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Use of Incentives in Performance-Based Logistics Contracting: Initial Findings

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Abstract

Performance-based logistics (PBL) contracts, which have been used by private industry for decades, (particularly in the airline industry as a way to manage complex fleets) have only relatively recently begun to be used in the public sector worldwide. Research on PBL application indicates that PBLs can be successful in lowering costs and improving performance in both government and private contracting. In both cases, PBL contracts depend on the ability of the customer to properly structure and implement contract incentives to promote vendor behavior that reduces costs and improves performance while delivering the customer's desired outcomes.

This report examines how such incentives are used in PBL contracting and looks further towards how incentives can best be utilized in a PBL contracting environment. This report is structured in three parts: a review of the available literature on the use of incentives in PBL contracting, a data analysis of where and how PBL contracts are used in the DoD, and a summary of initial findings from the experts CSIS has interviewed on the subject.

Introduction

Performance-based logistics (PBL) contracts, which have been used by private industry for decades, (particularly in the airline industry as a way to manage complex fleets) have only recently begun to be used in the public sector worldwide. Research on PBL application indicates that PBLs can be successful in lowering costs and improving performance in both government and private contracting. In both cases, PBL contracts depend on the ability of the customer to properly structure and implement contract incentives to promote vendor behavior that reduces costs and improves performance while delivering the customer's desired outcomes.

In order to examine the question of incentive use in PBL contracts, CSIS has undertaken a research effort focused around interviews with PBL experts among Department of Defense (DoD) PBL vendors, private sector PBL vendors, and government customers (both domestic and foreign). The objective of this research effort is to better understand how incentives are used in PBL contracting and how incentives can best be utilized in a PBL contracting environment.

This report is structured in three parts: a review of the available literature on the use of incentives in PBL contracting, a data analysis of where and how PBL contracts are used in the DoD, and a summary of initial findings from the experts CSIS has interviewed on the subject, which are primarily focused on the experiences of DoD PBL vendors at this stage of the research effort.

Literature Review

In the current resource environment, the DoD has become increasingly interested in performance-based logistics (PBL) contracts due to their potential for cost saving and improved outcomes. PBLs are a form of performance-based contracting, something that the DoD has had an interest in since the 1960s (Hildebrandt, 1998). At the most basic level, PBLs alter the normal incentive and risk structure of a contract to more strongly incentivize improvements in performance and quality of service from a contractor. This report uses the broad economics definition of the term incentives, which is not limited to fee structure but includes approaches like longer contract periods to incentivize up front investments or granting the contractor more control over process as an incentive to also take on more risk. While PBLs are currently in use broadly in the private sector, and to a more limited extent in the DoD, the effect of the incentives built into PBLs needs to be better understood. This review will examine incentives based on time, cost, and scope, and will discuss other potential incentives and challenges to designing incentives.

Performance-Based Contracting and Performance-Based Logistics

Performance-based contracting is a type of contracting that calls for contracts to be structured in such a way as to enable and reward better performance on the part of the service provider or contractor. PBLs are the DoD's performance-based contracts and are specifically agreements that are "usually long term, in which the provider … is incentivized and empowered to meet overarching customer oriented performance requirements … in order to improve product support effectiveness while reducing" total ownership costs (Estevez, 2011). While definitions do vary between sources, the DoD's PBL Guidebook states that PBL is "synonymous with performance-based life cycle product support, where outcomes are acquired through performance-based arrangements that deliver Warfighter requirements and incentivize product support providers to reduce cost through innovation" (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016a). This type of performance-based contract has been used in the private sector for decades, particularly in the aviation industry (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016a; A. Hunter et al., 2015). Its popularity is due to its design, which aligns incentives between customers and suppliers (Guajardo et al., 2012). PBLs differ from other forms of contracted support because the contracted outcomes are logistical and because a PBL must include a service component (A. Hunter et al., 2015).

Traditionally, product acquisition and sustainment have been treated as separate considerations, with the government granting a greater priority to acquisition. The recent shift to placing a greater emphasis on sustainment has helped to increase the value of systems purchased by the DoD (Berkowitz et al., 2005). The DoD began using PBLs in 1999 when the Air Force reached an agreement with Lockheed Martin to provide support for the F-117 Nighthawk. While initially intended as a way to improve readiness, the DoD has

since begun using PBLs to "deliver needed reliability and availability, reduce total cost, and encourage and reward innovative cost reduction initiatives" (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016a).[1] While the DoD's *PBL Guidebook* does not specify the difference between "reduc[ing] total cost" and implementing "innovative cost reduction initiatives," for the purposes of this report, the former is interpreted as taking known steps to reduce costs and the latter is finding new ways to reduce costs. Currently, the DoD describes PBLs as "the Department of Defense's preferred product support strategy to deliver improved weapons systems readiness at the same or lower total cost" (Center for Executive Education, 2012). Since PBLs came into use, they have helped the DoD achieve both cost reductions and higher availability rates for systems (A. Hunter et al., 2015).

In a guide to best practices regarding PBLs, the Center for Executive Education from the University of Tennessee (2012) identified three success factors that define good PBL contracts. The first success factor is "alignment," which can be best understood as ensuring that the government and the contractor have both embraced PBLs as a new way of structuring the provider-client relationship and not just a variant of business as usual. The second success factor is "contract structure." The report defines a good contract structure as one that appropriately balances risk and asset management, establishes an environment that allows for creativity and shared success, and uses a pricing model that takes incentive types into account. These incentive types can take many forms, as discussed in the next section. The final success factor is performance management, which involves establishing and aligning desired outcomes and establishing metrics for reporting and improving. These points are all echoed in the DoD's *PBL Guidebook* (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016a).

This paper focuses on incentives as the key to achieving good contract structure.

Incentives

Every business arrangement involves incentives. An incentive can be defined as a "stimulus to a desired action" or "anything that encourages or motivates somebody to do something" (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016a; Office of the Under Secretary of Defense, 2016). In the context of PBLs, an incentive is a "term or condition that encourages the desired product support integrator and/or provider behavior to deliver the relevant Warfighter outcome" (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016a). While incentives can be a part of any type of contract, they are particularly integral to PBLs. In fact, the DoD considers the "key to a successful PBL arrangement [to be] the use of incentives to elicit desired behaviors and outcomes" (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016a).

