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Logistical Support Analysis for the Self-Protected Adaptive Roller Kit (SPARK) System

20 October 2009

by

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Abstract

Due to the current urgent warfighter needs—documented in the Joint Urgent Operational Needs Statement (JUONS)—and the need for increasing the speed of the Acquisition process, Program Managers (PM) find it increasingly necessary to utilize Contractor Logistic Support to field these rapid acquisition programs. The logistics support concepts used to maintain and service these systems play a large part in determining the overall lifecycle cost of a system. More efficient and effective logistics support plans can translate to substantial cost savings. Under the appropriate conditions, Contractor Logistics Support (CLS) is an effective means to support and expedite rapid acquisition programs and to get the equipment quickly into the hands of the warfighter. For example, the Self-Protected Adaptive Roller Kit System (SPARKS) is a 3,500-pound roller that is used to pre-detonate Improvised Explosive Device (IEDs) in roadways. The JUONS process identified this requirement, and the Department of the Army established and directed Product Manager Improvised Explosive Device Defeat/Protect Force (PM IEDD/PF) to manage the overall effort in both Iraq and Afghanistan. The purpose of this study is to identify potential cost savings to PM IEDD/PF and to the US Army by conducting an analysis of the CLS Contract for SPARKS, focusing on the current Maintenance Plan, Personnel requirements, Technical Data, and Supply Support.

Keywords: Logistics, SPARKS, Logistical Support Analysis

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List of Acronyms and Abbreviations

3PLP	Third-party Logistics Provider
ACAT	Acquisition Category
AR	Army Regulation
AS	Acquisition Strategy
BCA	Business Case Analysis
C-IED	Counter-Improvised Explosive Device
CLIN	Contract Line-item Number
CLS	Contractor Logistics Support
CM	Configuration Management
CONUS	Continental United States
COTS	Commercial Off-the-shelf
DASA	Deputy Assistant Secretary of the Army
DCS	Deputy Chief of Staff
DLA	Defense Logistics Agency
DoA	Department of the Army
DoD	Department of Defense
DoDI	Department of Defense Instruction
FAR	*Federal Acquisition Regulation*
FM	Field Manual
FMTV	Family of Medium Tactical Vehicles
FOB	Forward Operating Base
FSR	Field Service Representative
FUED	First Unit Equipped Date
FWLWMR	Full-width, Light-weight Mine Roller
FY	Fiscal Year
GAO	Government Accountability Office
GCSS-A	Global Combat Support System–Army
GFE	Government-furnished Equipment
GWOT	Global War on Terrorism
HEMTT	Heavy Expanded Mobility Tactical Truck
ICS	Interim Contract Support
ID/IQ	Indefinite Delivery/Infinite Quantity
IED	Improvised Explosive Device
ILS	Integrated Logistics Support
ILSP	Integrated Logistics Support Plan
ITV	In-transit Visibility

JIEDDO	Joint Improvised Explosive Device Defeat Organization
JUONS	Joint Urgent Operational Needs Statement
LCC	Lifecycle Cost
LCCS	Lifecycle Contract Support
LIBS	Laser-induced Breakdown Spectroscopy
LIS	Logistics Information Systems
MNCI	Multi-National Corps Iraq
MOS	Military Occupational Specialty
MRAP	Mine Resistant Ambush Protected
NASA	National Aeronautical Space Administration
NDI	Non-developmental Item
NMC	Non-mission Capable
NS-LIN	Non-standard Line-item Number
NSN	National Stock Number
O&M	Operations and Maintenance
OEF	Operation Enduring Freedom
OEM	Original Equipment Manufacturer
OIF	Operation Iraqi Freedom
OR	Operational Readiness
PAM	Pamphlet
PBA	Performance-based Agreement
PBL	Performance-based Logistics
PBUSE	Property Book Unit Supply Enhanced
PLS	Palletized Load System
PM	Program Manager
PM CCS	Program Manger Close Combat Systems
PM IEDD/PF	Program Manger Improvised Explosive Device Defeat/Protect Force
POM	Program Objective Memorandum
POR	Program of Record
PSI	Product Support Integrator
PSM	Product Support Manager
PSP	Product Support Provider
QDR	*Quadrennial Defense Review*
RMA	Revolution in Military Affairs
RSC	Regional Support Center
SALE	Single Army Logistics Enterprise
SAMS-E	Standard Army Material System–Enhanced
SARRS-O	Standard Army Retail Supply System–Objective

SME	Subject-matter Experts
SMK	Soldier Maintenance Kit
SPARKS	Self-Protected Adaptive Roller Kit System
STAMIS	Standard Army Management Information Systems
T&E	Test & Evaluation
TARDEC	Tank and Automotive Research, Development, and Engineering Command
TAV	Total Asset Visibility
TCAIMS	Transportation Coordinator's Automated Information for Movements System
TLCSM	Total Lifecycle Systems Management
TM	Technical Manual
TMDE	Test, Measurement, and diagnostic Equipment
TPE	Theater-provided Equipment
TPS	Test Program Sets
ULLS-AE	Unit Level Logistics System–Aviation Enterprise
ULLS-G	Unit Level Logistics System–Ground

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I. Introduction/Literature Review

A. Introduction

1. Purpose/Scope

Due to the current urgent warfighter needs—documented in the Joint Urgent Operational Needs Statement (JUONS)—and the need for increasing the speed of the Acquisition process, Program Managers (PM) find it increasingly necessary to utilize Contractor Logistic Support to field these rapid-acquisition programs. Accordingly, the logistics support concepts used to maintain and service these systems play a large role in determining the overall Lifecycle Cost (LCC) of a system. More efficient and effective logistics support plans can translate into substantial cost savings.

Under appropriate conditions, Contractor Logistics Support (CLS) is an effective means to expedite rapid-acquisition programs and to get the equipment to the warfighter quickly. For example, the 3,500-pound Self-Protected Adaptive Roller Kit System (SPARKS) is used to pre-detonate Improvised Explosive Devices (IEDs). The JUONS process identified this critical requirement, and the Department of the Army established and directed PM IED Defeat/ Protect Force (PM IEDD/PF) to manage the overall effort of this new program for Iraq and Afghanistan.

The purpose of this study is to identify potential cost savings to PM IEDD/PF and the US Army by conducting an analysis of the current CLS Contract for SPARKS. The study focuses on the Integrated Logistics Support Plan (ILSP) in the areas of the Maintenance Plan, Personnel Requirements, Technical Data, and Supply Support for the Iraq Area of Operations, specifically. The study also seeks to determine if this program can be modified to incorporate future cost savings for the Department of Defense (DoD) and the US Army.

B. Research Questions

1 Primary Question

- Can cost savings be realized for the SPARKS program?

2. Secondary Question

- Does PM IEDD/PF's current logistics management plan represent the best allocation of resources?
- What are the operational and technical characteristics of the system?
- Can one transform from CLS to a hybrid mix of CLS and Organizational/Unit support?

C. Methodology

This research study is a mix of quantitative and qualitative methods and uses open literature, DoD policies, Army Regulations, and forecasting models in order to optimize and determine if there is a best mixture of cost savings and performance metrics for the SPARKS program.

D. Limitations

1. This thesis does not cover the implementation of Performance-based Logistics (PBL), but will consider the overarching concepts of PBL.
2. We will only focus on the high-value and historically most-used parts of the SPARKS program to delineate organic versus contractor maintenance support.
3. Although SPARKS is being used in Iraq and Afghanistan, this thesis only examines Iraq systems.
4. The data used to create the Microsoft Excel workbook used for this project contains proprietary pricing information. To obtain copies of this workbook, readers may contact the authors or the PM IEDD/PF office.

E. Literature Review

1. Integrated Logistics Support (ILS)

a. Introduction

The Department of Defense (DoD) currently defines Integrated Logistics Support (ILS) as "a composite of all the support considerations necessary to assure the effective and economical support of a system for its life cycle. It is an integral part of all other aspects of system acquisition and operation" (DoD, 2001, p. 276). Furthermore, the DoD defines logistics as:

> Planning and executing the movement and support of forces. It includes those aspects of military operations that deal with: a. design and development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposition of materiel; b. movement, evacuation, and hospitalization of personnel; c. acquisition or construction, maintenance, operation, and disposition of facilities; and d. acquisition or furnishing of services. (DoD, 2001, p. 326)

b. Development of ILS

The threads for developing the modern concept of integrated logistics support (ILS) have roots in the earliest days of warfare in the United States. Primary and secondary requirements divide all classes of logistics requirements—primary requirements are those that directly support tactical units; secondary requirements are those that support the means used to fill the primary requirements (Huston, 1966, p. 659). During the Civil War, General Sherman recognized that an army could not operate more than 100 miles from its base, since the horses used to move the supplies by wagon consumed the entire contents of the wagon over this distance (p. 659). This idea extrapolated to modern warfare brings forth the concept that logistics creep is a detriment and a limiting factor of any nation to wage war effectively. Rear Admiral Henry E. Eccles calls this creep the "logistic snowball," and describes how logistic activities have a propensity to outgrow the forces they support (Eccles, 1959, p. 102). As the logistics activities continue to grow, an over-expenditure on logistics will directly result in depriving combat forces of manpower, training, or equipment necessary for effective operation. Other elements, such as transportation of supplies and raw materials, may also limit the efficacy of those combat forces. In essence, as long as combat forces are limited by some logistic element, the need to effectively manage those logistics elements will always exist.

Initially, the Ordinance and Quartermaster Bureaus of nineteenth-century America were responsible for most of the logistical concerns of the small national defense segment (Lynn, 1993, p. 253). These bureaus managed large public arsenals, depots, and armories that produced most of the weapons and clothing for the Nation's armed forces (p. 253). A select few civilian producers met the remaining logistic requirements, built to standards specified by the appropriate bureau. Both bureaus were relatively small, and due to a dependence on personnel detailed from combat arms and civilian contractors, oversight of civilian producers suffered (p. 253). This led, in large part, to the establishment of a formal military logistic corps in 1912 (p. 253). The *National Defense Act of 1920* further delineated the importance of the effective integration of military logistics. The Harbord Board, responsible for implementing the *National Defense Act of 1920*, allocated the function of logistics into what later became the G-4 of the General Staff; the bureaus designed, tested and issued equipment, and the Assistant Secretary of War interfaced with the civilian sector in military procurement (p. 255). The next step was the establishment in 1923 of the Army Industrial College (p. 256). The college formalized business connections between top business leaders and Army officers with a focus on production and procurement tasks encountered in the event of war (p. 256). The Army Industrial College was the first of its kind and offered "opportunity for full time study and investigation of the basic industrial, economic, political, administrative, and other aspects of harnessing national resources in modern war" (p. 256). Although the associated terminologies and concepts of ILS were not specifically identified until later, the link between effective logistics implementation and success on the battlefield was clearly understood by the Nation's defense leadership by 1923.

The defense sector introduced the specific concepts and doctrine of ILS in the 1960s and refined them throughout the next four decades to their current state. Specifically, *DoD Directive 4100.35*, *Development of Integrated Logistics Support for Systems and Equipment*, issued on June 19, 1964, assured "effective logistics support for systems and equipments is systematically planned, acquired, and managed as an integrated whole […] to obtain maximum material readiness and optimum cost effectiveness" (Criscimagna, 1977, p. 59). The directive was jointly developed by the DoD Equipment Maintenance and Readiness Council and the Maintenance Advisory Committee of the National Security Industrial Association (p. 59). This directive was a milestone in and of itself, because it represented the first official move toward improving the development of a logistic support system, and it was unique in that it demonstrated a universal understanding that effective and economical support systems were essential for the long-term success of both industry and the DoD (p. 59).

One of the first key meetings for organizing and implementing ILS took place in October 1965: the first Electronics Industries Association Conference on Systems Effectiveness (p. 59). The *DoD Directive 4100.35* was one of the main discussion points, and C.W. Winkler of Douglas Aircraft presented a paper that outlined the seven basic elements of ILS at that time, making these key observations:

1. ILS is necessary for the development of an effective and economical support system.
2. For the most part, the cost of ownership of weapon systems far exceeds the development and investment costs.
3. The cost of ownership of weapon systems is most effectively controlled by emphasis on ILS as early in the conceptual phase of the system as possible.
4. ILS represents the start-to-finish life cycle planning of total maintenance and logistics support of weapon systems (p. 60).

ILS was continually refined over the next several years as industry and DoD officials alike worked to fully understand and implement this DoD Directive. George J. Vechietti of the National Aeronautics and Space Administration (NASA) gave a presentation at the First Annual Logistics Management Symposium. This symposium covered the award-fee contract strategy and early identification and analysis of logistics support requirements that NASA was utilizing to improve its logistics support management (Criscimagna, 1977, p. 60). Ben S. Blanchard of General

Dynamics addressed the second Systems Effectiveness Conference on the specific elements of system effectiveness and cost effectiveness and their relationship to integrated logistics support (p. 60). Likewise, at the Sixth Annual Reliability and Maintainability Conference, John E. Losee discussed how Air Force programs were developing quantitative logistics performance parameters early in programs' life cycles (p. 60). Further guidance from the DoD came in the form of the *ILS Planning Guide for DoD Systems and Equipment,* issued in October of 1968 as a tool to help industry and the DoD identify and establish "a systematic management approach to the early integration of support criteria into design activities" (DoD, 1968, p. 3). The first major implementation of ILS in a DoD weapon program occurred in the B-1 bomber and the F-15 fighter programs, with the ILS directorate having an equal footing with other directorates such as engineering (Criscimagna, 1977, p. 60). This move was a milestone in defense system programming because it gave recognition to the importance of ILS and set the stage for ILS integration into all programs.

During the 1980s, the Defense Acquisition Improvement Program emphasized improved readiness throughout the Department of Defense (DoD). Some of the core areas of emphasis included: establishment of operational readiness objectives by system development programs, the mandate of greater visibility of both logistics and support requirements in each Service's Program Objective Memorandum (POM), the incorporation of reliability and maintainability specifications into program design, and incentives for contractors to design for reliability and support (DoD, 1986, May). Initially, ILS policy focused on the development and integration of a total logistical support configuration. While this is still an important aspect of ILS, the current focus of the DoD is on logistics and maintenance costs in the system design phase. Program Managers are responsible for ensuring that readiness and supportability objectives translate into specific design parameters that minimize LCC of the system while maximizing system readiness (Krieg, 2007). This focus on reducing LCC resulted from the realization that a large portion of a system's total LCC resulted directly from the operations and sustainment phase during a system's lifecycle (see Figure 1). As seen here, decisions made early in the system design phase, specifically those involving design and management, proved to be vital in influencing costs associated with system operation and maintenance downstream.

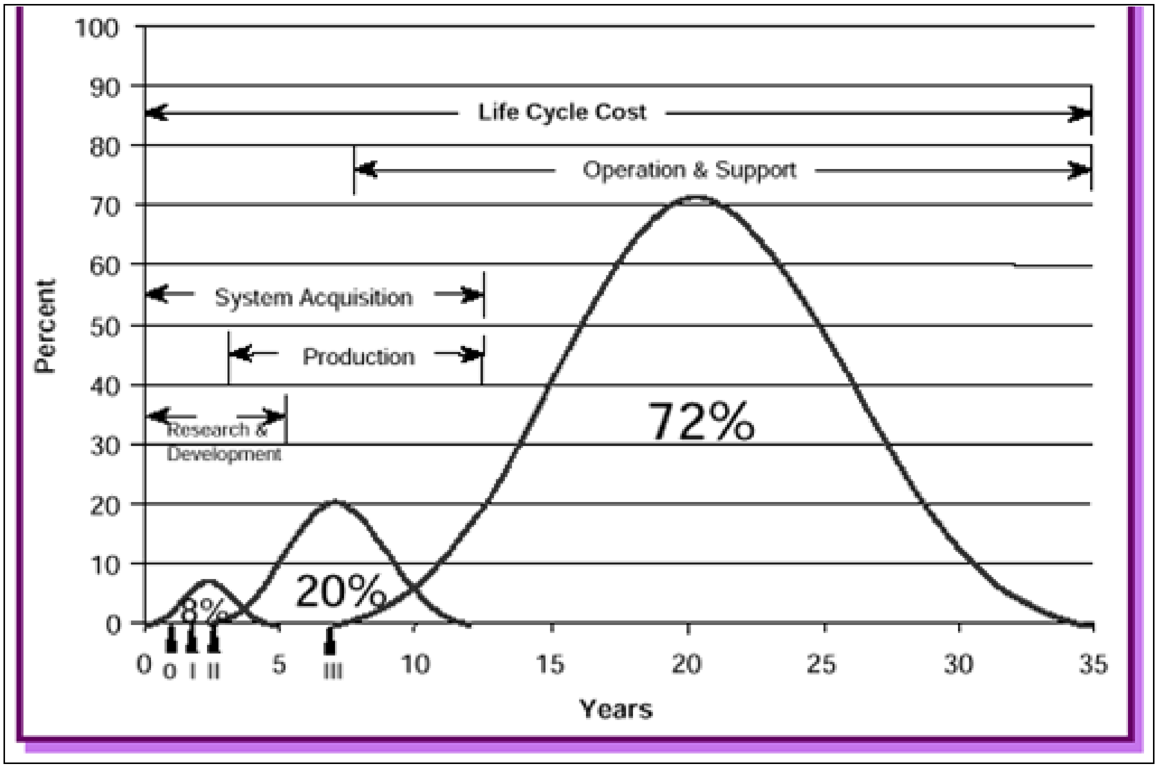

Figure 1. Typical Lifecycle Cost Distribution
(Alford, 2000, p. 13)

c. Current ILS Policy

Army Regulation (AR) 700-127 states the purpose of the ILS process "is to: 1. Introduce and sustain fully supportable material systems in current and projected environments that meet operational and system readiness objectives at minimum Life Cycle Cost (LCC); 2. Right-size the logistics footprint (demand for logistics); 3. Reduce LCC and cycle times; [and] 4. Reduce duplication of efforts" (DoA, 2009, p. 10). Simply put, ILS is the iterative process of considering logistics and maintenance costs throughout the lifecycle of a system. Typically, the most effective time to influence the supportability of a system is early in the system design and development process. ILS ensures system quality in terms of reliability, availability, maintainability, and testability through consideration of a strategy that:

- Optimizes functional support elements of a system.
- Leverages existing investments in manpower, systems, equipment, training, facilities, and other resources.
- Guides the system engineering process using supportability to achieve goals, and to:
  - Identify the support (design the support and support the design),
  - Influence the best design alternative,
  - Refine the supportability strategy,
  - Influence the test and evaluation of both the system and supportability strategy,
  - Resource and acquire the requisite support,
  - Provide the support to the soldier, and
  - Improve the support and introduce and support material systems.
  - Ensures interoperability of material within the Army, Department of Defense (DoD) and coalition partners. (DoA, 2009, p. 10)

The objective of the ILS process is to ensure that systems acquired by the DoD have a longer lifespan and a reduced logistical support requirement—thereby increasing the return on investment for a system with a long lifespan, as is the case in many DoD systems. As such, *AR 700-127* directs that all acquisition programs, including highly classified programs, will incorporate ILS as a method to help develop and direct the acquisition strategy through a detailed plan of the supportability strategy (DoA, 2009, p. 10). It further defines that the supportability strategy will contain specific exit criteria for each phase of program development, and that the program's probability of success model will specifically outline supportability decision points linked to milestones (p. 10). The ILS methodology provides Program Managers with a framework that enables the project office to emphasize supportability early in the system lifecycle by influencing system performance specifications, design and material selections—all in conjunction with sustainability and maintainability considerations. ILS helps optimize product support by ensuring a feasible supportability strategy is developed for the lifecycle of the system. Finally, by encouraging the implementation of performance-based logistics (PBL), ILS helps Program Managers obtain data necessary to improve support systems continuously and to increase reliability throughout the operational lifecycle of the system (DoA, 2009, p. 11).

