

GAO

Report to the Subcommittee on
Readiness, Committee on Armed
Services, House of Representatives

December 2008

DEFENSE LOGISTICS

Improved Analysis and Cost Data Needed to Evaluate the Cost- effectiveness of Performance Based Logistics



GAO

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Highlights of [GAO-09-41](#), a report to the Subcommittee on Readiness, Committee on Armed Services, House of Representatives

Why GAO Did This Study

In 2001, the Department of Defense (DOD) identified performance based logistics (PBL) as the preferred weapon system support strategy. Within DOD, PBL is the purchase of performance outcomes, such as system availability, rather than the purchase of individual elements of logistics support—such as parts, repairs, and engineering support. Although PBL initially arose from efforts to reduce support costs, questions have arisen about whether PBL has reduced support costs as originally intended. GAO was asked to evaluate the extent to which DOD has used business case analyses to guide decisions related to PBL arrangements and the impact PBL arrangements have had on weapon system support costs. In conducting the review, GAO analyzed the implementation of PBL arrangements for 29 weapon system programs. GAO also looked at the use and characteristics of performance-based contracting in the United Kingdom's Ministry of Defence.

What GAO Recommends

GAO makes five recommendations, including that DOD require the development of business case analyses, clearly define specific criteria for their development, and require that the services improve their internal controls to ensure that the analyses are performed. GAO also recommends that DOD require program offices to collect and report detailed support cost data for their PBL arrangements. DOD generally concurred with these recommendations.

To view the full product, including the scope and methodology, click on [GAO-09-41](#). For more information, contact William M. Solis at (202) 512-8365 or solisw@gao.gov.

DEFENSE LOGISTICS

Improved Analysis and Cost Data Needed to Evaluate the Cost-effectiveness of Performance Based Logistics

What GAO Found

Although DOD's guidance recommends that business case analyses be used to guide decision making regarding the implementation of PBL to provide weapon system support, the services are not consistent in their use of such analyses. About half of the DOD program offices responsible for the 29 PBL arrangements GAO reviewed either did not use a business case analysis or could not provide documentation for significant parts of their analyses. Almost all of the remaining analyses were missing one or more of the recommended elements in DOD's instruction for economic analysis. Finally, business case analyses were often not updated in accordance with service policies and guidance. Program office use of these analyses is inconsistent because DOD only recommends, but does not require, that they be prepared and because DOD's guidance on preparing a business case analysis is not comprehensive and does not adequately specify the criteria to be included. Also, most of the services have not established effective internal controls to ensure that the analyses are prepared or that they provide a consistent and comprehensive assessment. As a result, DOD has implemented PBL arrangements without the benefit of sound analyses that ensure that the chosen approach will provide the most cost-effective support option.

While one of DOD's goals in moving toward the use of PBL arrangements was to reduce weapon system support costs, the ability of these arrangements to reduce costs remains unclear 7 years after DOD first identified PBL as the preferred weapon system support strategy. Many DOD program offices that implemented PBL arrangements have limited cost data, and various other factors—such as the lack of business case analyses—further limit an evaluation of the costs of this support strategy. Available data from the programs GAO reviewed indicated mixed results. Although a few programs in GAO's sample provided evidence of some cost reductions, GAO's analysis of the only two systems in its sample that are managed using both a PBL arrangement and a more traditional, non-PBL arrangement indicated that in both cases the PBL arrangement had higher costs. Also, GAO found that certain characteristics of DOD's PBL arrangements—contract length, funding stability, ownership of inventory, and the lack of cost metrics and effective incentives—could limit the ability of and incentive for contractors to reduce support costs. Neither DOD nor the services require detailed cost reporting for PBL arrangements and the lack of detailed cost data hinders DOD's ability to determine whether PBL has reduced support costs as intended.

GAO describes the use of performance-based arrangements for weapon system support in the United Kingdom's Ministry of Defence, which the ministry refers to as contracting for availability. The Ministry of Defence began awarding availability contracts as an approach to reduce weapon system support costs, and officials believe that support cost reductions have been achieved as a result of using availability contracts. In general, the availability contracts used are significantly longer than those used by DOD, and the ministry uses an "open book accounting" arrangement to gain visibility into the contractors' costs to provide support.

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United States Government Accountability Office
Washington, DC 20548

December 19, 2008

The Honorable Solomon P. Ortiz
Chairman
The Honorable J. Randy Forbes
Ranking Member
Subcommittee on Readiness
Committee on Armed Services
House of Representatives

In the 1990s, the Department of Defense (DOD) predicted that it would save billions of dollars by reengineering defense logistics to increase its reliance on the private sector for the support of military weapon systems.¹ In 1999, DOD set a goal to reduce weapon system operating and support costs by 20 percent by 2005. Around the same time, a DOD study identified 30 pilot programs on which to test various logistics reengineering initiatives, and DOD began to consider the concept of long-term contractor logistics weapon system support with performance metrics, which DOD later called performance based logistics (PBL). By 2001, DOD had identified PBL as its preferred weapon system support strategy. DOD defines PBL as the purchase of performance outcomes (such as the availability of functioning weapon systems) through long-term support arrangements rather than the purchase of individual elements of support—such as parts, repairs, and engineering support. The concept of PBL evolved from the more general concept of performance-based contracting, which has been used in both the commercial and government sectors for over 20 years. While the use of PBL was first applied to weapon system platforms, DOD now also uses it to purchase support for subsystems and components. Under DOD guidance,² prior to entering into a PBL

¹ “Weapon system support” includes functions such as materiel management, distribution, technical data management, maintenance, training, cataloging, configuration management, engineering support, obsolescence management, technology refreshment, and repair parts management.

² Department of Defense, *Product Support for the 21st Century: A Program Manager’s Guide to Buying Performance* (Washington, D.C., Nov. 6, 2001); Under Secretary of Defense (Acquisition, Technology and Logistics), Memorandum, Performance Based Logistics (PBL) Business Case Analysis (BCA) (Jan. 23, 2004); Under Secretary of Defense (Acquisition, Technology and Logistics), Memorandum, Performance Based Logistics (PBL) and Business Case Analysis (BCA) (Mar. 20, 2004); and Department of Defense, Defense Acquisition University, *Performance Based Logistics: A Program Manager’s Product Support Guide* (Fort Belvoir, Va., March 2005).

arrangement, program offices should conduct a business case analysis as part of their decision-making process. A business case analysis is an analytical tool for assessing the projected costs and benefits of a PBL arrangement compared with other alternative weapon system support options. However, since DOD first implemented PBL arrangements, questions have arisen about whether they have reduced the costs of weapon system support as intended.

In 2004 and 2005, we reported that DOD's use of PBL arrangements did not reflect the best practices of private-sector companies and that DOD could not demonstrate that PBL arrangements had reduced costs and improved performance.³ Specifically, in 2004, we recommended that DOD incorporate into guidance the private sector's practice of using performance-based contracts at the component level (for example, to support engines or auxiliary power units) rather than only at the weapon system platform level (for example, to support aircraft). In response, DOD issued policy memorandums emphasizing that PBL may be applied at the weapon system, subsystem, or component level and revised its guidance to implement our recommendation. In 2005, we recommended that DOD, in conjunction with the military services, develop procedures to track whether DOD program offices update their business case analyses as called for under DOD guidance. We also recommended that DOD verify the reliability of contractor cost and performance data. DOD concurred with our recommendations and has issued limited guidance to the services regarding the verification of the reliability of contractor cost and performance data. However, DOD and the services, with the exception of the Army, have not developed procedures to track whether program offices update business case analyses after PBL implementation.

Given concerns about the cost of programs using PBL arrangements, you requested that we examine DOD's use of PBL for providing weapon system support. In response to your request, we evaluated the (1) extent to which DOD has used business case analyses to guide decisions related to PBL arrangements and (2) impact PBL arrangements have had on weapon system support costs. In addition, we describe the use and characteristics of "availability contracts," a concept similar to PBL arrangements that the United Kingdom's Ministry of Defence uses for weapon system support.

³ GAO, *Defense Management: DOD Needs to Demonstrate That Performance-Based Logistics Contracts Are Achieving Expected Benefits*, [GAO-05-966](#) (Washington, D.C.: Sept. 9, 2005), and *Defense Management: Opportunities to Enhance the Implementation of Performance-Based Logistics*, [GAO-04-715](#) (Washington, D.C.: Aug. 16, 2004).

We looked at the Ministry of Defence's use of availability contracts to identify potential promising practices because reducing costs was a clear goal of the implementation of this concept in the United Kingdom and a National Audit Office report stated that the Ministry of Defence has reduced support costs as a result of its implementation of this concept, and related initiatives, for two aircraft systems.

We collected and analyzed data on 27 PBL arrangements—specifically 9 from the Army, 8 from the Navy, and 10 from the Air Force—that were initiated from 1996 through 2007 to support DOD weapon systems.⁴ In addition, we reviewed 2 additional weapon systems that the Marine Corps was considering as candidates for PBL arrangements.⁵ We selected these programs from lists of PBL arrangements provided by the services and chose both component- and system-level arrangements from each of the services on the basis of the dollar value of the arrangements, prior audit findings, and location.⁶ While we focused on the costs of PBL arrangements, program officials said that performance generally met or exceeded requirements established in the contracts or other agreements.

To evaluate the extent to which DOD has used business case analyses to guide decisions regarding PBL arrangements, we obtained and examined the analyses prepared by program offices. In assessing the quality of these analyses, we used applicable criteria in DOD Instruction 7041.3, *Economic Analysis for Decisionmaking*.⁷ This economic analysis instruction is generally consistent with DOD's guidance on conducting a business case analysis; in both cases, DOD recommends that costs and benefits (both qualitative and quantitative) be considered and documented. However, the economic analysis instruction contains more specific information for evaluation of program costs. This guidance is also consistent with Office

⁴ Of the 29 PBL arrangements, 6 were first initiated before 2001 when DOD guidance recommended conducting a business case analysis; however, 4 of the 6 negotiated subsequent PBL arrangements after 2001. The remaining 2 programs conducted a business case analysis.

⁵ According to Marine Corps officials, no PBL arrangements for ground systems have been implemented yet. The Naval Air Systems Command manages PBL arrangements for support of Marine Corps aviation systems.

⁶ The results from this nonprobability sample cannot be used to make inferences about the population because the sample may not reflect all of characteristics of the population.

⁷ DOD Instruction 7041.3, *Economic Analysis for Decisionmaking*, November 7, 1995. In this report, we refer to this as DOD's economic analysis instruction.

of Management and Budget guidelines for the benefit-cost analysis of federal programs.⁸ DOD's economic analysis instruction also states that analytical studies that evaluate the cost and effectiveness of weapon system support are considered to be "economic analyses" even if not titled as such.

To evaluate the impact that PBL arrangements have had on weapon system support costs, we asked program officials to identify and document savings attributed to PBL implementation. In addition, if a program had renewed a PBL arrangement or had finalized contract options that were not priced, we analyzed the contracts for trends in PBL support costs. We also compared PBL contract costs with estimated PBL support costs in business case analyses to determine how closely the estimates matched the actual PBL arrangement costs, where available. We also relied on our previously issued reports and testimonies on DOD's implementation of PBL.

To provide information regarding the characteristics and use of availability contracts for weapon system support in the United Kingdom's Ministry of Defence, we met Ministry of Defence and National Audit Office officials and officials from defense contractors having availability contracts with the Ministry of Defence. We also reviewed a 2007 National Audit Office report regarding the Ministry of Defence's use of availability contracting to support Harrier and Tornado fast jets.⁹ We obtained these data for informational purposes and to identify promising practices and did not independently verify the statements or data provided by Ministry of Defence and National Audit Office officials.

We conducted this performance audit from February 2007 through December 2008 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. A detailed description of our scope and methodology is contained in appendix I.

⁸ Office of Management and Budget, Circular A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs* (Oct. 29, 1992).

⁹ National Audit Office, *Transforming Logistics Support for Fast Jets* (London: July 17, 2007).

Results in Brief

Although DOD's guidance recommends that business case analyses be used to guide decision making regarding the implementation of PBL to provide weapon system support, the services are not consistent in their use of such analyses. In general, for the PBL arrangements we reviewed business case analyses either were not done, were not fully documented, or were not comprehensive or sound. About half of the DOD program offices responsible for the 29 PBL arrangements we reviewed either did not use a business case analysis (or economic analysis) or could not provide documentation for significant parts of their analyses. Almost all of the remaining analyses were missing one or more of the recommended elements in DOD's economic analysis instruction. Finally, business case analyses were often not updated in accordance with service policies and guidance. Program office use of these analytical tools is inconsistent because (1) DOD's guidance did not require that they be prepared and updated and (2) DOD did not provide specific criteria for conducting the analyses. Additionally, most of the services have not established effective internal controls to ensure that the analyses are prepared or that they provide a consistent and comprehensive assessment of weapon system support options. As a result, DOD has implemented PBL arrangements to provide weapon system support without sound analyses that ensure that the chosen approach will provide the most cost-effective support option for the department.

Although the PBL concept was an initiative in a DOD logistics reengineering pilot program intended to reduce weapon system support costs, the ability of these arrangements to reduce costs remains unclear 7 years after DOD first identified PBL as the preferred support strategy. Many DOD program offices that implemented PBL arrangements have limited cost data, and various other factors, such as the lack of business case analyses and changing operational and materiel conditions, further limit an evaluation of the costs of this support strategy. Available data from the programs we reviewed indicated mixed results. Although a few programs in our sample provided evidence of some cost reductions, our analysis of the only two systems in our sample that were managed using both a PBL arrangement and a more traditional, non-PBL arrangement indicated that the PBL arrangement had higher costs in both cases. We also found few examples of decreasing support costs after PBL contract renewal, as the PBL concept suggests should occur. Finally, we found that certain characteristics of DOD's PBL arrangements—such as short-term contracts, unstable requirements and funding, DOD ownership of inventory, and the lack of cost metrics and effective incentives—could limit the ability of and incentive for contractors to reduce support costs. Neither DOD nor the services require detailed cost reporting for PBL (or

for any type of contractor logistics support). Further, in its implementation of PBL arrangements, DOD has emphasized the potential to improve performance and not the potential to reduce support costs. The lack of detailed cost data for evaluating the impact of PBL arrangements on support costs, compounded with deficiencies in DOD's use of business case analyses for decision making, hinders DOD's ability to determine whether most PBL arrangements have reduced support costs as intended.

We describe the use of performance-based arrangements for weapon system support in the United Kingdom's Ministry of Defence, which is referred to as contracting for availability. The Ministry of Defence began awarding availability contracts—generally for aviation systems but also for some maritime equipment—as an approach to reduce weapon system support costs after a 1999 cost reduction goal of 20 percent was set. Ministry of Defence officials believe that support cost reductions have been achieved as a result of using availability contracts, and the National Audit Office reported savings for the Tornado and Harrier fast jets, although it is unclear to what extent the availability contracts generated the cost reductions because other cost reduction initiatives were implemented at the same time. In general, the availability contracts used by the ministry are significantly longer than those used by DOD, and the ministry uses an “open book accounting” arrangement to gain visibility into the contractors' costs to provide support.