When articulating the PBL business model, Kleemann, Glas, and Essig (2012), like the Center for Executive Education (2012), included incentive payments as one of the three

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[1] Some recent examples of DoD programs that include PBL contracts are the C-17 Globemaster III Sustainment Partnership, the T-45 Goshawk Contractor Logistics Support, the High Mobility Artillery Rocket System Life Cycle Contract Support I/II, the E-8 Joint Surveillance & Target Attack Radar System Total System Support Responsibility, the F/A-18 Hornet F/A-18 Integrated Readiness Support Teaming, and the F-117 Nighthawk Total System Performance Responsibility & Total System Support Partnership (Gardner et al., 2015)

key components of the compensation part of the model. After reviewing the literature on the experiences of organizations that implemented PBLs, Sols and Johannesen (2013) found broad consensus in the existing literature that aligning incentives with performance achievements is a main factor for PBL success. Therefore, while incentives are not required for a PBL, they are an integral component of contract structure and often make it work better (Kleemann, Glas, & Essig, 2012; Straight, 2006). Their importance was highlighted by the Proof Point study, which found that incentives "drive the behavior, actions, and investment decisions" of product support providers (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016a). It follows that the appropriate use of incentives can lead to preferable outcomes for the government.

Yet effective incentives are not as simple as just offering money in exchange for desired behavior. As recently as the early 2000s, the DoD was found to be giving firms award fees that were not linked to outcomes (GAO, 2005). This finding potentially calls into question the efficacy of incentives. In other words, if a firm knows it will be paid its award fee regardless of whether it achieves its performance targets, the award fee is no longer an incentive. A more recent report from the Government Accountability Office (GAO) found that, although incentives are a key part of PBLs, many of the contracts they reviewed lacked "effective incentives," a circumstance that both lowers the ability of firms to reduce support costs and lowers their incentive to do so. For example, of the 29 PBL arrangements GAO reviewed, only four contained incentives intended to control or reduce costs (GAO, 2008). This finding by the GAO suggests that a better understanding of the effects of incentives could improve the outcomes of PBLs.

When included in contracts, incentives "encourage contractors to meet specified objective and subjective outcome metrics, resulting in explicit … or implicit … financial benefits to industry" (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016b). With traditional contracts, a contractor profits from selling increasing numbers of its given product or service and has little incentive to improve that product beyond staying ahead of a competing contractor, and even less incentive if the contractor has a monopoly on the product or service. With PBLs, the focus is on performance, not on the quantity produced, meaning that contractors are incentivized to provide products and services that perform well regardless of potential competition. If done well, PBLs can increase profits for the contractor, but they do shift risk from the government to the contractor when compared to more traditional contracts. In a traditional contract, the government purchases a number of components and thus risks having to pay in spite of a higher than anticipated failure rate or even equipment becoming obsolete. With PBLs, the government is purchasing a performance output, meaning that these risks are shared between the government and the firm (Gardner et al., 2015; Gupta, et al., 2010). This is part of their appeal to the government. However, while firms are certainly willing to enter into PBL contracts, this change in the balance of risk means that firms must have the capacity to attain a greater reward in return for greater risk. In the case of PBLs, this is through incentives, with the caveat that those incentives must promote behaviors and outcomes that benefit both the DoD and the firm (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016a). Incentives can take multiple forms, each of which is discussed subsequently.

When considering incentives, it must be remembered that contractors and the government have different priorities when it comes to risk. Vendors care primarily about financial risk, meaning concern about their return on investment. In contrast, the DoD is primarily concerned with operational risk, meaning its ability to meet mission objectives. In the face of these competing interests, PBLs strike a balance between risk to the vendor and risk to the government, with vendors accepting higher risks (i.e., having to make

expenditures to react to the DoD's use of equipment, which is outside the control of the vendor) in return for the premium of higher potential profitability (Doerr, Lewis, & Eaton, 2005; Gardner et al., 2015). A further complication is that, in addition to aligning incentives for the government and the contractor, incentives must sometimes align with the components of the contractor or subcontractors that will be working on the project (Boyson et al., 2008). This potentially leads to an increase in the complexity of creating effective incentives.

Time-Based Incentives

Time-based incentives involve the initial length of a contract and altering contracts with a given contractor to extend their life. After conducting a series of interviews, Gupta et al. (2010) found that the main incentive for contractors is the continuation of the contract. The authors recommend that initial contracts should be for at least five years, which allows contractors to recover their initial investment in a project and solidifies expectations for needed employees and equipment. For example, the contract for support for the F-117 was for five years with the option to extend for an additional three, a feature that was considered a key to the success of the program (J. Hunter, n.d.). However, it should be noted that contracts for relatively simple subsystems or arrangements can be shorter, as they require less investment (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016a). In practice, the Navy specifies that its PBL contracts are long term, as is the case with the Consolidated Automatic Support System (Klevan, 2008; Stailey, n.d.).

In comparison, the UK's Ministry of Defense negotiates through-life capability management contracts that are similar to PBLs, but can be much longer. These lengthier contracts incentivize more long-term investments than shorter contracts and have been credited with billions of pounds saved for the UK government (Gansler, Lucyshyn, & Harrington, 2012). However, as is discussed in the *Cost-Based Incentives* section, lengthier contracts are not currently an option for the U.S. government under the current Federal Acquisition Regulation (FAR) and various related statutes. Another comparison can be made to the Australian approach, which involves using contract duration as the primary incentive. While a contract may initially be for a period of five years, the government can begin review in the second year to determine whether to add to the length of the contract if vendors can demonstrate that they have met performance benchmarks. This would face the same challenges as the UK approach, but potentially could be done through the use of indefinite contract vehicles, which have previously been used by the DoD (A. Hunter et al., 2015).

For the contract to be continued, and thus have the benefit of the incentive realized, the contractor must meet certain requirements related to cost, quality, or delivery. As should be evident, if a contractor cannot meet the requirements specified in the contract, the contractor runs the risk of not having the contract extended. In this case, either the incentive could be inadequate or the contractor could be incapable of reaching the agreed-upon goal.