In order to execute this strategy effectively, ILS relies on integration into the systems engineering process of product development (Blanchard, 1991, p. 23). While there is no commonly accepted definition of systems engineering in literature, *DoD Regulation 5000.2-R* defines the systems engineering process as one that will:

> 1. Transform approved operational needs and requirements into an integrated system design solution through concurrent consideration of all life cycle needs (i.e., development, manufacturing, [Test and Evaluation] T&E, deployment, operations, support, training, and disposal).
>
> 2. Ensure the interoperability and integration of all operational, functional, and physical interfaces. Ensure that system definition and design reflect the requirements for all system elements: hardware, software, facilities, people, and data, characterize and manage technical risks.
>
> 3. Apply scientific and engineering principles, using the system security engineering process, to identify security vulnerabilities and minimize or contain information assurance and force protection risks associated with these vulnerabilities. (DoD, 2002, p. 76)

Further, *DoD Regulation 5000.2-R* states that Program Managers shall implement a sound systems engineering approach to translate approved operational needs and requirements into operationally suitable blocks of systems. The approach shall consist of a top-down, iterative process of requirements analysis, functional analysis and allocation, design synthesis and verification, and system analysis and control (DoD, 2002, p. 76).

To do this effectively, programs must take into account the ten elements of ILS as defined by *AR 700-127*. These elements, objectives, and brief descriptions are shown in Table 2, Appendix A, "Elements of Integrated Logistics Support."

By integrating these ten elements of ILS into the systems engineering process, Program Managers will enable the system to achieve not only the readiness levels required by the warfighter, but also a supportable design that ensures optimum logistics lifecycle costs. Although it is ideal to have a system that optimizes all ten elements, tradeoffs between elements are likely to occur in any given program. A logistical support analysis is the main tool employed by PMs to identify logistics support criteria and goals and to quantify system support plans in relation to the lifecycle of the system (DoA, 1989, p. 2). Figure 2 from *AR 700-127* (DoA, 2009, p. 15) shows the iterative process of incorporating ILS into the systems engineering process.

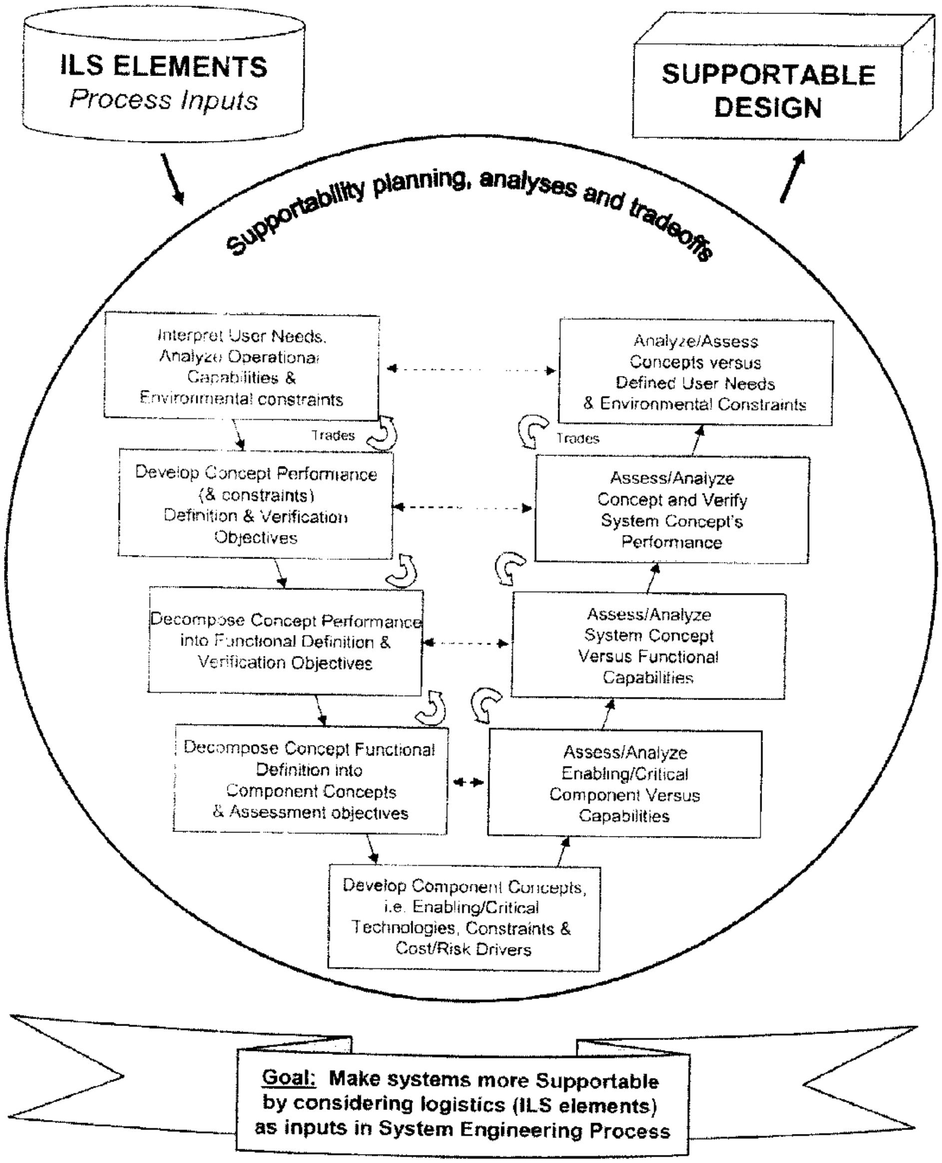

Figure 2. Systems Engineering Integrated ILS Elements
(DoA, 2009, p. 15)

d. ILS and Non-developmental Items (NDI)/Commercial Off-the-shelf (COTS)

The NDI/COTS program is the Army's preferred acquisition strategy over developmental programs (DoA, 1989, p. 5). NDI/COTS items fall into two categories: Category A—those that require no modification and are used in the intended environment, and Category B—those that require modification but still operate in the intended environment (DoA, 1989, p. 5). Obviously, the Program Manager's ability to influence ILS planning in either case is limited; however, ILS should still be a factor in the supportability strategy that compliments the overall acquisition strategy. Some factors that come into consideration are:

- Reduced lead-time in acquisition means less time to prepare for organic support;
- Standardization goals may not be reached;
- An analysis of existing support elements should be conducted to determine suitability and adaptability;
- Interim contract support should be considered during the requirements formulation. (DoA, 1989, p. 5)

Additionally, the *Defense Acquisition Guidebook* directs:

> The acquisition strategy should state whether organic, contractor, or a mix of organic/contractor logistics support is the most cost-effective and operationally effective approach to support the item. Appropriate tradeoff analyses should be conducted to arrive at the most cost-effective and operationally effective support strategy. Interim contractor support, incremental (block) development and fielding strategies, lifetime contractor logistics support, or full organic logistics support shall be considered and planned during the development of the acquisition strategy and definitized in the solicitation. (DoD, 1997, pp. 21-26)

Although the Program Manager most likely cannot influence the design of an NDI/COTS item, the elements of ILS and supportability issues should influence source selection.

e. The Future: Revolution in Military Affairs and ILS

Many theorists propose that the world is in the midst of a Revolution in Military Affairs (RMA) (Kane, 2001, p. 149). To fully understand the implications on logistics of this RMA, it is necessary to describe the vision of a network-centric approach to warfare. Network-centric warfare is not a single breakthrough technology, but rather a blend of ongoing trends in technology development that create a "revolution in military efficiency" (Kane, 2001, p. 150). The first trend involves the technology advances and the proliferation of sensors on modern battlefields that have greatly increased the ability to monitor statuses and friendly, as well as enemy forces. The continued advances in communications and communication technology comprise the second trend and allow for real-time information flow, decentralized operations, and information sharing that is unprecedented. The final trend of the RMA involves the increasing use of precision-guided munitions for all modes of operations in combat. Theoretically, all three trends provide the wherewithal to form a network that is multi-faceted and capable of detecting, communicating, and eliminating threats while also being difficult to defeat—since there is no decisive point to attack.

> While this RMA may indeed change the nature of war, the necessity of logistics will remain, and possibly grow. Real sensors will communicate with real hardware nodes, and real munitions will destroy threats. The logistics necessary to develop, operate, and sustain these systems could shrink over time as technology matures, but for the near future, these logistics will remain a formidable requirement. While the requirement for large armies to conduct massive campaigns may wane as the RMA progresses, it will be rare to neutralize an enemy without soldiers on the ground. The necessary logistics support requirements for those soldiers, tanks, planes, and ships will remain for the near future. As such, the need for effective management of logistics support requirements will likely increase as commanders struggle to balance an increasingly complex force. ILS is the overarching doctrine and concept embraced by the United States Department of Defense (DoD) that enables effective management of logistics requirements. (Kane, 2001, p. 151)

2. Contractor Logistics Support (CLS)

a. Historical Perspective

Contractor Logistical Support (CLS) is not a new and emerging trend; it has been evolving for several hundreds of years. As early as the mid-1600s, armies utilized civilians for support of their armies while on the march, primarily for subsistence (Lynn, 1993, p. 17). Prior to the mid-1600s, most advancing armies would pillage occupied towns as a means of subsistence. Lynn states, “Under the threat of force, civil authorities agreed to provide money and goods to the general of the threatening army or to officials of the ruler he served" (1993, p. 17).

Depending on the number of soldiers supplied, the occupying army could drain a town of its resources within a few days if that army did not have the logistical support accompanying it or if that support was too far behind. As a result, a new system emerged called the *e`tapes* system (Lynn, 1993, p. 17). Lynn explains, "'*e`tapes'* originated in the word for market," and through this system, the "troops on the march drew [purchased] their food from local markets or depots at set intervals along their route" (p. 17). Although this type of support seemed transparent to the soldiers, it did require a significant amount of coordination to be executed expeditiously. Advance parties would contact the local officials of the town and inform them of the day the troops would arrive and of the amount of food that would be required. Then, the arriving soldiers would buy the supplies they needed from the local vendors.

Huston (1966) describes another example of civilians providing support to armies during the War of 1812: "Many ordinary military supplies were obtained by the contract system, [in which] a contractor would undertake to furnish all necessary articles of supply for troops at a given post" (p. 99). Huston also brings to light several issues that could occur as a result of these types of agreements:

> As Hamilton and Washington pointed out, the system of direct purchases by officers of the government put emphasis on satisfying the troops, on the quality of the supplies, and on assuring their delivery, but direct purchase was subject to the weakness of incompetent or unfaithful officials, and, since the buyers were little concerned with price, the system was likely to be less economical.
>
> Private contractors, on the other hand, were more interested in assuring their own profits than in delivering articles of good quality or making delivery at the times convenient to the purchaser. They were most concerned with prices; sometimes so much concerned that they postponed purchases and deliveries with a view of increased profits. (1966, p. 99)

There appears to be a correlation of past practices and current procedures for the contracting of supplies. For direct purchase of supplies, the Department of Defense (DoD) instituted the purchase card. The card has several different limits, the most common being $2,500 for a single purchase. The practice of using civilians to perform logistics functions within the DoD continues today. A recent example of this practice is the use of contractors to support the US Army's Stryker vehicle. When the program was established, the Product Manager (PM) used CLS to support the platform until an in-house military support organization was established. Once all the necessary personnel and support functions were in place, the PM transitioned the program from strictly CLS to a mix of CLS and organic support (Coryell, 2007, p. 7). The Department of the Army has instituted several guiding-principle documents concerning CLS: *Department of the Army (DoA) Pamphlet 700-56* and *Army Regulation (AR) 700-127*.

AR 700-127 is the guiding document concerning CLS—especially Chapter 6, which defines key terms, identifies areas of support, states policy for the application of CLS, and provides standard planning factors and contractor constraints.

The *AR* defines two key terms, organic and CLS, in this chapter:

> *Organic.* Any logistics support performed by a military department under military control, using Government owned or controlled facilities, tools, test equipment, spares, repair parts, and military or civilian personnel, is considered organic support. Logistics support provided by one military service to another is considered organic within DOD.
>
> *Contractor logistics support.* Logistics support of Army materiel performed under contract by commercial organizations (including the original manufacturer) is considered CLS. (DoA, 2009, p. 46)

Chapter 6 of *AR 700-127* also delineates the areas of support for CLS consideration and may include materials, facilities, and services in the areas listed below.

- Supply and distribution
- Maintenance
- Training
- Software support
- Rebuild/overhaul
- Modification
- System support (DoA, 2009, p. 46)

AR 700-127 sets forth the policy guidelines in five major areas for using CLS. Initially, the Government must acquire or have access to the technical data concerning the program in question in order to permit competitive procurement. Secondly, the material developer (along with the material command) is responsible for the overall management of the contractor support. This support should include contract administration, contract negotiations, contract award, contract budget, and budget programming (with regard to the overall program of support considered). The third policy principle is that system development will limit/minimize contract support personnel during combat operations. The actions of the contract support personnel must be clearly justified in accordance with *AR 715-9* Chapter 3: "Contractors Accompanying the Force," if used during combat operations. Next, the contractor support must be integrated into the DoD logistics chain and standard systems. Finally, during wartime or contingency operations, the support contract must include a clause stating the requirement(s) of contractor support. This will allow seamless and continuous support from garrison operations and deployment operations (DoA, 2009, p. 46).

The application of CLS is performed in two major areas: Interim Contract Support (ICS) and Lifecycle Contract Support (LCCS). *AR 700-127* defines ICS as, "The use of commercial support resources in lieu of organic capability for a predetermined amount of time. […] This includes the use of contractor support for initial fieldings" (DoA, 2009, p. 46).

This was the case for the Stryker program mentioned earlier and is the case for the subject of this thesis: the SPARKS, explained in later chapters. LCCS is defined as:

> A method of providing all or part of a system's logistics support by contract, with the intention of continuing this support throughout its life cycle [cradle to grave]. (DoA, 2009, p. 46)
>
> LCCS considerations will be based upon readiness and availability requirements, LCC, support risks, design maturity, planned useful life, materiel system complexity, available manpower and personnel, and other acquisition and support issues. Wartime mission and deployment requirements will be the primary considerations on which support risks are based. (DoA, 2009, p. 47)

The major difference between these two concepts is that LCCS is an acquisition technique, and ICS is a support concept. Also, ICS should be used only in the short run (approximately three years), when the military support cannot be provided by the First Unit Equipped Date (FUED), as specified in the support strategy.

Decision-makers should address several planning factors when considering the use of CLS for support actions. First, CLS must be a cost-effective solution in order to provide logistics support in the intended geographic location. Also, material developers must limit the burden on organic maintenance organizations and/or field maintenance organizations by limiting the use of contractors for maintenance functions soldiers can perform. The decision to use CLS should be based on a tradeoff analysis of alternative support considerations during the early stages of the system development. The analyses should cover the following areas: optimum strategy from the alternatives, accomplishment of support in both peacetime and wartime scenarios, effectiveness of support cost, and a determination of the government's best interest when allowing for CLS. Chapter 6 of *AR 700-127* also states that the material developers and/or PM's decision to use CLS should use the following factors to support the analyses:

- Wartime operational readiness supportability
- Compliance with 10 *USC* 2464 and related statutory laws
- Need to maintain a peacetime training and rotational base for military technical personnel (manpower requirement data)
- Security implications
- Cost effectiveness
- Availability of Test Program Sets (TPS) and Test, Measurement, and Diagnostic Equipment (TMDE)
- Access to the technical data suitable for competitive procurement under contractor and/or organic support
- Availability of repair parts and costs required to maintain stock levels to meet readiness requirements
- Timeframe for fielding the system
- Warranties under the acquisition contract
- Spare parts pricing
- Commercial activities program
- Density of equipment and geographical dispersion
- Training costs
- Personnel skills required/available
- Force structure
- Contractors accompanying the force
- Administrative and support workload
- Design stability
- Risk of commercial or military obsolescence
- Availability of contractors to support the system over its expected life at all proposed locations (including mobilization conditions)
- Use of operational readiness float/repair cycle float

- Availability of technology and technological complexity of the system (DoA, 2009, pp. 46-47)

CLS funding considerations should be in accordance with existing guidelines, utilizing the same accounts as if the work were performed by organic Army elements normally involved with such fielding activities. "Normally, ICS is paid for with procurement funds, and LCCS is paid for with Operations and Maintenance (O&M), Army funds" (DoA, 2009, p. 46). The PM is responsible for the programming, budgeting, and funding of the CLS contract while the supported items remain under his/her control. If the CLS contract supports several items under the PM's control by the same contractor, then the PM should combine the efforts into a single contract if feasible (DoA, 2009, pp. 46-48).

Finally, *AR 700-127* establishes the constraints for contractors. These constraints provide not only the Commander but also the PM a quasi checklist of items that should be considered when dealing with contractors. Speaking on the use of contractors, the Department of the Army instructs:

- Be operationally executable and [do] not infringe on the commander's ability to execute missions.
- Comply with Army policy on contractors accompanying the force set forth in *AR 715-9*.
- Maintain Total Asset Visibility (TAV) of total system—to include supporting equipment and spares—while providing TAV to the Army In-Transit Visibility (ITV) network. Ensure that contractors feed ITV servers with data in the required format.
- Comply with DOD policy to use the Defense Transportation System and DOD transportation hubs where practical and where it meets the warfighter's performance requirements. If other than a DOD standard distribution system is recommended, DCS, G–4 through the DASA (ILS) will be notified of any intent to use a different distribution system prior to the decision.

- Use standard Army Logistics Information Systems (LIS), formerly known as Army Standard Army Management Information Systems (STAMIS). These include: Standard Army Maintenance System–Enhanced (SAMS–E), Unit Level Logistics System-Aviation Enterprise (ULLS-AE), Unit Level Logistics System–Ground (ULLS–G), Standard Army Retail Supply System-Objective (SARRS-O), Property Book Unit Supply Enhanced (PBUSE), and Transportation Coordinator's Automated Information for Movements System (TC AIMS).
- Transition seamlessly to the Global Combat Support System–Army (GCSS–A) when accepted, and interface completely with the Single Army Logistics Enterprise (SALE) as it develops at the business process/operational architectural level.
- Be compatible with emerging doctrine for sustainment operations, such as two-level maintenance. (DoA, 2009, pp. 48-49)

Also, *Field Manual (FM) 100-10-2* (DoA, 1999) further defines items of consideration for the military commander when he/she is deciding whether or not to place a contractor within his/her formation for weapon system support. However, that discussion is outside the scope of this thesis and not included in this discussion.

Chapter 16 of *DoA PAM 700-56* (DoA, 2006) concerns contractor support. This chapter is subdivided into four distinct parts: selecting a support alternative, contractor support decisions, planning and documenting contractor support, and contract content.

The sub-chapter about selecting a support alternative provides the basic outline for determining if CLS, whether ICS or LCCS, should be employed for support of the newly fielded system. During the initial stages of the support-planning process, a tradeoff analysis should be completed to show that the selected alternative meets the following four criteria:

- The support selected is the best/optimum solution from among the alternatives.
- The support selected will provide the desired support outcomes during both wartime and peacetime operations.
- It is the most cost-effective solution—not the cheapest, but the best-value option.

- The selected alternative is in the best interest of the Government. (DoA, 2006, p. 42).

b. Selecting a Support Alternative

DoA PAM 700-56 further explains the first overarching criterion in the Contractor support decisions: contract content, which we will explain later in this review. The second criterion determines that if the desired support cannot be obtained in wartime and peacetime operations, then a detailed tradeoff analysis should be completed. In an effort to determine a solution for the best-value option, certain characteristics need consideration.