We are making recommendations in this report aimed at documenting and improving the analysis of the cost-effectiveness of PBL arrangements. We recommend, for example, that DOD require the development of business case analyses, specifying the elements to be included in them so that they are comprehensive and sound and that the services improve their internal controls to ensure that the analyses are performed, and that program offices collect and report detailed support cost data for their PBL arrangements. Improvements in the collection and reporting of detailed cost data could go a long way toward providing required information for determining if PBL provides the most cost-effective approach for supporting DOD weapon systems. In written comments on a draft of this report, DOD generally concurred with our recommendations and discussed actions it has planned to implement some of our recommendations, such as revising DOD's acquisition directive to require the development of a business case analysis. DOD also stated that it would review existing policy and guidance in other areas as part of an ongoing study. While we view DOD's actions as positive steps to improve the implementation of PBL, it is unclear to what extent the results of the study, and any related actions, will affect the evaluation of the cost-

effectiveness of DOD's PBL arrangements. DOD's comments are reprinted in appendix II.

Background

PBL is a method of providing support for weapon systems by designating *what system performance is required*, such as a given level of system availability, and placing the responsibility for *how it is accomplished* on the support provider, which manages resources to achieve performance objectives. Logistics support for almost all of DOD's weapon systems, such as materiel management, maintenance, and engineering, is provided by a combination of government and private-sector sources. In the past, under traditional support arrangements, the government generally managed the provision of weapon system support, using a combination of support providers from the government and the private sector. PBL support arrangements often use a private-sector support integrator to manage support providers from both the public and private sectors to meet specified performance requirements.

PBL evolved from performance-based service contracting, which has been used in both the public and private sectors. The *Federal Acquisition Regulation* defines performance-based contracting as structuring all aspects of an acquisition around the purpose of the work to be performed. The *Federal Acquisition Regulation* further defines the statement of work for a performance-based acquisition as describing the required results in clear, specific, and objective terms with measurable outcomes.¹⁰ Performance-based service contracting has been referenced in regulation, guidance, and policy for more than two decades, and federal agencies have used it to varying degrees for acquiring a range of services. In 1991 the Office of Management and Budget issued a policy letter establishing the use of a performance-based approach for service contracting, and in 1994 it initiated a governmentwide pilot project to encourage the use of performance-based service contracts in federal agencies, including DOD. In October 1997, the *Federal Acquisition Regulation* was amended to incorporate the Office of Management and Budget's 1991 policy. The *Federal Acquisition Regulation* currently establishes a policy that

¹⁰ *Federal Acquisition Regulation* Subpart 2.101.

agencies use performance-based contracting methods to the maximum extent practicable for the acquisition of services, with certain exceptions.¹¹

Using performance-based service contracts is intended to offer a number of potential benefits, such as encouraging contractors to be innovative and to find cost-effective ways of delivering services for a fixed level of funding. By shifting the focus from process to results, these contracts can potentially produce better outcomes and reduced costs. The Office of Management and Budget reported that the agencies participating in the pilot reduced contract prices and improved customer satisfaction with contractor work after introducing performance-based contracting.

PBL Implemented as a Strategy to Reduce or Minimize Costs and Improve Performance

As an approach for supporting military weapon systems, PBL emerged from a 1999 DOD study to test logistics reengineering concepts that placed greater reliance on the private sector for providing weapon system support to reduce support costs and improve weapon system performance. The goal was for the military departments to reduce costs and improve efficiency by pursuing logistics support “reengineering” efforts using contractors.¹² The fiscal years 2001-2005 Defense Planning Guidance advanced this cost reduction effort by establishing a goal that directed each military department to reduce the operation and support costs of its fielded systems by 20 percent by the year 2005. During this time, the Under Secretary of Defense (Acquisition and Technology) directed the services to use an existing pilot program containing 30 weapon systems to demonstrate the type of cost savings depicted in the fiscal years 2001-2005 Defense Planning Guidance. The areas identified for potential cost savings were reducing demand on the supply chain by improving the reliability and maintainability of the equipment, reducing supply chain response time, and increasing competitive sourcing of product support. Some of the 30 pilot programs involved performance-type arrangements that the services subsequently converted to, or designated as, PBL arrangements.

¹¹ *Federal Acquisition Regulation* Subpart 37.102(a), implementing section 821 of the Floyd D. Spence Defense Authorization Act for Fiscal Year 2001 (Pub. L. No. 106-398). The *Federal Acquisition Regulation* addresses performance-based contracting generally at Subpart 37.6.

¹² GAO, *Defense Logistics: Actions Needed to Enhance Success of Reengineering Initiatives*, [GAO/NSIAD-00-89](#) (Washington, D.C.: June 23, 2000).

This emphasis on reducing costs through PBL implementation was reiterated in DOD's 2001 *Quadrennial Defense Review Report*,¹³ which advocated the implementation of PBL to compress the supply chain by removing steps in the warehousing, distribution, and order fulfillment processes; to reduce inventories; and to decrease overhead costs while improving the readiness of major weapon systems and commodities. In November 2001, DOD identified PBL as the preferred weapons system support strategy.¹⁴ In May 2003, DOD further strengthened this emphasis on PBL by stating in a DOD policy directive that acquisition managers shall use performance-based strategies for sustaining products and services whenever feasible and PBL strategies shall optimize total system availability while minimizing cost and the logistics footprint.¹⁵

In concept, a properly structured PBL arrangement is supposed to provide a level of performance and also reduce costs over time. According to the DOD/Defense Acquisition University PBL guide,¹⁶ a key aspect of PBL is the inclusion of an incentive for the support provider to reduce costs through increased reliability. Further, PBL arrangements can inherently motivate support providers to improve component and system reliability, since such improvements can provide the foundation for increased profit over the long term. In other words, the support provider should have the incentive to make reliability improvements to ensure that performance metrics are met and also to increase profit by earning a performance

¹³ Department of Defense, *Quadrennial Defense Review Report* (Washington, D.C., Sept. 30, 2001).

¹⁴ Department of Defense, *Product Support for the 21st Century: A Program Manager's Guide to Buying Performance*. Throughout this report, we refer to this document as DOD's 2001 PBL guide.

¹⁵ DOD Directive 5000.1, *The Defense Acquisition System*, paras. E1.1.16 and E1.1.17, May 12, 2003. The logistics footprint refers to the size or presence of government or contractor personnel, equipment, inventory, facilities, transportation assets, or real estate needed to deploy, sustain, and move the weapon systems or components.

¹⁶ Department of Defense, Defense Acquisition University, *Performance Based Logistics: A Program Manager's Product Support Guide* (Washington, D.C., Sept. 30, 2004). This document, which was reissued in March 2005, supersedes DOD's *Product Support for the 21st Century: A Program Manager's Guide to Buying Performance*, dated November 2001. In a November 2004 memorandum, the Acting Under Secretary of Defense (Acquisition, Technology and Logistics) described the Defense Acquisition University's *Program Manager's Product Support Guide* as guidance that should be used by DOD program and product support managers in conjunction with other DOD policy and Office of the Secretary of Defense memorandums. Throughout this report, we refer to this guide as the DOD/Defense Acquisition University PBL guide.

incentive tied to the metrics (an award fee or award term) and by reducing costs while still being paid the agreed-upon, fixed price for the remainder of the contract. The DOD/Defense Acquisition University PBL guide also states that a critical element of the PBL arrangement that facilitates this incentive and motivation is contract length. Further, long-term contracts provide the support provider with confidence in continuing cash flows and provide sufficient time for receiving an adequate return on any investments made to improve reliability.

DOD Recommended That Analyses Be Conducted to Guide Decisions regarding Weapon System Support Options

In 1995, before DOD identified PBL as the preferred weapons system support strategy, DOD's economic analysis instruction recommended using an economic analysis for evaluating options for weapon system support. The instruction stressed the importance of considering in the analysis both qualitative and quantitative factors. With respect to quantitative factors, the instruction recommended that costs and benefits be expressed in terms of net present value to account for the time value of money. These were also to be expressed as life cycle costs and benefits that were to be calculated and compared for each feasible alternative for meeting a given weapon system support objective.

Specifically, the economic analysis instruction identified and characterized the following seven elements that should be present in an economic analysis:

- *objectives*—to clearly identify the function to be accomplished and not to assume a specific means of achieving a desired result;
- *assumptions*—to incorporate both actual data and future uncertainties;
- *alternatives*—to comprise a comprehensive list of the feasible and infeasible options followed by a discussion of the infeasible options and comparisons of only the feasible options;
- *costs and benefits*—to compare the quantitative (expressed in terms of net present value) and qualitative factors for each option;
- *sensitivity and uncertainty (risk) analyses*—to determine the effect of uncertainties on the results of the analysis and to provide a range of costs and benefits;
- *summary of the results of the analysis*; and
- *summary of the analysis's recommendations*.

In DOD's 2001 PBL guide, in which DOD identified PBL as the preferred weapon system support strategy, the department recommended that for all new systems and fielded acquisition category I and II systems,¹⁷ program offices use an analytical tool called a business case analysis to support the decision to use PBL arrangements for weapon system support.

In 2004 and 2005, DOD guidance on conducting business case analyses described this tool in less specific terms than those used to describe the criteria laid out in DOD's economic analysis instruction. However, there are some common themes in the guidance and instruction. For example, a January 2004 Under Secretary of Defense (Acquisition, Technology and Logistics) memorandum on PBL business case analysis calls for an assessment of "best value," or the greatest overall benefit.¹⁸ The DOD/Defense Acquisition University PBL guide repeats the characterization of the business case analysis as a tool with the goal of determining a best-value solution and suggests that at a minimum a business case analysis should include an introduction outlining the purpose and objectives of the program, an explanation of the methods and assumptions used in the analysis, calculations of the relative costs and benefits of each weapon system support option, the financial and nonfinancial impacts of each, a risk assessment, and a section with conclusions and recommendations. Finally, both DOD's economic analysis instruction and the DOD/Defense Acquisition University PBL guide recommend documenting the results of the analysis, including all calculations and sources of data, down to the most basic inputs, to provide an auditable and stand-alone document. According to the guidance, a business case analysis must stand on its own and be able to withstand rigorous analysis and review by independent agencies.

¹⁷ The acquisition category determines the level of review, decision authority, and applicable procedures for an acquisition program. Acquisition category I programs have an estimated total of expenditure of more than \$365 million for research, development, test, and evaluation or procurement of more than \$2.19 billion. Acquisition category II programs have an estimated total expenditure for research, development, test, and evaluation from \$140 million to \$365 million or procurement from \$660 million to \$2.19 billion.

¹⁸ Under Secretary of Defense (Acquisition, Technology and Logistics), Memorandum (Jan. 23, 2004). Throughout this report we refer to this as the January 2004 Under Secretary of Defense (Acquisition, Technology and Logistics) memorandum.

DOD's 2004 and 2005 guidance on conducting business case analyses also recommended that program offices

- update their business case analyses at key decision points both to validate the approach taken and to support future plans and
- use certain criteria, such as the capability of a PBL arrangement to reduce the cost per operational unit of performance (i.e., cost per flight hour), to assess all acquisition I and II programs without plans for a PBL arrangement for the potential application of a PBL strategy at the system, subsystem, or major assembly level. If the assessment showed potential for a PBL arrangement, a business case analysis should be conducted and completed by the September 30, 2006, deadline required by DOD's Strategic Planning Guidance.

PBL Arrangements Included in Our Review

In our review, we looked at PBL arrangements initiated as early as 1996 (when performance-based contracting was encouraged governmentwide) and as recently as 2007 (by which time, at the DOD level, PBL arrangements had moved from being encouraged to being required whenever feasible). These PBL arrangements represent contract values totaling approximately \$12.1 billion and range from a low of \$10.5 million to a high of \$4.9 billion.¹⁹ Table 1 lists, by service, the weapon system programs supported by the 29 PBL arrangements we reviewed.

¹⁹ The costs for the two Marine Corps PBL arrangements are not included in this estimate because the PBL arrangements have not yet been implemented. Also, the total does not include support costs for the Army's Common Ground Station PBL arrangement because this arrangement is with a government activity and does not involve a contract. According to Common Ground Station officials, support costs for fiscal years 2003 through 2007 totaled about \$44 million.

Table 1: Weapon System Programs Supported by PBL Arrangements

| Service | Weapon system |
|-------------------------------|------------------------------------------------------------------------------------------|
| Army | Tube-launched Optically-tracked Wire-guided missile – Improved Target Acquisition System |
| | Javelin antitank missile |
| | High Mobility Artillery Rocket System |
| | RQ-7B Shadow Tactical Unmanned Aircraft System |
| | Sentinel Radar |
| | Patriot Air Defense System |
| | AH-64D Apache Helicopter – Sensors |
| | AH-64D Apache Helicopter – Airframe |
| | AN/TSQ-179AV(2) Common Ground Station |
| Navy | F-16 engines |
| | KC-130J ^a |
| | V-22 engine |
| | T-45 engine |
| | Phalanx Close-In Weapon System |
| | AV-8B Harrier |
| | F/A-18 E/F |
| | Consolidated Automated Support System |
| Marine Corps | Expeditionary Fighting Vehicle ^b |
| | Assault Breacher Vehicle ^b |
| Air Force | C-17 Globemaster III |
| | T-6A Joint Primary Air Training System |
| | F-117A Nighthawk |
| | F-22 Raptor |
| | B-2 Spirit |
| | Secondary Power Systems |
| | E8-C Joint Surveillance Target Attack Radar System |
| | LITENING Advanced Airborne Targeting and Navigation Pod |
| Sniper Advanced Targeting Pod | |
| C-130J Hercules | |

Source: GAO analysis of DOD data.

^aAlthough the KC-130J is a Marine Corps aircraft, the support contracts are managed by the Navy.

^bA PBL arrangement has not yet been implemented.

Business Case Analyses Have Not Been Used Consistently or Effectively to Influence Decision Making regarding Use of PBL

DOD has generally not used business case analyses consistently or effectively to influence decision making regarding the use of PBL. Although DOD guidance recommended that these analyses be used to guide decisions on the cost-effectiveness of weapon system support arrangements, about half of the programs we reviewed either did not conduct such an analysis or did not retain adequate supporting documentation.²⁰ Further, most of the remaining programs in our sample used analyses that were not comprehensive. For example, some analyses did not evaluate alternative support options and most did not contain all of the elements recommended in DOD's economic analysis instruction. Additionally, analyses were often not updated to support decision making after PBL implementation in accordance with service policies and guidance. The key reasons for DOD's ineffective use of business case analyses to support PBL decision making are that (1) DOD has not required such analyses or provided specific criteria for conducting them and (2) the services' internal controls have been inadequate to ensure that the analyses are performed and updated. As a result, DOD cannot ensure that decisions regarding weapon system support options are guided by comprehensive, consistent, and sound analytical tools. Further, the department cannot be sure that the support arrangements being implemented will result in the most cost-effective support program.

About Half of Programs Reviewed Either Did Not Use Business Case Analyses to Guide Decisions to Enter into PBL Arrangements or Did Not Retain Details of the Analysis

For 9 of the 29 PBL arrangements we reviewed, a business case analysis had not been completed. Additionally, for 6 others, program officials could not provide supporting details of the business case analysis they told us that they had conducted. When program offices did not conduct business case analyses as part of their PBL decision making, as we found for many of the programs we reviewed, the department cannot be sure that the support arrangements implemented will result in the most cost-effective support program.

Programs That Did Not Conduct a Business Case Analysis Before Entering into PBL Arrangements

Table 2 provides the number of PBL arrangements we reviewed by service that were initiated with and without the use of a business case analysis.

²⁰ According to Office of Management and Budget Circular A-94, a program is cost effective if, on the basis of a life cycle cost analysis of competing alternatives, it is determined to have the lowest costs expressed in present value terms for a given level of benefits.

