needed to be capable of serving both a strategic role (flying missions with a radius of at least 3,500 nautical miles with a 60,000 pound load), and a tactical role (being able to perform low-altitude air drops of supplies and paratroops in combat) (Boeing, 2015b).

The C-17 can carry up to 164,900 pounds, take-off from a 7,000-foot airfield, fly 2,400 nautical miles, be refueled inflight to extend its range, and land at a 3,000 foot airfield (Boeing, 2015a). It has proven to be a versatile aircraft performing a variety of missions including airlifting cargo, air-dropping equipment and personnel, aeromedical evacuation, and more.

Photo Courtesy of US Air Force

The aircraft has been purchased by eight international buyers, including NATO, and has become a core component of strategic airlift activities around the world. There are currently 268 C-17s in operation globally, the United States is the largest customer with 223 (Boeing, 2015b).

Acquisition of the C-17

In July 1982, the Air Force awarded McDonnell Douglas, which was acquired by Boeing in 1997, a contract to develop and produce the C-17 (GAO, 1995). As early as 1990, the C-17 program was plagued with significant cost overruns and schedule growth, prompting investigations and hearings on the continuation of the program. At that time, the procurement cost for 120 aircraft was estimated to be $43 billion, which exceeded the original DoD estimate for 210 aircraft by $1.3 billion (GAO, 1994a). As a result, the DoD decided to reduce the quantity of aircraft procured from 210 to 120 causing the Air Force to adjust its original plans for the C-17 (the aircraft would not be used for the intra-theater mission, as was originally intended) (GAO, 1995).

The change in quantity procured also raised the average target unit price of each aircraft by $33 million. In December 1993, as delivery schedules slipped to the point that aircraft were being delivered with unfinished work and technical problems, the Secretary of Defense threatened to reduce the total number of procured C-17s to 40 if significant improvements in management and productivity were not achieved (GAO, 1994a). These early procurement issues were overcome, and the Air Force eventually procured over 200 C-17's, with delivery of the final aircraft in September 2013 (Boeing, 2015b).

The Initial Product Support Strategy

Adding to the acquisition issues, a significant issue arose during testing of the C-17; the reliability of the aircraft was significantly less than expected (GAO, 1995). A 1995 Air Force reliability, availability, and maintainability (RAM) assessment of the C-17 found that the aircraft met or exceeded 10 of 11 contract specification requirements; however, the Government Accounting Office determined that Air Force evaluation of the C-17 was less demanding than required by the contract specifications, and concluded that the aircraft would be more expensive to maintain (GAO, 1996b). Furthermore, costs of spare parts were significantly higher than projected. The cost overruns were, in part, due to the manufacturing of some parts at an overly costly McDonnell Douglas facility. Parts from this facility were priced 4 to 56 times more than comparable parts from subcontractors. Additionally, errors by the original contracting officer meant that profits awarded on some orders were higher than warranted (GAO, 1996a).

Although the Air Force initially planned to handle sustainment of the C-17 organically, the 1995 Base Realignment and Closure (BRAC) Commission closed the planned sustainment depot for the C-17, the San Antonio Air Logistics Center. As a result, the Air Force delayed developing a long-term sustainment plan until FY2003, and instead implemented their Flexible Sustainment strategy for the short-term. The strategy provided short-term sustainment while keeping the options available for establishing an organic depot, competing the contract for contractor logistics support, or continuing the current contract strategy (DoD IG, 2006).

The C-17 Globemaster III Sustainment Partnership

For long term C-17 sustainment, the Air Force reported that it would consider the strengths of contractor and government support and adopt the best-value strategy. To determine best-value, the C-17 Program Office initiated a Cost Benefit Analysis (CBA)[3] in 1999; however, before the CBA was completed, the C-17 Program Manager announced that Boeing would retain Total System Support Responsibility (TSSR) over the long-term, and would partner with the Air Logistics Centers (ALCs) for a portion of the depot maintenance (DoD IG, 2006).

While the DoD Inspector General (IG) has criticized the contract award process for not fully considering other sustainment strategies, which will impact future sustainment options for the C-17 (GAO, 2006), the Air Force argues that its decision was made in order to maintain and strengthen its partnership with Boeing, the original equipment manufacturer (DoD IG, 2010). An Air Force audit of the award process found that Air Force personnel identified and applied appropriate criteria/methodology, metrics, and data sources to evaluate business case analysis, but could have improved their documentation of data sources (AF, 2009).

On October 1, 2003, the Air Force awarded Boeing a letter contract, to provide sustainment for the C-17 through December 31, 2003, for an amount not to exceed $259 million. A definitized long-term sustainment contract was awarded on July 22, 2004, with a total potential value of approximately $4.9 billion (the period of performance included a base year, four priced annual options and three unpriced annual options that ran through FY2011) (DoD IG, 2006). This was originally intended to be a flexible sustainment strategy in which all support would be contracted to Boeing; however, at the direction of Congress, the Air Force shifted the arrangement to a PPP with Boeing identified as the Integrated Sustainment Partner.