> The best value alternative to the Government depends upon system complexity, system density, expected system life, availability of trained personnel, availability of spare parts, tools, and test equipment, and the availability of a commercial support system in the areas of the world where the system will be deployed. (DoA, 2006, p. 42)

Finally, with regard to the Government's best interest, many NDI/COTS items are fielded as soon as possible before any type of organic support can be developed. If such is the case, CLS would be the best option for support while the organic capability was being developed and phased into the support structure (DoA, 2006, p. 42).

c. Contractor Support Decisions

The tradeoff analysis should cover three major areas: the operational, economic, and technical aspects of the system. One of the operational tradeoffs areas includes the readiness requirements, commonly known as Operational Readiness Rates (OR rate) and expressed as:

$$\frac{\text{Days Operational} - \text{Days NonOperational}}{\text{Total Days in the Reporting period}}.$$

Other operational areas are the sustainability of the system, the system's useful life, any manpower/personnel requirements to not only operate the system but also to maintain the system, and the wartime mission of the system (DoA, 2006, p. 42). In addition, contractor personnel on the battlefield should be considered part of the operational tradeoff analysis. The management, legal considerations, and protection of these civilians are other major concerns for the operational commander, and the PM needs to address these potential concerns (p. 43).

In order to determine whether organic support or LCCS will be used for system support, the economic analysis must involve the LCC. These costs have differing degrees of associated costs and occur in different places in the lifecycle of the system (p. 43). “All of these costs must be assessed and played against one another as decisions on support are being made” (p. 43).

When considering the technical aspects of the tradeoff analysis, the PM should weigh technology maturity and complexity of the individual components against the potential types of support. For instance, if “a very new technology is being used and the exact component design is likely to change after the initial fielding, then ICS for provisioning and depot maintenance might be the best choice until the design stabilizes” (p. 43).

d. Planning and Documenting Contractor Support

No matter what type of contractor support the PM decides on, it should be identified in detail in the Acquisition Strategy (AS) and should cover all the appropriate Integrated Logistics Support (ILS) elements developed by the PM, which are explained in detail in later sections of this chapter. In addition to the AS, contractor support should be included in the Material Fielding Plan—as outlined in *AR 700-142*, Chapter 5 (DoA, 2008)—to include any contractor support for the initial fielding of the system and ICS. In order to ensure continuous support for the system, the PM must plan the transition from ICS to organic support. The content of the plan is not specified in *AR 700-142* (2009) but should be mutually agreed upon by the major parties involved. Chapter 16 identifies some of the content to be considered, including:

- Logistics functions included in the ICS
- The length of time ICS will be required
- Procedures for possible extension of the ICS
- Funding requirements
- Control structure for ICS
- A checklist of actions to be completed before transition can take place
- Milestone dates for major actions up to transition date
- Tracking and reporting procedures for transition
- Contract data on maintenance actions, repair parts consumption, and other data beneficial to establishing organic support. (DoA, 2009, p. 43)

e. Contract Content

Several important items need addressing in the prime contract when the PM determines CLS is the best option for support. The first item that needs addressing is the Technical Data Package, which includes the maintenance data requirements during the deployment and sustainment phase of the acquisition lifecycle, any spares data requirements, and, finally, the configuration management (CM) of the system. The second major area that should be covered in the prime contract is the description of the product, which includes all the technical material describing the design of the system and the control of the manufacturing and quality of the system. Third, the support contract should include any technical manuals and the name of the personnel responsible for developing these manuals. Next, the contract should address any requirements for tools, test and support equipment, manpower and personnel data, quantity of spare parts provided, software data documentation, reliability and maintainability requirements, and rates that must be achieved. Finally, the contract must be specific in the division of the government and contractor responsibilities and must specify any issues of contractors on the battlefield supporting the system. *AR 700-142* Chapter 16 specifically defines the requirements for this division:

- Maintenance—who does what, and does the contract specify maintenance tasks to be performed, or does it specify allowable downtime?
- Supply—which supply functions is the contractor actually providing? The contract may include direct vendor delivery.
- Materiel management—the contractor may be controlling all the ordering and distribution functions under the contract or may be working through the existing government system. The contract must be specific.
- Overhaul/rebuild—the contractor's function may be to perform the specified rebuild until a government depot maintenance facility is ready. Another option is LCCS for depot maintenance at a contractor or Government-owned facility.
- Other services—these may be contracted either individually or as part of a larger support contract. They include engineering support, configuration management, facilities, software support, or data processing functions. In each of these, the contract should specify what functions will be performed, what services will be provided, and what is specifically required of the Government in support of the contract (DoA, 2008, p. 44).

3. Performance-based Logistics (PBL)

a. Introduction

Performance-based Logistics (PBL) is the Department of Defense's (DoD) preferred approach for product support (DoD, 2005). The purpose of highlighting PBL in this thesis is to introduce a strategy that is viable, saves the government money and examines contractor/organic support. A substantial amount of literature exists on the history, success and implementation of PBL. The goal of the PM is to minimize the overall logistics footprint required to sustain SPARKS and to identify and implement the right mix of contractor and organic support. General George S. Patton said, "Never tell people how to do things. Tell them what to do, and they will surprise you with their ingenuity" (Patton, 1947, p. 286). This is such the case with SPARKS. This program was established by the Department of the Army in response to a JUONS, and then it was handed off to the PM for execution with limited guidance.

PBL, when used properly, can assist in setting up the desired structure to support SPARKS. Our Army currently relies upon a significant number of contractor personnel on the battlefield—a reliance that generates operational costs and legal issues. Units that depend on contractor personnel for system support and maintenance must allocate precious resources to ensure their security and subsistence (Bolton, 2002, p. 1).

The intent is to design, develop, and field systems that limit deployment of contractors and improve system reliability and ease of maintenance (p. 3). PBL is specifically designed to meet the needs of the Army. PBL needs to meet the warfighter's operational requirements and be cost effective, as validated by a Business Case Analysis (BCA). The *PBL Support Guidebook* explains, "PBL can help PMs optimize performance and cost objectives through the strategic implementation of varying degrees of Government-industry partnerships" (DoD, 2005, pp. 2-3).

PBL is not a one-size-fits-all strategy. Figure 3 shows that strategies will vary along a spectrum, depending on the program, the age of the system (phase in the lifecycle), existing support infrastructure, organic/commercial capabilities, and legislative and regulatory constraints.

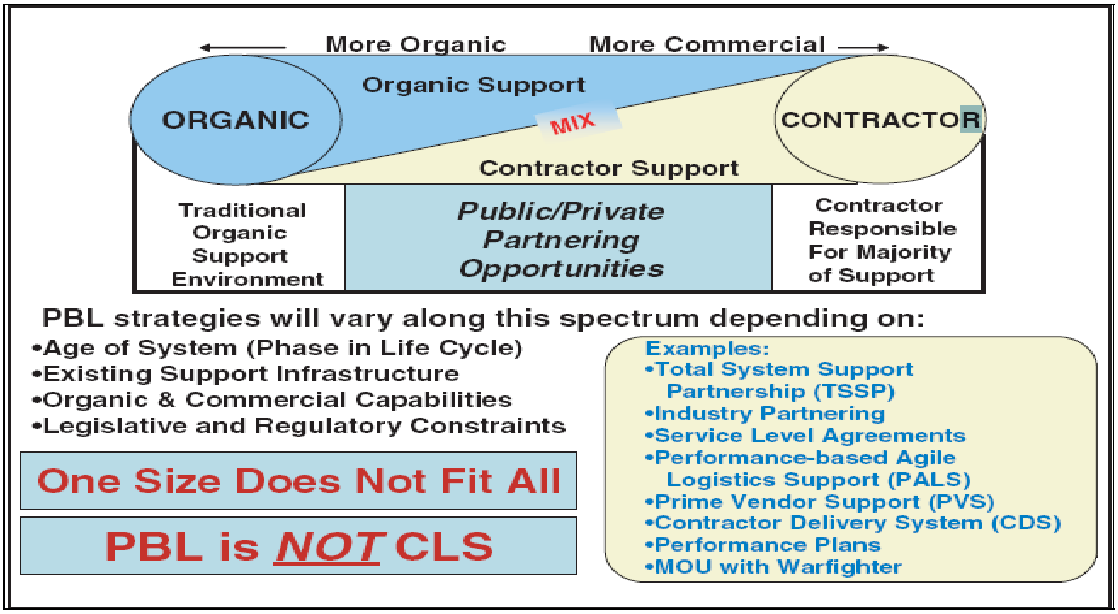

Figure 3. Spectrum of PBL Strategies
(DAU, 2005, p. 2-3)

b. Definitions of Performance-based Logistics

There are several definitions of PBL in the commercial sector and in the Department of Defense. PBL is an overarching support strategy for procuring performance that takes advantage of the integrated logistics chains and public/private partnerships. In layman's terms, PBL buys performance—not just products or services. The Department of the Army defines PBL in *DoA PAM 700-56*, *Logistics Supportability Planning and Procedures in Army Acquisition* as follows:

> Performance-based Logistics (PBL) is the mandated approach for executing affordable product support so that the accountability and responsibility for the integration of support elements are linked to specific warfighter performance requirements for weapon system readiness and operational capability. PBL is the delineation of output performance goals/thresholds for acquisition system supportability and

> sustainment and the assignment of responsibilities and implementation of incentives for the attainment of these goals/thresholds, and the overall life cycle management of system reliability, sustainability, and total ownership costs. The goal of PBL is to design and build a reliable system that will reduce the demand for logistics and [provide] a maintainable system that reduces the resources, such as manpower, equipment and time, required to provide the logistics support. (2006, p. 1)

c. Current Policy on Performance-based Logistics

Current policies regarding PBL are being defined, as well as refined, as PBL continues to evolve in DoD-specific programs.

> The PM, as the Total Life Cycle Systems Manager (TLCSM), must ensure that the system, as designed, maintained, and modified, minimizes the demand for logistics. The PBL approach is based on [the] DOD managing and sharing risk with those who promise set levels of reliability and supportability. (DoA, 2006, p. 1)

The Department of the Army in *DoA PAM 700-56, Logistics Supportability Planning and Procedures in Army Acquisition* (2006) identifies five levels of military objectives using PBL. In other words, the PM will develop program metrics using the following levels of metrics:

> <u>Operational availability—</u>the percent of time that a weapon system is available for mission or the ability to sustain operations tempo.
>
> <u>Operational reliability—</u>the measure of a weapon system in meeting mission success objectives (percent of objectives met, by weapon system). Depending on the weapon system, a mission objective would be a sortie, tour, launch, destination reached, capability, and so on.
>
> <u>Cost per unit usage</u>—the total operating costs divided by the appropriate unit of measurement for a given weapon system. Depending on the weapon system, the measurement unit could be flight hour, steaming hour, launch, mile driven, and so on.
>
> <u>Logistics footprint</u>—the Government/contractor size or “presence” of logistics support required to deploy, sustain, and move a weapon system. Measurable elements include inventory/equipment, personnel, facilities, transportation assets, and real estate.

> Logistics response time—the period of time between when a logistics demand signal is sent and the time that demand is satisfied. "Logistics demand" refers to systems, components, or resources (including labor) required for weapon system logistics support. PBL metrics should support these desired outcomes. (DoA, 2006, p. 1)

The DoD's policy outlined in *DoDD 5000.01* (2007) paragraph E1.1.17 states that under PBL,

> The PM shall develop and implement performance-based logistics strategies that optimize total system availability while minimizing cost and logistics footprint. Tradeoff decisions involving cost, useful service, and effectiveness shall consider corrosion prevention and mitigation. Sustainment strategies shall include the best use of public and private sector capabilities through government/industry partnering initiatives, in accordance with statutory requirements. (Department of Defense, 2007, p. 7)

The Department of Defense Instruction *DoDI 5000.2*, (2003) paragraph 3.9.2.3 states,

> The PM shall work with the users to document performance and support requirements in performance agreements specifying objective outcomes, measures, resource commitments, and stakeholder responsibilities. (Department of Defense, 2007, p. 46)

d. Background of Performance-based Logistics

PBL is a work in progress that was mandated in September 2001 in the *Quadrennial Defense Review* (*QDR*) (Aldridge, 2002, p. 1), and initial guidance was stated in a memorandum from the Under Secretary of Defense, E.C. Aldridge, Jr., dated February 13, 2002. The memo states that the:

> QDR mandated implementation of PBL and modern business systems with appropriate metrics to compress the supply chain, eliminated non-value added steps and improve readiness for major weapon systems and commodities. PBL delineates outcome performance goal of

> weapon systems, ensures that responsibilities are assigned, provides incentives for attaining these goals and facilitates the overall life cycle management of system reliability, supportability, and total ownership costs providing guidance on the application of PBL. (Aldridge, 2002, p. 1)

The memorandum required each service, in accordance with the "*FY03 Defense Planning Guidance and Change 1 to DoD 5000.2*, [to] develop schedules to ensure implementation of Performance-based Logistics (PBL) on all new systems and ACAT I and II fielded systems" (p. 53). In March 2003, a memorandum from the Under Secretary of Defense emphasized the importance of the use of PBL with Total Life-cycle Systems Management (TLCSM) (p. 97).

Further, the DAU guidebook on PBL states that:

> TLCSM and PBL emphasize an early focus on sustainment within the system life cycle. TLCSM is the implementation, management, and oversight, by the designated Program Manager (PM), of all activities associated with the acquisition, development, production, fielding, sustainment, and disposal of a DoD weapon system across its life cycle. (DAU, 2005, p. 2-1)

In March 2004, the Acting Under Secretary of Defense issued a memorandum entitled *Performance Based Logistics and Business Case Analysis*. The memo promoted aggressive implementation of PBL and required services to complete a Business Case Analysis by September 30, 2006, on all new and fielded Acquisition Category (ACAT) I and II programs for application of PBL sustainment strategies (Wynne, 2004). The memo also provided guidance to assist PMs in assessing the potential applications of PBL strategies to meet the September 2006 deadline.

Under direction from the Under Secretary of Defense, the Department of the Army issued the memorandum *Performance Based Logistics (PBL) Business Case Analysis (BCA) Policy* in August 2005. This document provided the initial US Army's policy for using BCAs in support of a best-value assessment of PBL support strategies (Bolton, 2002).

e. Concept of Performance-based Logistics

As stated earlier, there is no one-size-fits-all when it comes to PBL. The *Performance Based Logistics: A Program Manager's Product Support Guide* and *DoA PAM 700-56*, *Logistics Supportability Planning and Procedures in Army Acquisition* establish the guidelines for PMs, the Product Support Manager (PSM), and the product team to implement PBL. In order to begin the PBL process, logistical requirements need to be identified and stated as expected results based on the warfighter requirements. The Department of the Army asserted, "The responsibility and accountability for meeting these expectations fall on the PM's designated Product Support Integrator (PSI)" (DoA, 2006, p. 17).

PBL arrangements establish clear lines of accountability for results based on warfighters' expectations that are documented in a Performance-based Agreement (PBA). PMs use PBAs to establish overall PBL strategy. This agreement establishes ranges of outcome performance with:

> Thresholds and objectives, and the target price (cost to the user) for each level of PBL capability. The agreement also delineates any constraints or boundary conditions and will reflect normal operations. (DAU, 2005, p. 3-17)

"The specific PBL responsibilities are stated in PBAs between the PM and the user/warfighter, as well as between the PM and the PSI" (DoA, 2006, p. 17). Figure 4 provides a visual representation of PBAs and the interaction among the PM, industry and the warfighter.

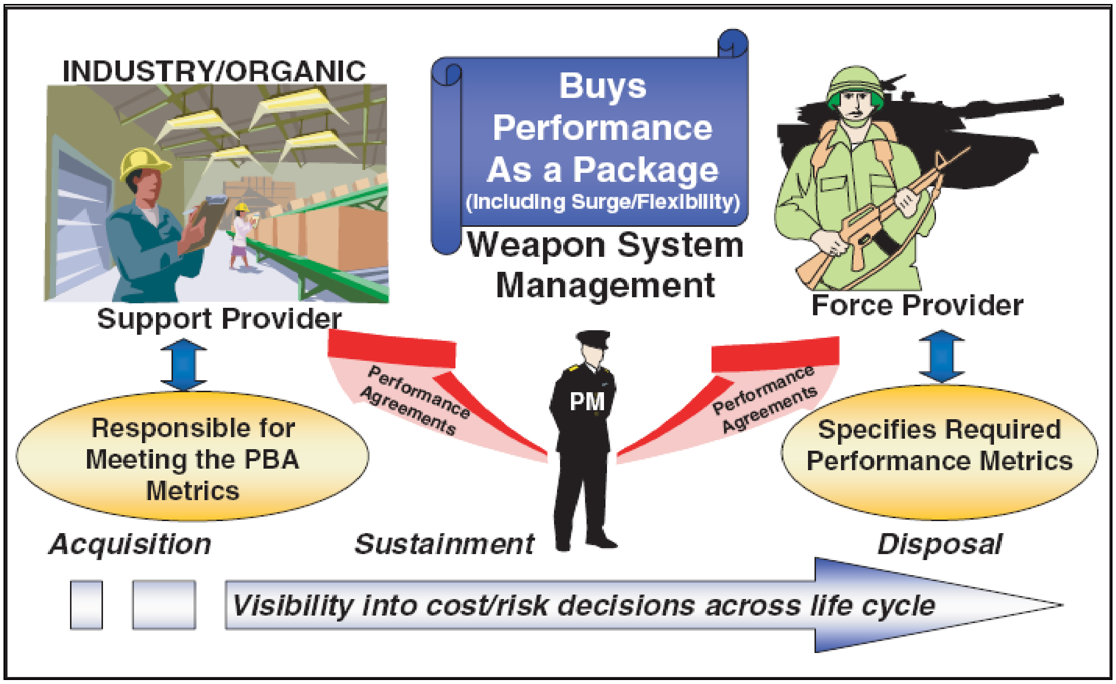

Figure 4. Performance-based Agreements
(DAU, 2005, p. 3-17)

The *DoA PAM 700-56, Logistics Supportability Planning and Procedures in Army Acquisition,* states as a minimum, PBL system support/sustainment management planning shall address:

- Integrated supply chain segmented support by system or subsystems
- Responsive relationships with the warfighter based on system readiness
- Best-value support based on long-term and competitive arrangements with product-support providers (PSPs) and integrators (PSIs).
- Continuous support performance monitoring based on high-level metrics such as operational availability
- Product affordability and mission reliability
- Dedicated investment in technology refreshment (DoA, 2006, p. 17)

f. Success of Performance-based Logistics

There are hundreds of Performance-based Logistics programs currently underway. The following are some examples of successful Performance-based Logistics programs. "Program Managers (PMs) are encouraged to consider relevant examples for application to their own PBL efforts, and are also encouraged to contact the program offices' Product Support Manager (PSM) for additional guidance or information" (DAU, 2005, p. 5-1).

