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A GLIMPSE INTO DoD WEAPON SYSTEMS PROGRAMS

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An important strategic topic confronting the United States of America is sustaining Department of Defense (DoD) weapon systems as part of the overall defense life cycle management process. For the past several decades, billions of taxpayer dollars have been spent on weapon systems annually. The lives of U.S. Armed Forces members and the people they protect depend upon the quality of these weapon systems. As these weapon systems have become more sophisticated and more complex coupled with a decrease in the size of the U.S. Armed Forces over the past 30 years, the military has become increasingly reliant on these weapon systems for our nation's security.

This article focuses on three major aspects of the topic: (a) background information, in which key DoD documents and concepts such as the 2006 Quadrennial Defense Review (QDR), 2005 National Defense Strategy and logistics transformation, including Future Logistics Enterprise, will be discussed; (b) the defense life cycle management system will be discussed; and (c) an analysis of the defense life cycle management system, which is covered by six Government Accountability Office (GAO) reports.

BACKGROUND

DoD is the executive department responsible for organizing and managing all of the government's agencies and functions relating to national security and the military. The February 2006 QDR serves as a roadmap for change to transform the U.S. military to an outcome-oriented, capability-based force to better support the joint warfighter well into the 21st century. It calls for a continuing adaptation and reorientation for an integrated joint force that is more capable to defend our national interests as well as to deter and defeat our adversaries. The QDR shapes DoD's plans, policies, and programs into a broader strategy and, later, becomes part of the President's budget request.

The cornerstone of the 2006 QDR is the March 2005 National Defense Strategy. Although the U.S. military maintains considerable technological advantages in the world, our adversaries are starting to catch up. Threats are categorized as traditional, irregular, catastrophic, and disruptive. A traditional challenge uses military capabilities and forces in military conflict. An irregular challenge uses unconventional methods to offset a stronger opponent's traditional advantages. A catastrophic challenge uses weapons of mass destruction (WMD) or similar methods yielding WMD-like effects. A disruptive challenge is when an adversary finds a breakthrough technology that nullifies a U.S. advantage (DoD, March 2005).

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Considering these four threats, the QDR identified four focus areas: (a) defeating terrorist networks, (b) defending the homeland in depth, (c) shaping the choices of countries at strategic crossroads, and (d) preventing hostile states and non-state actors from acquiring or using WMD (DoD, 2006). These inter-related focus areas are the foundation of the force planning construct, showing the capabilities and forces needed to mitigate the four threats (DoD, 2006). The force planning construct determines the size of the force (capacity) and the types of capabilities (forces and equipment) needed for a diverse range of scenarios (DoD, 2006). During this QDR, senior leaders confirmed the four focus areas, but divided the force planning construct into three objective areas: homeland defense, war on terror/irregular warfare, and conventional campaigns (DoD, 2006).

The 2006 QDR listed the need for the following types of capabilities:

- Security cooperation and engagement activities including joint training exercises, senior staff talks, and officer and foreign internal defense training to increase understanding, strengthen allies and partners, and accurately communicate U.S. objectives and intent. This will require both new authorities and 21st century mechanisms for the interagency process.
- Considerably improved language and cultural awareness to develop a greater understanding of emerging powers and how they may approach strategic choices.
- Persistent surveillance, including systems that can penetrate and loiter in denied or contested areas.
- The capability to deploy rapidly, assemble, command, project, reconstitute, and re-employ joint combat power from all domains to facilitate assured access.

- Prompt and high-volume global strike to deter aggression or coercion and, if deterrence fails, to provide a broader range of conventional response options to the President. This will require broader authorities from the Congress.
- Secure broadband communications into denied or contested areas to support penetrating surveillance and strike systems.
- Integrated defenses against short-, intermediate-, and intercontinental-range ballistic and cruise missile systems.
- Air dominance capabilities to defeat advanced threats.
- Undersea warfare capabilities to exploit stealth and enhance deterrence.
- Capabilities to shape and defend cyberspace.
- Joint command and control capabilities that are survivable in the face of WMD-, electronic-, or cyber-attacks (DoD, 2006).

The 2001 QDR called for improved effectiveness and efficiency in moving and sustaining military forces in distant theaters, which included efforts to have a quicker deployment process and reduce the logistics footprint and its associated costs. The 2006 QDR called for examining supply chain logistics costs by showing the relationship between resources and supply chain logistics to better understand the costs they incur. Also, it called for continuous performance improvement. For example, DoD uses Radio Frequency Identification (RFID) to carry out logistics support through automated asset visibility and management. The RFID allows for the sharing, integration, and synchronizing of data from the strategic to the tactical level, which shows the cause-and-effect relationship between resources and readiness. Using RFID and implementing Lean Six Sigma and performance-based logistics will markedly improve DoD's supply chain (DoD, 2006).