Gardner et al. (2015) conducted a survey of six existing PBL programs and conducted interviews with PBL experts from both the DoD and industry. Like Gupta et al. (2010), they found that there was a "high level of satisfaction" with contracts that lasted five years with the option for continuation. Those interviewed said that the length ensured that risks were shared in an acceptable manner. The authors found that the ability to continue the contract past its initial period strengthened the relationship between a contractor and the government because it allowed for flexibility to make changes to the contract.

In addition, among those interviewed by Gardner et al. (2015), those who were party to a contract with multiple guaranteed years felt the most satisfied with their incentive to

invest. One interviewee also told the authors that long-term contracts are one of the most important factors for contractors to accomplish weapon systems affordability improvements. In determining the optimal length of contract, the report from the Center for Executive Education (2012) found that the best practice was to have the contract last as long as the payback period for the contractor's investments.

Another question Gardner et al. (2015) sought to answer was whether the limits on contract length set by the Federal Acquisition Regulation (FAR) and related statutes limited the desired contract length for projects. The FAR regulates the acquisition of supplies and services by all federal executive agencies (GSA, DoD, & NASA, 2005). Generally, the individuals interviewed did not think the limits set by FAR were a major problem and the issue was secondary to other concerns, though some did express a desire for the ability to negotiate longer contracts. The authors did find that one of the main concerns among those they interviewed was that funding was not guaranteed over the years of a contract due to the nature of the congressional appropriations process (Gardner et al., 2015). As noted previously, one way to mitigate these challenges is to use indefinite contract vehicles such as IDVs, which do not make future work automatic but do ensure that a mechanism is already in place to allow it (A. Hunter et al., 2015).

Cost-Based Incentives

Cost-based incentives are those that are focused on contractor profits. When thinking about cost incentives, the most important consideration is the type of contract and types of fees the government will offer the contractor (Gupta et al., 2010). The FAR identifies a spectrum of contract types that fit into these categories based on the fee-type of the contract. The fees include fixed fees, incentive fees, and award fees. The primary difference between these different contract types and fee types is what criteria are used to adjudicate contractor fee and the resulting profits or losses (GSA et al., 2005).

One important factor when considering contract types is profit sharing. Typically, if there was an increase in efficiency in a cost-plus contract, the government would use this as an opportunity to lower costs, meaning that the DoD would enjoy all of the return and the contractor would not be incentivized to improve performance. In fixed-price contracts, the contractor receives the financial benefit of any gains in efficiency without the DoD cutting costs. The area of the spectrum between these two ends is filled by various types of contracts with incentive fees.

PBLs have typically been either firm-fixed-price or fixed-price incentive firm, but can also take the form of other types of fixed-price contracts (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016a). While fixed-price is not required, it is the DoD's preferred type of contract (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016a). Other forms of PBLs, such as fixed-price incentive fee, allow for profit sharing, so that both the DoD and the contractor benefit from cost reductions and increases in efficiency (Gardner et al., 2015). However, a firm-fixed-price contract may be picked deliberately to further strengthen the incentive for the firm to save money and thus come in below budget (Gupta et al., 2010).

Another approach is to use cost-based incentives that are based on performance metrics. And just as there are different types of PBL contracts for various circumstances, each type of performance-related incentive makes sense in different contexts. For example, the DoD's *PBL Guidebook* (2016) says that "shorter-term cost-type incentive arrangements are appropriate" until sufficient information has been collected on the program. In an instance where there is a single metric for defining success, the government and firm can adopt a model described by Sols, Nowick, and Dinesh (2007). The authors described a

model with a “dead zone” at its center. They defined this as normal system performance, with the bottom edge and top edge of the dead zone representing the lower and upper limits of normal system performance respectively. If performance remains in this zone, the contractor will receive no reward and will not be assessed a penalty. If performance falls below the dead zone, then a penalty should be incurred by the contractor. If performance rises above the dead zone, the contractor should be awarded a bonus for exceeding normal performance. The key consideration, according to the authors, is that the contractor and government must agree on linking awards and penalties to given performance parameters. An example of a performance metric that could be used is average number of backorders and average total downtime of a system. Mirzahosseinian and Piplani (2011) found that a compensation model based on the time average of backorders leads to lower amounts of both backorders and downtime. Sols et al. (2007) also note that this could be harder if several metrics are needed, a scenario that they consider more likely than having a single parameter. Their model for a single metric is represented in a two-dimensional space. Two metrics would require a three-dimensional space. The DoD has five parameters for assessing logistic performance (operational availability, mission reliability, logistics response time, logistics footprint, and cost per unit usage), which would require a six-dimensional representation. This presents challenges when designing metrics for a contract.

When used, cost-based incentives appear to have a positive effect. In one analysis, the DoD found that performance increased for 12 out of 14 PBL projects with cost reduction incentives (Office of the Deputy Assistant Secretary of Defense Materiel Readiness, 2011). A commonly cited example of this is the set of F-117 sustainment contracts. These were cost plus incentive fee/award fee contracts. The performance incentive fee was awarded based on seven objectively measured metrics. The award fee was based on four subjectively evaluated categories. This number of metrics is mostly in keeping with the PBL Guidebook’s suggestion that three to five is the “effective number” of metrics (Assistant Secretary of Defense for Logistics and Materiel Readiness, 2016a). In total, 80% of the contract dollars were incentivized (J. Hunter, n.d.). The contracts are also Total System Performance Responsibility (TSPR) contracts, which raises the concern that within any given year they are “must-pay” obligations for the Air Force. TSPR contracts entail the government obligating the agreed-upon funds at the start of each year, which ensures that funding is stabilized. This means that the funds must be paid, even if operations requirements were to change (GAO, 2000; Gardner et al., 2015). In spite of these concerns, the operating cost for the F-117 increased minimally. In other words, the contracts largely controlled costs to the government (J. Hunter, n.d.).

Scope

Scope-based incentives take advantage of the inherent profit structure of PBL contracts. Whether there is a firm-fixed-price contract or a fixed-price incentive contract, that firm-fixed price will be based on government estimates of cost plus an allowance for contractor profits. The contractor generates additional profits by providing the agreed-upon outcome for a lower cost than was achieved in the past. A contractor’s ability to wring out further efficiencies is theoretically proportional to the portion of the process it controls. Because of this, greater scope means greater revenue and greater chance for profits for the contractor, and it means increased efficiency for the DoD (A. Hunter et al., 2015). Gupta et al. (2010) argued that another way to approach scope-based incentives is to use them as a mechanism for giving the contractor both more responsibility and larger incentives through changes in the contract based on performance. In other words, an increase in scope can be a reward for good performance.

