ACHIEVING OUTCOMES-BASED LIFE CYCLE MANAGEMENT

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Over the course of 60 years, DoD has attempted to improve its acquisition and life cycle process through a series of incremental changes to address requirements creep, cost growth, funding instability, and technical risk. Unfortunately, these innovations have not improved cost, schedule, or technical performance of DoD programs. Currently, the United States faces significant economic and national security threats from near-peer competitors, rogue states, and transnational terrorist organizations. This multiplicity of threats requires an agile, cost-efficient process to mature and sustain military capabilities. This article explores fundamental changes needed within government and industry to evolve a highly agile and responsive life cycle process.

Keywords: *Acquisition, Logistics, Effects-Based Requirements, Industry-Government Partnerships, Commercial*

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Background

The Department of Defense (DoD) acquisition and sustainment processes are straining under the demands of the Global War on Terror and an emerging shortage of skilled acquisition and sustainment professionals. Significant cost and schedule growth, extended development cycles, schedule delays, elongated logistics response times, and increasing backorders are evidence of those strains. The Government Accountability Office (GAO) documented a 36 percent cost growth for major defense acquisition programs and characterized DoD logistics as high risk (Government Accountability Office [GAO], 2008). Additionally, the DoD continues to struggle to keep pace with and develop new technologies, and is no longer the catalyst driving the development of new revolutionary technology (Hagar, 2008).

In July 2008, the Defense Science Board (DSB) issued its report, "Creating an Effective National Security Industrial Base for the 21st Century: An Action Plan to Address the Coming Crisis." The report provided specific recommendations to enable the DoD to achieve lower costs, field capabilities faster, and improve logistics support. The DoD also issued revised guidance on implementing a life cycle management framework that focuses on life cycle metrics, aligning resources and readiness, and implementing performance-based life cycle product support (Young, 2008). In March 2009, the Chairman of the Joint Chiefs of Staff (CJCS) issued CJCS Instruction 3170.01G. The intent of the revised guidance on the Joint Capabilities Integration and Development System was to improve the requirements process (CJCS, 2009).

The Weapon Systems Acquisition Reform Act of 2009 is the most recent attempt to reform the DoD acquisition and life cycle process. The act includes provisions to enhance oversight, foster independent cost estimates, and improve the DoD acquisition workforce. These provisions are directed toward addressing DoD's challenges with requirements, stability, cost growth, and schedule delays.

Our current national security posture and budget realities dictate that DoD and industry continue to explore and refine new acquisition and sustainment processes to enable greater agility and capability at reduced costs. To appreciate the challenges DoD faces in achieving that agility, one must first review the path that DoD and industry have traveled since World War II.

THE WORLD WAR II ACQUISITION AND LOGISTICS ENVIRONMENT

The acquisition process during World War II focused on mass production of weapon and support systems, as the American economy served as the heart of the Allied war effort. The United States produced over 2.4 million vehicles, 88,000 tanks, and 303,000 aircraft during

the war, with the lend-lease program exporting $57.4 billion worth of equipment to its Allies. U.S. production exceeded that of the Allies and adversaries combined (Dana, 1998). The ability of the U.S. industrial base to rapidly transition from civilian to defense production enabled the Allied victory in World War II (Dana, 1998).

ACQUISITION AND LOGISTICS DURING THE COLD WAR

In 1945, U.S. industrial capacity transitioned from a wartime footing to a commercial market burgeoning with pent-up demand. Commonality in manufacturing processes, similarity in products, and a dramatic increase in demand for consumer durables made for a relatively smooth transition to a peacetime, consumer-driven economy.

The subsequent emergence of the Soviet Union as a peer competitor gave birth to a dedicated defense industry that focused on developing and manufacturing the increasingly complex systems needed for deterrence (Defense Science Board, 2007). Weapon systems acquisition during this period displayed several market characteristics:

- A monolithic threat enabled the United States to concentrate on relatively stable and predictable requirements.
- A national decision to capitalize on technology to seize and maintain qualitative superiority led DoD and industry to concentrate on equipment performance.
- A robust set of industrial competitors enabled DoD to experiment, develop, and prototype needed technologies while capitalizing on competitive market forces.
- A national decision to forward-deploy forces in Europe and Korea encouraged large logistics footprints of supplies, personnel, and maintenance facilities to also be forward-deployed.
- A national will supported DoD efforts and provided funding at approximately 5–15 percent of the GDP (Center for Strategic and Budgetary Assessments, 2006).
- A supportive environment of exploratory technology tolerated test failures and allowed new data findings.

The DoD and industry became increasingly governed by unique government practices—first in engineering and manufacturing, then in finance and business—with the DoD specifications and standards numbering 30,000 by 1980 (Poston, 2003). These specifications and standards drove a wedge between defense and commercial industries and served as significant barriers for non-defense firms trying to enter the defense market.

The continuing DoD challenges with requirements stability, technical/risk management, funding stability, and the lack of schedule adherence produced a national will that after three decades of Cold War, began to demand more efficiency and accountability within defense acquisition and logistics.