> **F/A-18E/F**
>
> The single-seat F/A-18E and the two-seat F/A-18F Super Hornets perform a variety of missions, including air superiority, day and night strike with precision-guided weapons, fighter escort, close air support, suppression of enemy air defense, maritime, reconnaissance, forward air controller, and tanker. The F/A-18E/F has 11 weapon stations, which allows for a significant degree of payload flexibility with the capability to carry a variety of both air-to-air and air-to-ground ordnance on one mission, including the complete complement of Precision-Guided Munitions (PGM).
>
> The F/A-18E/F Integrated Readiness Support Team (FIRST) PBL contract covers approximately 73 percent of F/A-18 E/F materiel support, including 3,889 E/F WRAs, 653 I-Level Repairables, 349 Support Equipment Items, 130 Defense Logistics Agency (DLA) Consumables, and over 10,000 Non-DLA Consumables. The Naval Inventory Control Point (NAVICP) is a major Product Support Integrator (PSI), and Boeing is the PBL Contractor. DLA is the primary source for common consumables. Through the FIRST contracts, Boeing provides total aircraft support—including supply chain support, reliability improvements, obsolescence management, E/F squadron activation, technical publication, and support equipment management. Additionally, Boeing has commercial service agreements with all three Naval Air Depots (NADEPs) for depot-level repair. (DAU, 2005, p. 5-1)
>
> ***Joint Surveillance Target Attack Radar System***
>
> The E-8C Joint Surveillance Target Attack Radar System (JSTARS) is an airborne battle management, Command and Control (C2) platform. From a standoff position, the Modified 707-300, manned by a joint Army-Air Force crew, detects, locates, tracks, and targets hostile surface movements, communicating real-time information through

secure data links to Air Force and Army command centers. Northrop-Grumman is the prime contractor under a Total System Support Responsibility (TSSR) arrangement for Sustainment of JSTARS over a maximum contract period of 22 years. Warner-Robins Air Logistics Center (WRALC) performs core sustaining workloads (e.g., repair of prime mission equipment and system software maintenance) and other workloads (e.g., ground support software maintenance and various back shop functions) under a work-share partnership with Northrop-Grumman. DLA is the primary provider for common Consumable parts and almost all JSTARS-unique consumable part. (DAU, 2005, p. 5-4)

Naval Inventory Control Point: Aircraft Tires

The Naval Inventory Control Point (NAVICP) Aircraft Tires PBL contract transfers traditional Department of Defense (DoD) inventory management functions to the contractor, which will guarantee a level of tire availability versus physical inventory. Under this vehicle, the contractor is tasked to become the single supply chain integrator for Navy aircraft tires and is responsible for requirements forecasting, inventory management, retrograde management, stowage, and transportation. The contractor provides a full-service 24/7 service center with Web-based access. In addition, the contractor is committed to providing surge capability to support up to twice the normal monthly demand. Finally, the Navy expects to achieve significant transportation, warehousing, and inventory savings over the system life cycle. The performance benefit is 96% materiel availability during initial performance review with 8,000 fleet orders filled and zero backorders. (DAU, 2005, p. 5-6)

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II. Background

A. Global War on Terror (GWOT) and the Joint Improvised Explosive Device Defeat Organization (JIEDDO)

In the early stages of Operation Iraqi Freedom, Improvised Explosive Devices (IEDs) emerged as a leading threat to the safety of service members in Iraq. Faced with the increased use of IEDs in both Iraq and Afghanistan, the Department of the Army established the Army IED Task Force in October 2003 (JIEDDO, n.d.). This task force reached out to its sister services, academia, the Department of Defense (DoD) research laboratories, and private-sector companies to develop Counter-IED (C-IED) technologies and C-IED training equipment.

Based on the early successes of this task force, then-Deputy Secretary of Defense Paul Wolfowitz transformed the task force now known as the Joint IED Defeat Organization (JIEDDO) (JIEDDO, n.d.). “The Joint IED Defeat Organization shall focus (lead, advocate, coordinate) all Department of Defense actions in support of Combatant Commanders’ and their respective Joint Task Forces’ efforts to defeat improvised explosive devices as weapons of strategic influence” (n.d.). In February 2006, JIEDDO became a permanently manned entity by *DoD Directive 2000.19E* (JIEDDO, n.d.). JIEDDO continues to reach out to its partners to support the Combatant Commanders in the C-IED fight by funding, developing, and fielding new technologies to identify and disrupt IED networks. Since a large number of personnel deployed in support of the Global War on Terror (GWOT) are Army personnel, the Department of the Army established a Product Manager office to provide lifecycle support for these new and emerging technologies.

B. Product Manager IED Defeat/Protect Force

The Army established Product Manager Office PM IED Defeat/Protect Force (PM IEDD/PF), chartered September 2007, to manage all of the Army’s C-IED efforts. PM IED/PF, commanded by LTC Karl Borjes, is under the direction of

Project Manager Close Combat Systems (PM CCS). Both PM IEDD/PF and PM CCS are subsets of the Joint Munitions and Lethality Life Cycle Management Command, and all three offices are headquartered at Picatinny Arsenal, NJ. PM IEDD/PF's mission is:

> To ensure the development, production, fielding and sustainment of the Army's non-traditional, IED defeat and protect force capabilities using accelerated acquisitions strategies to provide the warfighter with the capability to win the war on IEDs (and other global threats) against an adaptive asymmetrical enemy. (JM&L Public Affairs Office, 2007)

PM IEDD/PF products vary widely from simplistic items such as Command Wire Neutralization (Wolf Collar) to the more complex systems of Laser-induced Breakdown Spectroscopy (LIBS) explosives detection. PM IEDD/PF mainly focuses on items and technologies that are defined through the Joint Urgent Operational Needs Statements (JUONS). JIEDDO responds to these JUONS requirements by linking potential material solutions and managers with the resources (funding) in order to get the items to the Soldiers in the shortest amount of time possible. Several of the more prominent items the PM manages that are direct responses to the JUONS process and that JIEDDO has funded include Rhino, Cyclone, Schonstedt, and the Self-Protection Adaptive Roller Kit System (SPARKS)—the largest product managed by PM IEDD/PF. Due to the late Fiscal Year (FY) 07 PM Charter, PM IEDD/PF was unable to complete the required documentation in order to apply for the Program Objective Memorandum cycle for FY 08-13 and is working towards the cycle for FY 10-15.

Currently, PM IEDD/PF is supporting the SPARKS program through several Regional Support Centers (RSC) located throughout Iraq and Afghanistan. Each of these RSCs is responsible for all aspects of the system—from fielding all levels of maintenance concerning the end-item, to system component upgrades, to training new users of the equipment. These RSCs, denoted by stars on the map, are depicted in Figure 5.

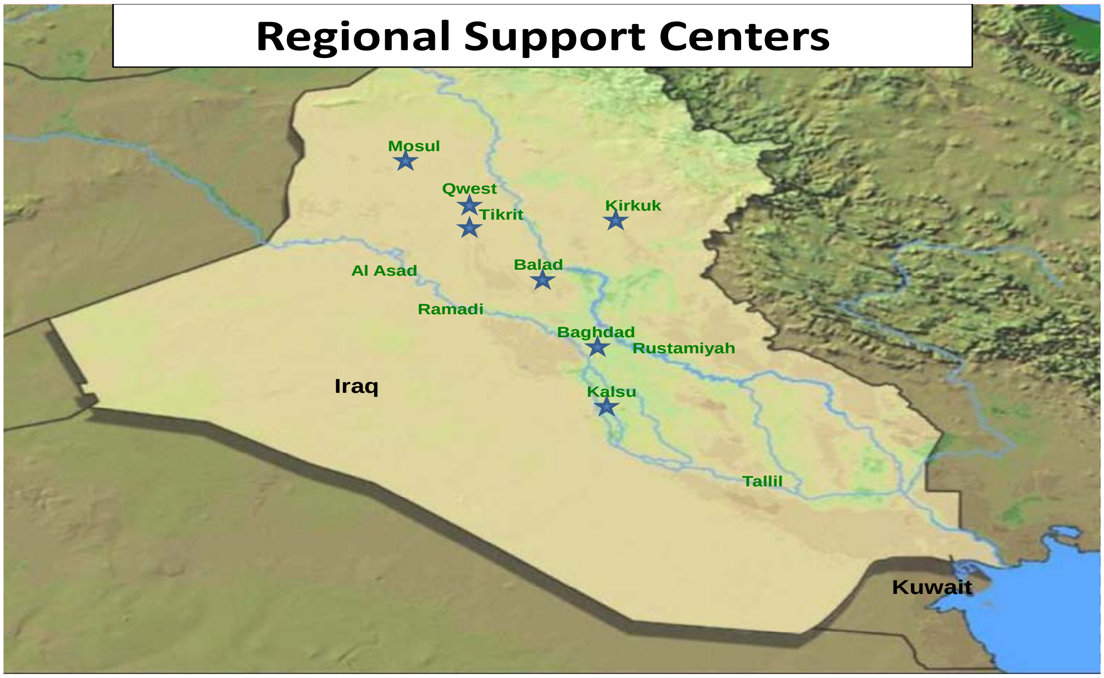

Figure 5. Iraq Regional Support Centers
(Borjes, 2009, p. 5)

The number one threat to Soldiers in Iraq and Afghanistan is the Improvised Explosive Device (IED), which has been responsible for almost 40% of US casualties in Operation Iraqi Freedom. There are numerous ways to activate IEDs—ranging from crude timers to command wires to remote activation via a cell phone. However, one of the most common activation methods is a pressure-sensitive trigger that relies on targets to activate the IED by rolling over it themselves, killing everyone in the vehicle (Borjes, 2008).

The SPARK program is a niche, urgent procurement in order to satisfy a Joint Urgent Operational Needs Statement (JUONS). The overall mission need of this program is to provide the troops in Iraq, fighting in Operation Iraqi Freedom (OIF), and in Afghanistan, fighting in Operation Enduring Freedom (OEF), with a device to trigger the mines before they are killed by driving over them. The Self-protective Adaptive Roller Kit, or SPARK, is the device that connects to the front of the vehicle. The mine roller kit can be mounted to a number of different vehicles. It is designed for "standoff protection" to trigger explosive devices before they can do the most harm to the vehicle and its occupants. Soldiers realized in late 2004 that there was a need to detonate mines before their vehicle physically ran over the mine and all occupants inside were killed, so they improvised and created Sharp Knife (Figure 6) and Sharp Edge (Figure 7).

Figure 6. Sharp Knife Mine Roller
(PM CCS, 2009)

Figure 7. Sharp Edge Mine Roller
(PM CCS, 2009)

C. SPARKS OIF

Figure 8. RG-31 with Track-width Rollers (OIF) Installed
(PM IEDD/PF Product Office, 2009, p. 0002-16)

Figure 9. Full-width RG-31 with Track-width Rollers (OIF) Installed
(PM IEDD/PF Product Office, 2009, p. 0002-7)

With a special need and a Joint Urgent Operational Needs Statement (JUONS) issued from Multi-National Corps Iraq (MNCI) in March 2007, PM IED Defeat and Tank and Automotive Research, Development, and Engineering Command (TARDEC) were able to give the Soldier a mine-roller system that created the standoff they needed.

The OIF variant of the SPARK System has a roller mounted on the front of the vehicle that rolls the route ahead of the vehicle wheels. A second roller mounted on the rear of the vehicle rolls the route left between the wheels of the vehicle to make it safe for following vehicles. The rear roller houses a hydraulic Power Pack to control the front and rear rollers. The Power Pack is electrically driven from the vehicle's 24v system. Specific characteristics of the OIF system are displayed in Table 3 (Appendix A).

D. SPARKS OEF

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Figure 10. MRAP Vehicle with Forward Full-width Rollers (OEF) Installed
(DoA, 2009, p. 002-3)

The OIF SPARK Roller was not designed for use in the rugged terrain of Afghanistan; its inadaptability rendered our soldiers vulnerable to attack. With a special need and a JUONS, PM IED Defeat and TARDEC replaced the OIF SPARK Roller in March 2007 with the Full-width Light-weight Mine Rollers (FWLWMR) in future missions conducted in Afghanistan.

The OEF variant of the SPARK System (the electro-hydraulic power pack) is located behind the track-width rollers and also serves to control the entire roller assembly. Specific characteristics of the OEF system are displayed in Table 4 (Appendix B).

Both SPARK variants serve to provide sufficient pressure to detonate mine fuses and to ensure that the rollers stay in contact with the route at speed; a pushdown system transfers weight from the vehicle onto the front and/or rear rollers.

E. Differences between the Two Models

The OIF track-width rollers have four wheels on each castering roller bank. The full-width configuration can be covered with either the rear rollers or a forward, center roller bank. OEF track-width rollers have three wheels on each castering roller bank. The full-width configuration is covered with a forward, center roller bank only. Both SPARK variants (OIF and OEF) use an identical forward, center roller, which implements a six-wheel castering roller bank (PM IEDD/PF Product Office, 2009, p. 0002-16). Figure 11 depicts the evolution from improved areas in current, fielded SPARKS systems to future concepts.

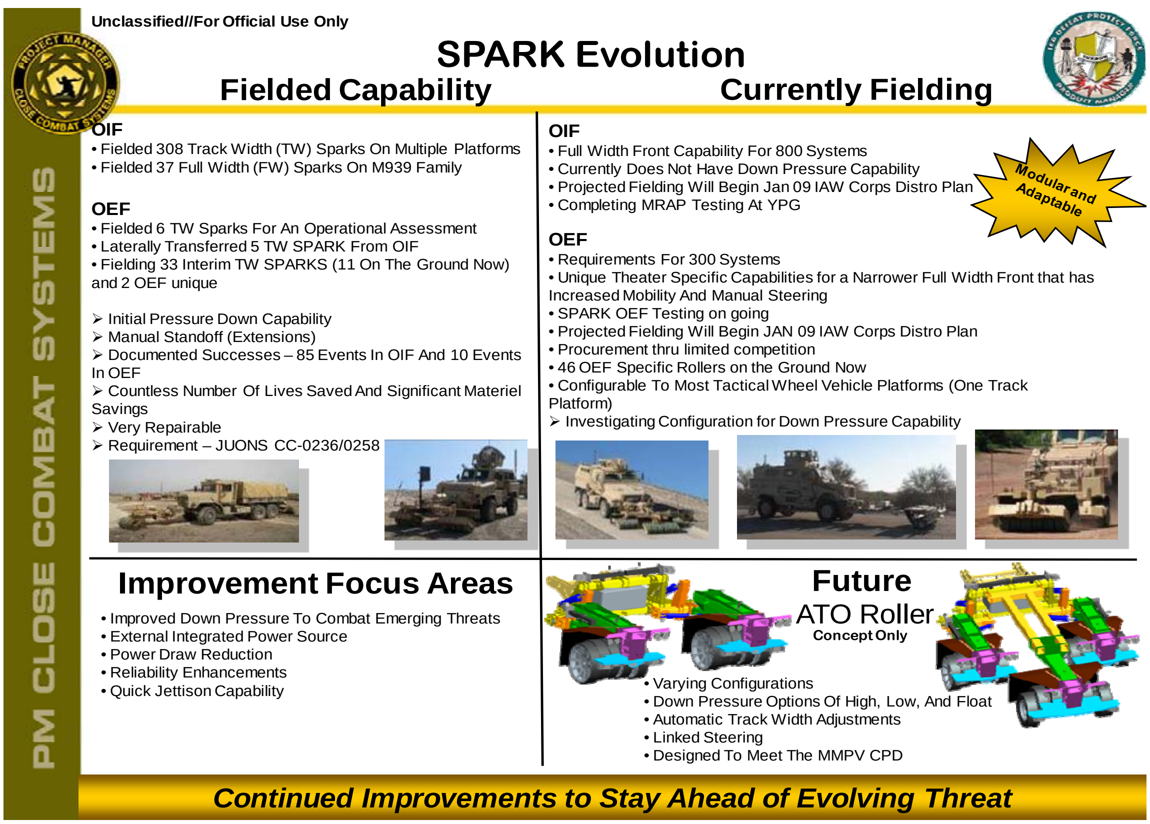

Figure 11. SPARKS Evolution
(Borjes, 2009, p. 11)

F. Procurement Method and Type Used

Based on the procurement history in the commercial sector and the market research that was conducted, the PM determined that the Mine Roller System meets the definition of a commercial item in accordance with the *Federal Acquisition Regulation (FAR)* Part 2.101 (General Services Administration, 2005). The Mine Roller System meets the definition of a commercial item because it is an adaptation of the Roller System customarily found in the commercial construction industry. The Mine Roller System was acquired using the acquisition policies and procedures set out in *FAR* Part 12, "Acquisition of Commercial Items" (2005). The decision to use sole source was based on the results of market research, which showed Pearson to be the only contractor with the ability to produce and deliver the SPARK without unacceptable delays.

G. Market Research

Market research was conducted via a sources-sought notice to Federal Business Opportunities (http://www.fbo.gov) and Subject-matter Expert (SME) research (trade and internet sources). In accordance with *FAR* Part 10, and *FAR* Part 12.101 (a) (General Services Administration, 2005), market research was conducted in support of their determination.

Based on the procurement history, knowledge of the item, and the market research that was conducted—the contracting legal officer determined that the Mine Roller System met the definition of a commercial item in *FAR* Part 2.101. The Pearson Mine Roller System has been sold to the general public via humanitarian organizations, which are funded with monies from private citizens. The Pearson Mine Roller Systems are offered to the general public in the form of a Product

Catalog, which is accessible via the Web at http://www.pearson-eng.com/. Pearson customarily offers training to the general public for all Pearson products; therefore, the requirement for CONUS training meets the definition of a commercial service. The Mine Roller System was acquired using the acquisition policies and procedures set out at *FAR* Part 12, “Acquisition of Commercial Items.”

III. Analysis

A. Introduction

In order to conduct a detailed analysis of the SPARKS program, we first must identify the current practices used by the PM to support this system. Although the SPARKS program is still considered a niche item, we have identified several areas of potential cost savings for the PM to consider. These will be addressed in the following sections of this chapter. Currently, the PM office utilizes an Acquisition Strategy plan, developed in 2007, to purchase repair parts as initial spare parts packages that coincide with the delivery of the SPARKS systems into the OIF theater of operations. Additionally, the PM's plan established CLS as the mechanism for support for the entire system—from the initial receipt of the equipment to the major overhaul of damaged equipment. To determine if any realized cost savings existed, we analyzed elements of the ILS, focusing specifically on Maintenance Planning, Support Equipment, and Supply Support in order to provide substantive recommendations for the PM. The data consists of 48 weekly inventory reports for each of the 471 parts for the SPARKS system. We utilized the data and additional information provided by the PM to identify if any cost savings could be determined based on high parts usage, analysis of high-dollar parts, and analysis of current spare parts ordering (FOB Kits). Additionally, the data provided from the PM and insights and recommendations from the current CLS contractor will allow for the creation of a mixture between an organically maintained Soldier Maintenance Kit (SMK) and contractor-maintained items.

B. Research Questions Addressed

1. Can Cost Savings Be Realized for the SPARKS Program?

In order to answer the primary research question, our analysis focuses on the elements of Integrated Logistics Support outlined in Chapter I. Our analysis utilizes the data provided to accomplish the following:

- Determine which spare parts are considered as High-usage Parts (20% or higher),
- Determine which spare parts are High-dollar Parts ($100+) based on the PM recommendations and show the allocation of funds spent on spare parts (Gullifer, 2009),
- Determine the potential of establishing a Soldier Maintenance Kit (10/20 level organic maintenance) (Harrison, 2009),
- Compare the current plan the PM utilizes to order spare parts and provide a different set of ordering criteria (Forward Operating Base) based on spare-parts analysis, and
- Provide the PM office with a forecasted fiscal-year ordering model with safety stocks incorporated for both the Soldier Maintenance Kit (SMK) and the contractor-maintained RSC.

Upon completion of data compilation, the researchers determined the usage quantity for each of the 471 individual parts; we subsequently expressed each of these statistics as a percentage. This data identifies that a significant portion (89.38%) of the 471 parts were used less than or equal to 15% of the time compared to the total quantities of the spare parts purchased from early 2007 through August 2009. Figure 12 indicates that of the 471 spare parts comprising the OIF SPARKS system, 285 of those parts showed zero demand over the 48-week data-collection period. Figure 12 also shows the significance of having a large inventory of spare parts on-hand to support the SPARKS system.