However, Gupta et al. (2010) noted that, because of the government's requirement for a competitive procurement process, it is challenging to employ scope-based incentives. While it may make sense for the same contractor to cover multiple responsibilities for a system, if another contractor can perform some of those functions for a lower price then it will receive the contract. In addition, even without this concern, it can be challenging to determine the appropriate scope of a project. For example, A. Hunter et al. (2015) examined the Industrial Product-Support Vendor contract, which provides support for several Air Force Air Logistics Centers. The authors found that the scope of the contract was very narrow, creating the potential for duplicative efforts on the part of the contractor, the Defense Logistics Agency, and the Air Logistics Center, and limiting the contractor's ability to provide improved support by restricting its ability to leverage usage information to achieve efficiencies. Because increased scope for the contractor means reduced scope for government organizations, there are inherent limits to how easily scope can be shifted between the two. Although this situation has been improved over time, it does illustrate the difficulty in determining the appropriate scope of a contract, never mind scope-based incentives.

Other Incentives

The literature on other types of incentives for PBLs is limited. Other types of incentives that could be considered are those based on scale of the contract, flexibility of the contract, and prestige accrued by the contractor.

Challenges to Designing Incentives

One of the main challenges to adopting any form of performance-based contracting (the more generic term for what the DoD calls PBL) is achieving what Selviaridis and Norrman (2015) call a joint intent between the two parties involved in the contract. Their research found that customers were reluctant to offer extra rewards and providers were concerned about agreeing to performance-based incentives, perceiving them to be risky. While the authors were not examining defense contractors, the same challenges apply to PBLs.

Another potential issue arises when more than one contractor is involved in fulfilling the contract, such as when a contractor uses subcontractors (Selviaridis & Norrman, 2014). As noted previously, each contractor may react to incentives differently or incentives designed for the main contractor may not incentivize changes in behavior by the subcontractors. Yet another issue is that if incentives are poorly designed and overseen, they can also lead to unintended behavior that is beneficial for the contractor but detrimental to their client (Koning & Heinrich, 2013). The authors of this study found that in some contexts, such as when the risk of failing to meet contract expectations is greater, contractors can exhibit gaming behavior to avoid losing out on funding. However, it should be noted that the authors found this behavior to have little impact on outcomes.

An additional concern is that it is possible for a system to exceed expectations based on one parameter while underperforming based on another parameter (Sols, Nowick, & Verma, 2007). This creates a challenge when designing incentives, as the award of the benefits of incentives is based on measurable metrics. This scenario creates some

complexity in determining whether the award should be given.The Current State of DoD PBL Contracting[2]

This section of the report examines how PBL contracts are currently used within the DoD to provide context for the analysis that follows. Data for this analysis is drawn from the publicly-accessible Federal Procurement Data System.

The use of PBL contract structures within the DoD grew steadily through much of the 2000s. From less than $400 million in 2000, obligations under PBL contracts rose to over $2 billion by 2004, and just under $6 billion by 2010. Use of PBL contracts has surged since then, reaching a high of nearly $9 billion in 2014, before falling off since. Figure 1 shows total DoD contract obligations under PBL contracts, broken out by major DoD component.

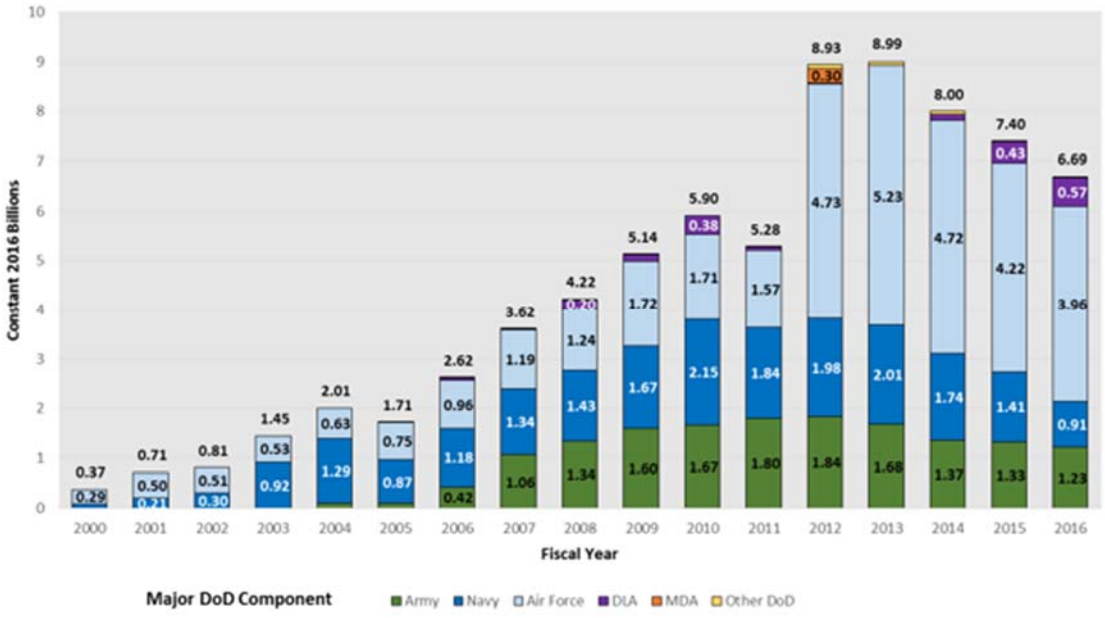

Figure 1. DoD PBL Contract Obligations by Component, 2000–2016
(Source: FPDS; CSIS analysis)

Overall DoD PBL contract obligations were nearly four times higher in 2016 than they were in 2005, indicative of the degree to which acceptance of the utility of PBL contract structures has grown within the DoD. As a share of overall DoD contract obligations, PBL contracts have risen from just over 1% in 2009 to nearly 3% between 2013 and 2015, before declining slightly in 2016 to 2.3%.