Sixty-five percent of the GISP contract is Firm Fixed-Price (FFP) and covers the engine subcontract and labor, and the remaining thirty-five percent of the contract is a Cost-Plus-

[3] Program managers in the Air Force use Business Case Analysis (BCA) as a decision support document to identify alternatives and present business, economic, risk, and technical arguments for selecting an option to achieve organizational or functional missions and goals (AF, 2009). Performance based logistic integration of acquisition and sustainment allows Program Managers (PM) to develop programs which optimize system readiness while minimizing cost and the logistic footprint. Successful PBLs assemble key stakeholders, conduct sound BCA, and establish meaningful performance measures (Mahon, 2007)

Incentive-Fee (CPIF) contract for hours, materiel support and procurement, as well as component repair. The CPIF portion of this contract is evaluated on the established criteria of eighty-five percent for aircraft availability and fifteen percent on customer satisfaction for materiel support and procurement as well as component repair (Mahon, 2007). This contract structure provides incentive for Boeing to constantly seek improved performance while also sharing some of the contract risk with the government.

PBL Partnership with Boeing

As the product support integrator for the C-17, Boeing is responsible for integrating all support requirements between the ALCs, private subcontractors, and other government agencies. Boeing has total system support responsibility for the C-17 and performs the following functions: program management; supply support; engineering sustainment; depot-level aircraft maintenance; engine management; long-term sustainment planning; and support to foreign military customers (Mahon, 2007). All of the international buyers of the C-17 have contracted with Boeing to be a part of the GISP as well, making Boeing the sole sustainment partner for the C-17 globally (Pocock, 2012).

The PBL arrangement with Boeing is a three-tier award-fee structure: a Standard of Excellence tier that earns 100 percent of the award fee; an Exceeds Requirements tier that earns 50 percent; and a Minimum Award-Fee tier that earns 25 percent. This arrangement incentivizes Boeing to implement practices that achieve high standards (Mahon, 2007).

Three ALC's perform sustainment and maintenance operations on the C-17: Warner-Robins Air Force Base (AFB), Georgia; Hill AFB, Utah; and Tinker AFB, Oklahoma. Boeing's direct-sales partnership with the ALCs leverages the best of industry and government logistics processes (SECDEF PBL AWD, 2012). Using the ALCs allows Boeing flexibility in managing the sustainment of the C-17. As part of the original contract arrangement, Boeing invested $62 million over 5 years to retrofit these facilities (this investment is discussed in detail in the previous section on Competition) in order to increase productivity and facilitate effective implementation of the GISP (DoD IG, 2006). While investing private capital into government facilities is viewed as somewhat controversial by some, Boeing's investment in the ALCs has enabled continuous maintenance support at reduced costs for the fleet of C-17 aircraft.

Evaluating Boeing's Performance under the PBL

There are six performance metrics that Boeing is required to achieve in order to ensure proper sustainment support. The measures include:

1. Globemaster Sustainment Aircraft Availability – required performance is measured by the number of mission capable aircraft relative to the total fleet assigned
2. Flying Hours Achievable – required performance is measured by the number of flying hours available for wartime missions
3. Mission Capable – required performance is measured by the ability to deliver mission capable assets in the continental United States within 48 hours
4. Aircraft Depot Maintenance Schedule Effectiveness – required performance is measured by the time adherence of scheduled maintenance
5. Issue Effectiveness – required performance is measured by the number of issue requests filled relative to the number received
6. Customer Satisfaction – required performance is measured by the calculation of customer scores across 11 focus areas and coincides with the award-fee schedule

Each performance metric has a different requirement standard, which may change over the course of each PBL contract. For instance, the Globemaster Sustainment Aircraft Availability requirement rose from 75% in FY04 to 79.1% in FY08, while the requirement for Flying Hours Achievable held steady at 95% over the same time period (Mahon, 2012).

The Air Force PM is responsible for developing weapon system sustainment strategies that include all stakeholders and providers (government and industry) in the process. Air Force regulation requires PMs to continually compare baseline and actual weapon system performance and re-evaluate support strategies at appropriate decision points in the weapon system life-cycle. Therefore, a BCA is a living document that helps substantiate the initial investment decision and tracks the success of those decisions over time (AF, 2009).

A Successful Partnership

In 2012, Gus Urzua, vice-president and general manager at Boeing, said that no other weapon system was able to reduce flight costs while increasing reliability the same way Boeing

has with the C-17. Boeing reduced flight-hour costs by 29% between 2004 and 2011 while achieving 86% operational availability. According to Lt Col Jeff Hayden, the C-17 chief of program integration for the Air Force, Boeing exceeded each of the performance metrics by large amounts (Pocock, 2012). Additionally, Boeing, in partnership with Pratt & Whitney, generated over $3 billion in cost avoidance through sustainment efforts (Gouré, 2009).

Boeing uses a "Virtual Fleet" concept for the sustainment of the C-17 (SECDEF PBL AWD, 2012). The virtual fleet strategy pools and distributes spare parts and services worldwide, for increased responsiveness to the servicing of the C-17. Through aggregating requirements, examining demand patterns, and repositioning the buy and repair processes, Boeing was able to save $42 million in FY2012—reducing operating cost by 10% per flight hour. The virtual fleet construct enabled an 86% aircraft-in-commission rate with over 49 sorties flown between aircraft failures (Pocock, 2012). The globally stocked and positioned inventory ensured that 84% of all supply needs are handled at the time and place of the initial order. The C-17's sustained annual flying rate of 950 flying hours per aircraft is over twice the rate of other strategic airlift systems (SECDEF PBL AWD, 2012). Maintenance turnaround time of the C-17 vastly improved since 1998 when the Air Force handled sustainment in house.