Table 2: Number of PBL Arrangements Initiated with and without the Use of a Business Case Analysis

| Service | Prepared an analysis | Did not prepare an analysis | Total |
|----------------|-----------------------------|------------------------------------|--------------|
| Army | 7 | 2 | 9 |
| Navy | 6 | 2 | 8 |
| Marine Corps | 2 | 0 | 2 |
| Air Force | 5 | 5 | 10 |
| Total | 20 | 9 | 29 |

Source: GAO analysis of DOD data.

Although both of the Marine Corps programs we reviewed conducted a business case analysis, about 50 percent of Air Force programs, 22 percent of Army programs, and 25 percent of Navy programs did not. In general, the Air Force programs only developed a source-of-repair analysis, which evaluated only the repair element of weapon system support. For the two PBL arrangements for which the Army did not conduct an analysis—the Apache sensor and airframe arrangements—the Deputy Assistant Secretary of the Army (Integrated Logistics Support) approved the Apache program office’s request for a waiver from Army business case analysis policy based on prior analyses and program decisions. However, the U.S. Army Audit Agency reported that the prior analyses did not consider all components included in the two PBL arrangements, other support strategies, performance metrics, and relative costs.²¹ According to an Army official, a business case analysis for the airframe components is being conducted and is expected to be completed in December 2008, and efforts to develop a business case analysis for the program’s sensors are expected to begin in November 2008.

The F-22A Raptor and KC-130J are examples of programs where the Air Force and Navy did not conduct a business case analysis as part of the PBL decision-making process. When DOD recommended in 2001 that program offices fielding new systems base PBL arrangement decisions on business case analyses, the F-22 was beginning low-rate initial production. In 2002, the Assistant Secretary of the Air Force (Acquisition) and the Air Force Deputy Chief of Staff (Logistics, Installations and Mission Support)

²¹ U.S. Army Audit Agency, *Army’s Process and Controls for Effectively Implementing Performance Based Logistics*, A-2007-0072-ALM (Alexandria, Va., Feb. 9, 2007).

directed the F-22 program office to develop a long-term support strategy and manage life cycle product support through a PBL arrangement that includes government-contractor partnerships as necessary. From 2003 through 2007, the program office acquired support as part of the aircraft's production contract, and in 2008 the office signed a separate PBL support contract with Lockheed Martin, one of the original equipment manufacturers, to support the aircraft from 2008 to 2012. In March 2008, program officials said that they did not conduct a business case analysis before awarding the 2008 contract because current program data, such as material usage rates and costs, are immature. Officials planned to conduct an analysis in 2010 or 2011 when it could be completed using more meaningful data. However, program officials subsequently decided that the available data were sufficient and in July 2008 awarded a contract to develop a business case analysis. Completion of the analysis is expected in late 2009.

In 2002, the Navy contracted for a PBL arrangement to support the Marine Corps' KC-130J engines without first preparing a business case analysis. Program officials explained that the decision was made not to develop an analysis because the technical data needed to repair the engines were not available and the Marine Corps did not have the infrastructure necessary to support the system. Officials also said that a market analysis was conducted prior to implementing the PBL arrangement, but they could not provide a copy of the analysis. Nonetheless, a business case analysis that documented the results of the market analysis and the program's negotiated costs versus expected flight hours and anticipated repairs and maintenance could have been used to monitor the actual results and cost-effectiveness of the performance-based approach, especially since support for the engines is obtained under a commercial contract and the contractor does not provide detailed cost data to the government.

Supporting Documentation Not Fully Available for Some Programs That Conducted Business Case Analyses

Program officials from 20 of the PBL arrangements we reviewed told us that they had conducted business case analyses before implementing the arrangements; however, officials for 6 programs could not provide all or some of the data to support the analyses. According to DOD's economic analysis instruction, the results of the analysis, including all calculations and sources of data, must be documented down to the most basic inputs to provide an auditable and stand-alone document. Table 3 lists by service the number of PBL arrangements for which all of the business case analysis documentation was retained and those for which it was not.

Table 3: Number of PBL Arrangements with and without Supporting Documentation of a Business Case Analysis

| Service | Programs that did retain supporting documentation | Programs that did not retain all or some supporting documentation | Total |
|----------------|----------------------------------------------------------|--------------------------------------------------------------------------|--------------|
| Army | 3 | 4 | 7 |
| Navy | 5 | 1 | 6 |
| Marine Corps | 2 | 0 | 2 |
| Air Force | 4 | 1 | 5 |
| Total | 14 | 6 | 20 |

Source: GAO analysis of DOD data.

In general, program officials for six programs said that they were unable to locate all the details of their analyses; however, the amount of data that was missing varied. For example:

- Although officials for the Army’s Common Ground Station said that an analysis was performed in 2002, they were unable to provide any details of the analysis or the results.
- While program officials for the Army’s Shadow Tactical Unmanned Aircraft System were able to provide the results of their 2002 analysis, they did not retain the details regarding the assumptions, data sources, or calculations used to develop the analysis. However, program officials said that the analysis was developed early in the life cycle of the program and was not based on historical cost and maintenance data, and therefore they did not consider it to be very accurate based on actual program results that have occurred since the analysis was developed.
- For the Army’s Javelin PBL arrangement, the DOD Office of the Inspector General reported in 2005 that it was unable to validate the program office’s 2001 analysis because the program office was not able to provide adequate documentation.²² The documentation has not been located, and program officials were only able to provide a summary of the results of the analysis.

²² Department of Defense, Office of the Inspector General, *Logistics: Implementation of Performance-Based Logistics for the Javelin Weapon System*, D-2005-037 (Arlington, Va., Mar. 7, 2005).

Most Remaining Programs Used Business Case Analyses That Were Not Comprehensive

Service program officials could provide documentation of the business case analyses conducted for 14 of the PBL arrangements we reviewed, but all but 1 of the 14 analyses were missing one or more of the elements recommended in DOD's economic analysis instruction. As a result, decisions regarding weapon system support options for many of the programs we reviewed were not guided by comprehensive, consistent, and sound economic analysis. Further, the department cannot be sure that the support arrangements implemented will result in the most cost-effective support programs. Figure 1 shows which elements were missing from the 14 business case analyses.

Figure 1: Elements Missing from the Business Case Analyses We Reviewed

| Service | Weapon system | Life cycle costs | Net present value | Objectives | Assumptions | Documentation of feasible and infeasible alternatives considered | Costs and benefits | Comparison of feasible alternatives | Sensitivity and uncertainty analysis | Results and recommendations |
|--------------|----------------------------------------------------------------------------------------|------------------|-------------------|------------|-------------|------------------------------------------------------------------|--------------------|-------------------------------------|--------------------------------------|-----------------------------|
| Army | Tube-launched Optically-tracked Wire-guided missile—Improved Target Acquisition System | | | △ | | △ | (a) | | △ | △ |
| | Sentinel Radar | | | (b) | | △ | | | | |
| | Patriot Air Defense System | △ | | | | | | | (c) | (d) |
| Navy | V-22 engine | | △ | | | △ | (a) | | △ | (d) |
| | Phalanx Close-In Weapon System | △ | △ | △ | | △ | (a) | | △ | △ |
| | AV-8B Harrier | △ | △ | △ | | △ | (a) | | △ | △ |
| | F/A-18 E/F (e) | | △ | | | △ | | | △ | |
| | Consolidated Automated Support System | △ | △ | | | △ | (a) | | △ | △ |
| Marine Corps | Expeditionary Fighting Vehicle | | | (b) | | | | | | |
| | Assault Breacher Vehicle | | △ | (b) | | | | | | |
| Air Force | C-130J Hercules | | | | | | | | | |
| | C-17 Globemaster III | | | (b) | | (f) | | (f) | | |
| | B-2 Spirit | △ | △ | (b) | | (f) | | (f) | (c) | |
| | Joint Surveillance and Target Attack Radar System | | △ | (b) | | (f) | | (f) | | |

Source: GAO analysis of DOD data.

- △ Indicates missing element
- (a) Included costs but no analysis of nonquantifiable benefits
- (b) Included objective of document, not objective of warfighter or warfighter need
- (c) Included either sensitivity or risk analysis, but did not include both
- (d) Included results but no recommendation
- (e) Both the Navy Inventory Control Point and the Naval Air Systems Command prepared a business case analysis for the F/A-18 E/F PBL arrangement. We summarize the elements missing from both analyses.
- (f) Did not analyze alternative support strategies

For three PBL arrangements, the business case analyses did not compare alternative support options and either evaluated only a single option for weapon system support or evaluated contracting strategies instead of alternative support arrangements. For example, the 2007 business case analysis for the Joint Surveillance and Target Attack Radar System did not analyze the costs and benefits of alternative support strategies for the program. The business case analysis was developed in response to a 2006 recommendation from the DOD Office of the Inspector General after a review found that the program office had not evaluated alternative support strategies prior to implementing a PBL arrangement in 2000.²³ However, the 2007 analysis covered only the potential impacts of changing the type of contract used to obtain support for the program from cost plus award fee to firm fixed price.²⁴ The business case analysis for the B-2 also did not analyze alternative support strategies but focused on potential efficiencies available to the current program through funding consolidation,²⁵ funding stability, and long-term contracting. According to program officials, the only assumption in the analysis that actually occurred to some extent after PBL implementation was funding consolidation. Finally, although the C-17 program office developed a business case analysis in 2003, the DOD Office of the Inspector General reported in 2006 that the analysis focused only on one support option and did not evaluate the costs and benefits of multiple support options.²⁶ In 2007, a contract was awarded for development of another business case analysis planned for completion prior to awarding the next C-17 support contract.

²³ Department of Defense, Office of the Inspector General, *Logistics: Implementation of Performance-Based Logistics for the Joint Surveillance Target Attack Radar System*, D-2006-105 (Arlington, Va., Aug. 9, 2006).

²⁴ The *Federal Acquisition Regulation* defines fixed price types of contracts as providing for a price that is not subject to any adjustment on the basis of the contractor's cost experience in performing the contract. FAR 16.202-1. A cost-plus-award-fee contract is a cost-reimbursement contract that provides for a fee consisting of (1) a base amount (which may be zero) fixed at inception of the contract and (2) an award amount, based upon a judgmental evaluation by the government, sufficient to provide motivation for excellence in contract performance. FAR 16.305.

²⁵ The B-2 program office received its operations and maintenance funding—the majority of the funds used for B-2 support—in separate elements of expense/investment codes, which had to be used for specific purposes. In the business case analysis, program officials assumed that operations and maintenance funds could be used more effectively if the funds were consolidated and not separated into different elements of expense/investment codes.

²⁶ Department of Defense, Office of the Inspector General, *Acquisition: Procurement Procedures Used for C-17 Globemaster III Sustainment Partnership Total System Support*, D-2006-101 (Arlington, Va., July 21, 2006).

Two other important elements missing from some analyses were an evaluation of costs over the remaining life cycle of the program and the calculation of net present value to account for the time value of money.²⁷ For example, the analysis for the Patriot PBL arrangement only evaluated the costs and benefits over a 3-year period. On the other hand, while the business case analysis for the Assault Breacher Vehicle evaluated costs over the 20-year life cycle of the program, the net present value of the alternatives was not calculated. Four other business case analyses—those prepared for the F/A-18 E/F, AV-8B Harrier, Close-In Weapon System, and Consolidated Automated Support System—did not include these two elements and several others, such as sensitivity or risk analysis. These analyses were prepared in a similar format by the Naval Inventory Control Point, an organization that provides supply support to the Navy, Marine Corps, and others. We conducted a net present value analysis on the amounts contained in the Naval Inventory Control Point's business case analysis for the F/A-18 E/F PBL arrangement and found that the PBL option it chose was about \$1.7 million more expensive than the alternative option. Its analysis, which did not use net present value, found that the PBL option was about \$277,000 less expensive. The Naval Inventory Control Point's philosophy is that if the costs of PBL are equal to or less than the costs for government-provided support, a PBL arrangement will be used. Therefore, if Naval Inventory Control Point officials had conducted a net present value analysis, based on this decision criterion, they would not have implemented the PBL arrangement. According to Naval Inventory Control Point officials, there is confusion in the Navy regarding the purpose of the analyses they prepare. Officials said that the analyses were conducted for internal decision making and were not intended to satisfy Navy PBL policy, which places responsibility for development of a life cycle business case analysis on the weapon system program office.²⁸ However, program officials for the Close-In Weapon System, Harrier, and Consolidated Automated Support System did not develop business case analyses that evaluated PBL implementation over the remaining life cycle of the system.

²⁷ According to Office of Management and Budget Circular A-94, net present value is the standard criterion for deciding whether a government program can be justified on economic principles.

²⁸ DOD's economic analysis instruction recommends an evaluation of the costs and benefits over the life cycle of the program. Further, according to the *Department of the Navy Performance Based Logistics Guidance Document* (Jan. 27, 2003), the program office is responsible for completion of a business case analysis, and total life cycle costs should be used in the analysis.

Other Factors Influencing the Quality of Business Case Analyses

Several other factors affected the quality of the business case analyses we reviewed. Most of the analyses we reviewed did not identify and quantify the benefits that could be expected from contractor incentives to increase reliability or improve processes to reduce support costs. The only business case analysis that specifically identified cost savings based on contractor incentives to reduce costs was the 2005 life cycle business case analysis for the F/A-18 E/F. The life cycle analysis included an estimate of future cost savings associated with investments the contractor was willing to make under the arrangement to reduce supply chain costs. In addition, most of the analyses did not recognize or quantify the costs associated with the transfer of risk that occurs under a performance-based support arrangement. According to the DOD/Defense Acquisition University PBL guide, PBL arrangements transfer responsibility for making support decisions—and corresponding risk—to the support provider, and risk is one of the major cost drivers for contractors. Therefore, the use of performance metrics could introduce a large element of risk for the contractor that may be built into the costs of such an arrangement. In general, many of the business case analyses we reviewed simply estimated the costs for contract logistics support and government-provided support. One exception was the business case analysis for the Marine Corps' Assault Breacher Vehicle, which attempted to address the costs of risk transfer and the benefits of contractor incentive to reduce costs by estimating the costs for a traditional contractor logistics support arrangement and a performance-based contractor logistics support arrangement, in addition to estimates for government-provided support and performance-based, government-managed support.

Another business case analysis was based on questionable assumptions. The 2002 business case analysis for the Sentinel program estimated that the cost for the government depot to overhaul the system was 50 percent of the total cost of the system. The business case analysis estimated that for the alternative option—a partnership between the government and the contractor with the government depot performing enough work to meet the system's core requirements—the cost for an overhaul was only 25 percent of the system's cost. The analysis assumed that under the partnership option the overhaul cost less because, instead of complete disassembly and parts replacement, the system would be inspected and repaired only as necessary. However, according to an official at the Army depot that would perform the overhaul, the depot also could have used the inspect and repair concept as the basis for its maintenance work. Therefore, this assumption in the business case analysis may have overstated the costs for the government depot to perform the work.