[2] The Federal Procurement Data System, which CSIS uses as its primary source for government contract data, does not have a field that can be used to broadly identify PBL contracts, CSIS has attempted to fill this gap with a number of data sources, including reviews of contract solicitations. While some smaller PBLs may not have been captured in this effort, CSIS is confident that it has identified a sufficient share of DoD PBL contracts to meaningfully inform an analysis of trends.

Army, which had less than $100 million in PBL contract obligations in 2005, saw PBL contract obligations rise to a high of over $1.8 billion by 2012, driven by large PBL contracts related to the UH-72A light utility helicopter and the RQ-7 Shadow tactical UAV.

Navy, meanwhile, was at the forefront of the adoption of PBL contract structures in the early- to mid-2000s, with nearly $1.3 billion in PBL contract obligations in 2004, spread among a number of PBL programs not readily identifiable in FPDS. Obligations peaked in 2010 at nearly $2.2 billion and remained near that level until 2013. Air Force, meanwhile, saw significant obligations for PBL contracts as early as 2000, related to the B-2 bomber platform, and steady growth between 2003 and 2010, due to increasing obligations related to that same platform. Air Force PBL contract obligations more than tripled between 2011 and 2012, primarily driven by $2.2 billion in obligations in 2012 under a PBL contract related to the C-17A transport aircraft.

Since DoD PBL contract obligations peaked in 2013, total obligations have declined by 26%, over three times as steeply as the decline in overall DoD contract obligations between 2013 and 2016. Both Army (-27%) and Air Force (-24%) have seen declines roughly in line with the overall rate of decline for DoD PBL contract obligations, but Navy has declined at more than double that rate (-55%), with significant declines across the range of platforms and systems that the Navy maintains under PBL contract structures.

Notably, despite what seems to be the end of a period of decline for DoD contracts, with overall DoD contract obligations rising by 7% in 2016 after sustained declines between 2009 and 2015, DoD PBL contract obligations fell by 10% in 2016.

What the DoD Uses PBL Contracts For

Because PBL contracts often involve purchasing a mix of multiple products and services, the usual FPDS categorization schema that CSIS uses to track what is being contracted for—Product or Service Code—is less useful here. Instead, Figure 2 looks at platform portfolios, a categorization schema developed by CSIS, using a combination of the *ProductorServiceCode* and *ClaimantProgramCode* fields in FPDS, that aggregates all product, service, and R&D contracts by the type of platform the contracts are associated with.

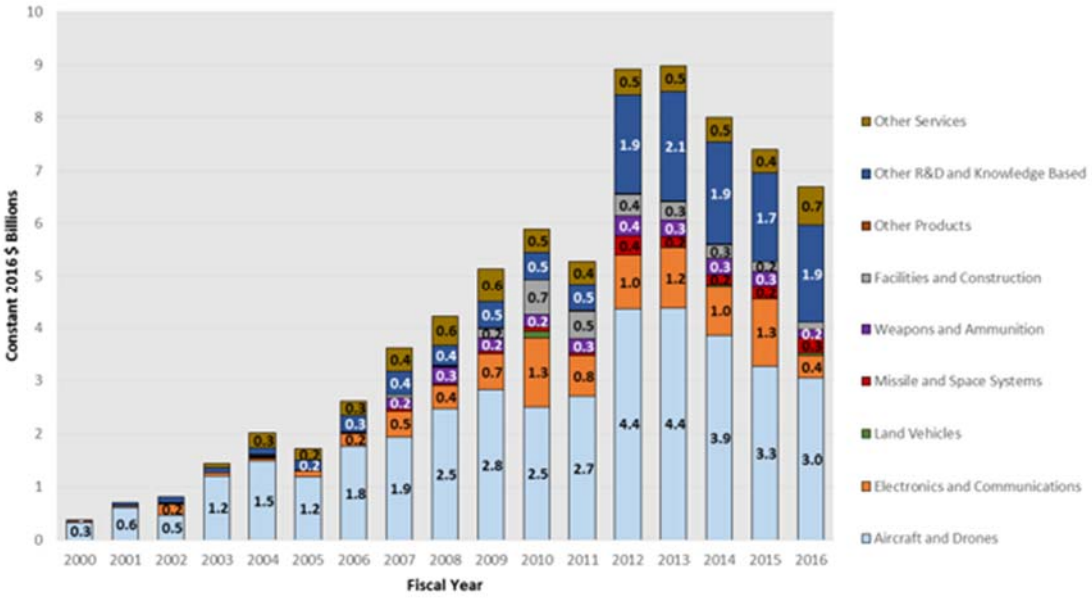

Figure 2. DoD PBL Contract Obligations by Platform Portfolio, 2000–2016
(Source: FPDS; CSIS analysis)

Unsurprisingly, the Aircraft & Drones platform portfolio has been the biggest driver of growth in PBL contracting over the 2000 to 2016 period. Aircraft & Drones accounted for over 54% of DoD PBL contract obligations in every year from 2000 to 2009, and have accounted for at least 43% in every year since. That decline is largely maintained by the growth in obligations under the "Other R&D and Knowledge Based" category, but further investigation by CSIS into the individual contracts has revealed that much of the growth in that category is for PBLs that are related to Aircraft & Drones platforms, but are not identifiable as such using the *ProductorServiceCode* and *ClaimantProgramCode* fields. CSIS is presently testing ways to improve the accuracy of the Platform Portfolio categorization schema based on this discovery, and will integrate that revision into the final analysis of this research effort.

Despite that minor data issue, the available data does show Aircraft & Drones PBL contract obligations returning to prior levels after a notable spike in 2012 and 2013, driven heavily by the growth of the C-17A PBL program. The decline since 2013 has been broad-based, with a number of PBL programs seeing reduced contract obligations.

Electronics & Communications has consistently been one of the larger categories of PBL contract obligations, accounting for more than 10% in every year from 2007 to 2015. Land Vehicles, meanwhile, have only accounted for more than 1% of DoD PBL contract obligations in a single year (2% in 2010) during the 2000 to 2016 period. Missiles & Space Systems had never accounted for more than 1% until 2012, but have accounted for between 2% and 4% since. Similarly, Weapons & Ammunition, which had never accounted for more than 1% of PBL contract obligations from 2000 to 2006, accounted for between 4% and 7% in every year from 2007 to 2015.