Boeing's focus on materiel reliability increased the Mean Time Between Maintenance (MTBM) for the C-17 by 38% (SECDEF PBL AWD, 2012). The Materiel Improvement Program (MIP) estimates aggregate requirements for retrofits and upgrades allow Boeing to anticipate future needs and respond more effectively to issues as they arise (DID, 2013). Further cost reduction was achieved by treating all aircraft as one fleet, creating significant economies of scale to the benefit of all (SECDEF PBL AWD, 2012).

Main C-17 GISP Case Takeaways

The PPP between Boeing and the Air Force ensures that maintenance is conducted in an efficient, cost-effective manner while also keeping the customer active in the sustainment of the C-17. A combined program office at Robins AFB, where Boeing and Air Force personnel work together on C-17 sustainment, facilitates a strong partnership that has increased the amount of maintenance work performed organically. The number of organic depot work hours more than

doubled between FY2009 and FY2013 to a total of 44% of all C-17 maintenance, saving the Air Force $6 million for FY2013 alone (SECDEF PBL AWD, 2012).

Boeing has received multiple awards from the Office of the Secretary of Defense through the Performance-Based Logistics Award Program. The most recent was in 2012 when Boeing was awarded the Excellence in Performance-Based Logistics in Life-Cycle Product Support award. The award notes five areas where Boeing excelled in its C-17 sustainment approach: utilization and availability; reliability improvement; annual program sustainment estimates; increasing use of organic depots; and achievement of requirements (SECDEF PBL AWD, 2012). With such success spanning across the board, the comprehensive approach Boeing used in sustainment of the C-17 ensured continued reliability of the entire C-17 fleet. In 2011, the Air Force accepted a Boeing proposal to perform the Product Support Integration (PSI) role for the C-17, with a projected cost savings of $12.4 billion over a 30-year life-cycle (SECDEF PBL AWD, 2012).

C. Joint Surveillance and Target Attack Radar System PBL Program

The JSTARS Platform and Early Sustainment Strategy

The Northrop Grumman E-8 Joint Surveillance Target Attack Radar System (JSTARS) is an airborne command, control, intelligence, surveillance, and reconnaissance platform used by the U.S. Air Force for air to ground battle management and surveillance operations (Northrop, 2015). The platform provides all-weather ground situational information with Air Force command posts, Army mobile ground stations, and military analysis centers around the globe (Kable, 2015). It detects, locates, classifies, tracks, and targets hostile ground/surface movements and relays real time information through secure data links. The platform shortens the decision-making chain and is an important

part of battlefield operations as well as disaster relief, peacekeeping, and counter-drug efforts (Northrop, 2015).

The JSTARS platform is so critical to the United States military that the Air Force is currently looking to recapitalize the aircraft. The objective of the JSTARS Recapitalization is to field a 16 aircraft fleet with an on-board battle management command and control suite, advanced communication subsystem, and an updated radar (Oaks, 2014). The new platform will interact with all elements of the theater air control system, including the JSTARS and the Airborne Warning and Control System (AWACS) aircrafts, control and reporting centers, and air operations centers (Oaks, 2014).

The Air Force originally provided product support using a legacy transactional approach. This approach included a combination of 17 sustainment contracts coupled with Air Force organic maintenance support, while the Air Force managed and integrated all support. That approach proved to be inefficient and not cost effective. As a result, the Air Force changed their strategy and implemented a performance based approach for the JSTARS platform.

Current Product Support Approach

The Air Force initiated the process to change the product support strategy by developing a long-term support agreement,[4] wherein the JSTARS Program Office, Warner Robins ALC, and the Northrop Grumman Corporation agreed upon mutual support objectives. The intent of the long-range agreement was "to promote close and continuing cooperation, mutual support through shared information and expertise, and the dedication of their skills and resources to continuous innovation and process improvement, as the Parties faithfully execute their respective responsibilities to the JSTARS program."

As part of the long-range memorandum of agreement, all parties agreed to provide:

- Superior support to the warfighter, best value to the USAF (balancing both program and broader Air Force objectives);

[4] Long-Range Memorandum of Agreement (LRMOA) 15 Sept 2000 agreed to by JSTARS Program Office, Warner Robins ALC and Northrop Grumman Corporation

- Mechanisms necessary to meet the USAF's Core Logistics Competencies requirements;
- Support to future Core and Source of Repair Assessment Process (SORAP) analyses and decision-making to enable the USAF to balance objectives of the JSTARS Program with broader USAF imperatives, such as the maintenance of core competencies;
- Creation of an Integrated Digital Environment (IDE) as a key enabler in achieving the communication, coordination, insight and responsiveness objectives outlined in the document; and
- An ability for Northrop Grumman to achieve reasonable profits and enhance its corporate reputation through demonstrated performance in the achievement of the objectives as applicable to the Total System Support Responsibility (TSSR) Prime Contract (LRMOA, 2000).