To improve sustainment capability by achieving an integrated joint force that is more agile and more rapidly deployable with a reduced logistics footprint, DoD adopted the Future Logistics Enterprise (FLE). It serves as a near-term logistics blueprint to strengthen the warfighter from 2005 to 2010 through end-to-end customer service and enterprise integration into the 21st century (FLE, n.d.).

The FLE has six interrelated initiatives to meet the requirements of the QDR and the National Defense Strategy.

Depot Maintenance Partnership. Depot maintenance services cost over $17 billion annually. The purpose of this initiative is to increase partnerships with the commercial sector. Due to national security, DoD will continue to retain depot maintenance capability, but will encourage increased private sector investment in depot infrastructure, better facility and equipment management, and better depot business practices (FLE, n.d.).

Condition-Based Maintenance Plus (CBM+). Currently, DoD is unable to predict equipment failures in their maintenance programs, resulting in excessive supply

chain costs. The purpose of this initiative is to improve the operational availability and readiness of weapon systems life cycles at a decreased cost by using improved maintenance capabilities and integrated logistics and business processes (FLE, n.d.).

Total Life Cycle Systems Management (TLCSM). Weapon systems sustainment uses 80 percent of DoD logistics resources or approximately $64 billion annually (Cothran, Fowler, & Kratz, 2002). DoD is changing to a performance-based weapon systems sustainment model to achieve weapon systems performance integration across government and industry. The program manager (PM) manages and is accountable for the development of the weapon system and is responsible for meeting cost, schedule, and performance factors while considering the various and changing warfighter performance requirements in this process. Former Assistant Deputy Under Secretary of Defense for Logistics Plans and Programs Louis Kratz, stated:

> One of the fundamental tenets of performance-based logistics is the acquiring of weapon system support as an integrated package based on objective outcomes, such as system availability. The objective outcomes—or operational performance requirements of the customer—will be documented in a formal performance agreement document, negotiated across all stakeholders, consistent with the Services' corporate structure. The performance agreement defines system performance expectations (and corresponding support required), resources required to provide that level of performance, commitment to provide those resources, and signature by appropriate stakeholders (p. 51).

End-to-End Distribution. The purpose of this initiative is to enhance the flow of materiel to the end user, while at the same time, synchronizing deployment and sustainment efforts into an integrated, end-to-end distribution system (Staff Feature, 2003).

Executive Agents (EA). The purpose of this initiative is to ensure that EA designations match warfighter requirements with the National Defense Strategy by supporting the warfighter "across the full spectrum of operations/including support on an end-to-end basis and rapid response to all deployments" (p. 3).

Enterprise Integration. The purpose of this initiative is to unite information technologies in order to implement new logistics business processes.

None of these six initiatives can function by itself. Each initiative helps the other five initiatives by building an integrated logistics enterprise.

Kratz stated that "the most powerful weapon in the world is useless if we can't deploy and use it effectively" (Cothran, Fowler, & Kratz, 2002, p. 50). Logistics transformation serves the warfighter threefold: (a) to adopt the best business practices, (b) to have a logistics system open architecture so decision makers can use

integrated logistics information, and (c) to better logistics responsiveness to the joint warfighter (Staff Feature, 2003). As outlined in the 2006 QDR, the United States faces several types of dangerous threats. Logistics transformation, including the Future Logistics Enterprise, is needed in order to maintain technologically superior weapon systems for our well-deserving warfighter. Logistics matters have often been crucial in determining the outcome of wars.

DEFENSE LIFE CYCLE MANAGEMENT SYSTEM

The 2006 QDR described the need for continued transformation of acquisition and logistics processes in order to be more agile and more expeditionary, to increase reliability of DoD weapon systems, and to reduce logistics footprint. The defense life cycle management system is a total life cycle management system. Established by Department of Defense Instruction 5000.2, Operation of the Defense Acquisition System, in May 2003 as a revised policy, the defense life cycle management system is a knowledge-based, phased, evolutionary process used for the acquisition of major defense weapon systems.

The defense acquisition system uses a streamlined management process that delivers capable, reliable, and sustainable systems to the user.