Lastly, the Naval Air Systems Command's 2005 life cycle business case analysis for the F/A-18 E/F estimated that over the 28-year life cycle of the program, PBL support costs were \$76 million more expensive than costs for government-provided support. However, the business case analysis estimated that Naval Inventory Control Point surcharges would be \$325 million less for the PBL arrangement. The Naval Inventory Control Point adds a surcharge to the cost of goods sold to its customers (including weapon system program offices) to recoup its expenses, but according to officials, they do not adjust their resources based on PBL implementation and would still need to recoup their expenses through surcharges to other customers. Therefore, while the F/A-18 program office may realize a \$325 million benefit from the reduced surcharge, the overall costs to the Navy may remain the same. Including this reduced amount in the analysis is inconsistent with DOD's economic analysis instruction, which states that all measurable costs and benefits to the federal government should be included in the analysis. In addition, in the 2006 business case analysis prepared by the Naval Inventory Control Point, which estimated supply chain management costs for both PBL and government-provided support for a 5-year period from 2006 through 2011, the Naval Inventory Control Point's costs were estimated to remain the same under either option. If the Naval Inventory Control Point's costs had been the same in the life cycle business case analysis prepared by the Naval Air Systems Command for the F/A-18 E/F, the PBL arrangement would be \$401 million more expensive than government support for the 28-year period.

Business Case Analyses Were Often Not Updated for Decision Making After PBL Implementation

In 2004, DOD guidance recommended that business case analyses continue throughout the weapons system's life cycle and be updated at key decision points both to validate the approach taken and to support future plans. The services, with the exception of the Air Force, have also issued policies on conducting such updates. However, even when business cases were prepared, we found that program offices often did not update them in accordance with DOD's guidance and service policies, nor did the program offices validate them against actual support costs for decision making after PBL implementation. Neither DOD nor the services has issued guidance that specifies what should occur when updating or validating a business case analysis.

Army policy states that PBL business case analyses shall be updated prior to the exercise of an option period when there are significant changes to the performance period/terms of the contract or evaluation period, or updated whenever there are major programmatic changes or at least every

5 years.²⁹ Program offices for four of the Army PBL arrangements we reviewed had not updated their business case analyses as called for by Army policy. For example, the Tube-launched Optically-tracked Wire-guided missile – Improved Target Acquisition System program office developed a business case analysis in 1998 before awarding the original PBL contract and has not updated or validated the original analysis. Further, officials negotiated a follow-on PBL contract in 2007 after the terms of the original contract were complete. Although program officials for the Shadow Tactical Unmanned Aircraft System had planned to complete an update to their 2002 business case analysis by the end of 2007, the effort was delayed and the update is expected to be completed before the end of 2008. Although the Javelin program office implemented a PBL arrangement in January 2004, the business case analysis was developed in 2001, and program officials do not have plans to update the analysis. Additionally, although program office officials for the Army’s Sentinel weapon system had updated their 2002 business case analysis, Army policy calls for submission of the business case analysis to both the Office of the Deputy Assistant Secretary of the Army for Integrated Logistics Support and Army Materiel Command Headquarters for review and concurrence and then to the Program Executive Office for approval. In February 2008, before the new analysis had been reviewed and formally approved, another PBL contract was awarded.

The Navy’s 2007 business case analysis guidance calls for updates every 3 to 5 years or when significant programmatic changes occur.³⁰ Based on this policy, the T-45 program office should complete an update to its business case analysis for the PBL arrangement for support of the aircraft’s engines by 2008. Although program officials updated their 2003 analysis in 2006 with actual support costs and flying hours, they did not expand the analysis to account for the remaining life cycle of the engines. The analysis projected costs only through 2008, the original contract period. Program officials did not plan to further update the business case analysis or prepare another one because they believed that it was not required.

²⁹ Assistant Secretary of the Army (Acquisition, Logistics and Technology), Memorandum, Performance-Based Logistics Business Case Analysis Policy (Aug. 18, 2005), and Army Regulation 700-127, *Integrated Logistics Support* (Sept. 27, 2007).

³⁰ Department of the Navy, *Guide for Developing Performance Based Logistics Business Case Analyses*, P07-006 (Nov. 6, 2007). The foreword to this guide states that programs need to update their business case analysis data every 3 to 5 years, and the body of the document states that updates should occur when there are significant programmatic or support changes.

Neither DOD's nor the services' policies clearly specify what should occur when a program office updates or validates a business case analysis. Although some programs are conducting another business case analysis, as mentioned earlier, program officials for the T-45 did not plan to conduct another analysis because they had updated their analysis with actual data. Program officials for the V-22 engine updated their 1998 analysis in 2004. The update focused on assessing if several of the ground rules, assumptions, and factors used in the original study were still valid and providing a preliminary recommendation on pursuing a follow-on PBL contract, from a cost standpoint. However, the entire analysis was not updated.

Lack of Specific Criteria and Inadequate Internal Controls Led to Business Case Weaknesses

Business case analyses were inconsistently used for PBL decision making because DOD did not require that the analyses be conducted and updated or provide specific criteria to guide their development. Further, with the exception of the Army, the services' have not established effective internal controls to ensure that the analyses are prepared in accordance with service policies and guidance. As a result, DOD cannot ensure that decisions regarding weapon system support options are consistently guided by comprehensive and sound analytical tools.

DOD Guidance Has Not Provided Specific Criteria or Requirements for Conducting Sound Business Case Analyses

DOD guidance has not provided specific criteria for conducting and updating business case analyses for PBL decision making. Despite DOD's preexisting economic analysis instruction recommending the analysis of both quantitative and qualitative factors, in 2001 DOD recommended the development of a business case analysis prior to implementing a PBL arrangement but provided little criteria for conducting such an analysis. In 2003, a Defense Business Board study recommended that DOD issue standard guidance for the services to take a more consistent approach to PBL decision making and also require the use of business case analyses.³¹ In response, the January 2004 Under Secretary of Defense (Acquisition, Technology and Logistics) memorandum was issued containing "guiding principles" for business case analyses. The memorandum stated that business case analyses "will evaluate all services or activities needed to meet warfighter performance requirements using 'best value' assessments." This memorandum also listed several quantitative and

³¹ The Defense Business Board (also known as the Defense Practice Implementation Board) was established by the Secretary of Defense in 2001 and consists of private-sector executives with experience in business management who provide independent advice and recommendations on strategies for the implementation of best business practices.

qualitative factors³² for consideration when developing a business case analysis; however, it did not indicate how these factors were to be evaluated or their relative importance in the decision-making process. The memorandum also recommended that business case analyses be updated or repeated to validate the approach taken or to support future plans, but did not provide specific guidance as to when such updates should occur. According to the memorandum, a DOD PBL business case analysis handbook was supposed to be forthcoming. Later that year, the DOD/Defense Acquisition University PBL guide was published. It had two pages dedicated to the business case analysis concept—providing additional criteria and also incorporating the guiding business case analysis principles. However, a handbook specifically for PBL business case analyses was never issued.

In 2003, when DOD incorporated PBL implementation into DOD Directive 5000.1, which provides mandatory policies for all acquisition programs, a requirement to conduct and update a business case analysis was not included. Specifically, the directive only stated that acquisition managers shall use performance-based strategies for sustaining products and services whenever feasible and that such PBL strategies shall optimize total system availability while minimizing cost and logistics footprint. Also, despite the Defense Business Board's recommendation later that same year to require the use of business case analyses, DOD subsequently neither required program managers to prepare the analyses prior to PBL implementation nor required them to update the analyses after implementation. In fact, although most of the services have issued some guidance and requirements for business case analyses, the current *Defense Acquisition Guidebook*³³ no longer specifically refers to a business case analysis, but rather recommends the development of a "support strategy analysis" as part of the PBL implementation process. According to the guidebook, the support strategy analysis can be a business case analysis, economic analysis, decision-tree analysis, or other best-value-type assessment.

³² The factors listed are cost per unit of output (such as mile, hour, etc.), performance measures, asset ownership, size of footprint, reliability growth, life cycle costs, diminished manufacturing sources management, obsolescence mitigation, technology insertion, risk management, ability to synchronize with the Defense Transportation System, existing infrastructure, and common consumable support.

³³ The *Defense Acquisition Guidebook* provides an interactive, online reference to policy and discretionary best practice. The guidebook is available at <https://akss.dau.mil/dag/> (accessed Oct. 27, 2008).

**Service Policies and Guidance
for Conducting Business Case
Analyses Were Slow to
Develop, Inconsistent, and
Generally Not Enforced
Because of Lack of Effective
Internal Controls**

Another reason for the inconsistent use of business case analyses is that the services' policies and guidance for conducting the analyses were slow to develop and were generally not enforced because of a lack of effective internal controls. Moreover, we found inconsistencies among the services' policies and guidance. In response to DOD's recommendation that program offices conduct a business case analysis prior to implementing a PBL arrangement for weapon system support, the services issued their own policies and guidance. The time frames for these are summarized in table 4.

Table 4: Service-Issued Business Case Analysis Policies and Guidance

| Service | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|--------------|---------------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Army | Assistant Secretary of the Army Memorandum ^a | | U.S. Army Implementation Guide – Performance Based Logistics ^b | Assistant Secretary of the Army Memorandum ^c | Assistant Secretary of the Army Memorandum ^d | Army Regulation 700-127 ^e | |
| Navy | | Navy PBL Guidance Document ^f | Secretary of the Navy Instruction 5000.2C ^g | | | Navy Guide for Developing PBL Business Case Analyses ^h | |
| Air Force | | | Air Force Instruction 63-107 ⁱ | Assistant Secretary of the Air Force Memorandum ^j | | | Air Force Instruction 65-509 ^k Air Force Manual 65-510 ^l |
| Marine Corps | | | | | | Marine Corps Order 4081.2 ^m | |

Source: GAO analysis of DOD data.

^aAssistant Secretary of the Army (Acquisition, Logistics and Technology), Memorandum, Army Implementation of Performance Based Logistics (PBL) (Apr. 1, 2002).

^bDeputy Assistant Secretary of the Army, Integrated Logistics Support, *U.S. Army Implementation Guide – Performance Based Logistics (PBL)* (Washington, D.C.: May 4, 2004).

^cAssistant Secretary of the Army (Acquisition, Logistics and Technology), Memorandum, Performance Based Logistics (PBL) Business Case Analysis (BCA) Policy (Aug. 18, 2005).

^dAssistant Secretary of the Army (Acquisition, Logistics and Technology), Memorandum, Performance Based Logistics (PBL) for Army Working Capital Fund (AWCF) Secondary Items (Apr. 25, 2006).

^eArmy Regulation 700-127, *Integrated Logistics Support*, September 27, 2007.

^fAssistant Secretary of the Navy (Research, Development and Acquisition), Department of the Navy Performance Based Logistics (PBL) Guidance Document (Jan. 27, 2003).

^gNavy Instruction 5000.2C, *Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System*, November 19, 2004.

^hDepartment of the Navy, *Guide for Developing Performance Based Logistics Business Case Analyses*, P07-006 (Nov. 6, 2007).

ⁱAir Force Instruction 63-107, *Integrated Product Support Planning and Assessment*, November 10, 2004.

^jAssistant Secretary of the Air Force (Financial Management and Comptroller), Memorandum, Interim Guidance for Business Case Analysis (Mar. 18, 2005).

^kAir Force Instruction 65-509, *Business Case Analysis*, September 19, 2008.

^lAir Force Manual 65-510, *Business Case Analysis Procedures*, September 22, 2008.

^mMarine Corps Order 4081.2, *Marine Corps Performance Based Logistics (PBL)*, January 5, 2007.

Although DOD recommended the use of business case analyses in 2001, the services' business case analysis policies and guidance have evolved over time. In some cases, guidance was not issued until years later. For example, Marine Corps policy did not call for PBL business case analyses until 2007. Further, although the Air Force included business case analyses among mandatory procedures in 2004, these procedures were not specific. The Air Force's instruction states only that "the program manager is responsible for construction of a business case analysis to determine the best strategy for meeting the PBL goals." Final Air Force guidance for business case analyses, including PBL business case analyses, was not issued until 2008. As another example, the Army's early business case analysis guidance was general in nature, and more specific policy memorandums were issued in 2005 and 2006. In 2007, these policies were included in an Army regulation.

Currently, service policies and guidance vary with respect to which programs should implement PBL arrangements, which of those programs shall conduct business case analyses, and how often program managers should update their business case analyses. Until 2007 the services' policies and guidance varied significantly. However, the issuance of Navy guidance and Marine Corps policy in 2007 resulted in more consistency. Table 5 summarizes the services' business case analysis policies and guidance.

Table 5: Current Service PBL and Business Case Analysis Policies and Guidance

| Issue | Army | Navy | Air Force | Marine Corps |
|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| PBL implementation | Shall be implemented on all ACAT programs where it is operationally and economically feasible | Preferred for all new programs and fielded ACAT I and II programs | Shall be implemented for new ACAT I and II programs and preferred for new ACAT III and fielded programs if practicable | Applied to all new acquisitions and existing fielded ACAT I and II programs |
| Business case analyses | Shall be performed to support PBL implementation | Mandatory basis for selecting a support strategy | Required responsibility of program manager | Shall be developed for all ACAT I, II, III, and IV(T) programs and for all fielded ACAT I and II programs |
| Business case analyses for subsystem- and component-level PBL arrangements | PBL may be implemented on systems, subsystems, secondary items, components, assemblies, subassemblies, as well as processes, as validated by a business case analysis | Serves as a decision support tool for legacy subsystem- and component-level PBL | Not specified | Shall be conducted at the system, subsystem, and component levels |
| Business case analysis updates | Shall occur at least every 5 years, or whenever there are major programmatic changes, or prior to exercising contract options when there are significant changes to the agreement | Guide suggests updates at least every 5 years or when significant programmatic or support changes occur | Not specified | Shall be revalidated at least every 5 years |

Source: GAO analysis of DOD data.

Note: Acquisition categories (ACAT) are generally based on the acquisition program's location in the acquisition process, dollar value, and Milestone Decision Authority special interest. DOD Instruction 5000.2, *Operation of the Defense Acquisition System*, enc. 2, May 12, 2003.

With the exception of the Army, the services have not established the internal controls, including a review and approval process, necessary to ensure that business case analyses are conducted prior to PBL implementation and updated after implementation. For example, the Navy's 2003 guidance assigns responsibility for reviewing individual business cases analyses to the system commands' cost departments. However, the review only occurs when requested. Although a recently issued Air Force instruction calls for a formal review of all business case analyses, including those conducted for PBL arrangements, that meet certain criteria, it is unclear how many PBL business case analyses will meet any of the criteria and be subject to this review. The 2008 Air Force instruction calls for a review of all business case analyses that will be (1) forwarded outside of the Air Force; (2) forwarded to senior Air Force

officials, such as the Secretary of the Air Force; and (3) provided for weapon systems that require Defense Acquisition Board or Air Force Acquisition Board approval.

In contrast, Army policy states that program managers shall report semiannually on the status of PBL implementation and that business case analyses for acquisition category I and II programs should be submitted for review and verification to multiple offices—including Army headquarters, the Army Materiel Command, and the Office of the Deputy Assistant Secretary of the Army (Cost and Economics)—and for approval to the Army Acquisition Executive. In addition, business case analyses for lower-level programs should be reviewed and approved but will not be verified by the Office of the Deputy Assistant Secretary of the Army (Cost and Economics), and the approval authority is the program executive officer or commander of the related life cycle management command. While the Army's policy first provided for these internal controls in 2005, Army officials said that no programs have yet passed the review and approval process completely.

Impact of PBL Arrangements on Reducing Weapon System Support Costs Is Unclear

The extent to which PBL arrangements are reducing costs for weapon system support is unclear and generally remains undocumented even after several years of PBL implementation. A major difficulty in assessing the cost impact of PBL arrangements is the lack of detailed and standardized cost data maintained by the program offices. Various other factors, such as the lack of systems that are supported by both PBL and non-PBL support arrangements, the lack of sound program baseline information, and changing operational and materiel conditions, also limited our ability to assess the impact of PBL implementation on support costs. While the overall cost impact was unclear because of a lack of data and these other factors, the limited evidence on cost impact that was available showed mixed results. We did find some evidence that a few PBL arrangements have reduced costs. However, we also found that characteristics of DOD's PBL support arrangements, such as short-term contracts and unstable program requirements and funding, may limit their potential to reduce costs. Further, DOD has not sufficiently emphasized the potential to reduce costs as a goal for PBL programs. As a result, DOD cannot be assured that PBL arrangements will reduce support costs and provide cost-effective support for DOD systems.