Under the agreement, the Warner Robins Air Logistics Complex depot would perform core depot maintenance work under a work-share partnership with Northrop Grumman. The mutual objectives of the long-term support agreement enabled the Air Force to accomplish mission requirements with program cost reductions, and the agreement enabled Northrop Grumman to earn the financial incentives that stakeholders desire.

In 2000, the Air Force awarded a PBL contract to Northrop Grumman. The Air Force's approach was to use the contract structure to develop and maintain an atmosphere of cooperation between Northrop Grumman and the Air Force, and to incentivize long-term contractor investment in product support improvements. To accomplish this, the Air Force used a two pronged strategy; they used award fee incentives to encourage short-term performance, and simultaneously, they used award-term incentives to encourage long-term performance. The resulting contract structure is cost-plus award fee with award terms. The basic contract includes a base of 6 years with 16 possible option years for a total potential contract term of 22 years (LRMOA, 2000). With the current implementation, Northrop performs the Product Support Integrator (PSI) role, is physically co-located with the Air Force program office, and is included in all business decisions.

The contractor approach for the TSSR contract consisted of several different components that included: Systems Engineering; Footprint Reduction; Obsolescence Management; Reliability, Maintainability and Supportability Improvements; and development of a PPP with the depot. Northrop determines the depot's work requirements and provides sustainment engineering as well as other support functions to ensure the work is completed (Gupta, et al, 2004). Through the PPP, the contractor also has government maintenance personnel perform some of the touch labor. The workload breakdown structure in ***Exhibit 2*** shows which party is responsible for maintaining each part of the JSTARS aircraft.

Northrop Grumman is responsible for Original Equipment Manufacturer and vendor tasks, depot performance under the government/contractor work share agreement, and management of items that are unique to individual platforms (OSD PBL, 2011). Depot and depot-level repair work is executed via a partnership agreement between the Warner Robins ALC and Northrop. Northrop performs periodic depot maintenance and modifications on JSTARS including all software integration. Software maintenance activities are performed by both the ALC depot and Northrop, gradually transitioning from the contractor to the depot to comply with the Air Force's core determination. Some Prime Mission Equipment (PME) repair is performed by the Warner Robins ALC, while the PME repair is handled by Northrop. Northrop also maintains Implementation Agreements with the Warner Robins ALC for back shop support, chemical lab support, and Precision Measurement Equipment Laboratory support (OSD PBL, 2011).

Systems engineering approaches are utilized when the JSTARS engineering team and the PSI are responsible for integrating and coordinating processes and procedures for system evolution, testing, and sustainment (OSD PBL, 2011). Northrop is also accountable for the JSTARS-specific materiel and equipment to ensure adequate inventory is stocked, stored, and issued at the Contractor Inventory Control Point. Footprint reduction is accomplished through the use of Government On-Line Data that is used to exchange information with the interface of the Enterprise Solution-Supply. Enterprise Solution-Supply assists in the collection of materiel and equipment demand data. The supply chain responsibilities are arranged so that parts can be sourced from commercial supply chains to allow for weapon system footprint reduction (OSD PBL, 2011). Obsolescence Management is accomplished through the use of a DMSMS Program

that applies Lean Six-Sigma principles. This management method enables the program to save an estimated $8 million by utilizing lifetime buys for JSTARS mission-required equipment (OSD PBL, 2011). Reliability, Maintainability and Supportability Improvements are accomplished through the contributions of the Programmed Depot Maintenance team who assists with providing recommendations for improvements to the system.

One success of this approach is the reduction in the required number of days for repairs, which was accomplished through work with sub-contractors and providing guidance to personnel maintaining the aircraft and associated equipment (OSD PBL, 2011). As reflected in the 2011 award for Excellence in Performance Based Logistics awarded to Northrop Grumman, the approaches used by the contractor resulted in mutually beneficial results for both parties.

Contractor Performance Evaluation

As reflected in ***Exhibit 3***, the JSTARS program included evaluation criteria for the overall performance of Northrop, and to assist with award-fee determination. The following is a list of the evaluation criteria components: technical performance measures how well the contractor has met the technical performance requirements specified in the contract; cost performance to contract estimate measures how well Northrop is managing costs with respect to target costs established at the beginning of each Fiscal Year (Pettingill and Knipper, 2004); customer support measures how well the contractor has met customer support requirements. Each is weighted according to importance to overall customer support requirements, and the Air Force utilizes these evaluations to assist with an overall determination on Northrop's performance and award fee payout.

To assist with the assessments of contractor performance, the JSTARS contract includes a cost-based incentive matrix, scheduled price re-negotiation(s), and Incurred Cost data. Cost-based incentive matrices provide more definitive criteria to achieve in order for Northrop to qualify for additional cost reduction incentives. These cost-based incentive metrics are also used by the program office to evaluate award fee and award term determinations. For example, under the terms of the program's January 2012 award fee plan, 10% of the contractor's award fee is determined by tracking cost performance against contract estimates, and cost containment is also evaluated as part of the weapon system's improvement metric, which accounts for 37% of award

term determination. The scheduled price re-negotiation(s) enable both the contractor and the Government to capitalize on the materialized program cost reductions, and update the contract with new performance targets. Incurred Cost data enables the Government to see details on actual costs incurred by the contractor. The program office uses the incurred cost data to renegotiate contract prices during triennial reviews. This data also provides the Government with the opportunity to identify additional areas it would like to target for further cost reductions.