Interestingly, there have been almost no PBL contract obligations for Ships & Submarines, with total PBL contract obligations of less than $40 million over the entire 2000 to 2016 period. While the maintenance and repair needs of ships and submarines differ greatly from those of most other platforms in the DoD's inventory, it is nonetheless surprising

to see that virtually no PBL work has been tried, even for smaller surface ships or shipboard systems.

How the DoD Structures PBL Contracts

Unsurprisingly, the vast majority of DoD PBL contracts are structured as Firm Fixed Price contracts, which follows generally accepted best practices for PBL contracting. Since 2000, 68% of DoD PBL contract obligations have been awarded under Firm Fixed Price contract, as seen in Figure 3.

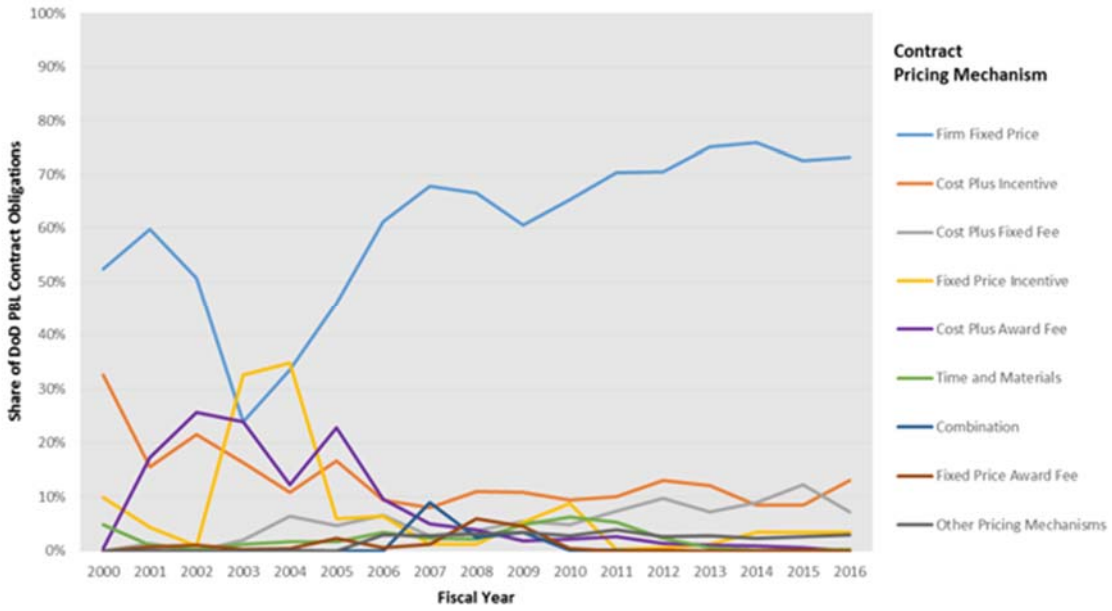

Figure 3. DoD PBL Contract Obligations by Contract Pricing Mechanism, 2000–2016

(Source: FPDS; CSIS analysis)

Aside from a brief dip in the early- to mid-2000s, when the share of obligations awarded under Fixed Price Incentive, Cost Plus Incentive, and Cost Plus Award Free briefly surged. While both Fixed Price Incentive Fee and Cost Plus Award Fee contract types have not been a significant factor in DoD PBL contracting since those brief spikes in usage, a surprisingly large share of PBL contracts are still structured as Cost Plus Incentive; between 8% and 13% of PBL contract obligations were structured as Cost Plus Incentive in every year since 2006. Cost Plus Fixed Fee, which was not used significantly for PBL contracts in the early 2000s, grew to account for between 3% and 7% of DoD PBL contract obligations from 2004 to 2011, and between 7% and 12% from 2012 to 2016. Both Cost Plus contract types seem to be primarily used for PBL contracts that are more transactional in nature, but CSIS is consulting with experts to better understand how and why the decision is made to structure some PBLs as Cost Plus, rather than Fixed Price.

Competition for DoD PBL Contracts

While about half of overall DoD contract dollars in recent years have been awarded after effective competition,[3] DoD PBL contracts are far less competitive, as seen in Figure 4.

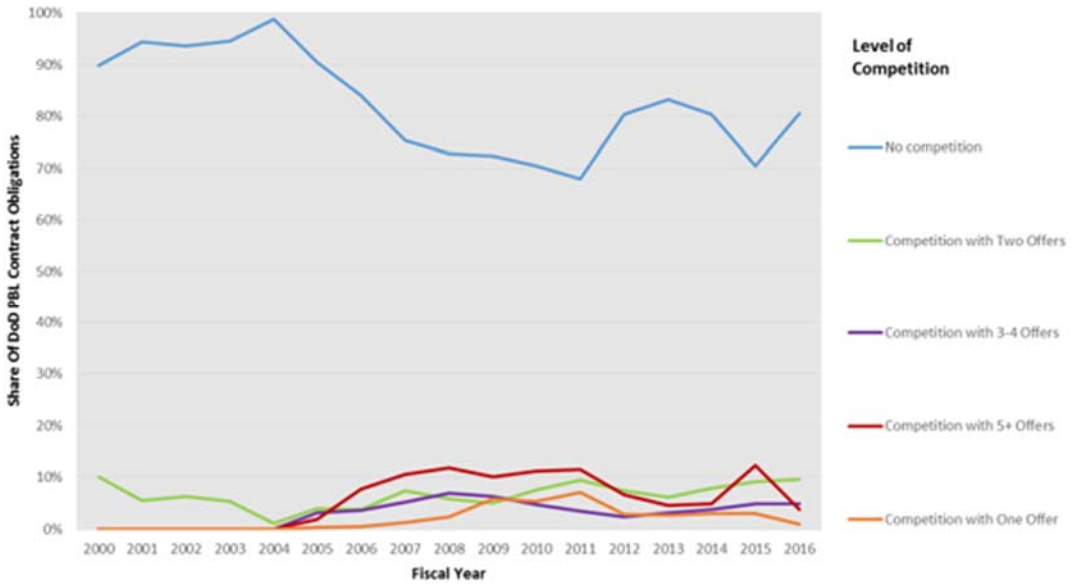

Figure 4. Level of Competition for DoD PBL Contract Obligations, 2000–2016
(Source: FPDS; CSIS analysis)