Program Managers Often Lacked Detailed and Standardized Cost Data

In 2004, a memorandum from the Under Secretary of Defense (Acquisition, Technology and Logistics) recognized the importance of cost data for contract management and future cost estimating and price analysis and stated that PBL contracts shall include cost reporting requirements.³⁴ However, for the PBL arrangements we reviewed, program offices often did not have detailed cost data that would provide insights regarding what the program office was spending for various aspects of the support program—such as the cost of depot maintenance by subsystem and major component or the cost of engineering support, supply support, and transportation. When cost data were available, the level of detail and format of cost data varied considerably. This condition significantly affected our ability to determine the impact of the implementation of PBL on the costs of supporting the systems in our sample, as many factors influence support costs.

For PBL arrangements using fixed-price contracts or fixed-price contract line items—DOD’s “ideal” type of PBL arrangement—we found that program offices generally did not receive detailed cost data for the program and only knew the overall amounts paid for support. Only two program offices in our sample obtained contractor support cost data for their fixed-price PBL arrangements, and the format and contents of the reports were very different. For example, the F/A-18 E/F program office obtained Boeing’s report on fiscal year 2006 costs, including general/administrative costs and profit, in a detailed reporting structure approved by the Office of the Secretary of Defense (OSD), Cost Analysis Improvement Group. According to program officials, an annual cost reporting requirement was included in the 2005 fixed-price PBL contract to provide cost visibility into the program and was added at no additional cost to the government. In contrast, the B-2 program office receives a monthly funds utilization report that allocates the amount the Air Force pays the contractor into seven high-level categories, such as planned depot maintenance.

Although the PBL arrangements that used cost-reimbursable contracts generally obtained more detailed cost data than those with fixed-price contracts, the format and level of detail also varied. For example, under the 1998 PBL contract, the F-117 program office did not receive cost data

³⁴ Under Secretary of Defense (Acquisition, Technology and Logistics), Memorandum, Performance Based Logistics: Purchasing Using Performance Based Criteria (Aug. 16, 2004).

in a format that was detailed enough to report in OSD's standard support cost structure. The program office subsequently required more detailed cost data reporting from Lockheed Martin in the 2006 PBL contract. As another example, the 2003 C-17 PBL contract has both fixed-price and cost-reimbursable elements. According to program officials, Boeing did not report support cost data at the level of detail necessary to report in OSD's support cost structure under the contract. According to an Air Force Cost Analysis Agency official, a cost-reporting requirement was included in the contract's option years and more detailed cost reporting will begin in fiscal year 2009.

Limited Available Evidence on Cost Impact Indicates Mixed Results

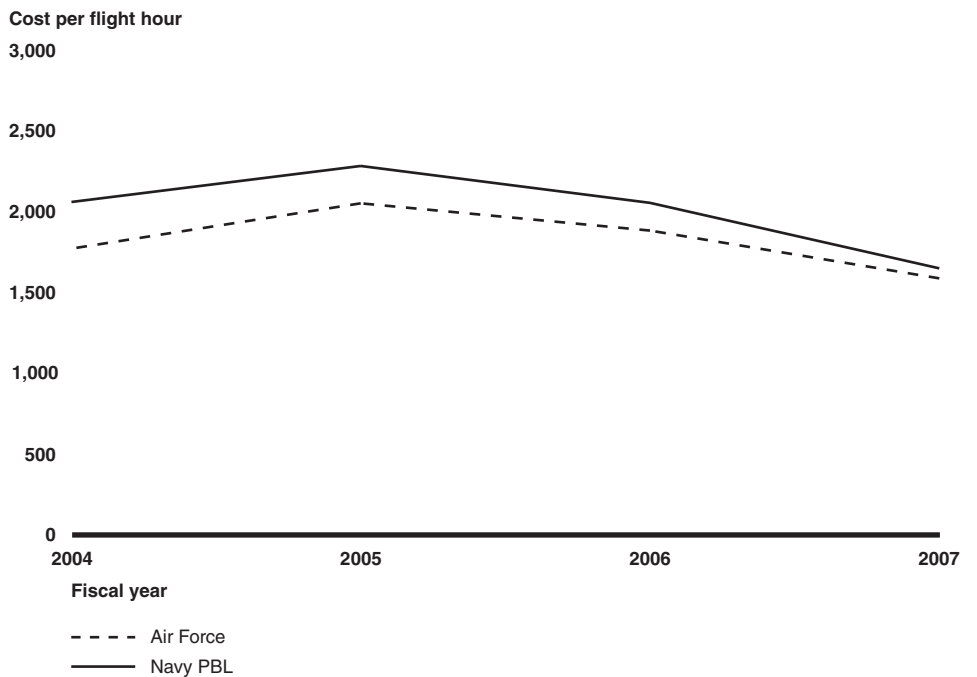
Although cost data were generally lacking, the limited available evidence on cost impact showed mixed results. Data we reviewed for the two systems that were managed by both PBL and non-PBL arrangements indicate that the PBL arrangements were more costly, but based on other assessments of available data, there are some indications that PBL arrangements can reduce costs. However, in seven out of eight programs we reviewed where follow-on, fixed-price PBL contracts had been negotiated, expected cost reductions either did not materialize or could not be determined. Finally, we noted that officials reported performance levels for some programs that were significantly higher than required under the PBL arrangement, but it is unknown whether the required levels could be achieved at a lower cost.

Two Comparisons of PBL Arrangements to Traditional Government Support Show That PBL Arrangements Cost More

Of the 29 programs we reviewed, only the F100-PW-220 engine and the KC-130J/C-130J airframes are maintained by both PBL arrangements and traditional government support strategies. We found that the Air Force's traditional support arrangement for the F100-PW-220 engine costs slightly less than the Navy's PBL arrangement for the same engine. The Navy uses the F100-PW-220 engines in its F-16A/B aircraft and sustains the engines through a PBL contract with Pratt & Whitney. The Air Force uses the same engines in its F-16 and F-15 aircraft and supports the engines at the Oklahoma City Air Logistics Center. The Air Force maintains an engine total ownership cost estimate that includes all costs incurred (depot-level repairables, general services division (expendable repair parts), depot programmed equipment maintenance, organizational-level maintenance, intermediate-level maintenance, and continuous improvement program). To compare the Navy's PBL costs with the Air Force's engine total ownership costs, we removed the costs associated with organizational-

level maintenance from the Air Force's costs. As shown in figure 2, converted to costs per flight hour, the Navy's PBL costs were slightly higher than the Air Force's costs in constant fiscal year 2008 dollars.³⁵

Figure 2: Comparison of Navy PBL Costs with Air Force Government/Traditional Costs



Source: GAO analysis of DOD data.

Although the cost difference appears to be decreasing, the Navy's 5-year contract ended in 2008 and a new PBL contract has not yet been negotiated. The engines are currently being supported under a 6-month extension to the original contract, and the fixed price paid per engine cycle is significantly higher than that paid during the previous 5 years. According to Navy officials, the decision to contract with Pratt & Whitney for the support of the Navy's engines was not solely based on costs but was also based on other factors, such as turnaround time for engine

³⁵ Constant dollars measure the value of purchased goods and services at price levels that are the same as those in the base or reference year. Constant dollars do not contain any adjustments for inflationary changes that have occurred or are forecast to occur outside the base year.

repairs. However, program officials could not provide the data on which they based their decision.

Elements of the Air Force's PBL arrangement to support the C-130J airframe are more expensive than the support for the KC-130J airframe provided by the Navy. According to Navy officials, an analysis was prepared in 2005 to compare costs for alternative repair arrangements to determine whether to continue using the Navy's repair capability or to transition to contractor-provided repair in 2006. The Navy's analysis concluded that the support provided by the Naval Surface Warfare Center, Crane Division, would cost 43 percent less than the support provided by the contractor. The analysis was based on anticipated 2006 flight hours, actual government support costs from 2005, and the costs to exercise an option for repair under a preexisting contract. Additionally, we independently compared overall costs for inventory management and repair of repairable components³⁶ and found that the Air Force's PBL costs on a per flight hour basis for these elements were significantly higher than the Navy's costs—approximately 131 percent higher in 2006 and 164 percent higher in 2007. However, according to officials, several factors account for some of the difference. For example, the Air Force's PBL arrangement includes 36 percent more consumable and repair parts than the Navy's support arrangement, maintenance of support equipment, and support for six locations, while the Navy's arrangement includes support for only three locations.

A Few Indicators Showed That PBL Arrangements Reduced Support Costs for Some Programs

Only a few of programs we reviewed were able to provide some indicators of reduced weapon system support costs that could be attributed to the use of a PBL arrangement. As mentioned earlier, some programs did not have a business case analysis demonstrating how current support costs compared to other support approaches. Of the nine PBL arrangements that had been implemented and had a business case analysis that looked at alternative support options, only four could be compared with PBL contract costs. Based on this comparison, three of these four PBL arrangements indicate potential savings from PBL implementation, while the fourth is more expensive than estimated in the business case analysis. The remaining analyses could not be compared to actual program costs

³⁶ While we could not identify comparable costs for all elements of support, we did obtain repair costs for repairable components for both the Air Force's PBL arrangement and the Navy's government support arrangement.

after PBL implementation because of programmatic changes that occurred after the analyses were conducted.

The 2005 business case analysis for the Army's Patriot estimated a 3-year cost savings of \$1.6 million from using a PBL arrangement to provide 107 high-demand parts.³⁷ According to a program official, the contract is in its final year and total obligations are expected to be about \$1 million less than estimated in the business case analysis. Additionally, two business case analyses prepared by the Naval Inventory Control Point estimated that supply chain management support costs were reduced by implementing a PBL arrangement. The business case analyses projected cost savings of about \$2.2 million for the 5-year Close-In Weapon System PBL arrangement awarded in 2006 and \$1.3 million for the 5-year Harrier PBL arrangement awarded in 2007.³⁸ Based on actual contract costs—and if the contracts are not modified in the future—the total savings for these programs are projected to be \$5.2 million and \$5.8 million, respectively. Although the F/A-18 E/F business case analysis estimated a 5-year supply chain management savings of approximately \$1.4 million, the actual contract cost is about \$1.6 million more than the estimated amount in the analysis. Given the difference, the PBL arrangement has not reduced support costs for the program. As previously noted, two of the PBL arrangements having evidence of reduced support costs are managed by the Naval Inventory Control Point. This activity has used PBL arrangements since fiscal year 2000 and has reported achieving cost reductions as a result, using the Navy working capital fund to issue longer-term, multiyear contracts that can extend up to 5 years in length to support aircraft or ship subsystems or components. According to agency officials, these longer-term agreements have enabled the Naval Inventory Control Point to guarantee the contractors a more stable business base, which provides contractors an incentive to make investments to reduce costs. Overall, as a result of using PBL arrangements, Naval Inventory Control Point officials estimate that they have reduced support costs by approximately \$26.7 million and \$63.8 million—or 2.8 and 5.8 percent—in fiscal years 2006 and 2007, respectively.

³⁷ The business case analysis did not calculate net present value to take into account the time value of money. If calculated, the projected savings in net present value terms would have been about \$684,000.

³⁸ The business case analyses did not calculate net present value to take into account the time value of money. If calculated, the projected savings in net present value terms would have been about \$2.3 million and \$4.1 million, respectively.

Although the V-22 program conducted a business case analysis in 1998 to estimate alternative costs for supporting the engines and projected savings of \$249.5 million³⁹ over the 53-year life cycle of the program, the analysis did not take into account the time value of money and calculate savings based on net present value. For this and other reasons, we cannot validate that the savings are reasonable. In addition to DOD's economic analysis instruction, guidance from the Office of Management and Budget also states that net present value is the standard criterion for deciding whether a government program can be justified on economic principles. In 2004, another analysis was prepared for the V-22 engine program to determine (1) if several assumptions used in the 1998 analysis were still valid and (2) the impact of any changes to those assumptions on the cost savings estimate for the PBL arrangement. The later analysis concluded that differences in three of the original assumptions increased the projected PBL cost savings to \$305.9 million—an increase of \$56.4 million.⁴⁰ The updated savings again were not calculated using net present value. Moreover, although limited actual data were available, the calculations generally made adjustments using assumptions that generated the maximum potential savings for the PBL alternative. For example, when adjusting the 1998 analysis to account for differences in the costs experienced for excluded repairs (repairs that were not covered by the PBL arrangement), the total potential PBL cost savings were increased by \$48 million because the average excluded repair cost was lower than previously estimated. However, even though data showed that excluded repairs occurred at a higher frequency than projected in the original analysis, the later analysis did not adjust for the higher frequency of excluded repairs. Thus, the savings calculation is questionable, because the analysis noted that the frequency of these repairs could eliminate all of the estimated cost savings. Finally, the 10-year-old analysis has not been completely updated to estimate costs based on actual data.

The remainder of the analyses could not be compared to current PBL arrangement costs because of programmatic changes that occurred after the analyses were conducted. For example:

- According to an Air Force C-130J program official involved in the development of the 2004 business case analysis, the analysis was conducted while the aircraft was supported by a commercial contract;

³⁹ The savings were calculated in constant fiscal year 1996 dollars.

⁴⁰ The savings were calculated in constant fiscal year 1996 dollars.

PBL Cost Reductions Either Did Not Materialize or Were Not Documented for Most Follow-on Contracts

therefore, the program office did not have detailed cost data on which to base the estimate. The estimate was developed, in part, using cost data from other legacy programs and other assumptions that program officials said did not turn out to be accurate. Thus, though the business case analysis helped program officials develop the program's support strategy, the cost estimates contained within are not useful for monitoring current program costs.

- The 2002 business case analysis for the Army's Sentinel PBL arrangement estimated costs for a 26-year period beginning in 2003 using a fleet size ranging from 126 to 198 radars. According to program officials, since 2003 the fleet size has ranged from 140 to 143 radars and additional radars are not anticipated. Although a new business case analysis was prepared, it had not completed the Army's review and approval process at the time of our review.

Few of the remaining programs in our sample could document cost reductions attributable to the use of a PBL arrangement after negotiating a follow-on fixed-price contract. The PBL concept envisions that support providers are incentivized to improve reliability to ensure that performance metrics are met and reduce their costs to provide support to increase profits—especially under fixed-price arrangements. To the extent practicable, we examined how contract costs changed for eight programs in our sample that negotiated follow-on contracts or priced previously unpriced contract options after completing fixed-price PBL contracts. According to officials, a variety of factors affected the support costs negotiated in the PBL contracts that caused both costs increases and decreases. Only one program had decreasing support costs that program officials attributed to the use of a PBL arrangement. One additional program supported under a cost-plus-award-fee contract also reduced support costs by changing the metrics included in the contract. However, these two programs did not have updated business case analyses that analyzed alternative support options over the remaining life cycle of the program. Finally, only one program office had developed a methodology for tracking and verifying reliability improvements made under the PBL arrangement, although this is necessary for quantifying the related cost savings.