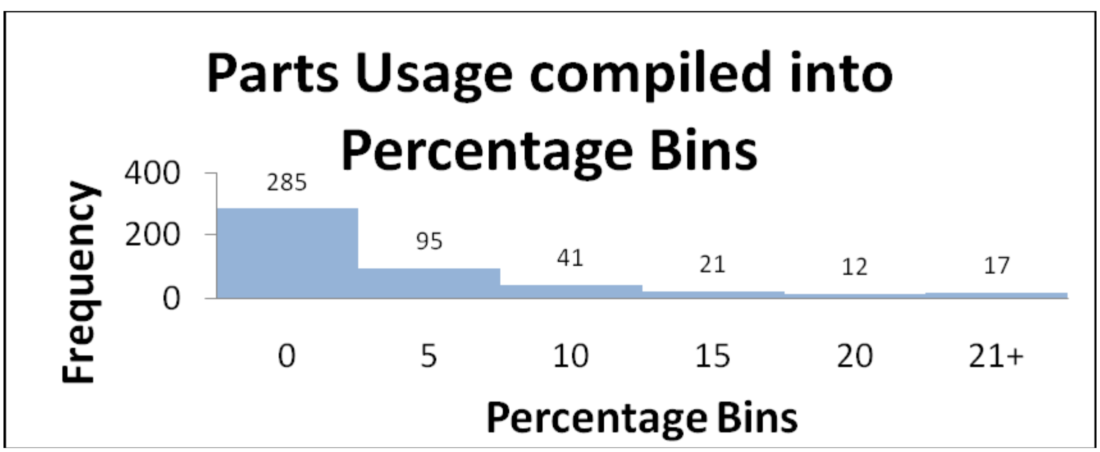

Figure 12. Parts Usage Compiled into Percentage Bins

a. High-usage Parts

High-usage parts are defined as those parts totaling a usage value of 21% or higher when compared to the quantities purchased from program inception to August 2009. The 21% value was determined by the PM office as a starting point for the analysis of the SPARKS program since no significant analysis has been performed prior to this effort (Gullifer, 2009). Table 1 identifies the 17 parts that met the established criterion, as well as the critical parts the PM Office should monitor closely. The data provides insight into parts that may require redesign, remanufacturing techniques, and/or higher order quantities for future spare-parts packages. An example of a major redesign/remanufacture might include part numbers ND8994 and PE26426. ND8994 represents the original part design, and PE26426 represents the improved design. While serving as a forward element of the PM office, one of the authors of this study (MAJ Snipes) worked closely with the receiving units and the Field Service Representatives (FSRs) in order to determine if a redesign of part number ND8994 was needed due to its high-usage/failure rate during deployment from September 2007–March 2008. Based on the data provided from OIF, Pearson—along with support from Government engineers—determined that a redesign was warranted in order to mitigate some of the initial part failures. Although this redesign did improve the life of the part, it still shows a high level of usage.

From this analysis, the researchers identified two outliers: PE24966 and PE25097 usage percentages of 191% and 223%, respectively. One possible explanation for these high percentages could be that the PM IEDD/PF instructed the FSRs to remove as many salvageable spare parts from battle-damaged equipment as possible in order to reduce the downtime for systems.

Table 1. High-usage Parts

PART NO	PRIMARY DESCRIPTION	Total Purchased (all contracts)	Cost / Part US $$$$ (Proprietary Information)	Totals	Difference between Purchased and Used	% Used
KP00461	AXLE ASSEMBLY KIT	**349**		154	195	45%
ND0763	SCREW CAP SOCKET	**1330**		394	936	30%
ND8994	SUSPENSION UNIT TYPE DW-A.70 x 200	**1187**		532	655	45%
PE24569	LOWER PIVOT FRAME	**32**		22	10	69%
PE24622	SPRAY GUARD FRAME - LH	**110**		36	74	33%
PE24626	SPRAY GUARD FRAME - RH	**110**		30	80	28%
PE24690	INDICATOR ROD ASSEMBLY	**483**		99	384	21%
PE24731	REAR BOOM CYLINDER	**24**		5	19	21%
PE24813	PIN - UPPER BOOM / PIVOT	**255**		55	200	22%
PE24907	SCRAPER	**349**		71	278	21%
PE24966	ADJUSTABLE (STAMPED AS PE24965)	**22**		42	-20	191%
PE24977	SPRAY FLAP	**201**		137	64	69%
PE25035	HOSE, F/R, F STEER QR - R STEER QR, A	**30**		9	21	30%
PE25097	JACK ASSEMBLY, FRONT	**31**		69	-38	223%
PE25766	TRAILING ARM PLATE	**674**		142	532	22%
PE25851	JACK	**503**		125	378	25%
PE26426	SUSPENSION UNIT TYPE DW-A.70 x 200	**1030**		309	721	30%

Figure 13 shows the total funds allocation for the parts used versus the overall parts purchased. Additionally, the figure shows that out of the $18.1 million utilized to purchase spare repair parts for the SPARKS system, $16.2 million remains in unused inventory. Again, this figure provides the PM visibility for spare parts usage, allowing the PM to determine if his or her initial assumptions were valid or whether they require updating. To determine the best fit for future spare parts packages, further analysis of spare part type/quantity inventory levels may be required.

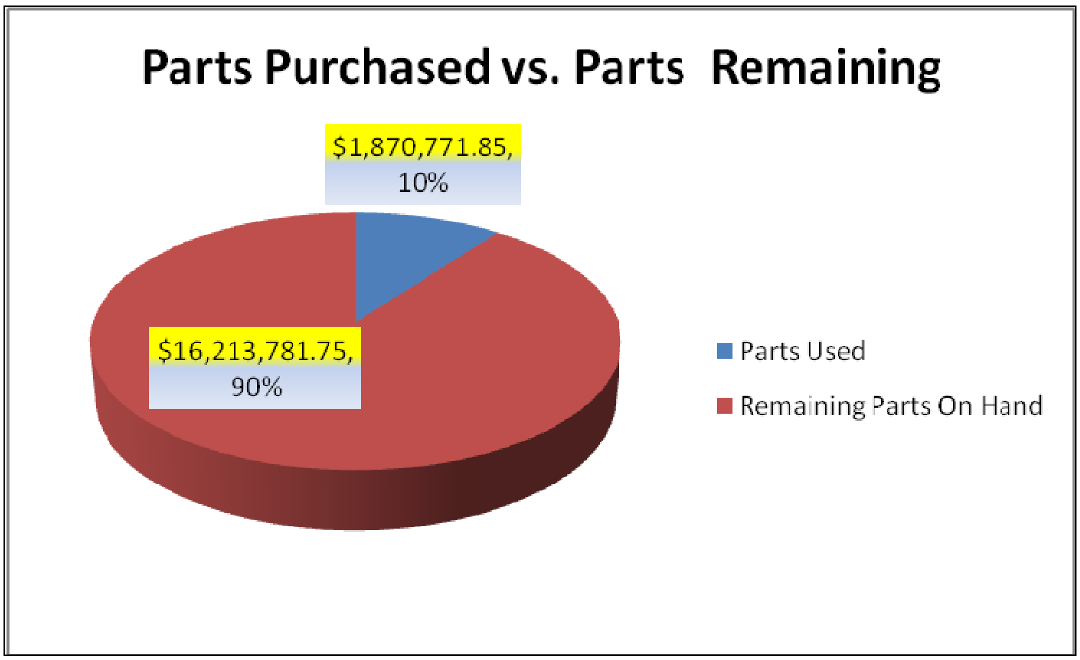

Figure 13. Spare Parts Purchased versus Spare Parts Remaining

b. High-dollar Parts

PM IEDD/PF identified a high-dollar part as any part that has an individual purchase price of $100 or greater (Gullifer, 2009). Figure 14 shows a detailed view of the $18.1 million spent on spare parts, of which 95% was spent on parts costing over $100 each. Further data analysis by the PM office in the area of comparing spare-parts-used data and high-usage parts data will potentially allow the PM office to identify cost savings by reducing inventory levels. If the identified high-dollar part has a low-usage rate, then future purchases of that particular spare part should not occur until there is a demand for that part.

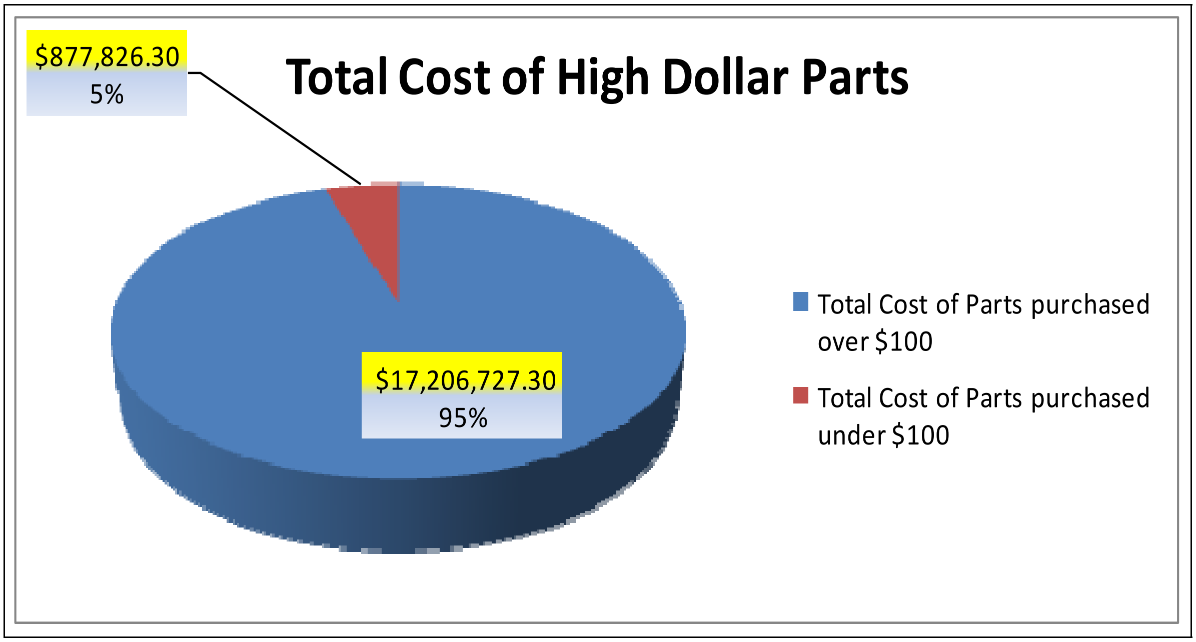

Figure 14. Total Cost of High-dollar Parts

c. Potential Changeover for FOB Kit Ordering

As previously stated, PM IEDD/PF utilizes an acquisition strategy plan to order spare repair parts based on the delivery schedule of the SPARKS systems. From the data provided by the PM office and Pearson Engineering, and based on the current system for ordering FOB Kits, we determined that during the FY09 time period, the PM spent a total of approximately $9.3 million on spare parts. Figure 15 displays the breakdown and overall cost figures for the purchases of the FOB Kits. Table 5 (Appendix B) shows the current policy for ordering FOB Kits.

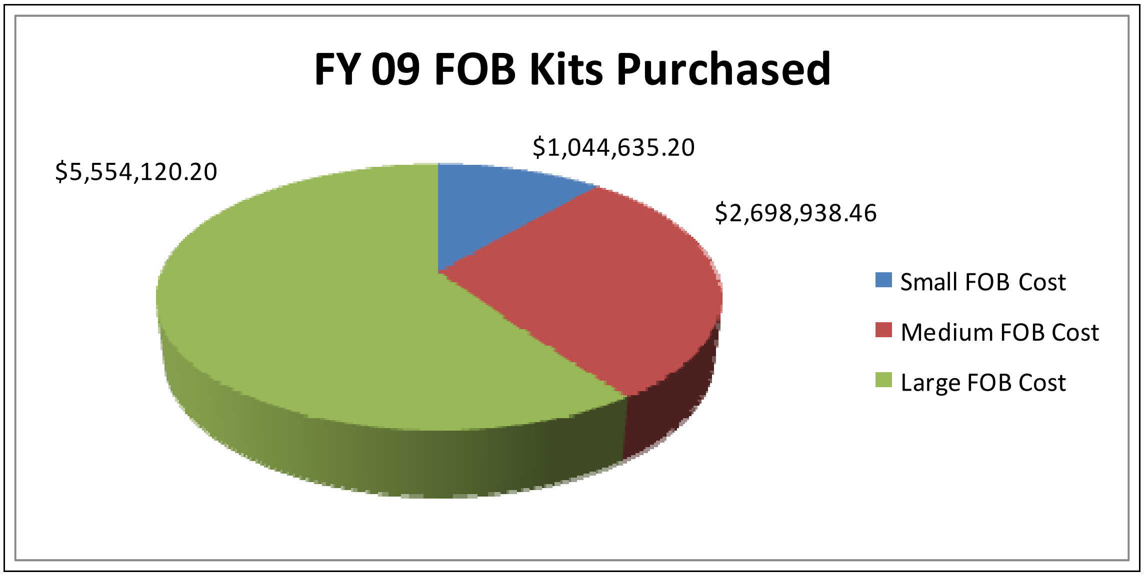

Figure 15. FY09 FOB Kit Spare Parts Purchased (via Current Acquisition Strategy Plan)

From the historical usage data compiled, we determined a potential cost savings of approximately $8.3 million for the PM Office. Figure 16 depicts the cost comparison of all spare part purchases for FOB Kits based on the current acquisition strategy plan versus those same FOB Kit parts being purchased based on the quarterly average use, normalized to one year. We examined the FOB Kit spare parts, identified the usage for the parts, and compared the parts to those ordered under the current plan. We determined the PM office is continually spending money on excess inventory based on the current plan. We determined the average quarterly usage levels for the same FOB Kit spare parts based on the historical usage levels from the data provided. As a result, it is clear that the spare parts in the FOB Kits with low usage levels should not be ordered in the future. Based on the analysis, the PM office could have spent less than $1 million on spare parts—versus the $9.2 million they did spend for the FOB Kit repair parts. Table 6 (Appendix B) displays the FOB Kit New Ordering Policy from quarterly use based on the high-use analysis combined with the current policy for ordering FOB Kits.

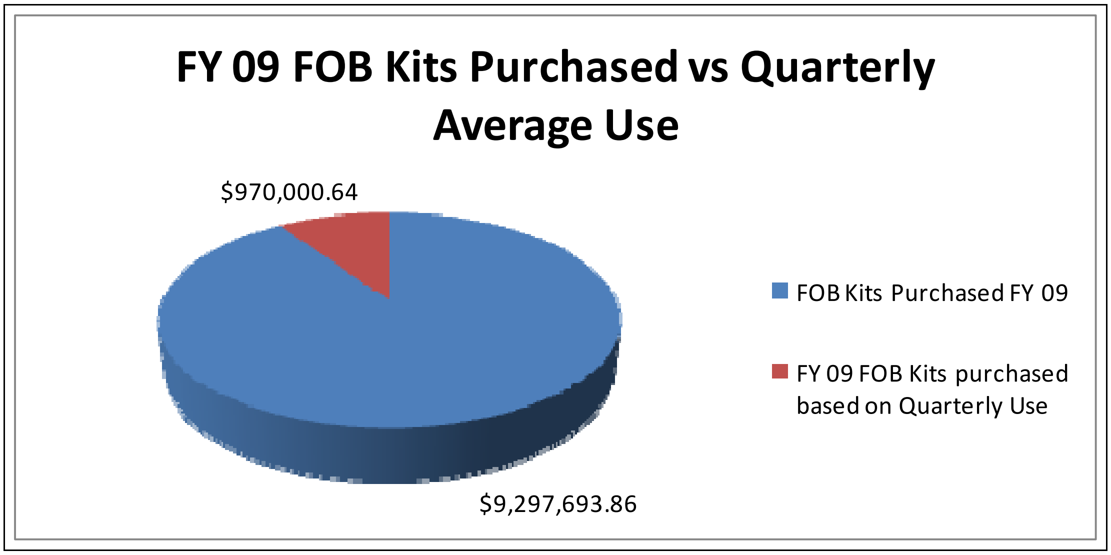

Figure 16. FY09 Comparison of Current Acquisition Strategy Plan versus Historical Usage Normalized to FY09

d. Soldier Maintenance Kit (SMK)

In an effort to reduce CLS costs, PM IEDD/PF requested that this research focus on the repair of spare parts at the organic maintenance level; if this was considered a feasible solution, then the research could focus on determining quantity and type of spare parts that should be managed by a third-party logistics provider (3PLP), i.e., Defense Logistics Agency (DLA). After conferring with the PM office representatives and the contractor providing the actual maintenance of the systems, we have determined that a portion of the 471 individual spare parts that comprise the SPARKS system could transfer to an organic-level maintenance team (Harrison, 2009; Gullifer, 2009). This determination was made by reviewing each individual part with the contractor; in this way, we could support or deny whether a typical organic maintenance person, with the current battalion-level maintenance toolkits already in the Army inventory, could replace the part. Table 7 (Appendix B) shows the parts discussed in this conference. The parts not identified as organic-level maintenance items will remain as items for contractor repair. The collected data provided by the PM was compiled into the total parts used for each spare part included in the SMK. Since the time period of collected data accounted for approximately 11 months, we normalized the data to a full year. The values shown in Table 7 (Appendix B), in the column titled "Qty to Purchase for DLA Stock Next FY Safety Stock @ 12.5%," also represent a 12.5% safety stock included, based on the recommendations from PM IEDD/PF (Gullifer, 2009). The quantity levels indicated in this column represent the amount of spare parts that could potentially be managed by a 3PLP, the DLA. Additionally, the PM stated that the RSC should maintain a certain quantity of each of the SMK parts but on a reduced level when compared to the DLA stock levels. PM IEDD/PF recommended that the contractor maintain at each RSC approximately 25% stock level of the DLA-managed items, including the safety stock, to ensure responsive operations throughout the theater of operations. These quantities are represented by the column titled "Qty to Purchase for RSC Safety Stock at 25%." From the parts previously identified as high usage, 41% of those comprise parts included in the SMK.

2. Does PM IEDD/PF's Current Logistics Management Plan Represent a Best Allocation of Resources?

From the 10 ILS elements, we analyzed numerous aspects surrounding Maintenance Planning, Support Equipment, and Supply Support. The objective of maintenance planning is to provide the warfighter with the best equipment possible at the lowest LCC by identifying, planning, resourcing, and implementing sound maintenance concepts (DoA, 2009, p. 13). Currently, PM IEDD/PF uses a CLS contract, Firm-Fixed-Price for Time and Materials, for all maintenance actions. Because SPARKS is a rapid-acquisition program from a JUONS requirement, CLS maintenance was paramount to ensure rapid delivery and support of the system to enhance the warfighters' capabilities. As the program continues to mature, other maintenance options (rather than purely CLS) should be explored. We examined the following maintenance options: a mixture of organic and contractor maintenance options, required manpower skill levels, levels of repair, repair times, and maintenance-support equipment needs. Based on firsthand knowledge we garnered and the interviews conducted with the PM office and the contractors, we determined that a mixture of organic and contractor maintenance options was a feasible solution and would not require the addition of a new Military Occupational Specialty (MOS). The current 63B MOS (Wheeled Vehicle Mechanic) could perform some of the repairs for the SPARKS system, given that the soldier was trained, had a Technical Manual (TM) explaining the repairs, or both. Once trained, the mechanic could also train/oversee the individual unit operators of the SPARKS system in repairs, leaving the mechanic to perform other maintenance duties as required. Based on these aspects, we were able to determine that by establishing differing levels of repair, the operating unit would experience a decrease in repair times for the systems. Currently, if a SPARKS is deemed Non-mission Capable (NMC), the unit must decide how best to get the system back to an RSC. Once the SPARKS was at the RSC, the contractors would repair the system and inform the unit the system had been repaired and was ready to pick up. If the unit could not return the damaged equipment to an RSC, then the contractor would be required to travel to the unit location, conduct the inspection, determine the repair parts needed, and, finally, fix the system. This process could take several weeks due to numerous factors such as airlift capability, size of the repair parts needed (are they transportable by hand or do they require shipping?), unit operational tempo, and so on. If the unit had the repair parts necessary to bring the SPARKS back to FMC status, most of the downtime from the example could be eliminated. Additionally, a mixture of organic and contractor maintenance should reduce the contractor's logistics footprint throughout the theater.

The objective for Support Equipment is to provide the necessary equipment to sustain the system and, therefore, ensure the system is available to warfighters when they need it (DoA, 2009, p. 13). Initially, PM IEDD/PF completed an excellent analysis of support equipment required for SPARKS. From their analysis, they designed the SPARKS system such that no specialized repair equipment was needed. The system could be repaired utilizing current Army assets, the Common Number One Toolkit. Also, the system can be transported by the most common Army assets: Family of Medium Tactical Vehicles (FMTV), Palletized Load System (PLS), Heavy Expanded Mobility Tactical Truck (HEMTT), Fixed-wing aircraft (C-130 and higher). The system can also be sling-loaded by current rotary wing assets. Again, based on the PM's initial assessment, they were able to ensure that the SPARKS would not require any specialized test equipment such as Test, Measurement and Diagnostic Equipment (TMDE). From their analysis, PM IEDD/PF has potentially reduced the overall LCC concerning support equipment needs for SPARKS. As previously mentioned, two-thirds of a system LCC occurs during the operations and sustainment phase. Any reduction in specialized support equipment will contribute significant savings over the total life of the system.