For the 2000 to 2016 period, 78% of DoD PBL contract obligations have been awarded without competition. This is not surprising, since most PBLs for platforms and systems go to the original manufacturer for a number of reasons, including the following:

- Most manufacturers retain the technical data rights to their platforms and systems, without which it is impossible for another vendor to perform the functions under a PBL. (Even in cases where the original manufacturer might be willing to sell those data rights, the cost is likely to be more than the DoD is willing to pay.)
- Original manufacturers have supply chains already developed, whereas anyone competing to take over a PBL would have to build a new supply chain from scratch.
- In discussion with experts, some mentioned their hesitance to try to compete to take over an existing PBL even when one was potentially going to be put up for competition, due to the large advantage that the incumbent vendor is perceived to have.

[3] CSIS defines "effective competition" as a competitively-sourced contract which receives at least two offers, and which excludes competitions where only one offer is received.

Nonetheless, there has been a significant increase in the share of PBL contract obligations awarded after effective competition since the early 2000s. While only 1% of PBL contract obligations were awarded after effective competition in 2004, that share rose to between 23% and 25% between 2007 and 2011, with competitions receiving five or more offers making up the largest portion of those effectively competed PBL contracts. That share has declined in recent years, mostly hovering in the mid to high teens, but nonetheless remains notably higher than in the early 2000s.

For both the Navy and Air Force, the share of PBL contract obligations awarded on a sole source basis has remained in the low to mid 80% range in recent years, which, while higher than the overall DoD PBL rate, is an improvement over the rates seen in the early- to mid-2000s. The Army and DLA, by contrast, have always seen lower rates of sole source awards, with 52% and 62%, respectively, awarded on a sole source basis since 2000. This difference is primarily a factor of the fact that DLA and the Army spend a greater share of their PBL contract obligations on subsystem- and component-level PBLs, which are more likely to have multiple vendors able to potentially perform.

Who Performs DoD PBL Contract Obligations

The industrial base that performs PBL contracts for the DoD is heavily concentrated, which is not surprising, given that many of the large PBL contracts are tied to major platforms and systems, which are in turn produced by a small number of the largest defense vendors. Table 1 shows the top 15 DoD PBL vendors between 2009 and 2016, with both their respective contract obligations and their shares of overall DoD PBL contract obligations for that period.

Table 1. Top 15 DoD PBL Vendors, 2009–2016

(Source: FPDS; CSIS analysis)

Rank	Vendor	Total DoD PBL Contract Obligations 2009-2016	Share of Total DoD PBL Contract Obligations 2009-2016
1	Boeing	14.5	26%
2	L3 Communications	7.4	13%
3	Northrop Grumman	6.5	12%
4	Lockheed Martin	4.4	8%
5	General Electric	3.3	6%
	Top 5 Total	**36.1**	**64%**
6	Airbus	3.0	5%
7	General Dynamics	2.2	4%
8	Rolls Royce	2.2	4%
9	Maritime Helicopter Support [Lockheed Martin/Sikorsky Joint Venture]	1.8	3%
10	Bell-Boeing Joint Program Office	1.5	3%
11	Textron	1.5	3%
12	Raytheon	1.3	2%
13	General Atomics	1.2	2%
14	Honeywell	0.9	2%
15	Dyncorp International	0.5	1%
	Top 15 Total	**52.2**	**93%**
	Overall DoD PBL	**56.3**	

The top five DoD PBL vendors accounted for 64% of the total DoD PBL contract obligations between 2009 and 2016, and the top 15 accounted for 93%. Both of those figures have increased significantly over the 2009 to 2016 period: The share going to the top

five PBL vendors has increased from 55% in 2009 to a high of 71% in 2015, before falling back to 66% in 2016, while the share going to the top 15 has risen from 87% in 2010 to 95% in 2016.

Northrop Grumman accounted for the largest shares of DoD PBL contract obligations in 2009 through 2011, but since 2012, Boeing has received nearly 75% more obligations than the second-ranked vendor, L3 Communications.

Initial Interview Findings

The core of this research effort is a series of interviews with experts on PBL contracting within vendors who perform PBLs for the DoD, vendors who perform PBLs for the private sector, and government entities (both foreign and domestic) that contract for PBLs. At this stage of the research effort, CSIS has conducted interviews with multiple experts that manage PBLs for the DoD, covering the range of PBL projects, from component-level PBLs to system-level PBLs to full platform PBLs. While CSIS plans to conduct more interviews in the coming months, to gain the broadest range of perspectives on the issue of incentives in PBL contracting, the experts that CSIS has already spoken to have provided a few key insights into how they approach the issue of incentives in PBLs.

There are three key initial findings from discussions with these experts:

- Contract length is the most powerful incentive.
- Negative monetary incentives are effective, even down to the subcontractor level.
- Positive monetary incentives are not seen as effective or desirable.

Contract Length Is the Most Powerful Incentive

Virtually every expert that CSIS has interviewed thus far has cited contract length as the most powerful incentive in a PBL environment. This consistency is likely the result of the nature of how vendors operate in a PBL environment. As discussed briefly in the literature review section, PBLs generate savings and performance improvements because vendors are incentivized to invest up-front in equipment and process improvements that allow them to meet performance targets and reduce costs. In theory, these up-front investment costs will be offset by profits in later years, but that assumes that there are later years to the contract.

In some cases, vendors performing PBLs for the DoD have found themselves on year-to-year contracts, and those experts cited the uncertainty in those structures as a powerful disincentive to invest in equipment and process improvements. After all, if the basic business model for PBLs is for up-front costs to be justified by long-term profits, and there is no guarantee that the contract will still be active long-term, it is difficult to make a business case to justify the up-front investments. Longer-term contracts also allow vendors to fund their suppliers long-term, which can help generate significant savings. In a year-to-year contract environment, or any one with particularly short contract terms, the risk to vendors is likely to be too high for them to tolerate in order to make the sorts of investments necessary for a successful PBL.