Northrop is able to earn up to 10% of the total contract cost in award fee based on 29% qualitative and 71% quantitative measures. The award term part of the contract requires an annual assessment based on 79% qualitative and 21% quantitative measures. The method of assessment applies different weightings to those metrics. The table in ***Exhibit 3*** shows the evaluation criteria and their associated weightings that are used to evaluate the contractor's performance and eligibility for award fee and award terms.

Over the course of the JSTARS contract, the contractor has earned nearly all of the available award fee and award term years. In 2009, the Air Force identified some serious maintenance failures, including the presence of foreign objects in engine fibers and aircraft structural damage resulting from maintenance errors, caused by the JSTARS contractor. Because the incentive structure encompasses the broad range of responsibilities assigned to the contractor, the contractor still earned most of that evaluation period's available fee, and enough award-term points to earn another year of contractor performance. While the failures were reflected in the award-fee evaluation under three performance metrics, the contractor's aggregate performance against the remaining metrics allowed them to earn 90% of the eligible fee for the 2009 evaluation period. The JSTARS program subsequently amended its award-fee plan to make the contractor ineligible for 40% of the award fee if its performance caused or contributed to a major accident (GAO, 2012). Even with the award-fee plan modifications, the contractor continues to be awarded the vast majority of available award fee and additional award terms in accordance with its performance on the contract.

The potential length of the period of performance included within the Justification and Approval (J&A) for the contract was long enough to encourage some investment from Northrop Grumman, but the year-to-year nature of the contract discouraged long-term investment –

therefore, the company initially did not want to make large investments in the program. When the Government moved the negotiations to three (3) year increments instead of annually, it provided the contractor more incentive to invest corporate funds. As such, the government recognized that the time and resources involved in annual contract re-negotiations was not worth the additional time required of both contractor and Government personnel as some improvements required more time to realize the benefits of such improvements than would be available in 1-year increments.

As the contractor executed performance of the PBL contract, a number of program performance metrics were tracked to help monitor the success of the PBL approach to JSTARS aircraft life-cycle sustainment.

- Mission Success was measured by a percentage effectiveness rate; the contractor achieved a **96% effectiveness rate** and therefore exceeded the performance requirement.
- Materiel Availability was achieved through an average mission capable (MICAP) delivery time of 30 hours, **with stockage effectiveness of 96.9%** for the life of the contract.
- The Readiness Spares Packages (RSP) **fill rates were also above 96%** for the life of the contract, so the contractor was able to exceed its performance requirements for Materiel Availability.
- Materiel reliability was achieved through superior performance of scheduled missions in support of contingency operations even though the number of actual flying hours significantly exceeded the projected flying hours.
- Ownership cost reduction was achieved through cost reductions that were incentivized by contract language seeking **to achieve costs below 98% of the annual contract cost**. The funds provided by the cost reductions were used to fund unexpected requirements that arose throughout the year (OSD PBL, 2011).

Main JSTARS Case Takeaways

The contractor was awarded additional award terms in response to its performance on the contract. The Government recognized that it needed to re-examine its evaluation metrics in

awarding award fee and award terms, so it modified the evaluation criteria to accommodate additional considerations in the award of award terms. Even with the modification of the evaluation metrics, the contractor continues to earn award terms with its performance, so it can be concluded that the Government is receiving the performance it requires to conduct operations.

The JSTARS contract is considered effective since it incentivizes the contractor to continue to achieve cost reductions. The protocol for making award term decisions encourages the contractor to both perform at a high level, and to make life-cycle decisions across a long time horizon (OSD PBL, 2011). As of the end of 2010, Northrop Grumman had already earned contract term extensions through 2018 (OSD PBL, 2011).

Case Study Conclusions

Performance Based Logistics Makes Sense

The AH-64 Sensors contract has demonstrated how PBL contracting provides a logical solution for equipment sustainment for the Department of Defense. The PBL achieved significant cost savings, improved system reliability, increased supply availability rates, and reduced the amount of required maintenance. By structuring the product support contract to incentivize Lockheed to achieve performance criteria, the DoD has supplied the AH-64 warfighter with a cost effective, reliable sensor system. The Apache sensors program highlights the value of PBLs and serves as a model for future sustainment efforts.

Public Private Partnerships Benefit All

The PPP between the USAF and Boeing for the sustainment of the C-17 exemplifies how PPPs are mutually beneficial. The PBL contract incentivized Boeing to constantly seek innovation, and thus provide the Air Force with a more cost efficient and reliable aircraft. The partnership reduced flight-hour costs 29% between 2004 and 2011 and achieved an 86% operational availability. By aggregating requirements, examining demand patterns and repositioning buy and repair processes, Boeing reduced costs per flying hour another 10% in recent years. The C-17's sustained annual flying rate of 950 flying hours per aircraft is over twice the rate of other strategic airlift systems (SECDEF PBL AWD). Additionally, maintenance

turnaround time has vastly improved since 1998 when the Air Force handled sustainment in house.

Award Terms work as an Incentive

The PBL approach to contracting on the JSTARS aircraft has resulted in positive performance for government and industry. The contractor has met its operational requirements well enough to receive additional award term years. The contractor received incentives through profit and award terms to remain motivated to reduce costs over time and increase reliability. These examples highlight how the PBL approach to contracting was a successful approach for the JSTARS aircraft.