DoD has three major decision-making support systems to support the overall defense life cycle management system: (a) Planning, Programming, Budgeting & Execution (PPBE); (b) Joint Capabilities Integration and Development System (JCIDS); and (c) Defense Acquisition System. These three systems use an integrated approach for strategic planning, identification of military capabilities' needs, system acquisition, and program and budget development. The three support systems work together simultaneously while the phases are carried out throughout the life cycle.

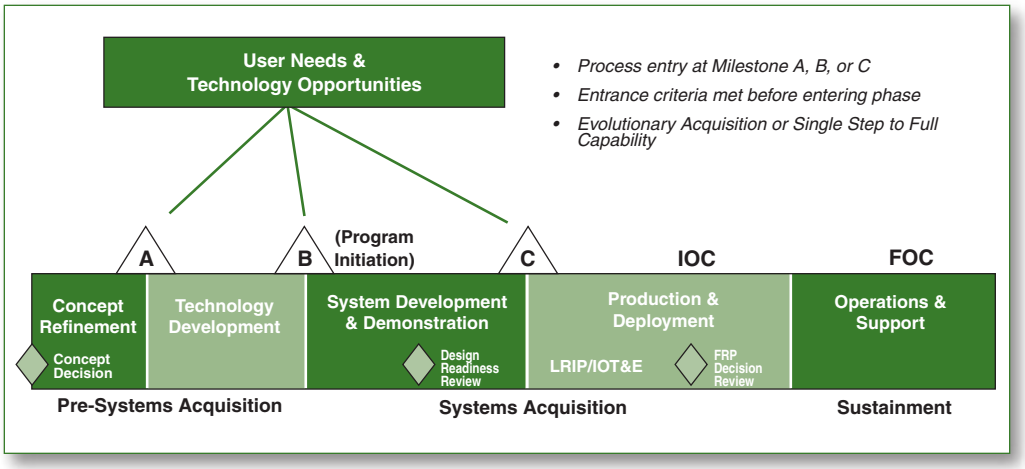
The PPBE is DoD's primary resource allocation process. The PPBE has three objectives. First, it is a biennial, calendar-driven process used for obtaining funding for major weapon systems acquisition. Second, it provides a factual basis for affordability assessment and resource allocation decisions. Third, it offers a formal structured system for making decisions on policies, strategies, prioritized goals, and the development of necessary forces and capabilities to accomplish DoD's various missions.

The JCIDS is dependent on warfighting deficiencies or needs. It assesses mission requirements and strategies for meeting those requirements as well as providing the basis for establishing priorities (DAU, ACQ-101, Lesson 2).

The defense acquisition system uses a streamlined management process that delivers capable, reliable, and sustainable systems to the user. It is an event-driven,

risk management process that uses periodic reviews and program approvals to progress into subsequent efforts of the acquisition life cycle. The process also connects milestone decisions to demonstrated accomplishments.

FIGURE 1. THE DEFENSE ACQUISITION MANAGEMENT FRAMEWORK



The framework, as depicted in the framework chart shown here, is divided into three activities: Pre-Systems Acquisition, Systems Acquisition, and Sustainment. These activities are divided into five phases: Concept Refinement, Technology Development, System Development and Demonstration (SDD), Production and Deployment, and Operations and Support. A milestone or decision point comes before each phase. The concept decision approves entry into the Concept Refinement Phase. Milestone A approves entry into the Technology Development phase. Milestone B approves entry into the SDD. The Design Readiness Review approves entry into the System Demonstration phase. Milestone C approves entry into the Production and Deployment Phase. The Full-Rate Production Review authorizes Full Rate Production. The two activities of Systems Acquisition and Sustainment are divided into six work areas: System Integration, System Demonstration, Low Rate Initial Production, Full-Rate Production and Deployment, and Sustainment and Disposal.

The acquisition process begins with a selected concept to meet a particular capability need. In the Concept Decision review, the Milestone Decision Authority (MDA) determines entry into the Concept Refinement phase. Also, a date for Milestone A is established and an Acquisition Decision Memorandum (ADM) is prepared and documents the decision's results. Entry into the first phase does not signify a new acquisition will begin.

ANALYSIS OF THE DEFENSE LIFE CYCLE MANAGEMENT SYSTEM

The 2006 QDR stated there is an increasing, profound concern among DoD's senior leadership and Congress or, more specifically, the GAO, about the Major Defense Acquisition Programs (MDAP). This lack of confidence is a result of measuring

weapon systems acquisition by cost, schedule, and performance. These acquisition programs are unpredictable and unstable. Ongoing reviews for acquisition improvements are being conducted both within and outside DoD to enforce these acquisitions, resulting in better outcomes for the taxpayer and more responsive support to the joint warfighter in the 21st century. The major problems addressed by GAO reports are summarized below.