Support costs for the Navy's Consolidated Automated Support System have decreased over the 8-year PBL arrangement that began in April 2000. Program officials attribute the cost reductions the program has experienced to the implementation of a PBL arrangement. Depending on the level of support chosen, the fixed price charged for the annual support of a test station decreased from 53 to 20 percent (constant 2008 dollars) from 2000 through 2008. Program officials said that they closely monitored

maintenance data and failure rates in order to negotiate lower fixed prices where possible. In addition, officials said that they were able to increase the number of repair and consumable parts covered under the arrangement over the years. According to officials, prior to the implementation of the PBL strategy support costs for the program were even higher, but officials were unable to locate the contracts.

Although support costs for a few of the other seven programs decreased, officials said that there were a number of other factors that influenced costs, such as changes in the scope of work or planned usage of the systems. For example, according to Tube-launched Optically-tracked Wire-guided missile – Improved Target Acquisition System program officials, a variety of factors affected the costs negotiated in the 2007 contract, and increased fleet size was one factor that allowed them to negotiate lower rates per system. In addition, when the first fixed-price PBL arrangement was implemented in 2001 the program was fairly new with very few systems, so the program office did not have an extensive amount of historical program data with which to negotiate. Since 2001, the program office has collected actual data that it used to negotiate lower rates in the latest contract. However, according to program officials, the contractor only recently started making changes to the system to improve reliability. These improvements were not included in negotiations for the 2007-2011 contract but have begun to improve failure rates and are expected to reduce costs in future contracts.

Although the Army's Shadow Tactical Unmanned Aircraft System is not supported by a firm-fixed-price PBL contract, program officials for the system said that they were able to reduce support costs by changing the performance metrics used in the PBL arrangement. The maximum amounts authorized in the annual cost-reimbursable PBL contract for the support of this system were reduced by 28 percent from fiscal years 2006 through 2007. According to program officials, a program office review of PBL processes in early fiscal year 2006 concluded that while the PBL arrangement was effective in terms of meeting the performance levels specified in the contract, it was not cost efficient and costs associated with the vehicle's high accident rate were an area of particular concern. In response, the program office changed the performance metrics in the contract to encourage the contractor to improve reliability and reduce the accident rate, and also to improve depot maintenance efficiency. As the accident rate improved, the program office was able to negotiate for lower support costs in the 2007 PBL contract.

Finally, while the 2005 life cycle business case analysis for the F/A-18 E/F program office estimated that support provided under a PBL arrangement would be more expensive than government-provided support, program officials for the Navy's F/A-18 E/F PBL arrangement have developed a process to track and document support cost reductions attributed to contractor investments to improve reliability and reduce costs. Program officials said that both the Navy and Boeing have funded initiatives to improve F/A-18E/F component reliability, maintainability, and supportability as part of the Supportability Cost Reduction Initiatives program. Under the current fixed-price PBL arrangement, Boeing has invested approximately \$11.39 million to fund initiatives that officials currently estimate will generate cost reductions of approximately \$279 million over the remaining life cycle of the system. According to program officials, Naval Air Systems Command cost analysts have validated baseline estimates and will annually track the results of the initiatives in order to quantify actual support cost reductions attributed to the investments in the future.

Costs to Achieve Higher-Than-Required Performance Levels Are Unknown

According to program officials, eight of the PBL arrangements within our sample of 29 systems generally achieved a level of performance that significantly exceeded what is required under the contracts. According to the DOD/Defense Acquisition University PBL guide, PBL arrangements should be structured to meet the needs of the warfighter. Therefore, if actual performance exceeds what is called for in the PBL arrangement, it also exceeds the level of performance that is needed. According to program officials, for eight of the PBL arrangements we reviewed, the contractors significantly exceeded some of the contractual performance requirements. For example:

- Since 2002, Army officials said that the average annual operational readiness for the Tube-launched, Optically-tracked, Wire-guided missile – Improved Target Acquisition System has not been below 99 percent, and the system's operational readiness has averaged 100 percent since 2004. According to a program official, the Army's readiness standard for this system is 90 percent. Despite the Army's standard, it continued to include a performance incentive that encouraged higher levels of performance when negotiating a follow-on PBL contract in 2007. The performance incentive includes payment of an award fee that encourages operational readiness rates from 91 to 100 percent, with the highest award fee paid for 100 percent average operational readiness.
- According to officials, since early 2005, monthly readiness rates for the Army's Javelin have generally been measured above 98 percent.

However, the PBL contract for support of this system only requires 90 percent mission readiness.

- Although the contractual requirement for parts availability for the Navy's V-22 engine PBL arrangement has been 90 percent since 1998, according to program officials, actual parts availability has consistently averaged 98 to 100 percent.
- Similarly, with availability averaging 98 percent since 2004, Air Force program officials for the LITENING Advanced Airborne Targeting and Navigation Pod said that the contractor has consistently exceeded the contract requirement for 92 percent system availability.

For programs where performance significantly exceeded contractual requirements, it is unclear how much extra was paid to get the added performance. Since the government is paying for this excess performance, then the arrangement, as structured, may not provide the best value to the government, particularly since there are other DOD programs that are not funded at levels that would be required to achieve their desired level of readiness.

Characteristics of DOD's PBL Arrangements May Limit Their Potential to Reduce Support Costs

Several characteristics of DOD's PBL arrangements may limit their potential to reduce costs. First, DOD's PBL contracts are limited to relatively short time periods, while proponents of the PBL concept believe that longer-term PBL arrangements are necessary to encourage support providers to make investments to improve reliability. Second, in DOD—where changing requirements and priorities can result in fluctuations in the funding for support of DOD's weapon systems—creating a stable level of funding is challenging. Third, many PBL arrangements only transfer responsibility for inventory management to the contractor and do not transfer inventory ownership, which reduces incentives for ensuring a correctly sized inventory level. Finally, many of DOD's PBL arrangements do not contain cost metrics or offer specific incentives to encourage cost reduction initiatives.

Short-term Contracts

According to program officials, DOD support contracts, including PBL contracts, that are funded by operation and maintenance funds⁴¹ are generally limited to 1 year, and working-capital-funded⁴² contracts are

⁴¹ Operations and maintenance funds are typically available for 1 year as provided for by the annual appropriations act. See, for example, Pub. L. No. 110-116, 121 Stat. 1295, 1298 (Nov. 3, 2007).

⁴² Working capital funds are revolving funds and subject to the authorities stated in section 2208 of Title 10 of the U.S. Code.

generally limited to 5 years, with subsequent option years allowed up to a total of 10 years. However, according to the DOD/Defense Acquisition University PBL guide, longer-term PBL contracts are preferred because a key aspect of PBL is the provision of incentives for contractors to reduce costs over time through increased reliability while still making a profit. Further, contract length should be sufficient to allow for an adequate return on any investments made to improve reliability.

Officials from several PBL arrangements cited instances in which reliability improvements were needed but contractors were hesitant to make investments while under annual support contracts. For example, Joint Primary Air Training System program officials said that during the original 10-year PBL arrangement that began in 1996, the contractor did not make any investments to improve unreliable components. Although officials were expecting the fixed-price performance contract to motivate the contractor to invest in improvements to increase reliability and maximize profit, they found that the contractor minimized its own costs during the contract period and passed on the costs to improve the reliability of components with high failures to the government when the contract was renegotiated. Our prior work found that the private sector sometimes used PBL contracts of 10 to 12 years.⁴³

Unstable Requirements and Funding

Stable requirements and funding, like longer-term contracts, could enable contractors to make reliability improvements and other business decisions, such as long-term supplier arrangements, that could improve performance and reduce future support costs because they have reasonable assurance of future needs. For example, officials representing one of the PBL arrangements we reviewed credited stable funding for much of the program's cost savings. The F-117 program office estimated that its arrangement would have cost over \$80 million more if the Air Force had not agreed to stabilize the program's support budget and provide the necessary support funding each year of the contract. However, DOD's requirements and priorities, and related funding, for weapon system support are not always stable. For example, according to Army officials, the Tactical Airspace Integration System's PBL arrangement was affected by a significant reduction of the program's support budget. The Army subsequently requested that the Defense Acquisition University study the implications of funding on PBL arrangements and prepare a case study based on this example. In addition, for the last several years some of

⁴³ [GAO-04-715](#).

the Army's PBL arrangements we reviewed did not receive all of their support funds at the beginning of the fiscal year but rather in increments throughout the year. Program officials for one Army system said that at one point during fiscal year 2005, they almost had to discontinue some of the support provided under the contract because they did not have adequate support funds. Additional funding was eventually made available after the program office notified its major command of the situation. Army program officials said that this funding instability further exacerbates the impact of having short-term contracts, since all of the funds are not available to the contractor to make business arrangements or investments for reliability improvements.

DOD's Ownership of Inventory

Many of the PBL arrangements we reviewed only transferred responsibility for inventory management, not ownership, to the contractor. An analysis by Sang-Hyun Kim, Morris A. Cohen, and Serguei Netessine of the Wharton School, University of Pennsylvania, suggests that the efficiency of a PBL arrangement depends heavily on the asset ownership structure: with higher ownership responsibility, the supplier is more likely to spend more to increase reliability and less for maintaining inventory levels.⁴⁴ According to this study, under an arrangement in which the contractor owns and manages the inventory, reliability improvements and inventory costs will both be evaluated in terms of their ability to meet performance metrics and minimize costs. If the PBL arrangement only includes inventory management, higher inventory levels may be used, instead of investments to improve reliability, to meet performance metrics—particularly those that measure availability—since inventory holding costs are not incurred by the contractor. Consequently, under DOD's PBL arrangements, contractors may choose to make fewer reliability improvements.

Availability of Cost Metrics and Effective Incentives

Finally, many of DOD's PBL arrangements do not contain cost metrics or offer specific incentives to encourage reduced costs. According to an August 2004 memorandum from the Under Secretary of Defense (Acquisition, Technology and Logistics) regarding performance-based criteria, PBL should be constructed to purchase performance, which is defined in terms of operational availability, operational reliability, cost per

⁴⁴ Sang-Hyun Kim, Morris A. Cohen, and Serguei Netessine, "Reliability or Inventory? Contracting Strategies for After-Sales Product Support" (working paper for the Wharton School, University of Pennsylvania, Philadelphia, Pa., March 2007) <http://opimweb.wharton.upenn.edu/ideas/workingpapers.cfm?year=2007> (accessed Oct. 21, 2008).

unit usage, logistics footprint, and logistics response time. The guidance recommended that PBL metrics be tailored to reflect the unique circumstance of the arrangement, but still support desired outcomes in terms of the five performance criteria. A subsequent 2005 memorandum from the Under Secretary of Defense (Acquisition, Technology and Logistics) directed the use of these metrics as the standard set of metrics for evaluating overall total life cycle systems management.

Some of the aviation PBL arrangements we reviewed negotiated their support on a cost per flight hour basis. For those that did not, cost per flight hour was generally not included as part of the contract performance plan, with the exception of the F/A-18 E/F PBL arrangement. For example, the C-17 program office did not negotiate its contract on a per flight hour basis and does not monitor cost per flight hour as part of its PBL arrangement. None of the nonaviation PBL arrangements we reviewed included cost metrics as part of the PBL arrangement. In addition, only four of the PBL arrangements we reviewed contained incentives for reducing or controlling costs. For example, the F-117 and Shadow Tactical Unmanned Aircraft System PBL arrangements each included a cost-sharing provision where the government and the contractor would share annual savings if actual costs were below negotiated costs. Further, officials said that the award plan for the F-22 PBL arrangement also will consider how actual costs compare to negotiated costs when calculating the amount of award fee the contractor earns at the end of the year.

DOD Did Not Emphasize the Potential for PBL Arrangements to Reduce Costs or Require the Collection and Reporting of Detailed Contractor Support Cost Data

Although PBL arrangements were included in a DOD pilot program intended to demonstrate the ability of various initiatives to reduce support costs, DOD did not emphasize this goal in its guidance or requirements as it established the concept as the department's preferred weapon system support strategy. In general, improved performance was given greater emphasis, and we found only a few references to cost reduction in DOD's guidance on implementing PBL arrangements. With respect to requirements for cost reporting, DOD and the services do not require that programs using PBL arrangements, or other contractor logistics support arrangements, collect and report detailed cost data in a consistent, standardized format.

Since 2001 DOD's guidance regarding PBL has emphasized higher levels of readiness and stressed rapid implementation. For example, in 2001, when DOD cited PBL as the preferred weapon system support strategy, PBL was described as a strategy for achieving a higher level of system readiness through efficient management and direct accountability. In a 2002 Under

Secretary of Defense (Acquisition, Technology and Logistics) memorandum, the services were instructed to prepare PBL implementation plans that aggressively pursue the earliest feasible program implementation end dates.⁴⁵ A January 2004 Under Secretary of Defense (Acquisition, Technology and Logistics) memorandum stated that PBL was the department's near-term strategy to increase weapon system readiness through integrated logistics chains and public/private partnerships. The memorandum contained guidance to implement PBL where economically feasible and provided guiding principles for a best-value assessment. The following month a Deputy Secretary of Defense memorandum again directed the services to provide plans for aggressively implementing PBL arrangements.⁴⁶

In contrast to DOD's clearly stated goal to reduce support costs in the late 1990s, we found few references to the potential for PBL to reduce support costs since 2001. DOD guidance generally only indirectly refers to potential PBL cost reductions to "compress the supply chain" and "reduce non-value added steps." In May 2003, DOD Directive 5000.1, *The Defense Acquisition System*, was updated to emphasize that program managers shall implement PBL strategies "that optimize total system availability while minimizing cost and logistics footprint." In March 2004, an Under Secretary of Defense (Acquisition, Technology and Logistics) memorandum reiterated that PBL was the preferred strategy and provided criteria on which to assess potential for PBL application.⁴⁷ One of the criteria stated that the cost per operational unit of performance (such as a flying hour) should be capable of being reduced through PBL implementation. Finally, in 2005, the DOD/Defense Acquisition University PBL guide contained several references to the potential for PBL to improve reliability and reduce costs.

Program offices often lacked detailed and standardized weapon system support cost data because DOD has not required them to obtain and report cost data from the contractors that provide such support, including those

⁴⁵ Under Secretary of Defense (Acquisition, Technology and Logistics), Memorandum, Performance Based Logistics (Feb. 13, 2002).

⁴⁶ Deputy Secretary of Defense, Memorandum, Implementation of the Defense Business Practice Implementation Board (DBB) Recommendation to the Senior Executive Council (SEC) on Continued Progress on Performance Based Logistics (Feb. 4, 2004).

⁴⁷ Under Secretary of Defense (Acquisition, Technology and Logistics), Memorandum, Performance Based Logistics (PBL) and Business Case Analysis (BCA) (Mar. 20, 2004).

involved in PBL arrangements. According to the OSD Office of Program Analysis and Evaluation, historical operating and support costs, organized in a standard format, are necessary for preparation of life cycle cost estimates for new systems, budget formulation, analysis of working capital funds, development of business case analyses, and future contract negotiations. Until 2007, DOD's guidance for structure of support cost estimates, which is also suggested as a defined presentation format for historical operating and support costs, included all contractor support—labor, materials, overhead, and other assets—in one category, while government-provided support was reported in greater detail among multiple categories and lower-level subcategories.⁴⁸ Therefore, amounts paid for contractor support were generally reported in the aggregate. In October 2007, DOD changed its guidance to include a more detailed presentation of contractor support costs in the various categories, similar to the reporting of government support costs.⁴⁹ However, neither DOD nor the services have required program offices to obtain or report contractor support costs, including PBL arrangements with contractors, in this format.