V. Findings and Recommendations

Findings

Performance-Based Logistics contracting ensures the DoD can achieve dominant capabilities through technical excellence and innovation. It incentivizes contractors to increase system Reliability, Availability, and Maintainability while addressing Diminishing Manufacturing Sources and Material Shortages and lowering sustainment costs in backlogs, man maintenance hours, and inventory. It also helps to reduce the impact of base closures, acquisition regulations, sequestration, and obsolescence. Through PBL contracting, the DoD supplies the soldier with better, more reliable equipment at a lower cost. In order to maximize these benefits, the DoD needs to continue to promote and communicate the effective use of PBL contracting within its leadership and workforce.

DoD sustainment costs continue to rise as weapon systems age and the industrial base continues to shrink. The continuing budgetary pressure only increases the need to find more cost effective ways to provide product support for these systems. PBL contracting provides a way to increase product support effectiveness, while also achieving significant cost savings; however, PBL contract competitions need to be conducted smartly, to ensure best overall value.

Smart competition within the defense industry is more about maintaining a competitive environment than the frequency of competitions. The DoD can encourage smart competitions, within the context of a PBL environment, by incorporating contractual elements that: encourage the establishment of PPP, provide sufficient incentives for contractors to assist with the DoD's cost reduction efforts, and provide sufficient contractual period of performance to encourage long-term commitment from contractors. Each of these elements are connected and are mutually beneficial for the public and private sectors.

Smart competitions provide the Government with a valuable tool to increase system performance for warfighters, streamline supply chains, and reduce costs at the same time.

Based on the three award winning PBL program case studies, and the results of our research, we have developed the following recommendations for using a performance-based logistics sustainment approach.

Recommendations

Continue to encourage the use of PBL for Weapons Systems

The Defense Department has experienced success with PBL agreements for weapons systems with significant life-cycle expenditures. The AH-64 Sensors PBL contract is one example of when PBL has achieved significant cost savings, improved system reliability, and increased supply availability rates. The C-17 PBL contract is another which resulted in significantly reduced flight-hour costs and achieved very high operational availability. The C-17 has sustained very high annual flying hours per aircraft, twice the rate of other strategic airlift systems, while also significantly reducing maintenance turnaround times since the Air Force handled sustainment activities organically. The JSTARS PBL contract produced performance results that enabled the Government to meet its operational requirements.

As the DoD evaluates existing systems and begins to field new ones, the DoD should determine the best application of PBL (at the system, subsystem, or component level) and how this contract structure impacts life-cycle cost reduction efforts. While every weapon system could benefit from the use of PBL, systems with significant life-cycle expenditures should be the first to conduct business case analyses to determine the best way to implement PBL.

Encourage the Development of PPPs

The PPP between the Air Force and Boeing for the sustainment of the C-17 show how PPPs provide significant benefit for the government. Within this partnership, Boeing is constantly seeking ways to improve product support, and provide the Air Force with more cost efficient and reliable C-17 aircraft. By aggregating requirements, examining demand patterns and repositioning buy and repair processes, Boeing consistently reduced costs per flying hour and achieved annual flying rates over twice the rate of other strategic airlift systems. They also significantly improved the maintenance turnaround time compared to when the Air Force handled sustainment in house.

The Apache sensor systems case study shows how the PPP between Lockheed and the Army saved over $100 million per year on the sustainment of both sensor systems while

achieving superior performance. The PPP between Northrop and the Air Force achieved an effectiveness rate for the JSTARS program over 96%. None of these achievements would have been accomplished without the assistance of PPPs.

As the military services shed excess infrastructure, the number of sustainment options available continues to decrease. Public-private partnerships provide a way for the military to leverage private sector resources to improve product support, while enabling the DoD to make the best use of their organic capabilities and reduce resource expenditures.

Contract Length should be used to Incentivize Contractor Investment.

Contractors need proper incentives to make investments to improve product support performance and cost-efficiency extending beyond the life of the basic contract. When the Government re-competes contracts after a relatively short period of time, contractor motivation shifts from improving processes and creating efficiencies to winning the new contract. By frequently re-competing contracts, the Government is, in a sense, encouraging contractors to focus on short-term cost-cutting instead of investing in long-term strategies. The Government is in a better position to incentivize contractor investment by awarding medium-term contracts, with option years, than they are by frequently re-competing contracts.

A contract must be long enough for contractors to recoup their investment in product support improvements. For example, a five-year base, with five option years, gives the contractor up to 10 years to get a return on an investment, while still providing the Government with "off-ramps" if its dissatisfied with the contractor's performance.

The use of award terms is another potential strategy that can be used as an incentive, as DoD looks to improve product support services. Incentive award terms can be used to extend the contract's Period-of-Performance (PoP), as long as the product support continues to improve. With enough incentive through contract term awards, contractors will implement cost-reducing measures that are mutually beneficial.

Another strategy is for the government to have the contractor submit plans for cost-reduction strategies, which, if implemented successfully during the term of the contract, could result in the award of additional years of PoP. Such strategies can be implemented to upgrade the

capabilities of DoD facilities. These improvements would be available in the event a contract is re-competed due to degradation in performance.