The objective of Supply Support is to implement management actions to acquire all classes of supplies needed to ensure the system is in the best operational condition to support the warfighters' mission at the lowest possible LCC (DoA, 2009, p. 13). PM IEDD/PF identified early in the response to the JUONS that a certain quantity of Battle-damaged Replacement Systems and initial quantities spare repair parts would be required. Resourced from JIEDDO, the PM created the initial repair parts packages (which are still in use) based on the size of the Forward Operating Base (FOB) where the RSC would be potentially located. For example, the RSC located in Balad, Iraq, is considered a large FOB, and, therefore (as shown in Table 5 in Appendix B), the PM would order quantities of each of the identified repair parts deemed appropriate for a large FOB. Once acquired, the repair parts would be issued to the contractors as Government-furnished Equipment (GFE), and the contractors would be required to account for and maintain a 90-day stock level for all repair parts (Bean, 2008, p. 5). For any parts that fall below the 90-day stock level, the contractor must request replenishment through the PM IEDD/PF ILS support office (Bean, 2008, p. 5). Since the SPARKS system was developed in response to an urgent requirement, the PM office requested that the system be issued a Non-standard Line-item Number (NS-LIN) in order to maintain 100% property accountability. This NS-LIN enabled the PM office to transfer the systems to the Theater-provided Equipment (TPE) list quickly and into the hands of the warfighter in a smooth and efficient manner.

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IV. Conclusions and Recommendations

A. Conclusion

Throughout this project, we focused on current ILS and PM practices to ascertain if any cost savings could be determined for the SPARKS program. As a result of our analysis and ongoing discussions with the PM office throughout this project, the PM is implementing new spare-part ordering policies and will continue to strive to implement other recommendations for current and future support of the SPARKS program.

Logistics is an ongoing process. Support requirements for weapon systems change almost daily. To accommodate these changes, the DoD and PMs are continuously trying to improve the process based on PBL, CLS support, Organic support, or simpler ideas of logistics analysis. There is no single best way to optimize logistics support. Making a measurable impact on any program generally involves a combination of all these processes. After reviewing all the information collected and analyzed for this project, we believe that an overarching support analysis approach, as previously mentioned, will optimize the logistics support for SPARKS. From this analysis, we believe that the recommendations presented below will ultimately save the PM money for the SPARKS program, regardless of the operating environment.

Key Takeaway Points

- Effective tracking of high-usage parts can yield repair parts cost savings and identify potential redesign/reengineer efforts for specific parts.
- High-dollar parts must be monitored, as they could result in significant cost drivers for the program over the lifecycle of the system when those parts begin to fail.
- PM IEDD/PF should complete a Business Case Analysis (BCA) for PBL and CLS. The Program Office should compare the results to determine the best value option for the SPARKS program.

- Bulk ordering of spare parts by FOB Kits should be replaced with quarterly forecasts based on historical part usage analysis.
- The Soldier Maintenance Kit is a viable option for implementing a hybrid mix of organic and contractor support that could generate additional savings for the SPARKS program.

B. Recommendations

1. Conduct a Business Case Analysis on the Implementation of Performance-based Logistics (PBL) versus Maintaining Contractor Logistics Support (CLS)

As mentioned previously, PM IEDD/PF currently utilizes CLS for support of the SPARKS program. When the SPARKS system was first fielded, the CLS concept was the most effective means of supporting this rapid-acquisition program. Now that the logistical support for the SPARKS systems has matured, CLS may no longer be the best/most effective option for logistical support of the program.

As noted in several GAO reports and DoD policies, PBL is mandatory for all Army Category (ACAT) I and II programs. The Department of the Army still considers SPARKS a niche item, and it does not meet the requirements for ACAT I or ACAT II programs. Classification as a niche item presents several complicating issues for the PM. The DoD still encourages other non ACAT I and II programs to institute PBL where applicable. In order for the PM to determine if PBL would be beneficial for the SPARKS program, the PM office must conduct a Business Case Analysis for the system. Although conducting a BCA is outside the scope of this project, we recommend that the Program Office conduct its own BCA based on the elements defined in *DoD Instruction Economic Analysis for Decision Making* (DoD, 1995, pp. 7-12).

2. Continue to Monitor High-usage Parts for Potential Savings and High-dollar Parts for Potential Future Support Issues

Based on our analysis of available data, there appears to be more potential cost savings that could be retrieved if the PM focused attention on high-usage parts over high-dollar parts. However, high-dollar parts should be continuously monitored, as they could become a support issue and have significant impact on repair parts costs as the systems age. From the analysis of the data collected for this project, the PM Office should apply the techniques[1] described previously in the analysis section of this report. This will enable the PM to determine if the high-usage part requires reengineering due to part failures, or if the part is an initial-issue item. By continuing to monitor the high-usage parts, the PM can make better-informed decisions regarding future spare parts purchases, possibly reducing excess inventory. The insight the PM gains from applying these principles to the OIF Theater will provide a path forward to logistical support for the SPARKS in the OEF Theater or for any future contingency.

3. Reformulate Current Repair Parts Ordering Kits to an Ordering System Based on Quarterly Spare Parts Consumption

Bulk ordering based on FOB size was the original approach for spare parts ordering. Since SPARKS started as a rapid-acquisition initiative, purchasing spare parts by bulk packages was a sound strategy. Now that the program has historical data, a better approach for spare parts management could be achieved via the following elements:

- Review historical parts usage data to help forecast future spare parts purchases.
- Conduct an analysis of the forecasted spare parts purchases with current on-hand quantities in order to determine the optimal order quantity.
- For future contracts, establish individual Contract Line-item Numbers (CLINs) for each of the parts that comprise the SPARKS.
- Update the Acquisition Strategy Plan to reflect the CLIN ordering structure.

[1] These techniques include: monitoring the identified high-usage parts and coupling the information with an analysis to determine if redesign/reengineering is required; monitoring quantities of spare parts available in theater and potentially adjusting spare parts package orders as necessary; and monitoring order quantities on all spare parts to identify changes to the high-usage parts list.

- If the SPARKS program moves from a niche item to a Program of Record (POR), the PM should establish Indefinite Delivery/Indefinite Quantity (ID/IQ) contracts.

4. Institute the Soldier Maintenance Kit (SMK)

As discussed in the analysis chapter, the contractor currently performs all maintenance activities for the SPARKS. This study found that a mixture of CLS and organic support would be a viable option for the SPARKS program. Even though the SPARKS program is still considered a niche item, the PM office can still provide an interim level of support given that the following elements are addressed:

- The PM, in conjunction with the Original Equipment Manufacturer (OEM) and support contractor, must create a unit-level maintenance manual that describes the maintenance procedures for identifying faults and the necessary steps to correct those faults based on the parts identified in the SMK.
- The PM should consider creating an offline ordering account with the Defense Logistics Agency (DLA) in order to help the program transition from solely contractor maintenance support to a mixture of contractor and organic maintenance support. This will allow units to order repair parts through the DLA, therefore reducing inventory levels in theater at each of the RSCs.
- As described in the analysis chapter, although the DLA would manage a certain quantity of the SMK inventory levels, each of the RSCs would also maintain specific quantities of the SMK items for urgent logistical support to the operating units.
- If the SPARKS Program matures into a POR, then the nonstandard part numbers created through the offline account will allow the DLA to transition those parts into National Stock Numbers (NSNs).
- The assignment of NSNs will allow any unit maintenance team to order the required spare parts through any DoD supply system. This will transition spare parts ordering responsibilities from the PM Office to the units maintaining and employing the SPARKS.

C. Further Research

Although we based this analysis solely on the OIF Theater, the same type of data analysis is applicable to OEF (Afghanistan) to determine a better logistics support approach. Additionally, as contingency operations in Iraq continue to decrease and the need for the SPARKS system increases in OEF, the PM could transfer a majority of the spare parts inventory in Iraq to Afghanistan. Finally, the PM should conduct (or sponsor) further research into the costs and benefits associated with contractor personnel levels and determine if additional cost savings can be obtained using a mixture of contractor and organic personnel logistics support.

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APPENDIX A. Elements of Integrated Logistics Support

Table 2. Elements of Integrated Logistics Support
(From DoA, 2009, p. 15)

Element	Objective	Description
Maintenance planning	Identify, plan, resource, and implement maintenance concepts and requirements to ensure the best possible equipment/capability is available when the warfighter needs it at the lowest possible LCC.	Establishes maintenance concepts and requirements for the life of the system to include hardware and software. It includes, but is not limited to, levels of repair, repair times, testability requirements, support equipment needs, training and TADSS, manpower skills, facilities, interservice, organic and contractor mix of repair responsibility, site activation, development of preventive maintenance programs using reliability centered maintenance, sustainment, PBL planning and post-production software support, etc. This element has a great impact on the planning, development, and acquisition of other logistics-support elements.
Manpower and personnel	Identify, plan, resource and acquire personnel, civilian and military, with the grades and skills required: a) to operate equipment, to complete the missions, to effectively fight or support the fight, to win our nation’s wars; b) to effectively support the Soldier, and to ensure the best capability is available for the warfighter when needed.	Involves the identification and acquisition of personnel (military and civilian) with the skills and grades required to operate, maintain, and support systems over their lifetime. Early identification is essential. If the needed manpower is an additive requirement to existing manpower levels of an organization, a formalized process of identification and justification must be made to higher authority.
Supply support	Identify, plan, resource and implement management actions to acquire repair parts, spares, and all classes of supply to ensure the best equipment/capability is available to support the warfighter or maintainer when it is needed at the lowest possible LCC.	Consists of all management actions, procedures, and techniques necessary to determine requirements to acquire, catalog, receive, store, transfer, issue and dispose of spares, repair parts, and supplies. This means having the right spares, repair parts, and all classes of supplies available, in the right quantities, at the right place, at the right time, at the right price. The process includes provisioning for initial support, as well as acquiring, distributing, and replenishing inventories.

Element	Objective	Description
Support equipment	Identify, plan, resource and implement management actions to acquire and support the equipment (mobile or fixed) required to sustain the operation and maintenance of the system to ensure that the system is available to the warfighter when it is needed at the lowest LCC.	Consists of all equipment (mobile or fixed) required to support the operation and maintenance of a system. This includes but is not limited to ground handling and maintenance equipment, trucks, air conditioners, generators, tools, metrology and calibration equipment, and manual and automatic test equipment. During the acquisition of systems, program managers are expected to decrease the proliferation of support equipment into the inventory by minimizing the development of new support equipment and giving more attention to the use of existing government or commercial equipment.
Technical data	Identify, plan, resource and implement management actions to develop and acquire information: a) to operate, maintain, and train on the equipment to maximize its effectiveness and availability; b) to effectively catalog and acquire spare/repair parts, support equipment, and all classes of supply; c) to define the configuration baseline of the system (hardware and software) to effectively support the warfighter with the best capability at the time it is needed.	Represents recorded information of scientific or technical nature, regardless of form or character (such as equipment technical manuals and engineering drawings), engineering data, specifications, standards and Data Item Descriptions (DID). Technical manuals (TMs), including Interactive Electronic Technical Manuals (IETMs) and engineering drawings, are the most expensive and probably the most important data acquisitions made in support of a system. TMs and IETMs provide the instructions for operation and maintenance of a system. IETMs also provide integrated training and diagnostic fault isolation procedures. Address data rights and data delivery as well as use of any proprietary data as part of this element.
Training and training support	Plan, resource, and implement a cohesive integrated strategy to train military and civilian personnel to maximize the effectiveness of the doctrine, manpower and personnel, to fight, operate, and maintain the equipment throughout the lifecycle. As part of the strategy, plan, resource, and implement management actions to identify, develop, and acquire Training Aids Devices Simulators and Simulations (TADSS) to maximize the effectiveness of	Consists of the policy, processes, procedures, techniques, Training Aids Devices Simulators and Simulations (TADSS), planning and provisioning for the training base—including equipment used to train civilian and military personnel to acquire, operate, maintain, and support a system. This includes New Equipment Training (NET), institutional, sustainment training and Displaced Equipment Training (DET) for the individual, crew, unit, collective, and maintenance through initial, formal, informal, on-the-job training (OJT), and sustainment proficiency training. Significant efforts are focused on NET, which (in conjunction with the overall training strategy) shall be validated during

Element	Objective	Description
	the manpower and personnel to fight, operate, and sustain equipment at the lowest LCC.	system evaluation and test at the individual, crew, and unit level.
Computer resources support	Identify, plan, resource, and acquire facilities, hardware, software, documentation, manpower and personnel necessary for planning and management of mission-critical computer hardware and software systems.	Encompass the facilities, hardware, software, documentation, manpower, and personnel needed to operate and support mission-critical computer hardware/software systems. As the primary end-item, support equipment, and training devices increase in complexity, more and more software is being used. The expense associated with the design and maintenance of software programs is so high that one cannot afford not to manage this process effectively. It is standard practice to establish some form of computer resource working group to accomplish the necessary planning and management of computer resources support. Computer programs and software are often part of the technical data that defines the current and future configuration baseline of the system necessary to develop safe and effective procedures for operation and maintenance of the system. Software technical data comes in many forms to include, but not limited to, specifications, flow/logic diagrams, Computer Software Configuration Item definitions, test descriptions, operating environments, user and maintainer manuals, and computer code.
Facilities	Identify, plan, resource, and acquire facilities to enable training, maintenance and storage to maximize effectiveness of system operation and the logistic support system at the lowest LCC. Identify and prepare plans for the acquisition of facilities to enable responsive support for the warfighter.	Consists of the permanent and semi-permanent real property assets required to support a system—including studies to define types of facilities or facility improvements, location, space needs, environmental and security requirements, and equipment. It includes facilities for training, equipment storage, maintenance, supply storage, ammunition storage, and so forth.
Packaging, handling, storage, and transportation (PHST)	Identify, plan, resource, and acquire packaging/preservation, handling, storage and transportation (PHST) requirements to maximize availability and usability of the materiel—to include support	The combination of resources, processes, procedures, design, considerations, and methods to ensure that all system, equipment, and support items are preserved, packaged, handled, and transported properly—including environmental considerations, equipment preservation for the short and long storage,

Element	Objective	Description
	items whenever they are needed for training or mission.	and transportability. Some items require special environmentally controlled, shock-isolated containers for transport to and from repair and storage facilities via all modes of transportation (land, rail, air, and sea).
Design influence/interface	Participate in the systems engineering process to impact the design from its inception throughout the lifecycle, facilitating supportability to maximize the availability, effectiveness and capability of the system at the lowest LCC.	Logistics-related design influence parameters include the following: –Reliability, availability, maintainability (RAM) (RAM) –Human factors –Soldier/machine/software/interface/ usability –System safety –Survivability and vulnerability –Hazardous material management –Environmental quality factors such as assessment of air, water, and noise pollution. –Standardization and interoperability –Energy management –Corrosion –Nondestructive inspection –Transportability These logistics-related design influence parameters are expressed in operational terms rather than inherent values and specifically relate to system readiness objectives and support costs of the system. Design interface really boils down to evaluating all facets of an acquisition, from design to support and operational concepts for logistical impacts to the system itself and the logistic infrastructure. Design interface includes developing the system to operate in a net-centric environment (for example, CLOE that complies with the Army Integrated Logistics Architecture (AILA)).

Table 3. SPARKS OIF
(From PM IEDD/PF Product Office, 2009, p. 0002-16)

Full-width Rollers:
Weight .... 3,005 kg (6,620 lbs)
Total width .... 314.5 cm (124 in)
Front roller width .... 98.5 cm (39 in)
Center gap .... 117.5 cm (46 in)
Rear roller width .... 147.5 cm (58 in)

Front Roller:
Height... 125 cm (49 in)
Length .... 240 cm (95 in)
Width... 240 cm (95 in)
Weight .... 1,225 kg (2,700 lbs)

Rear Roller with Hydraulic Power Pack:
Height... 125 cm (49 in)
Length .... 240cm (95 in)
Width... 240 cm (95 in)
Weight .... 1,225 kg (2,700 lb)

5-Ton Vehicle Mounting Brackets (Full-width):
Length attached to vehicle .... 420 cm (14.04 ft)
Length beyond front of vehicle .... 220 cm (7 ft)
Length beyond behind vehicle .... 220 cm (7 ft)
Width... 330 cm (10.78 ft)
Width beyond vehicle.................................... 81 cm (2.67 ft)
Weight .... 46 kg (500 lbs)

HMMWV Vehicle Mounting Bracket (Track -width):
Length beyond vehicle .... 220 cm (7 ft)
Width beyond vehicle (w/ Frag Kit 5 armor). 60 cm (1.9 ft)
Weight .... 148 kg (325 lb)

RG-31 MPV Mounting Bracket (Track-width):
Length beyond vehicle .... 220 cm (7 ft)
Width beyond vehicle.................................... 110 cm (3.5 ft)
Weight .... 159 kg (350 lbs)

BFV Mounting Bracket (Track-width):
Length attached to vehicle .... 878 cm (28.83 ft)
Length beyond vehicle .... 236 cm (7.75 ft)
Width beyond vehicle.................................... 36 cm (1.17 ft)
Weight .... 150 kg (330 lb)
Weight of vehicle with roller......................... 35,471 kg (78,200 lbs)

Table 4. SPARKS OEF
(From PM IEDD/PF Product Office, 2009, p. 0002-17)

Complete Assembly:

Height (with Indicator Rods) .... 200.2 cm (78.8 in)
Length .... 393 cm (154.7 in)
Width... 274.3 cm (108 in)
Weight .... 2,629 kg (5,797 lbs)

Track-width Roller:

Height (without Indicator Rod)..................... 132.4 cm (52.1 in)
Length (without Power Pack)........................ 208.3 cm (82 in)
Length (with Power Pack)............................ 238.8 cm (94 in)
Width... 274.3 cm (107 in)
Weight .... TBD
Total width .... 274.3 cm (108 in)
Track-width roller bank width (each)............ 75.2 cm (29.6 in)
Center gap .... 123.9 cm(48.8 in)
Front Center Roller Width (with mud guards) 175.3 cm (69 in)

5-Ton Vehicle Mounting Brackets (Full-width):

Length attached to vehicle .... 420 cm (14.04 ft)
Length beyond front of vehicle .... 220 cm (7 ft)
Length beyond behind vehicle .... 220 cm (7 ft)
Width... 330 cm (10.78 ft)
Width beyond vehicle.................................... 81 cm (2.67 ft)
Weight .... 46 kg (500 lb)

HMMWV Vehicle Mounting Bracket (Track-width):

Length beyond vehicle .... 220 cm (7 ft)
Width beyond vehicle (w/ Frag Kit 5 armor). 60 cm (1.9 ft)
Weight .... 148 kg (325 lbs)

RG-31 MPV Mounting Bracket (Track-width):

Length beyond vehicle .... 220 cm (7 ft)
Width beyond vehicle.................................... 110 cm (3.5 ft)
Weight .... 159 kg (350 lbs)

BFV Mounting Bracket (Track-width):

Length attached to vehicle .... 878 cm (28.83 ft)
Length beyond vehicle .... 236 cm (7.75 ft)
Width beyond vehicle.................................... 36 cm (1.17 ft)
Weight .... 150 kg (330 lbs)
Weight of vehicle with roller......................... 35,471 kg (78,200 lbs)