First, the United States has the world's best weapon systems, unrivaled in superiority. The process to deploy these systems needs to be fixed. In today's acquisition environment, 40 percent cost increases are common, which add up to tens of millions of dollars, schedule delays that add up to years, and rebaselining of some large and expensive programs; indeed, some programs are even scrapped. Consequently, reduced quantities and capabilities are delivered to the warfighter.

For the past 35 years GAO has documented these problems. Since DoD will be spending more than $1.4 trillion dollars for new weapon systems between 2005 and 2009, quality and time are essential to maintain weapons superiority, quickly counter threats from the nation's adversaries, and better protect and enable the warfighter. Also, using constant 2006 dollars, the top five programs in 2001 cost $290.8 billion while the top five programs in 2006 totaled $550 billion. Considering this staggering, increased dollar spending for weapon systems, the nation will be faced with taking funds from other federal programs to fund these systems or to reduce funding for these systems.

Second, DoD does not separate long-term needs from wants. DoD starts many programs that it cannot afford. Each Service competes for funding creating a Service-centric structure and fragmented decision-making approach. It does not prioritize programs based on customer needs and DoD's long-term vision. Many times when a program needs funds because of cost increases or schedule delays, funds are taken away from other programs. This rewards poor performing programs (GAO, March 2007).

An integrated portfolio management investment strategy, as used successfully in the commercial world, would achieve more executable programs and ensure better return on investments. More importantly, warfighters would receive greater quantities and capabilities as promised to them. An investment strategy would prioritize the order of needed capabilities and match them up against resources—dollars, technologies, time, and people required to obtain these capabilities as well as define incremental product development programs for obtaining these capabilities and establish controls so the requirements, funding, and acquisition processes would work together. Without an integrated investment strategy, all other improvements will fail as shown in the past (GAO, March 2007).

Third, in 2003 DoD adopted the defense life cycle management system. This is a knowledge-based, evolutionary product development approach. GAO examined programs that began after this system started. DoD is not following it. Early decision points in the system are frequently bypassed, resulting in decision makers committing programs to premature system demonstration and initial manufacturing in the face of significant unknowns about technology, design, and production.

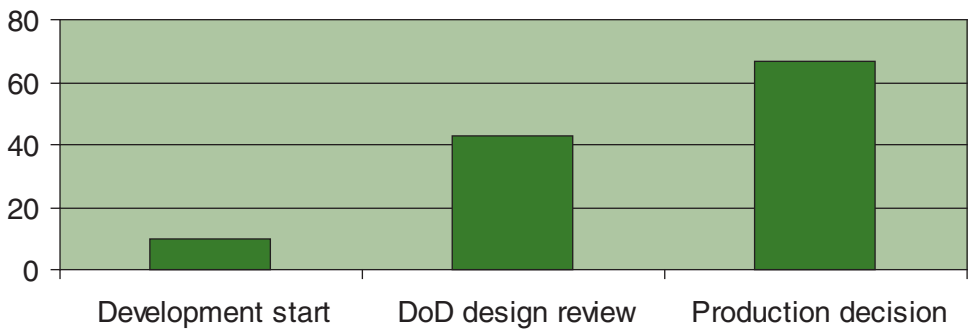
Critical points such as Milestones A and B, the Design Readiness Review, and Milestone C are not followed at all or only partially. Programs start system develop-

TABLE 1. TECHNOLOGY MATURITY AND PROGRAM OUTCOMES

Program	Percent increase in R&D (first full estimate to latest estimate)	Percent of critical technologies and associated maturity level at development start
Advanced Threat Infrared Countermeasure/Common Missile Warning System	5.6	50% (3 of 6) at 6 or higher
C-5 Reliability Enhancement and Reengining Program	2.1	100% (11 of 11) at 6 or higher
DD(X) Destroyer	417.3	25% (3 of 12) at 6 or higher
Future Combat System	50.8	32% (17 of 52) at 6 or higher
Joint Strike Fighter	30.1	25% (2 of 8) are 6 or higher

(GAO, 2005, p. 42)

TABLE 2. PERCENT OF PROGRAMS THAT ACHIEVED TECHNOLOGY MATURITY AT KEY JUNCTURES



(GAO, 2006, p. 11)

ment with immature technologies (DoD, April 2006). The Army's Future Combat System entered the SDD phase with 32 percent of its critical technologies mature. The Air Force's Joint Strike Fighter began SDD with only 25 percent mature technologies. When programs start development with mature technologies, they incur lower development and unit cost increases than those programs starting with immature technologies. Table 1 shows five examples.