OSD and service officials are beginning to recognize the need for further visibility of the costs of support provided by contractors. In late 2006, OSD's Office of Program Analysis and Evaluation began a study regarding the collection of contractor support costs because the department acknowledged that visibility into these costs in DOD's systems was generally limited. Many of the programs studied were PBL arrangements also included in our sample. OSD's study also found that program offices often did not have detailed cost data and, if cost data were provided, the data often did not conform to, or could not be converted to, the standard support cost structure. Based on the study results, OSD is considering requiring contractors to report their actual costs for providing logistics support, including profit and general and administrative expenses, in DOD's standard cost structure. However, the details of the requirement and which programs will be subject to such reporting have not been finalized.

⁴⁸ Department of Defense, Office of the Secretary of Defense, Cost Analysis Improvement Group, *Operating and Support Cost Estimating Guide* (Washington, D.C., May 1992).

⁴⁹ Department of Defense, Office of the Secretary of Defense, Cost Analysis Improvement Group, *Operating and Support Cost Estimating Guide* (Washington, D.C., October 2007).

Similarly, Air Force officials have also recognized the limitations on visibility into contractor support costs for weapon systems. The Air Force is currently considering expanding visibility by requiring that all contractor-supported programs report actual obligations for contractor labor and materials (including PBL arrangements) in each of DOD's cost structure categories for each aircraft mission design series. According to Air Force Cost Analysis Agency officials, this requirement is different from the one being considered by OSD in that the Air Force will have visibility over the Air Force's costs for contractor support but not the contractor's actual costs.

Use and Characteristics of Availability Contracts by the United Kingdom's Ministry of Defence

The United Kingdom's Ministry of Defence also uses performance-based arrangements to support its weapon systems. Ministry of Defence officials refer to this initiative as contracting for availability. Similar to DOD, when using availability contracts the Ministry of Defence pays industry for aircraft, engines, or components to be available for military operations, rather than paying for specific repairs, spares, and technical support. According to officials, the use of contracting for availability also started as an approach for reducing costs for weapon system support. Ministry of Defence officials said that their current contracts for availability generally provide support for aviation systems, such as helicopters and combat aircraft. Although there are maritime availability contracts, they said that most of the ministry's maritime availability contracts support specific types of equipment rather than entire ships. In general, the availability contracts used by the ministry are significantly longer than those used by DOD, and the ministry uses an "open book accounting" arrangement to gain visibility into the contractors' costs to provide support. According to officials, the annual budget for the Defence Equipment and Support organization is approximately £13 billion, including funds for conflict operations.

Ministry of Defence Budget Pressures Drove Need for Support Cost Reductions

In 1999, the United Kingdom's Defence Logistics Operation, one of two⁵⁰ entities that merged into the current Defence Equipment and Support organization, established a goal to reduce costs 20 percent by 2005/2006. According to Ministry of Defence officials, contracting for availability began during this period as a way to maintain or improve performance while assisting in achieving cost reductions. They believe that if industry is

⁵⁰ The other organization was the Defence Procurement Agency.

paid for a given level of availability, there are incentives to reduce support chain costs and make the weapon system more reliable and processes more efficient. The cost reduction goal was a key driver in the transformation of the maintenance, repair, and overhaul activity for Harrier and Tornado fast jet aircraft. A member of the Tornado Integrated Project Team stated that a number of factors drove the support strategy change for the Tornado aircraft, but the primary factor was the need to reduce costs to match budget reductions; the team identified availability contracting as an effective way to reduce costs and maintain performance. Officials also stated that the support strategies for all of the ministry's helicopters were changed because of increased budget pressures.

In 2007, the United Kingdom's National Audit Office reported that the Ministry of Defence has experienced significant reductions in the costs to support its fast jets; the Tornado and Harrier costs have been reduced from a total of £711 million in 2001 through 2002 to £328 million in 2006 through 2007, providing a cumulative saving of some £1.4 billion over the 6-year period.⁵¹ The National Audit Office reported that the savings were achieved by working with industry to reform traditional contracts into availability contracts. However, the report also stated that the ministry did not have sufficient data to assess the impact of changes in the pattern of frontline operations and productivity increases from the use of lean techniques on total costs.⁵² National Audit Office officials with whom we met confirmed that while they could validate overall cost reductions, they could not attribute the entire savings solely to the use of availability contracts. Other related initiatives, such as the reorganization and reduction of locations for aircraft repair and upgrade, the use of lean techniques, and the use of reliability-centered maintenance, also contributed to the support cost reductions.

Analytical Tools Used for Decision Making

Ministry of Defence officials said that they do not require the use of availability contracts or promote their use as the preferred strategy. According to officials, the support strategy can and should vary from system to system depending on the circumstances; in some cases, it may be appropriate for government activities to support some systems in the traditional manner and for others to use contracting for availability. To

⁵¹ National Audit Office, *Transforming Logistics Support for Fast Jets*.

⁵² Lean techniques aim to identify and eliminate any activity that does not add value to the end user and make the remaining activity flow in the most efficient sequence possible.

assist with the decision-making process, the Defence Equipment and Support organization developed a “support options matrix” for use in reviewing current and future support arrangements. Officials said that the matrix was developed to assist with analyzing components of support for cost and performance drivers, illustrating a range of support options differentiated by the gradual transfer of cost and performance drivers into industry management and presenting a clear rationale for each support chain design in terms of the benefit to be derived from the transfer of specific cost and performance drivers into industry management. In addition to the matrix, a contractor capability assessment is also completed to determine the ability of industry to assume greater management responsibility. Finally, according to officials, before they enter into a contract for availability, two additional analyses are conducted. The first is an investment appraisal, or an “internal value benchmark,” which calculates the lowest cost at which the service could be provided by the government. The second is a business case analysis, which discusses the different proposals and justifies the selection of the proposed approach. Officials noted that the proposed approach does not have to be the lowest-cost option, but is usually the option that offers the best value solution overall.

In its 2007 report, the National Audit Office indicated that internal value benchmarks were not developed consistently and recommended development of improved guidance and consistent application of a common methodology for benchmarks against which to assess the value of proposed availability contracts. National Audit Office officials said that they found variance in the quality of these cost estimates and a shortage of qualified people for cost modeling. They also pointed out that as less and less support is provided by the government, accurate cost modeling for use when renegotiating contracts will become more important, and the Ministry of Defence needs to maintain or improve visibility of support costs for its weapon systems.

Long-term Contracts (19-25 Years) Are Critical to Success

Defence Equipment and Support officials said that they have found the long-term nature of availability contracts a key factor in reducing costs and that annual contracts cannot achieve the same benefits as the longer-term contracts do. According to officials, the long-term contracts for Tornado aircraft and helicopter fleets reduced costs because the contractors were able to stabilize their supply chain and obtain better prices from the supplier base. The Ministry of Defence also found that industry preferred long-term contracts. In a discussion of contracting for availability, the “Defence Industrial Strategy,” a white paper dated

December 2005,⁵³ stated that companies are generally interested in using availability contracts because it provides the commercial firms with greater returns over a longer period.

Ministry of Defence officials provided us with the following examples of their long-term availability contracts:

- The Ministry of Defence has a 10-year contract with AgustaWestland to support the Sea King helicopter until it is projected to be removed from service. The Ministry of Defence has priced the contract for the first 5 years, and thereafter it will establish the price in 5-year increments.
- The Ministry of Defence has a 23-year contract with VT Group to support two survey ships owned by the ministry. The contract has price renegotiation points at the 7-, 15-, and 20-year points.
- The Ministry of Defence has a 19-year contract with BAE to support the fleet of Tornado aircraft. The ministry awarded the contract in December 2006 and priced it for the first 10 years.
- The Ministry of Defence has a 25-year contract with AgustaWestland to support the Merlin helicopter until it is projected to be removed from service. The price for the initial 5-year period of the contract is fixed, and the ministry is currently negotiating prices for the next 5-year period of performance that begins in 2011.

Other Characteristics of Ministry of Defence Availability Contracts

Ministry of Defence officials said that other factors, such as inventory ownership, contract incentives, and cost visibility, were also important when contracting for availability. Officials told us that they preferred to transfer not only management of inventory but also inventory ownership under such arrangements. They noted that under some of their current availability contracts this had not been possible for a variety of reasons. Nonetheless, in the future they intend to pursue transfer of inventory ownership as much as possible. Examples of Ministry of Defence availability contracts where officials said that inventory is owned by industry, also known as spares inclusive, include a contract for support of two survey ships.

In addition, according to ministry officials, several of the availability contracts—including those supporting the Sea King and Merlin helicopters

⁵³ Secretary of State for Defence, “Defence Industrial Strategy” (Defence White Paper presented to Parliament, December 2005).

and Tornado fast jets—had incentives referred to as gain share or pain share. In these types of arrangements, the contractor and government share cost savings or cost overruns in prenegotiated proportions. According to officials, they found that these types of metrics are useful to influence contractor cost control measures and provide an incentive for industry to develop changes and modifications that reduce support costs. Officials familiar with the Tornado fast jet availability contract explained that their arrangement included gain sharing and pain sharing on both the variable and fixed-price portions of the contract.

Finally, officials explained that in many of the Ministry of Defence's availability contracts, the concept of open book accounting is employed. Open book accounting is not a defined term but is more of a general expression describing a level of access to accounting data that would not normally be available under a conventional contract. In availability contracts, open book accounting allows government program officials to review the accounting records of the contractor. This access is not without limits. Officials said that the level of access must be agreed to in advance on a case-by-case basis and reflects the circumstances of the arrangement and the need for access to certain data to monitor performance or benefits arising from the arrangement. For example, one contract may only provide for man-hour data because that is all that needs to be shared given the circumstances. However, another contract may allow access to direct cost, direct labor hours, and other rates and factors that are relevant for the work involved. According to officials, the Ministry of Defence has an open book accounting agreement with AgustaWestland for the Merlin contract and the government has full visibility of the accounts pertaining to Merlin, including overhead costs. The contract must explicitly address the data access arrangements and not rely on vague and undefined phrases that could be open to misinterpretation.

The Ministry of Defence's Long-term Availability Contracts May Affect Budget Flexibility

According to the 2007 National Audit Office report, long-term availability contracts may limit flexibility to respond to changes in resources. In the past, integrated project team leaders in the Ministry of Defence had some ability to move funding between resource lines to overcome short-term funding issues. However, this flexibility is diminishing because of the transition to availability contracts, as larger portions of the budget are pre-allocated to fund these contracts. The Mine Warfare Patrol and Hydrographic Team also raised concerns about loss of budget flexibility. This team is responsible for providing support for 2 hydrographic ships, 1 patrol ship (HMS *Clyde*), 3 River class ships, 16 mine hunters, and 38 smaller ships. The budget for providing support to these ships is

approximately \$40 million, with \$18 million devoted to the long-term availability contracts for the 2 survey ships, 1 patrol ship, and 3 River class patrol ships. According to Ministry of Defence officials, these arrangements have for the most part been beneficial. However, as they are structured, these programs do not allow for any flexibility. When the Mine Warfare Patrol and Hydrographic Team recently had to absorb a 20 percent budget cut, officials said that the mine hunter ships bore the brunt of the cut because they had the majority of the remaining support budget not earmarked for an availability contract. The team views the 20 percent cut to its budget to be, effectively, a 40 percent cut to the mine hunter ship budget. Defence Equipment and Support organization officials said that they are looking to add more flexibility to future availability contracts.

The Ministry of Defence has already incorporated some flexibility in a few availability contracts. Officials said that the Tornado contract contains both fixed-price elements for management team, training, logistics, and information systems and a variable price element for flying hours. Given this, the contract is fairly flexible and payment is based on certain flying hour availability bands—with the bands ranging from 70 to 110 percent availability in 10 percent increments that are agreed to annually. As another example, officials explained that the Merlin contract provides flexibility in that the prenegotiated price is linked to banded flying hours with fixed and variable elements. Under traditional contracting, they estimate that only 20 percent of the cost would vary with flying hours. Also, within the basic contract parameters there is a provision for surge delivery for the Merlin helicopter. Finally, according to officials, the Sea King helicopter support contract has a similar flexibility because there are a number of flying hour bands and each band has its own price. In this manner, the Ministry of Defence can increase or decrease flying hours without renegotiating the contract. Officials pointed out that one drawback is that the price charged per flying hour at the lower bands is higher because the contractor must be able to cover fixed costs with fewer flight hours to charge. However, they said that the cost per flying hour is still far less than it would have been under a more flexible traditional arrangement.

Conclusions

While the concept of using PBL support arrangements was intended to be a cost reduction strategy as well as one that would result in improved performance, DOD's emphasis has been more focused on performance and less focused on cost. DOD no longer emphasizes reducing costs as a goal for PBL programs, and DOD's implementation of PBL, in its current form, does not ensure that its PBL arrangements are cost effective. DOD's

emphasis on the implementation of PBL as the preferred weapon system support strategy has deemphasized the importance of the development of consistent, comprehensive, and sound business case analyses to influence decisions regarding the use of a PBL arrangement. Although DOD's guidance recommends using business case analyses to guide decisions about using PBL arrangements for weapon system support, the DOD guidance does not require these analyses and almost half of the programs we reviewed either did not perform a business case analysis or did not retain documentation of their analysis. Further, the quality of the analyses of those programs that had performed a business case analysis varied considerably since many were missing elements of what DOD guidance recommends for sound economic analyses. Additionally, most of those analyses that should have been updated had not been. Thus, DOD lacks a sound approach for analyzing whether proposed PBL arrangements are the most cost-effective strategy for supporting weapon systems. Without instituting a more consistent, comprehensive, and sound process on which to base decisions regarding the type of arrangement to be used in supporting DOD systems, it is unlikely that the department will be successful in achieving the sizable savings that were envisioned when the PBL concept was adopted.

Assessing the cost-effectiveness of PBL programs also requires the availability of better cost data at a level of detail that would support the improved management of ongoing PBL programs, including awarding contract fees, assessing performance versus the cost to achieve it, evaluating historical costs to determine whether the status quo should be maintained over time, and making support decisions about future follow-on programs. Such data are usually not available for PBL programs, limiting the ability of program offices to make program adjustments or take restructuring actions when appropriate. Nonetheless, a few program offices have acquired data at this level and indicate that they obtained them in a cost-effective manner. Improved access to detailed cost data is another essential element in improving the quality of data available to DOD decision makers regarding the cost-effectiveness of PBL arrangements.

Recommendations for Executive Action

To ensure that PBL arrangements are the most cost-effective option for weapon system support, we recommend that the Secretary of Defense direct the Under Secretary of Defense (Acquisition, Technology and Logistics) to take the following five actions:

-
- revise DOD's Acquisition Directive to require development of a business case analysis to support the decision-making process regarding weapon system support alternatives, including PBL;
 - revise PBL business case analysis guidance to more clearly define what should be included in a business case analysis and to establish specific criteria and methods for evaluating PBL support arrangements, including evaluation at the subsystem and component levels;
 - revise PBL business case analysis guidance to more clearly define when business case analyses should be updated during the weapon system life cycle;
 - require that each service revise guidance to implement internal controls to ensure that program offices prepare and update business case analyses that are comprehensive and sound; and
 - require program offices to collect and report cost data for PBL arrangements in a consistent, standardized format with sufficient detail to support traditional cost analysis and effective program management.

Agency Comments and Our Evaluation

In written comments to a draft of this report (see app. II), DOD generally concurred with our five recommendations, noting that the department is committed to evaluating PBL strategies using business case analyses as part of the overall supportability assessment made during the development stages of weapon system acquisition programs. Specifically, the department fully concurred with three recommendations and partially concurred with two.