APPENDIX B. Spare Parts Ordering Tables

Table 5. FOB Kit Current Ordering Policy

PART	DESCRIPTION	Small Qty	Medium Qty	Large Qty
CS0348/14.0	HARNESS RCU TO VPU	0	0	2
CS0351/11.0	HARNESS POWER I/V FUSE BOX TO MPU	0	0	2
CS0354/9.0	HARNESS FUSE BOX TO VPU	0	0	2
CS3228/2.2	HARNESS VALVE PACK TO STEERING CYLINDER	0	0	2
ND0048	SCREW HEX M8X25L	150	200	350
ND0050	SCREW HEX M10X16L	200	250	500
ND0065	SCREW HEX M20X50L GRD 8.8 P	100	100	200
ND0072	NUT HEX FULL M6	1	1	25
ND0075	HEX NUT, FULL, M12	1	1	25
ND0076	NUT HEX FULL M16	25	75	100
ND0078	WASHER SINGLE COIL M3	1	1	50
ND0081	WASHER SINGLE COIL SPRING M6	25	25	25
ND0082	WASHER SINGLE COIL SPRING M8	75	150	250
ND0083	WASHER SINGLE COIL SPRING M10	75	100	200
ND0084	WASHER SINGLE COIL M12 STL P	30	50	100
ND0085	WASHER SINGLE COIL SPRING M16	30	50	100
ND0091	WASHER FLAT M10 STL. P.	1	1	100
ND0092	WASHER FLAT M12	25	75	100
ND0093	WASHER FLAT M16 STL. P	5	10	100
ND0114	SCREW HEX M12X50L	60	150	300
ND0128	WASHER FLAT M8	30	75	100
ND0149	SCREW HAMMER DRIVE No.6 x 1/4	15	25	100
ND0154	SPLIT KEY RING 30MM O/D	100	200	300
ND0285	PIN	100	150	200
ND0289	SCREW HEX M12x20L	1	1	25
ND0293	PIN, SAFETY LINCH	50	100	200
ND0294	PIN, SAFETY LINCH - 7.5mm DIA	100	200	300
ND0295	PIN, SAFETY LINCH	25	100	150
ND0306	NUT SELF-LOCKING M12	50	100	500

PART	DESCRIPTION	Small Qty	Medium Qty	Large Qty
ND0312	HEX NUT NYLOC M10	50	250	400
ND0315	SCREW HEX M10X50L	1	1	25
ND0332	BONDED SEAL 3/8"BSP (SELF CENTERING)	1	1	25
ND0336	ADAPTOR 3/8" BSP M-3/8" BSP M	15	25	50
ND0548	BOLT HEX M16X150L	50	75	100
ND0549	NUT HEX FULL M10 STL P	25	50	100
ND0578	SCREW HEX M12X35L	1	0	25
ND0763	SCREW CAP SOCKET	50	100	500
ND0923	BOLT HEX M12x50L	25	75	75
ND0930	TEE G 3/8" MALE	25	50	100
ND0973	SCREW HEX M16X50L	5	10	25
ND0979	WASHER FLAT M3	1	1	25
ND1002	SCREW HEX HD M8X30 GRD 8.8 ZINC PLT	150	600	600
ND10224	QUICK RELEASE COUPLING MALE 3/8"BSP	5	10	25
ND10225	QUICK RELEASE COUPLING FEMALE 3/8" BSP	5	10	25
ND10235	SPACER	100	300	300
ND10248	SPACER	200	800	800
ND1207	M20 NYLOC NUT	100	150	200
ND1209	NUT NYLOC M8 TYPE P GRD 8 ZINC PLT	100	600	700
ND2026	ADAPTER M/M 1/2" - 3/8"	1	1	5
ND2312	ELBOW 90DEG 3/8M X 3/8F	1	1	25
ND2627	BOLT HEX M10x70L GRD 8.8	150	500	500
ND2646	LOCKING COLLAR	25	50	100
ND2691	SCREW HEX M30 X 120L	10	25	50
ND2926	BONDED SEAL 3/8" BSP (SELF CENTERED)	25	25	100
ND2942	BULKHEAD CONN G 3/8	5	10	25
ND3209	ADAPTOR 3/8 BSP M - 3/8 BSP F	5	15	25
ND3315	WASHER BONDED S/C G3/8" NITRILE STL Z/PLT	2	6	10
ND3325	GREASE NIPPLE STRAIGHT M8 X 1.25P	50	100	400
ND4359	LOCTITE 243 (THREADLOCK)	2	6	10

PART	DESCRIPTION	Small Qty	Medium Qty	Large Qty
ND4418	WASHER SERRATED SAFETY M20	100	500	700
ND4452	M8x25 HEX HEAD SCREW Gr8.8	25	50	100
ND4780	BOLT HEX HEAD M6 X 60 LG GR8.8 ZP	1	1	5
ND4862	TEE 3/8 BSP M,M ON RUN, F ON BRANCH	2	6	10
ND5080	WASHER FLAT M8 FORM C, ZP	5	15	25
ND5705	BOLT HEX M12X110 L	20	50	75
ND5917	SCREW HEX M10x12L	65	100	150
ND6553	SWIVEL ELBOW (COMPACT) 3/8" BSP M/F,	25	50	75
ND6758	BUSH 44 O/D X 50 I/D X 30 LONG GRADE S	10	25	50
ND6759	BUSH 55 O/D X 50 I/D X 50 LONG GRADE S	25	100	500
ND6760	BUSH 75 O/D X 70 I/D X 40 LONG GRADE S	5	15	25
ND6761	BUSH 105 O/D X 100 I/D X 60 LONG GRADE S	5	20	25
ND6763	THRUST WASHER 90 O/D X 72 I/D X 6 THK	25	50	100
ND6764	THRUST WASHER 130 O/D X 102 I/D X 6 THK	15	25	50
ND6772	BOLT HEX M10x65L	25	50	100
ND6989	SCREW PAN HD SLOT M5x12L GRD A2	25	50	100
ND7040	BOLT HEX M20 X 120L	1	1	5
ND7095	SCREW SKT CAP M20x50L	100	200	400
ND7165	THRUST WASHER 150 O/D X 130 I/D X 6 THK	1	1	5
ND7342	SPLIT KEY RING 16MM O/D	1	1	5
ND7425	CHAIN 13 DIA LONG LINK	1	1	5
ND7532	ADAPTER 1/2 BSP MALE - MALE	1	1	5
ND7630	NUT NYLOC M12	15	25	50
ND7942	CHAIN 1/2" FISHING LONG-LINK	1	1	5
ND7973	BUFFER	5	10	25
ND8847	M6 GREASE NIPPLE	1	1	10
ND8849	TEST POINT 1/4" BSP	25	50	100
ND8896	ACCUMULATOR 4 LTR	5	10	25

PART	DESCRIPTION	Small Qty	Medium Qty	Large Qty
ND8897	ADAPTOR PIECE 1-1/4" BSP x 3/8 BSP M/M	5	10	25
ND8898	ACCUMULATOR SADDLE/CLAMP ASSY	5	10	25
ND8915	FLAT WASHER M8 FORM G	1	1	5
ND8953	GREASE NIPPLE COVER	50	100	400
ND8992	MEDIUM DUTY SAFETY WASHER M12	100	250	280
ND9038	1/2 BSPP PLUG (C/W O RING SEAL)50	1	1	5
ND9052	PIN SAFETY LINCH	1	1	5
ND9212	BALL JOINT END	30	50	100
ND9218	5/8" ROUND PIN SHACKLE (3.25 Tonne)	1	1	5
ND9222	NUT - M16 - 14mm SPHERICAL SEAT	100	500	700
ND9276	SCREW HEX HD M6X8 GRD 8.8 ZINC PLT	25	50	100
ND9330	SWIVEL ROD END 45 BORE M42 X 3P	5	10	25
ND9345	NUT HEX FULL M30	10	25	50
ND9384	WASHER, BELLEVILLE D501832	20	50	80
ND9730	SEAL, BONDED DOWTY 1 1/4"	25	75	100
PE20611	LANYARD - OVER CENTRE STOP	100	200	500
PE21252	10.5mm LINCHPIN/LANYARD ASSY (TURNBUCKLE)	5	10	25
PE24550	CROSS BEAM	2	10	15
PE24567	UPPER PIVOT FRAME	1	5	10
PE24569	LOWER PIVOT FRAME	1	5	10
PE24587	LOWER BOOM	1	5	10
PE24606	PIN - LOWER PIVOT FRAME MOUNTING	50	100	300
PE24608	PIN - UPPER BOOM / PIVOT FRAME	50	100	200
PE24611	ACCUMULATOR COVER	2	5	10
PE24614	SUSPENSION FRAME	10	15	35
PE24620	PIN - SUSPENSION FRAME	60	130	200
PE24631	STOP LINK	1	1	5
PE24646	DIRT GUARD	5	25	50
PE24681	PIN STEER LOWER BOOM	5	10	25
PE24690	INDICATOR ROD ASSEMBLY	25	50	75
PE24695	PIN - UPPER PIVOT FRAME MTG	5	25	50
PE24712	PIN - LIFT CYLINDER/LOWER BOOM	2	6	10

PART	DESCRIPTION	Small Qty	Medium Qty	Large Qty
PE24713	PIN - LIFT CYLINDER/UPPER BOOM	2	6	10
PE24735	PIN - TRUNNION	1	1	5
PE24736	PIN - TRANSPORT	1	1	5
PE24813	PIN - UPPER BOOM PIVOT	5	10	25
PE24896	WASHER M12 x 4 THICK	25	50	100
PE24907	SCRAPER	1	1	5
PE24964	TIE BAR - FIXED LENGTH	25	50	100
PE24965	TIE BAR BODY	25	50	100
PE24974	CASTOR BRACKET	25	100	200
PE24975	WHEEL & TYRE	100	200	500
PE24978	EDGE STRIP	1	1	5
PE24979	CLEVIS END L.H.	25	50	100
PE24980	CLEVIS END R.H.	25	50	100
PE24981	MODIFIED WASHER M30 FLAT	5	10	25
PE25040	HOSE, F, LIFT CYL - ACCUMR, A	25	50	100
PE25058	HOSE, F, LIFT CYL LINK	75	100	200
PE25122	ADAPTOR, FILLING, TRACK WIDTH ROLLER	1	1	1
PE25123	ASSY, PRESSURE GAGE (GFE TO REPAIR SITE)	1	1	1
PE25811	WASHER M10 X 4 THICK	25	50	75
PE25830	TOP BOOM	1	1	10
PE25841	STEER CYLINDER (NON SENSING)	1	1	2
PE25851	JACK, REAR	25	50	75
PE25864	SHACKLE	1	1	5
PE25865	SHACKLE PIN	1	1	5
PE25866	STEER CYLINDER SENSING	1	1	2
PE25870	WARNING PLATE	3	5	5
PE25947	WASHER M8 X 4 THICK	20	50	50
PE25952	LIFT CYLINDER	10	25	50
PE25966	CENTRE TUBE ASSY	25	75	100
PE26099	JACK, FRONT	5	20	25
PE26120	PIN	10	15	50
PE26163	2' EXTENDER FRAME	0	15	5
PE26166	ROLLER BRACKET LINK	1	0	15

PART	DESCRIPTION	Small Qty	Medium Qty	Large Qty
PE26182	1' EXTENDER FRAME	0	0	5
PE26192	FRAME - FULL WIDTH FRONT ROLLER	1	5	10
PE26194	YOKE, CENTRE CYLINDER	2	10	20
PE26199	PIN, CYLINDER CLEVIS	5	20	25
PE26204	PIN, CYLINDER, CENTRE ROLLER	5	20	25
PE26206	11.5 LINCH PIN/LANYARD ASSY	5	15	25
PE26217	SUSPENSION FRAME	2	10	10
PE26220	WEIGHT, 10KG	5	25	50
PE26232_LH	SPRAYGUARD, CENTRE ROLLER_LH	10	25	50
PE26232_RH	SPRAYGUARD, CENTRE ROLLER_RH	10	25	50
PE26235	SPRAY FLAP	25	75	100
PE26236	SPRAY FLAP	25	75	100
PE26243	EDGE STRIP (620 LONG)	10	25	50
PE26244	EDGE STRIP (300 LONG)	10	25	50
PE26306	CYLINDER, LIFT, CENTRE ROLLER	5	10	25
PE26317	PIN - UPPER FRAME / BOOM	15	25	50
PE26372	SPACER	25	50	150
PE26373	DISK, ROTOR	5	10	25
PE26374	PLATE, LOWER	5	10	25
PE26375	PLATE, TOP	5	10	25
PE26377	FRICTION PAD	5	25	50
PE26381	PLATE, UPPER	5	10	25
PE26426	SUSPENSION UNIT TYPE DW-A.70 x 200	100	150	250
PE26468	SPRING - SPRAY GUARD	25	50	100
PE26469-LH	SUPPORT, SPRAY GUARD, LH	25	50	100
PE26469-RH	SUPPORT, SPRAY GUARD, RH	25	50	100
PE26486	RUBBER - SPLASH GUARD	50	100	300
PE26510	CLAMP PLATE, SHORT, SPRAY GUARD	25	50	75
PE26511	CLAMP PLATE, LONG, SPRAY GUARD	25	50	75
PE26512	CLAMP STRIP, SHORT, SPRAY GUARD	25	50	75
PE26513	CLAMP STRIP, LONG, SPRAY GUARD	5	25	50
PE26537	SLINGING DATA PLATE	2	6	10
PE26854	BRACKET, RHINO	2	10	25
PE26901	AXLE/HUB ASSEMBLY	50	100	500

PART	DESCRIPTION	Small Qty	Medium Qty	Large Qty
PE26922	CASTOR COLLAR	50	70	100
PE26931	HOSE, F TOP BOOM QRA-F CTR LIFT CYL	2	6	10
PE26932	HOSE , ACCUMULATOR - BULKHEAD CONN.	2	6	10
PE30003	BANJO 3/8" BSP 90 DEG	5	10	25
PE30043	TRAILING ARM PLATE	25	50	100
PE30081	12 mm TEE COUPLING	2	6	10
PE30082	STEEL TUBE	2	6	10
PE30083	STEEL TUBE	2	6	10
PE30084	3/8" BSP MALE - 18 mm MALE ADAPTOR	2	6	10
PE30191	PIN (CENTRE ROLLER, TOWING)	5	25	50
PE30192	CAP PLATE (TOWING)	5	10	25
PE30460	CASTOR COLLAR	5	10	25
PE30908	FRONT PIVOT (Gen 3)	25	50	100
PE30921	PIN - UPPER BOOM	25	50	100
PE30955	PIN CROSS BEAM/FRAME	25	100	200
PE30956	WASHER, LOCK	25	50	75
PE30957	NUT, LOCK	25	50	75
PE30965	SPACER	25	50	75
PE30978	WASHER FLAT M42	5	25	50
PE30984	PUMP, RECHARGING	1	1	2

Table 6. FOB Kit New Ordering Policy from Quarterly Use

Part	Description	Cost per Part (Proprietary Information)	Average Quarterly Use	FOB Kits Purchased FY 09	FY 09 FOB Kits Purchased Based on Quarterly Use
CS0348/14.0	HARNESS RCU TO VPU		1	$22,310.08	$22,310.08
CS0351/11.0	HARNESS POWER I/V FUSE BOX TO MPU		1	$22,938.76	$22,938.76
CS0354/9.0	HARNESS FUSE BOX TO VPU		0	$5,234.28	$0.00
CS3228/2.2	HARNESS VALVE PACK TO STEERING CYLINDER		0	$4,005.84	$0.00
ND0048	SCREW HEX M8X25L		58	$280.00	$46.40
ND0050	SCREW HEX M10X16L		4	$380.00	$3.20
ND0065	SCREW HEX M20X50L GRD 8.8 P		7	$680.00	$23.80
ND0072	NUT HEX FULL M6		0	$14.58	$0.00
ND0075	HEX NUT, FULL, M12		5	$164.16	$60.80
ND0076	NUT HEX FULL M16		5	$612.00	$30.60
ND0078	WASHER SINGLE COIL M3		0	$14.56	$0.00
ND0081	WASHER SINGLE COIL SPRING M6		0	$13.50	$0.00
ND0082	WASHER SINGLE COIL SPRING M8		16	$104.50	$7.04
ND0083	WASHER SINGLE COIL SPRING M10		9	$67.50	$3.24
ND0084	WASHER SINGLE COIL M12 STL P		4	$50.40	$2.24
ND0085	WASHER SINGLE COIL SPRING M16		2	$32.40	$0.72
ND0091	WASHER FLAT M10 STL. P.		30	$26.52	$15.60
ND0092	WASHER FLAT M12		0	$48.00	$0.00
ND0093	WASHER FLAT M16 STL. P		0	$25.30	$0.00
ND0114	SCREW HEX M12X50L		18	$459.00	$32.40
ND0128	WASHER FLAT M8		3	$36.90	$1.08
ND0149	SCREW HAMMER DRIVE No. 6 x 1/4		0	$64.40	$0.00
ND0154	SPLIT KEY RING 30MM O/D		38	$240.00	$30.40
ND0285	PIN		32	$4,248.00	$604.16
ND0289	SCREW HEX M12x20L		0	$15.12	$0.00
ND0293	PIN, SAFETY LINCH		16	$2,905.00	$265.60
ND0294	PIN, SAFETY LINCH - 7.5mm DIA		43	$5,748.00	$823.88
ND0295	PIN, SAFETY LINCH		20	$2,700.50	$392.80
ND0306	NUT SELF-LOCKING M12		15	$260.00	$12.00
ND0312	HEX NUT NYLOC M10		46	$154.00	$20.24

Part	Description	Cost per Part (Proprietary Information)	Average Quarterly Use	FOB Kits Purchased FY 09	FY 09 FOB Kits Purchased Based on Quarterly Use
ND0315	SCREW HEX M10X50L		1	$7.56	$0.56
ND0332	BONDED SEAL 3/8"BSP (SELF CENTERING)		0	$21.60	$0.00
ND0336	ADAPTOR 3/8" BSP M-3/8" BSP M		4	$374.40	$33.28
ND0548	BOLT HEX M16X150L		2	$675.00	$12.00
ND0549	NUT HEX FULL M10 STL P		0	$70.00	$0.00
ND0578	SCREW HEX M12X35L		2	$30.16	$4.64
ND0763	SCREW CAP SOCKET		99	$533.00	$162.36
ND0923	BOLT HEX M12x50L		0	$126.00	$0.00
ND0930	TEE G 3/8" MALE		2	$3,881.50	$88.72
ND0973	SCREW HEX M16X50L		0	$41.60	$0.00
ND0979	WASHER FLAT M3		0	$7.56	$0.00
ND1002	SCREW HEX HD M8X30 GRD 8.8 ZINC PLT		0	$324.00	$0.00
ND10224	QUICK RELEASE COUPLING MALE 3/8"BSP		0	$5,741.60	$0.00
ND10225	QUICK RELEASE COUPLING FEMALE 3/8" BSP		0	$7,952.00	$0.00
ND10235	SPACER		0	$1,470.00	$0.00
ND10248	SPACER		0	$1,296.00	$0.00
ND1207	M20 NYLOC NUT		11	$405.00	$19.80
ND1209	NUT NYLOC M8 TYPE P GRD 8 ZINC PLT		0	$336.00	$0.00
ND2026	ADAPTER M/M 1/2" - 3/8"		0	$62.02	$0.00
ND2312	ELBOW 90DEG 3/8M X 3/8F		1	$531.36	$39.36
ND2627	BOLT HEX M10x70L GRD 8.8		47	$483.00	$39.48
ND2646	LOCKING COLLAR		2	$353.50	$8.08
ND2691	SCREW HEX M30 X 120L		0	$1,672.80	$0.00
ND2926	BONDED SEAL 3/8" BSP (SELF CENTERED)		5	$90.00	$6.00
ND2942	BULKHEAD CONN G 3/8		0	$313.60	$0.00
ND3209	ADAPTOR 3/8 BSP M		4	$398.70	$70.88
ND3315	WASHER BONDED S/C G3/8" NITRILE STL Z/PLT		0	$11.88	$0.00
ND3325	GREASE NIPPLE STRAIGHT M8 X 1.25P		7	$1,485.00	$37.80
ND4359	LOCTITE 243 (THREADLOCK)		0	$2,126.88	$0.00
ND4418	WASHER SERRATED SAFETY M20		31	$4,082.00	$194.68