History shows that programs with lower levels of knowledge at critical points lack demonstrated knowledge in the process and will continue to stay behind (Table 2).

TABLE 3. COST AND SCHEDULE OUTCOMES FOR 6 OF THE 10 LARGEST DEVELOPMENT PROGRAMS SORTED BY PERCENT OF SYSTEM DEVELOPMENT REMAINING

Programs	Percent development cost growth	Delay in delivery of initial capability in months	Percent of development remaining
Aerial Common Sensor	45%	24	85%
Future Combat System	48%	48	78%
Joint Strike Fighter	30%	23	60%
Expeditionary Fighting Vehicle	61%	48	49%
C-130 Avionics Modernization Program	122%	Delays anticipated due to program restructure	Undetermined due to program restructure Delays anticipated due to program restructure
Global Hawk (RQ-4B)	166%	Delays anticipated due to program restructure	Delays anticipated due to program restructure

(GAO, 2006, p. 10)

Fourth, Tables 3 and 4 show that immature technologies that advance without adequate demonstrated knowledge result in cost increases and schedule delays; thus, DoD delivers reduced quantities and capabilities to the warfighter and, ultimately, loses buying power.

Table 4 gives examples of DoD programs with reduced buying power (GAO, April 2006).

Fifth, to improve the defense life cycle management system, an item's technical data must be included and readily available. Technical data are recorded information used to define a design and to produce, support, maintain, or operate the item (GAO, July 2006). These data represent a significant element in the life cycle of a weapon system because they may be used for decades. The Army and the Air Force have experienced sustainment limitations on several deployed weapon systems because they lacked needed technical data rights. They have not been able to take advantage of cost savings and meet legislative requirements for depot maintenance. GAO pointed out seven weapon systems lacking technical data rights: C-17, F-22, and C130J aircraft,

TABLE 4. EXAMPLES OF DOD PROGRAMS WITH REDUCED BUYING POWER

Programs	Initial Estimate	Initial quantity	Latest estimate	Latest quantity	Percent of unit cost increase
Joint Strike Fighter	$189.6 B	2,866 aircraft	$206.3 B	2,458 aircraft	26.7%
Future Combat Systems	$82.6 B	15 systems	$127.5 B	15 systems	54.4%
F-22A Raptor	$81.1 B	648 aircraft	$65.4 B	181 aircraft	188.7%
Evolved Expendable Launch Vehicle	$15.4 B	181 vehicles	$28.0 B	138 vehicles	137.8%
Space Based Infrared System High	$4.1 B	5 satellites	$10.2 B	3 satellites	315.4%
Expeditionary Fighting Vehicle	$8.1 B	1,025 vehicles	$11.0 B	1,025 vehicles	35.9%

(GAO, 2006, p. 5)

the Up-armored High-Mobility Multipurpose Wheeled Vehicle, the Striker family of vehicles, the Airborne Warning and Control System aircraft, and the M4 carbine (GAO, July 2006). Long-term technical data need to be in the requirements before contract solicitation issuance (GAO, July 2006).

Sixth, the definition of success needs redefining. In the commercial world, success is defined by maximizing profit. At DoD, success is defined by the ability to obtain funds for new programs and to maintain funding for current, ongoing programs. Optimistic cost, schedule, and technology readiness factors attract funding. Honest assessments could result in a loss of funding. Delayed testing is preferred over early testing because bad news could result in a loss of funds. Success measures such as risk reduction, knowledge-based decision making, discipline, collaboration, trust, commitment, consistency, realism, and accountability could result in better outcomes for DoD (GAO, 2005).

CONCLUSION

DoD's acquisition of major weapon systems represents one of the most crucial and expensive activities in the federal government. Its impact is critical on the nation's economic and fiscal policies, especially considering the current long-term fiscal imbalances along with increasing conflicts over increasingly scarce resources. This could damage our national security. For the past several decades, deep concern

over DoD's management effectiveness of these weapon systems is prompting DoD to change business practices. By following DoD's defense life cycle management system, each weapon system could be an affordable, worthwhile investment and an executable program and, thus, achieve a better acquisition outcome. DoD is transforming military operations to function as a joint force on the battlefield in accordance with the 2006 QDR.

DISCLAIMER

The views expressed in this article are the author's and do not reflect the official policy or position of Information Technology, E-Commerce, and Commercial Contracting Center (ITEC4-W).

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