Additionally, when developing an acquisition strategy, government personnel should consider the transaction costs associated with the contracting process, as well as the resources required to transition contractors. Such resource expenditures present an obstacle to frequent contract competitions. The process to award a contract for service-based acquisitions, such as PBL arrangements, can be difficult to complete within a one-year time frame. If contracts are competed too frequently, there may not be sufficient time to adequately evaluate past performance (as the full effect of any changes may not have been fully expressed). Also, each competition can take six months or longer for government personnel to properly evaluate all of the proposals received, and mitigate other issues that arise during the course of the competition. In addition, protests of contract award could further delay contract award. Such delays could hinder the Government's ability to maintain operational tempo to support mission requirements.

Finally, PBL contracts require a level of expertise that may not be easily transferred between different contractors. As a result, there is a cost incurred by the Government when it transitions contractors. Competing PBL contracts frequently, levies a burden on both the Government and contractors' resources that can be very costly, to the point where the costs could far exceed the potential benefits of competing the contract. These transaction costs increase even more when the Government attempts to change contractors multiple times within a relatively short time frame. When this happens, Government personnel have to devote more time toward contractor transitioning, while contractor personnel would likely seek other employment opportunities due to job uncertainty, which might not provide for an efficient transition of contract responsibilities.

Create Incentives Utilizing Share Ratios to assist with Cost-Reduction Efforts

The Government should incentivize cost-reduction efforts through the use of share ratios of cost savings realized through efforts implemented by the contractor. Share ratios could be implemented using incentive-type contract structures until cost-reduction measures have been fully implemented and cost savings sufficiently realized to the point where a contract can be converted to a firm-fixed-price contract. These share ratios could be shared with the Government

and the contractor. Such incentives would motivate contractors to invest in the cost-reduction efforts required to assist the DoD with its budgetary pressures.

Monitor Industry to ensure Secondary Source Service Provider

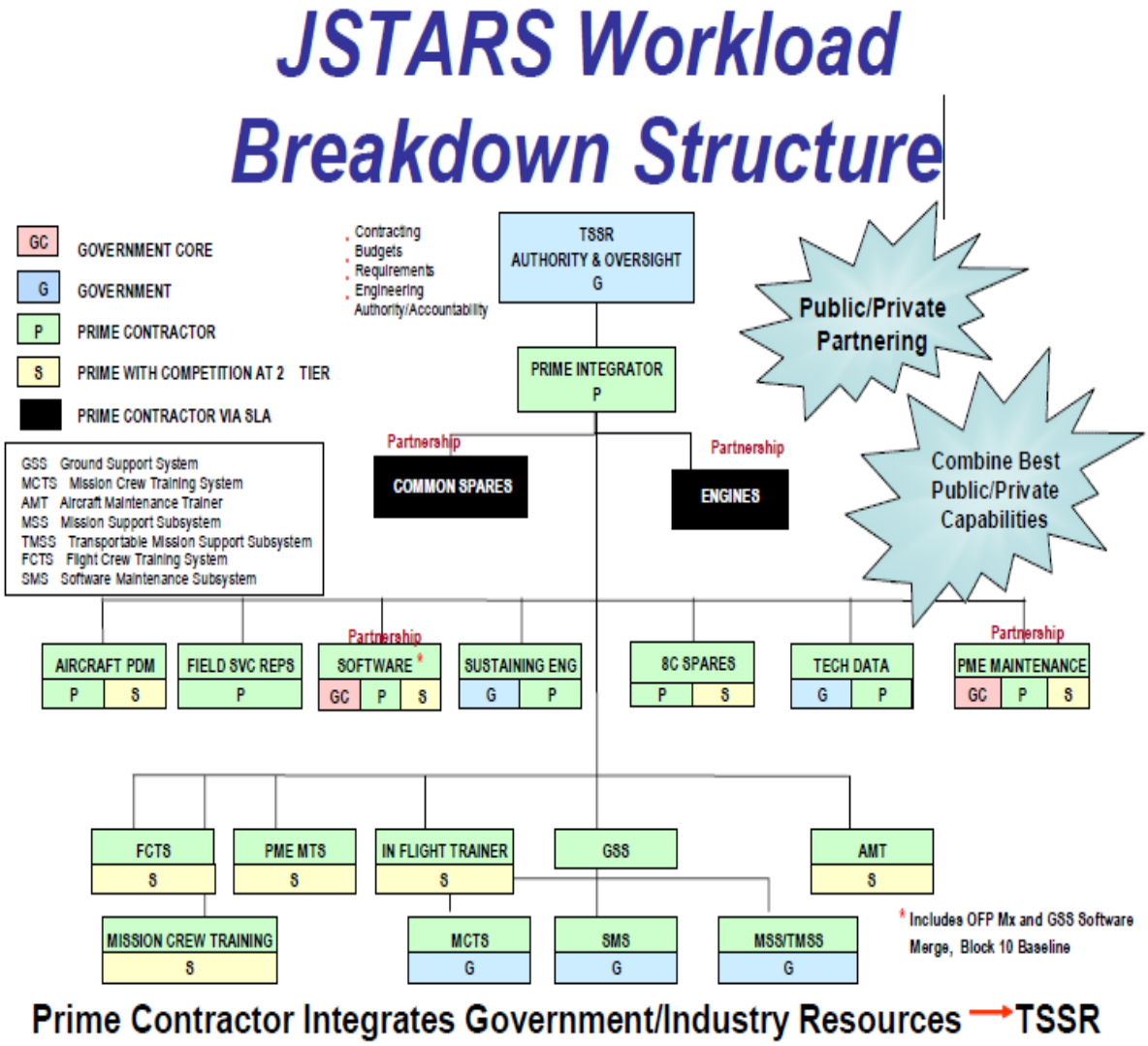
Lastly, PBL product support contracts naturally limit potential sources of competition to well-established contractors with developed global supply chain sourcing. The significant capital investments required to perform PBL type contracts that meet service mission requirements drastically limits the number of companies who can compete for such contracts. While smaller businesses are often used as 2nd and 3rd tier subcontractors, such businesses generally do not have all of the necessary expertise required to successfully perform as the prime on PBL contracts. As a result, the Government should ensure that the selected sources have the necessary capabilities to meet performance requirements. While the Government may initially select an OEM as the source, it should keep in mind that other firms can acquire the necessary expertise, and serve to maintain a competitive environment, for future requirements that might arise.