Part	Description	Cost per Part (Proprietary Information)	Average Quarterly Use	FOB Kits Purchased FY 09	FY 09 FOB Kits Purchased Based on Quarterly Use
ND4452	M8x25 HEX HEAD SCREW Gr8.8		2	$157.50	$3.60
ND4780	BOLT HEX HEAD M6 X 60 LG GR8.8 ZP		1	$8.12	$2.32
ND4862	TEE 3/8 BSP M,M ON RUN, F ON BRANCH		0	$307.44	$0.00
ND5080	WASHER FLAT M8 FORM C, ZP		0	$295.20	$0.00
ND5705	BOLT HEX M12X110 L		0	$153.70	$0.00
ND5917	SCREW HEX M10x12L		6	$365.40	$13.92
ND6553	SWIVEL ELBOW (COMPACT) 3/8" BSP M/F,		2	$2,949.00	$78.64
ND6758	BUSH 44 O/D X 50 I/D X 30 LONG GRADE S		0	$2,444.60	$0.00
ND6759	BUSH 55 O/D X 50 I/D X 50 LONG GRADE S		3	$20,200.00	$193.92
ND6760	BUSH 75 O/D X 70 I/D X 40 LONG GRADE S		9	$640.80	$256.32
ND6761	BUSH 105 O/D X 100 I/D X 60 LONG GRADE S		5	$4,146.00	$829.20
ND6763	THRUST WASHER 90 O/D X 72 I/D X 6 THK		26	$1,246.00	$370.24
ND6764	THRUST WASHER 130 O/D X 102 I/D X 6 THK		2	$4,069.80	$180.88
ND6772	BOLT HEX M10x65L		0	$126.00	$0.00
ND6989	SCREW PAN HD SLOT M5x12L GRD A2		0	$70.00	$0.00
ND7040	BOLT HEX M20 X 120L		14	$35.00	$140.00
ND7095	SCREW SKT CAP M20x50L		99	$2,842.00	$803.88
ND7165	THRUST WASHER 150 O/D X 130 I/D X 6 THK		0	$784.00	$0.00
ND7342	SPLIT KEY RING 16MM O/D		0	$5.60	$0.00
ND7425	CHAIN 13 DIA LONG LINK		1	$344.96	$98.56
ND7532	ADAPTER 1/2 BSP MALE - MALE		1	$37.52	$10.72
ND7630	NUT NYLOC M12		1	$81.00	$1.80
ND7942	CHAIN 1/2" FISHING LONG-LINK		3	$137.76	$118.08
ND7973	BUFFER		0	$414.40	$0.00
ND8847	M6 GREASE NIPPLE		1	$53.52	$8.92
ND8849	TEST POINT 1/4" BSP		3	$8,428.00	$288.96
ND8896	ACCUMULATOR 4 LTR		1	$72,693.60	$3,634.68
ND8897	ADAPTOR PIECE 1-1/4" BSP x 3/8 BSP M/M		0	$2,816.80	$0.00
ND8898	ACCUMULATOR SADDLE/CLAMP ASSY		0	$7,936.00	$0.00

Part	Description	Cost per Part (Proprietary Information)	Average Quarterly Use	FOB Kits Purchased FY 09	FY 09 FOB Kits Purchased Based on Quarterly Use
ND8915	FLAT WASHER M8 FORM		10	$11.48	$32.80
ND8953	GREASE NIPPLE COVER		36	$495.00	$64.80
ND8992	MEDIUM DUTY SAFETY WASHER M12		19	$567.00	$34.20
ND9038	1/2 BSPP PLUG (C/W O RING SEAL)50		1	$43.12	$12.32
ND9052	PIN SAFETY LINCH		4	$125.30	$143.20
ND9212	BALL JOINT END		5	$6,818.40	$378.80
ND9218	5/8" ROUND PIN SHACKLE (3.25 Tonne)		4	$813.54	$929.76
ND9222	NUT - M16 - 14mm SPHERICAL SEAT		87	$3,900.00	$522.00
ND9276	SCREW HEX HD M6X8 GRD 8.8 ZINC PLT		0	$42.00	$0.00
ND9330	SWIVEL ROD END 45 BORE M42 X 3P		0	$4,069.60	$0.00
ND9345	NUT HEX FULL M30		0	$302.60	$0.00
ND9384	WASHER, BELLEVILLE D501832		0	$780.00	$0.00
ND9730	SEAL, BONDED DOWTY 1 1/4"		0	$740.00	$0.00
PE20611	LANYARD - OVER CENTRE STOP		26	$16,688.00	$1,084.72
PE21252	10.5mm LINCHPIN/LANYARD ASSY (TURNBUCKLE)		0	$1,184.80	$0.00
PE24550	CROSS BEAM		4	$276,121.98	$81,813.92
PE24567	UPPER PIVOT FRAME		0	$18,906.88	$0.00
PE24569	LOWER PIVOT FRAME		6	$94,532.48	$70,899.36
PE24587	LOWER BOOM		0	$132,345.28	$0.00
PE24606	PIN - LOWER PIVOT FRAME MOUNTING		34	$73,872.00	$11,162.88
PE24608	PIN - UPPER BOOM / PIVOT FRAME		7	$83,895.00	$3,355.80
PE24611	ACCUMULATOR COVER		2	$8,281.72	$1,948.64
PE24614	SUSPENSION FRAME		2	$147,460.80	$9,830.72
PE24620	PIN - SUSPENSION FRAME		1	$110,268.60	$565.48
PE24631	STOP LINK		3	$4,936.82	$4,231.56
PE24646	DIRT GUARD		1	$9,467.20	$236.68
PE24681	PIN STEER LOWER BOOM		9	$3,207.20	$1,443.24
PE24690	INDICATOR ROD ASSEMBLY		25	$54,816.00	$18,272.00
PE24695	PIN - UPPER PIVOT FRAME MTG		1	$14,984.00	$374.60
PE24712	PIN - LIFT CYLINDER/LOWER		1	$1,571.40	$174.60

Part	Description	Cost per Part (Proprietary Information)	Average Quarterly Use	FOB Kits Purchased FY 09	FY 09 FOB Kits Purchased Based on Quarterly Use
	BOOM				
PE24713	PIN - LIFT CYLINDER/UPPER BOOM		1	$1,621.80	$180.20
PE24735	PIN - TRUNNION		0	$3,472.98	$0.00
PE24736	PIN - TRANSPORT		2	$1,466.92	$838.24
PE24813	PIN - UPPER BOOM PIVOT		14	$6,248.80	$4,374.16
PE24896	WASHER M12 x 4 THICK		6	$1,046.50	$71.76
PE24907	SCRAPER		18	$735.14	$3,780.72
PE24964	TIE BAR - FIXED LENGTH		12	$38,010.00	$5,212.80
PE24965	TIE BAR BODY		0	$39,049.50	$0.00
PE24974	CASTOR BRACKET		2	$2,057,276.00	$25,320.32
PE24975	WHEEL & TYRE		90	$984,832.00	$221,587.20
PE24978	EDGE STRIP		7	$2,614.78	$5,229.56
PE24979	CLEVIS END L.H.		6	$12,845.00	$880.80
PE24980	CLEVIS END R.H.		6	$12,845.00	$880.80
PE24981	MODIFIED WASHER M30 FLAT		3	$142.40	$21.36
PE25040	HOSE, F, LIFT CYL - ACCUMR, A		1	$34,034.00	$388.96
PE25058	HOSE, F, LIFT CYL LINK		3	$150,825.00	$2,413.20
PE25122	ADAPTOR, FILLING, TRACK WIDTH ROLLER		1	$282.72	$188.48
PE25123	ASSY, PRESSURE GAGE (GFE TO REPAIR SITE)		1	$615.00	$410.00
PE25811	WASHER M10 X 4 THICK		10	$1,158.00	$154.40
PE25830	TOP BOOM		0	$56,719.44	$0.00
PE25841	STEER CYLINDER (NON SENSING)		1	$9,248.16	$4,624.08
PE25851	JACK, REAR		32	$118,440.00	$50,534.40
PE25864	SHACKLE		0	$921.62	$0.00
PE25865	SHACKLE PIN		2	$940.24	$537.28
PE25866	STEER CYLINDER SENSING		0	$48,827.52	$0.00
PE25870	WARNING PLATE		0	$3,383.90	$0.00
PE25947	WASHER M8 X 4 THICK		0	$926.40	$0.00
PE25952	LIFT CYLINDER		5	$394,913.40	$46,460.40
PE25966	CENTRE TUBE ASSY		5	$3,552.00	$177.60
PE26099	JACK, FRONT		0	$45,691.00	$0.00
PE26120	PIN		0	$8,862.00	$0.00
PE26163	2' EXTENDER FRAME		0	$131,680.00	$0.00
PE26166	ROLLER BRACKET LINK		0	$4,556.80	$0.00

Part	Description	Cost per Part (Proprietary Information)	Average Quarterly Use	FOB Kits Purchased FY 09	FY 09 FOB Kits Purchased Based on Quarterly Use
PE26182	1' EXTENDER FRAME		0	$26,336.00	$0.00
PE26192	FRAME - FULL WIDTH FRONT ROLLER		0	$278,929.60	$0.00
PE26194	YOKE, CENTRE CYLINDER		0	$14,809.60	$0.00
PE26199	PIN, CYLINDER CLEVIS		0	$12,460.00	$0.00
PE26204	PIN, CYLINDER, CENTRE ROLLER		0	$7,654.00	$0.00
PE26206	11.5 LINCH PIN/LANYARD ASSY		0	$1,185.30	$0.00
PE26217	SUSPENSION FRAME		1	$123,718.32	$11,247.12
PE26220	WEIGHT, 10KG		0	$13,251.20	$0.00
PE26232_LH	SPRAYGUARD, CENTRE ROLLER_LH		0	$111,310.90	$0.00
PE26232_RH	SPRAYGUARD, CENTRE ROLLER_RH		1	$111,310.90	$2,619.08
PE26235	SPRAY FLAP		3	$24,920.00	$747.60
PE26236	SPRAY FLAP		1	$24,920.00	$249.20
PE26243	EDGE STRIP (620 LONG)		0	$3,026.00	$0.00
PE26244	EDGE STRIP (300 LONG)		0	$3,026.00	$0.00
PE26306	CYLINDER, LIFT		1	$132,521.60	$6,626.08
PE26317	PIN - UPPER FRAME / BOOM		0	$8,541.00	$0.00
PE26372	SPACER		2	$14,908.50	$265.04
PE26373	DISK, ROTOR		1	$7,952.00	$397.60
PE26374	PLATE, LOWER		1	$6,625.60	$331.28
PE26375	PLATE, TOP		1	$7,952.00	$397.60
PE26377	FRICTION PAD		1	$2,651.20	$66.28
PE26381	PLATE, UPPER		1	$5,301.60	$265.08
PE26426	SUSPENSION UNIT TYPE DW-A.70 x 200		78	$674,620.00	$210,481.44
PE26468	SPRING - SPRAY GUARD		0	$38,293.50	$0.00
PE26469-LH	SUPPORT, SPRAY GUARD, LH		0	$79,656.50	$0.00
PE26469-RH	SUPPORT, SPRAY GUARD, RH		0	$79,656.50	$0.00
PE26486	RUBBER - SPLASH GUARD		0	$147,708.00	$0.00
PE26510	CLAMP PLATE, SHORT, SPRAY GUARD		10	$5,826.00	$776.80
PE26511	CLAMP PLATE, LONG, SPRAY GUARD		11	$11,652.00	$1,708.96
PE26512	CLAMP STRIP, SHORT, SPRAY GUARD		6	$2,130.00	$170.40
PE26513	CLAMP STRIP, LONG, SPRAY GUARD		0	$3,500.80	$0.00

Part	Description	Cost per Part (Proprietary Information)	Average Quarterly Use	FOB Kits Purchased FY 09	FY 09 FOB Kits Purchased Based on Quarterly Use
PE26537	SLINGING DATA PLATE		0	$4,798.44	$0.00
PE26854	BRACKET, RHINO		1	$13,133.52	$709.92
PE26901	AXLE/HUB ASSEMBLY		14	$559,507.00	$24,101.84
PE26922	CASTOR COLLAR		0	$81,052.40	$0.00
PE26931	HOSE, F TOP BOOM QRA-F CTR LIFT CYL		1	$2,666.52	$296.28
PE26932	HOSE , ACCUMULATOR - BULKHEAD CONN.		0	$2,666.52	$0.00
PE30003	BANJO 3/8" BSP 90 DEG		0	$395.20	$0.00
PE30043	TRAILING ARM PLATE		6	$62,118.00	$4,259.52
PE30081	12 mm TEE COUPLING		0	$355.68	$0.00
PE30082	STEEL TUBE		0	$2,666.52	$0.00
PE30083	STEEL TUBE		0	$2,666.52	$0.00
PE30084	3/8" BSP MALE - 18 mm MALE ADAPTOR		0	$59.40	$0.00
PE30191	PIN (CENTRE ROLLER, TOWING)		0	$6,652.80	$0.00
PE30192	CAP PLATE (TOWING)		0	$5,868.00	$0.00
PE30460	CASTOR COLLAR		1	$27,450.40	$1,372.52
PE30908	FRONT PIVOT (Gen 3)		7	$639,716.00	$51,177.28
PE30921	PIN - UPPER BOOM		0	$46,088.00	$0.00
PE30955	PIN CROSS BEAM/FRAME		7	$307,229.00	$13,234.48
PE30956	WASHER, LOCK		7	$885.00	$82.60
PE30957	NUT, LOCK		7	$5,907.00	$551.32
PE30965	SPACER		6	$8,865.00	$709.20
PE30978	WASHER FLAT M42		0	$1,102.40	$0.00
PE30984	PUMP, RECHARGING		0	$23,702.40	$0.00
			Totals	**$9,283,465.30**	**$970,000.64**

Table 7. Soldier Maintenance Kit

Part No	Primary Description	Qty to Purchase for DLA Stock Next FY Safety Stock @ 12.5%	Qty to Purchase for RSC Safety Stock at 25%
KP00461	AXLE ASSEMBLY KIT	186	47
ND0048	SCREW HEX M8X25L	279	70
ND0050	SCREW HEX M10X16L	20	5
ND0065	SCREW HEX M20X50L GRD 8.8 P	34	9
ND0075	HEX NUT, FULL, M12	25	7
ND0076	NUT HEX FULL M16	23	6
ND0082	WASHER SINGLE COIL SPRING M8	74	19
ND0083	WASHER SINGLE COIL SPRING M10	40	10
ND0084	WASHER SINGLE COIL M12 STL P	17	5
ND0085	WASHER SINGLE COIL SPRING M16	9	3
ND0092	WASHER FLAT M12	102	26
ND0114	SCREW HEX M12X40L	87	22
ND0154	SPLIT KEY RING 30MM O/D	184	46
ND0285	PIN	154	39
ND0293	PIN, SAFETY LINCH	76	19
ND0294	PIN, SAFETY LINCH	208	52
ND0295	PIN, SAFETY LINCH	97	25
ND0306	NUT SELF-LOCKING M12	69	18
ND0312	HEX NUT NYLOC M10	220	55
ND0548	BOLT HEX M16X150L	8	2
ND0763	SCREW CAP SOCKET	475	119
ND0923	BOLT HEX M12x50L	90	23
ND1002	SCREW HEX HD M8X30 GRD 8.8 ZINC PLT	712	178
ND10235	SPACER	350	88
ND10248	SPACER	955	239
ND1207	M20 NYLOC NUT	52	13
ND1209	NUT NYLOC M8 TYPE P GRD 8 ZINC PLT	747	187
ND2627	BOLT HEX M10x70L	226	57
ND2646	LOCKING COLLAR	9	3
ND3325	GREASE NIPPLE STRAIGHT M8 X 1.25P	31	8
ND4359	LOCTITE 243 (THREADLOCK)	9	3
ND4418	WASHER SERRATED SAFETY M20	146	37
ND4726	SCREW HEX M12 x 150 LONG	8	2
ND5087	WASHER SERRATED M12	88	22
ND5705	BOLT HEX M12X110 L	74	19

Part No	Primary Description	Qty to Purchase for DLA Stock Next FY Safety Stock @ 12.5%	Qty to Purchase for RSC Safety Stock at 25%
ND6764	THRUST WASHER 130 O/D X 102 I/D X 6 THK	10	3
ND7095	SCREW SKT CAP M20x50L	476	119
ND7342	SPLIT KEY RING 16MM O/D	71	18
ND7942	LONG-LINK FISHING CHAIN 1/2"	13	4
ND8847	M6 GREASE NIPPLE	5	2
ND8953	GREASE NIPPLE COVER	170	43
ND8992	MEDIUM DUTY SAFETY WASHER M12	88	22
ND8994	SUSPENSION UNIT TYPE DW-A.70 x 200	642	161
ND9218	5/8" ROUND PIN SHACKLE (3.25 Tonne)	16	4
ND9222	NUT - M16 - 14mm SPHERICAL SEAT	417	105
ND9330	SWIVEL ROD END 45 BORE M42 X 3P	21	6
PE20611	LANYARD - OVER CENTRE STOP	125	32
PE24417	PIN	9	3
PE24567	UPPER PIVOT FRAME	8	2
PE24606	PIN - LOWER PIVOT FRAME MOUNTING	163	41
PE24609	PIN - FRAME CENTRE / PIVOT FRAME	7	2
PE24611	ACCUMULATOR COVER	7	2
PE24620	PIN - SUSPENSION FRAME	2	1
PE24646	DIRT GUARD	5	2
PE24690	INDICATOR ROD ASSEMBLY	120	30
PE24975	WHEEL & TYRE	434	109
PE24979	CLEVIS END L.H.	28	7
PE24980	CLEVIS END R.H.	26	7
PE24981	MODIFIED WASHER M30 FLAT	11	3
PE24983	CHAIN LINK ADJUSTER BLOCK	8	2
PE25097	JACK ASSEMBLY, FRONT	84	21
PE25608	JACK ASSEMBLY	4	1
PE25811	WASHER M10 X 4 THICK	45	12
PE25851	JACK	151	38
PE25947	WASHER M8 X 4 THICK	66	17
PE25966	CENTRE TUBE ASSY	23	6
PE26099	JACK, FRONT	25	7
PE26199	PIN, CYLINDER CLEVIS	26	7
PE26204	PIN, CYLINDER, CENTRE ROLLER	26	7
PE26220	WEIGHT, 10KG	42	11
PE26232_LH	SPRAYGUARD, CENTRE ROLLER_LH	43	11

Part No	Primary Description	Qty to Purchase for DLA Stock Next FY Safety Stock @ 12.5%	Qty to Purchase for RSC Safety Stock at 25%
PE26232_RH	SPRAYGUARD, CENTRE ROLLER_RH	2	1
PE26235	SPRAY FLAP	15	4
PE26236	SPRAY FLAP	5	2
PE26237	ASSY, SPRAY GUARD, CENTRE, LH	1	1
PE26242	ASSY, SPRAY GUARD, CENTRE, RH	1	1
PE26243	EDGE STRIP (620 LONG)	43	11
PE26244	EDGE STRIP (300 LONG)	43	11
PE26426	SUSPENSION UNIT TYPE DW-A.70 x 200	373	94
PE26510	CLAMP PLATE, SHORT, SPRAY GUARD	49	13
PE26511	CLAMP PLATE, LONG, SPRAY GUARD	51	13
PE26512	CLAMP STRIP, SHORT, SPRAY GUARD	29	8
PE26854	BRACKET, RHINO	4	1
PE26901	AXLE/HUB ASSEMBLY	68	17
PE26922	CASTOR COLLAR	111	28
PE30043	TRAILING ARM PLATE	26	7
PE30099	3 SUSPENSION FRAME	1	1
PE30192	CAP PLATE (TOWING)	21	6
PE31319-LH	SUPPORT, SPRAY GUARD, LH	13	4
PE31319-RH	SUPPORT, SPRAY GUARD, RH	11	3
PE31321	SPRING - SPRAY GUARD	54	14
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