DOD fully concurred with our first recommendation to revise DOD's acquisition directive to require the development of a business case analysis to support the decision-making process regarding weapon system support alternatives, including PBL. DOD stated that the department will take steps to address this issue in the next iteration of the DOD Directive 5000.1 and DOD Instruction 5000.2 acquisition regulations. According to DOD's response, this new policy will require that the use of a business case analysis be mandatory and that this analysis serve as a sound basis for the selected supportability strategy.

In response to our second recommendation to revise PBL business case analysis guidance to clearly define what should be included in a business case analysis and to establish specific criteria and methods for evaluating PBL support arrangements, DOD partially concurred, stating that it established a Life Cycle Product Support Assessment Team in September 2008 to study product support policy, guidance, past performance, and

results. As part of the study, existing business case analysis policy is being reviewed, and the department will evaluate the team's recommendations on providing specific criteria and methods for evaluating support arrangements and determine how best to incorporate these recommendations into mandatory policy. The team's initial recommendations are expected in April 2009.

DOD fully concurred with our third recommendation to revise PBL business case analysis guidance to more clearly define when, during the weapon system life cycle, business case analyses should be updated. According to DOD's response, the department's Life Cycle Product Support Assessment Team will evaluate the appropriate timing of initial business case analyses and follow-on updates to validate the life cycle support approach for weapon systems, and the team's recommendations will be evaluated for inclusion into mandatory policy.

DOD fully concurred with our fourth recommendation to require that each service revise guidance to implement internal controls to ensure that program offices prepare and update business case analyses that are comprehensive and sound. As we noted in our report, the Army has already implemented a PBL business case analysis review and approval process. DOD stated that the Army's internal controls will be reviewed by the Life Cycle Product Support Assessment Team, which will make recommendations for expansion for DOD-wide governance policy as part of the team's overall recommendations expected in April 2009.

DOD partially concurred with our fifth recommendation to require program offices to collect and report support cost data for PBL arrangements in a consistent, standardized format with sufficient detail to support traditional cost analysis and effective program management. DOD stated that a provision for tailored cost reporting for major acquisition programs designed to facilitate future cost estimating and price analysis has been included in the draft DOD Instruction 5000.2, which is expected to be approved in the next 30 days. Additionally, the Life Cycle Product Support Assessment Team is reviewing support cost reporting and cost analysis as a part of its ongoing study. According to DOD's response, the ultimate goal is standardized support cost reporting for all life cycle product support efforts, to include support provided by government activities.

While concurring with our recommendations, DOD's response noted that the department disagrees with the assertion that the goal of PBL arrangements is to reduce costs. Rather, the primary goal of PBL

arrangements is to increase readiness and availability while reducing overall sustainment costs in the long run. Our report recognized that the current DOD Directive 5000.1 provides that PBL arrangements shall optimize total system availability. However, our report notes that this directive also provides that PBL arrangements shall minimize costs and the logistics footprint. Moreover, our report stated that PBL emerged from a 1999 DOD study to test logistics reengineering concepts that placed greater reliance on the private sector for providing weapon system support to both reduce support costs and improve weapon system performance. Thus, reducing costs was a central focus of the adoption of PBL as DOD's preferred support strategy. Based on our analysis in this report, we continue to believe that the PBL support arrangement concept was intended to be a cost reduction strategy as well as a strategy that would result in improved performance.

DOD's response also noted that 22 of the 29 programs we reviewed produced business case analyses that enabled sound support strategy determinations. DOD further stated that for 28 of the 29 programs, the PBL strategies produced performance benefits, readiness benefits, or both, and 15 of the programs reflect cost-neutral or savings benefits resulting from the application of the PBL strategies. However, based on our analysis in this report, we continue to believe that only 20, rather than 22, of the programs had business case analyses that evaluated PBL strategies. Further, as we stated in our report, 6 of these did not retain some or all of the documentation and 13 were missing elements of DOD's criteria for economic analyses. For example, we found that for one analysis the less costly option would have changed if the department had calculated the net present value of the two options considered. Additionally, because the department did not document all the potential support options in the business case analyses, it is not possible to determine if the most cost-effective options were chosen. Thus we continue to question the extent to which these analyses enabled sound support strategy determination. Finally, while we recognize that the PBL arrangements may have produced performance benefits, readiness benefits, or both, deficiencies in updated business case analyses and detailed cost data did not support an assessment of support costs. Therefore, it is unclear how many of the programs may have actually had cost-neutral or savings benefits resulting from PBL strategies. We continue to believe that improvements in collection and reporting of support cost data and the updating of business case analyses are essential if DOD is to determine the cost-effectiveness of its PBL arrangements.

We are sending copies of this report to interested congressional committees and the Secretary of Defense. The report is also available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have any questions regarding this report, please contact me at (202) 512-8365 or solisw@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to the report are listed in appendix III.

A handwritten signature in black ink, appearing to read 'W. Solis', with a long horizontal flourish extending to the right.

William M. Solis
Director, Defense Capabilities and Management

Appendix I: Scope and Methodology

To evaluate (1) the extent to which the Department of Defense (DOD) used business case analyses to guide decisions regarding performance based logistics (PBL) arrangements and (2) the impact PBL arrangements have had on weapon system support costs, we selected a nonprobability sample of 29 PBL arrangements for weapon system support initiated from 1996 through 2007. The 29 PBL arrangements were selected from lists of weapon systems supported by PBL arrangements provided by service officials. With the exception of the Navy's, we found that the lists provided by the services either were not current or contained inaccuracies, and the content of the lists changed significantly during the course of our review, which affected our sample selection. We chose system-, subsystem-, and component-level PBL arrangements from each of the services based on length of time since implementation, location of program office, dollar value, and prior audit findings. The 29 PBL arrangements we selected constitute a nonprobability sample and the results are not generalizable to the population of PBL arrangements.

To evaluate the extent to which DOD used business case analyses to guide decisions regarding PBL arrangements, we interviewed officials regarding DOD and service requirements, policies, and guidance for business case analyses since 2001 and reviewed applicable documents. We also reviewed DOD's 1995 economic analysis instruction, which states that analytical studies that evaluate the cost and effectiveness of weapon system support are considered to be "economic analyses," and determined that the guidance is consistent with Office of Management and Budget guidance for benefit-cost analyses of federal programs.¹ We interviewed program officials to discuss any business case analyses prepared to evaluate the 29 PBL arrangements before or after PBL implementation and examined the analyses using the criteria contained in DOD's economic analysis guidance.

To evaluate the impact that PBL arrangements have had on weapon system support costs, we interviewed program officials to discuss the characteristics of the PBL arrangements, including contract length, contract type, scope of work, performance measures, performance incentives or disincentives, and cost data availability. In addition, we asked program officials to identify support cost reductions that occurred as a result of PBL implementation. If a program had renewed a fixed-price

¹ Office of Management and Budget Circular A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs* (Oct. 29, 1992).

PBL arrangement or had finalized contract options that were not priced, we analyzed the contracts for trends in PBL support costs. We also compared PBL contract costs to estimated PBL support costs in business case analyses, where available, to determine how closely the estimates matched the actual PBL arrangement costs. We also relied on previously issued GAO reports on DOD's implementation of PBL.

To analyze the use of availability contracts for weapon system support by the United Kingdom's Ministry of Defence, we interviewed officials from the Defence Equipment and Support organization regarding policies or requirements for availability contracts and trends regarding the use of these arrangements. We also interviewed officials from programs identified by the Ministry of Defence as using availability contracts for weapon system support to identify the characteristics of the specific arrangements and the impact that the use of these contracts had on support costs. In addition, we interviewed National Audit Office officials who reviewed the cost and performance of two availability contracts for support of fast jets. Finally, we reviewed audit reports and other documents from the Ministry of Defence and National Audit Office. We obtained these data for informational purposes only and did not independently verify the statements or data provided by Ministry of Defence and National Audit Office officials.

Specifically, in performing our work we interviewed officials and obtained documents related to PBL at the Office of the Under Secretary of Defense (Acquisition, Technology and Logistics), the Office of the Assistant Secretary of the Navy (Research, Development and Acquisition), the Office of the Assistant Secretary of the Air Force (Acquisition), the Office of the Assistant Secretary of the Air Force (Installations, Environment and Logistics), the Office of the Assistant Secretary of the Army (Acquisition, Logistics and Technology), the Marine Corps Headquarters, the U.S. Army Materiel Command, the U.S. Army Aviation and Missile Command, the U.S. Army Communications and Electronics Command, the Naval Sea Systems Command, the Naval Air Systems Command, the Naval Center for Cost Analysis, the Air Force Cost Analysis Agency, the Air Force Directorate of Economics and Business Management, the Air Force Materiel Command, the Air Force Aeronautical Systems Center, the Oklahoma City Air Logistics Center, the Warner Robins Air Logistics Center, the Ogden Air Logistics Center, the United Kingdom Ministry of Defence, and the United Kingdom National Audit Office. We conducted this performance audit from February 2007 through December 2008 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to

provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Comments from the Department of Defense



DEPUTY UNDER SECRETARY OF DEFENSE FOR
LOGISTICS AND MATERIEL READINESS
3500 DEFENSE PENTAGON
WASHINGTON, DC 20301-3500

December 3, 2008

Mr. William Solis
Director, Defense Capabilities and Management
U.S. Government Accountability Office
441 G Street, N.W.
Washington, DC 20548


Dear Mr. Solis,

This is the Department of Defense (DoD) response to the GAO draft report, GAO-09-41, "DEFENSE LOGISTICS: Improved Analysis and Cost Data Needed to Evaluate the Cost Effectiveness of Performance Based Logistics," dated November 4, 2008 (GAO Code 350975).

The Department generally concurs with the recommendations presented in the report on strengthening Business Case Analyses (BCA) guidance for evaluating supportability strategies. Further, the Department will take steps to update Acquisition Policy documents such as the 5000 series of DoD regulations to include guidance to Program Managers on basing supportability decisions on a BCA. However, the Department disagrees with the assertion that the goal of performance based logistics (PBL) arrangements is to reduce costs. Rather, the primary goal of PBL arrangements is to increase readiness and availability while reducing overall sustainment costs in the long run.

The Department is committed to evaluating PBL strategies via BCAs as part of the overall supportability assessments made during the development stages of weapon system acquisition programs. Moreover, the Department maintains that of the 29 programs examined by the GAO, 22 produced BCAs that enabled sound support strategy determinations. Further, for 28 of the 29 programs, the Military Departments assess that the PBL strategies produced performance and/or readiness benefits for the operational warfighter, and 15 of the programs reflect cost-neutral or savings benefits resulting from application of the PBL strategies. This number should increase as data becomes available on the other programs.

Detailed DoD comments on the draft GAO recommendations are provided in the enclosed. The DoD appreciates the opportunity to comment on the draft report.

Sincerely,

Jack Bell

Enclosure:
As stated



GAO DRAFT REPORT – DATED NOVEMBER 4, 2008
GAO CODE 350975 /GAO-09-41

"DEFENSE LOGISTICS: Improved Analysis and Cost Data Needed to Evaluate the Cost
Effectiveness of Performance Based Logistics"

DEPARTMENT OF DEFENSE COMMENTS
TO THE RECOMMENDATIONS

RECOMMENDATION 1: The GAO recommends that the Secretary of Defense direct the Under Secretary of Defense (Acquisition, Technology and Logistics) to revise DoD's acquisition directive to require development of a business case analysis to support the decision-making process regarding weapon system support alternatives including performance based logistics.

See pg. 55.

DOD RESPONSE: Concur. Although this is already stated by Department policy in the Performance Based Logistics Guide as mentioned in the draft report, the Department will take steps to include in the next iteration of the DoDD 5000.1 and DoDI 5000.2 acquisition regulations policy that will require use of a business case analysis be mandatory and that it should serve as a sound basis for the selected supportability strategy.

RECOMMENDATION 2: The GAO recommends that the Secretary of Defense direct the Under Secretary of Defense (Acquisition, Technology and Logistics) to revise Performance Based Logistics (PBL) business case analysis guidance to more clearly define what should be included in a business case analysis and to establish specific criteria and methods for evaluating PBL support arrangements, including evaluation at the subsystem and component level.

See pg. 55.

DOD RESPONSE: Partially concur. As stated in the draft report the Department has issued business case analysis guidance in the Department's Performance Based Logistics Guide, in past Department memos, and in Chapter 5, "Life Cycle Logistics," of the Defense Acquisition Guidebook. However, all of these documents are considered guidance in nature and are not mandatory. In September 2008, the Department established a Life Cycle Product Support Assessment Team composed of DoD, Service, Industry, and Academia representatives to review existing product support policy, guidance, past performance, and results. The goal of this study is to provide recommendations for furthering life cycle product support within the Department, and outline a plan for increasing the effectiveness of future life cycle product support strategies for weapons systems. Existing business case analysis policy is being reviewed by this group, and the Department will evaluate its recommendations on providing specific criteria and methods for evaluating support arrangements. The Department expects an initial draft version of the team's recommendation in April 2009. The Department will then review the recommendations and determine how best to structure the team's business case analysis recommendations for inclusion into mandatory policy.

See pg. 55.

RECOMMENDATION 3: The GAO recommends that the Secretary of Defense direct the Under Secretary of Defense (Acquisition, Technology and Logistics) to revise Performance Based Logistics (PBL) business case analysis guidance to more clearly define when business case analyses should be updated during the weapon systems' life cycle.

DOD RESPONSE: Concur. As stated in our response to Recommendation 2, a Product Support Assessment Team has been chartered by the Department to evaluate the specifics of business case analysis to include the appropriate timing of initial and follow-on updates to validate the life cycle sustainment approach for weapons systems. The Department expects an initial draft version of the team's recommendation in April 2009. The Department will then determine how best to include mandatory policy for updating business case analyses.

See pg. 55.

RECOMMENDATION 4: The GAO recommends that the Secretary of Defense direct the Under Secretary of Defense (Acquisition, Technology and Logistics) to require that each Service revise guidance to implement internal controls to ensure that program offices prepare and update business case analyses that are comprehensive and sound.

DOD RESPONSE: Concur. As noted in the report the Army has already implemented internal controls, including a review and approval process, necessary to ensure that businesses case analyses are conducted prior to performance based logistics implementation. The Department will ensure the Product Support Assessment Team reviews the Army's processes and make recommendations for expansion for DoD-wide governance policy as part of the team's overall recommendations that are expected in April 2009.

See pg. 55.

RECOMMENDATION 5: The GAO recommends that the Secretary of Defense direct the Under Secretary of Defense (Acquisition, Technology and Logistics) to require program offices to collect and report cost data for Performance Based Logistics (PBL) arrangements in a consistent, standardized format with sufficient detail to support traditional cost analysis and effective program management

DOD RESPONSE: Partially concur. As a first step, the Department has included in the draft DoDI 5000.2 expected for approval within the next thirty days a requirement for the provision of tailored cost reporting designed to facilitate future cost estimating and price analysis on major acquisition programs. Additionally, the Product Support Assessment Team is reviewing life cycle product support sustainment cost reporting and cost analysis as specific study areas, with the ultimate goal of standardized sustainment cost reporting for all life cycle product support efforts to include organic activities. The Department expects to see an initial draft version of the group's recommendation in April 2009. The Department will then review the recommendations and determine how best to structure them for standardized reporting.

Appendix III: GAO Contact and Staff Acknowledgments

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