Even in cases where the contract length is at least five years, which experts cited as the bare minimum necessary in order for them to feel that the risk inherent in up-front investments is justified by the long-term rewards, the experts that CSIS spoke with cited other factors that disincentivize investment. Even with a five year contract, which many contracting entities within the DoD are hesitant to award, the single year nature of federal budgeting means that a contract is no guarantee of future work. If a vendor has a five year

contract to ensure availability of a platform, invests money up-front to improve availability and drive down costs, and then, two years into the contract, Congress decides not to appropriate the funds necessary to conduct work on the platform at the previously understood levels, the vendor can find themselves in a bad situation. Even if the contract isn't outright cancelled, if the work level is scaled back significantly in a PBL where payment is based on the volume of work (as happened to some programs during the budget drawdown and sequestration), a vendor can find themselves without enough profit over the course of the contract to offset the up-front investments. (That same dynamic can act as a disincentive to government customers as well; experts cited cases where firm-fixed-price PBLs based on assumptions of workload ended up with lower workloads than expected, which left the government customer feeling like they had significantly overpaid.)

Experts that CSIS spoke to cited 10 years as an ideal length for a PBL contract; while contracts of that length are not an option under U.S. federal contracting regulations and related statutes, other countries such as the UK and Australia have had positive experiences with longer-term PBL contracts. In the UK, they have also used triggered option year contract structures, where a contract is awarded for a base length, and then future years are triggered as long as performance metrics are continually met. Australia also uses a rolling contract extension approach. A contractor performing well may receive a sixth year of performance during year three of the contract as a reward. A contractor not performing to the government's satisfaction may receive a warning in year three but have a chance to turn around their performance and still earn the extension in year four.

Experts among DoD PBL vendors indicated that these sorts of arrangements helped mitigate some of the risk and uncertainty of shorter-than-desirable base contract lengths, but they noted that these triggered option year arrangements have notable limitations. Most significantly, according to industry experts, they are most effective in competitive environments, which are a distinct minority of the PBL market; in a sole-source environment, where there is no threat of losing the contract to another vendor, the option years don't alleviate the fundamental concerns about future-year funding and workloads. This skepticism of length as an incentive in a sole-source environment has also been expressed by other U.S. experts in discussion of earlier CSIS work on this topic. This discrepancy between U.S. and international views of the efficacy of extensions merits further study in subsequent interviews.

Negative Monetary Incentives Are Effective, Even Down to the Subcontractor Level

Just as there was broad agreement about the efficacy of contract length as both a positive and negative incentive in a PBL environment, there was consensus among the experts that CSIS has spoken to about the effectiveness of negative monetary incentives. These sorts of incentives can take a number of forms, but at their core, they are fairly simple: if a vendor fails to meet a contractually-mandated performance metric over a particular period of time, the amount of money they receive under the contract is reduced by a pre-determined amount. The experts agreed that this sort of incentive was effective, primarily when it was something that was within their ability to control, and was something they could plan around. To the degree that negative performance incentives were tied to metrics that the vendor had less control over, or were harder to predict, the risk level inherent in those negative incentives would be greatly increased.

Some of the experts mentioned that these sorts of negative monetary incentives were effective even down to the subcontractor level. In a PBL environment, some vendors hold their larger subcontractors responsible for their role in meeting performance metrics, such that if they are responsible for the vendor not meeting the metric, they also share in the penalty. It was emphasized that, when this sort of shared responsibility is implemented, it

only extends to the largest subcontractors, who have the ability to weather the potential penalties without it threatening their stability as a business. In some cases, penalties might not flow down to the subcontractor level in the initial years of a PBL project, but would start to be enforced later in the contract. The interviewees also noted that, in a well-constructed supply chain, the subcontractors should already exist as part of a team with the prime vendor, and that a sense of shared responsibility for meeting performance metrics should already be assumed, even absent shared penalties.

Positive Monetary Incentives Are Not Seen as Effective or Desirable

One common theme among the experts that CSIS had not seen any indication of, either in the literature or in prior research on PBLs, is the consensus that positive monetary incentives are neither effective nor desirable for vendors. Most positive monetary incentives take the form of additional money for meeting performance metrics targets above the contractual baselines, but the experts within DoD PBL vendors expressed a number of concerns about these contract structures. Most fundamentally, there was broad agreement that the additional money was rarely worth the cost of meeting the higher metric target. In cases where the experts had managed or worked on PBL contracts with positive monetary incentives, they had rarely seen cases where the work to meet the higher metric target resulted in a net profit. One aggravating factor was that these positive incentives were sometimes combined with cost sharing measures such as fixed-price incentive fee contracts. In these cases, the cost sharing mechanism proved more important towards driving contractor decisions than the possibility of receiving a performance reward.

Interviewees noted that it was particularly difficult to predict the cost of meeting those higher targets at the start of the contract, which meant that properly pricing the positive monetary incentive was a challenge. Additionally, in cases where the vendors could properly price the higher metric target, it was difficult to get the government to agree to incentive levels high enough to make hitting the increased target potentially profitable.

Other Findings of Note

In addition to those three key findings from the experts that CSIS has spoken to thus far, the following are points of interest that have been raised by one or two experts, but which are interesting enough that CSIS will pursue them in future interviews:

- the government incentive to keep a certain percentage of work in-house;
- hesitancy of vendors to try to compete for existing PBLs because of the perceived difficulty of dethroning incumbents;
- control as an incentive and a risk factor—government-furnished equipment, requirements to use depots (which the vendor has minimal ability to manage) as subcontractors, and other features that lessen the scope of what factors of a PBL the vendor can exert influence over; and
- skepticism of “power-by-the-hour” PBL arrangements, due to the number of hours frequently coming in below projections.

Final Thoughts

In the final stages of this research effort, CSIS will continue to interview experts from across the spectrum of PBL contracting experience. This will help CSIS gather the broadest possible picture of how incentives are currently used in PBLs and how incentives should be used. Additionally, CSIS will identify specific PBL contracts as case studies and examine the incentive structures (both contractual and implicit) of those contracts to illustrate the real-world consequences of the choices made in structuring those PBL contracts. The final report

under this research project will provide lessons learned on using incentives in a PBL environment.

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