While the Government should be willing to commit to a longer PoP for PBL contracts, it should always have a strategy to identify a secondary source, in the event contractor performance does not meet requirements or the expectations for improvement. Contracts should be structured with “off ramps” to maintain the competitive environment and provide the Government the opportunity to change contract providers, if required. To that end, program officials should monitor and be mindful of the evolving dynamics within the applicable sector so that the capabil0ity for future potential competitions is maintained.

Exhibit 1: Discounted Payback Period Analysis

Exhibit 1										
Discounted Payback Period										
	1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Annual Cash Flow	$ (12,400,000)	$ (12,400,000)	$ (12,400,000)	$ (12,400,000)	$ (12,400,000)	$ 20,666,667	$ 20,666,667	$ 20,666,667	$ 20,666,667	$ 20,666,667
Ktr Depr Cash Tax Savings						$ 2,455,937	$ 4,208,949	$ 3,005,901	$ 2,146,581	$ 1,534,746
Total Cash to Ktr	$ (12,400,000)	$ (12,400,000)	$ (12,400,000)	$ (12,400,000)	$ (12,400,000)	$ 23,122,603	$ 24,875,616	$ 23,672,568	$ 22,813,248	$ 22,201,412
Discount Rate	0.924	0.854	0.789	0.729	0.674	0.623	0.575	0.532	0.491	0.454
Present Value	$ (11,458,141)	$ (10,587,822)	$ (9,783,609)	$ (9,040,482)	$ (8,353,799)	$ 14,394,333	$ 14,309,391	$ 12,583,027	$ 11,205,193	$ 10,076,398
Cumulative Present Val	$ (11,458,141)	$ (22,045,963)	$ (31,829,572)	$ (40,870,053)	$ (49,223,853)	$ (34,829,520)	$ (20,520,129)	$ (7,937,102)	***$ 3,268,092***	$ 13,344,489
Discounted Payback Pe	*Approximately 8 years 8 months*									
Payback Period										
	1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Annual Cash Flow	$ (12,400,000)	$ (12,400,000)	$ (12,400,000)	$ (12,400,000)	$ (12,400,000)	$ 20,666,667	$ 20,666,667	$ 20,666,667	$ 20,666,667	$ 20,666,667
Ktr Depr Cash Savings						$ 2,455,937	$ 4,208,949	$ 3,005,901	$ 2,146,581	$ 1,534,746
Total Cash for Ktr	$ (12,400,000)	$ (12,400,000)	$ (12,400,000)	$ (12,400,000)	$ (12,400,000)	$ 23,122,603	$ 24,875,616	$ 23,672,568	$ 22,813,248	$ 22,201,412
Cumulative Present Val	$ (12,400,000)	$ (24,800,000)	$ (37,200,000)	$ (49,600,000)	$ (62,000,000)	$ (38,877,397)	$ (14,001,781)	***$ 9,670,787***	$ 32,484,035	$ 54,685,447
Payback Period	*Approximately 7 years 7 months*									

EXHIBIT 2: JSTARS Work Breakdown Structure



Work Breakdown Structure obtained from the Performance Based Logistics report by the University of Alabama in Huntsville, AL

Exhibit 3: EVALUATION CRITERIA

Evaluation Area	Weight
Technical Performance	**60%**
Depot Possessed Aircraft	20%
Not Mission Capable Supply (C)(%)	8%
Average Mission Capable (MICAP) Delivery (Hours)	4%
Readiness Spares Package (RSP) Fill Rate (%)	2%
In-Flight Trainer (IFT) Sortie Effectiveness (%)	10%
Trainer Availability	2%
Air Force Training Order (AFTO) Form 22 Incorporation	2%
Flight Manual Conference Review Tasks	2%
Programmed Depot Maintenance Aircraft Quality	4%
Software Productivity	6%
Cost Performance to Contract Estimate	**20%**
Customer Support	**20%**
Training Effectiveness	6%
Weapon System Support, Field Service Representatives (FSRs), and Supply Chain Management (SCM) Engineering Support	8%
Technical Data Management	1%
Program Control and Management Effectiveness	4%
Quality	1%

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