THE REAGAN ERA

Beginning in the early 1980s, a series of incremental policy directives attempted to address skyrocketing weapons costs and increasing development schedules. In April 1981, Deputy Secretary of Defense Frank Carlucci presented 32 initiatives for reducing weapon systems costs, shortening development time, and improving weapons readiness and support (Carlucci, 1981). One goal of the initiatives was to control cost growth by attempting to achieve realism in cost estimating.

Secretary Carlucci also introduced the concept of Preplanned Product Improvement (P3I)—a means to deploy systems and sequentially upgrade them over time (Carlucci, 1981). This strategy was intended to minimize technological risk, and quicken the pace of modernization of the nation's armed forces. Other recommendations included the production of weapon systems at more efficient rates, reduction in the number of DoD directives, more advantageous use of competition, and greater use of standardized subsystems and support equipment. These initiatives represented a comprehensive list of measures with the potential to lower costs, but did not address the major causes of cost growth in weapon systems such as technical risk, requirements creep, and cost-plus business arrangements (Foelber, 1982).

During this period, Congress also took steps to curb the rising cost of weapon systems, including the introduction of more rigorous DoD reporting requirements, the establishment of audit procedures for acquisition activities, and wider use of multi-year contracts (Lockwood, 1983).

THE PACKARD COMMISSION

President Reagan established the Packard Commission in 1986 to reduce the inefficiencies in the defense procurement system, with an emphasis on the acquisition process. The Commission's conclusions supported the results of numerous prior studies, reporting that the acquisition process suffered from schedule delays, cost overruns, and inefficient performance (The President's Blue Ribbon Commission on Defense Managment, 1986). The Commission recommended streamlining the acquisition process, increasing the amount of tests and prototypes, and improving planning.

A subsequent review of 269 completed defense contracts found that the Packard Commission's recommendations were ineffective in

reducing cost overruns. Despite implementing over two dozen initiatives, no considerable progress in defense program cost performance was realized for over 30 years (Christensen, Searle, & Vickery, 1999). The recommendations did little to fundamentally change the DoD acquisition system that favored expensive, long programs, as shown in Table 1.

TABLE 1. THE EFFECT OF PACKARD COMMISSION RECOMMENDATIONS ON DEFENSE COST PERFORMANCE

		Contract Phase		Managing Services		
	All Contracts	Development Contracts	Production Contracts	Air Force	Navy	Army
Number of Contracts (n)	269	8	188	113	134	22
Final overrun before implementation (%)	5.6	4.1	6.2	2.8	7.6	8.1
Final overrun after implementation (%)	9.5	15.3	7.2	12.7	6.1	17.0
Difference (%)	3.9	11.2	1.0	9.9	-1.5	8.9
Statistical significance (p)	0.055	0.014	0.294	0.003	0.206	0.110

(Christensen, Searle, & Vickery, 1999)

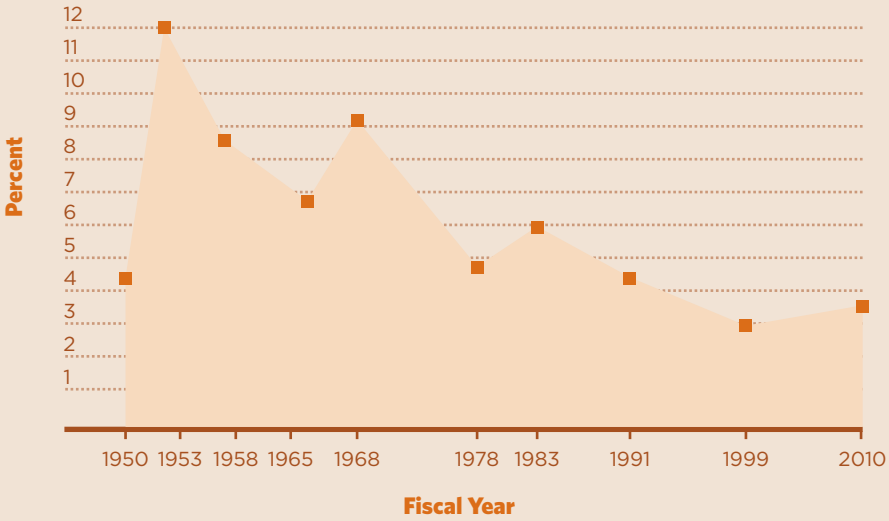
HISTORIC FUNDING

Figure 1 presents defense outlays as a percent of gross domestic product. As shown, defense spending has continuously declined from 1950 through the present. The recent spike, associated with the Global War on Terror, is projected to decline in the outyears, placing increased pressure on DoD modernization accounts.

THE END OF THE COLD WAR

By the end of the Cold War an industrial structure, an acquisition process, and a logistics system existed that was mismatched with the priorities of the American people and the global security environment. The DoD had honed an acquisition process that focused on providing technologically superior systems with industry geared up to produce those systems in large quantities. With the dissolution of the Soviet Union, the American public shifted its priorities to domestic issues. Multiple

FIGURE 1. DEFENSE OUTLAYS AS A SHARE OF GROSS DOMESTIC PRODUCT



(Lewis & Mehuron, 2009)

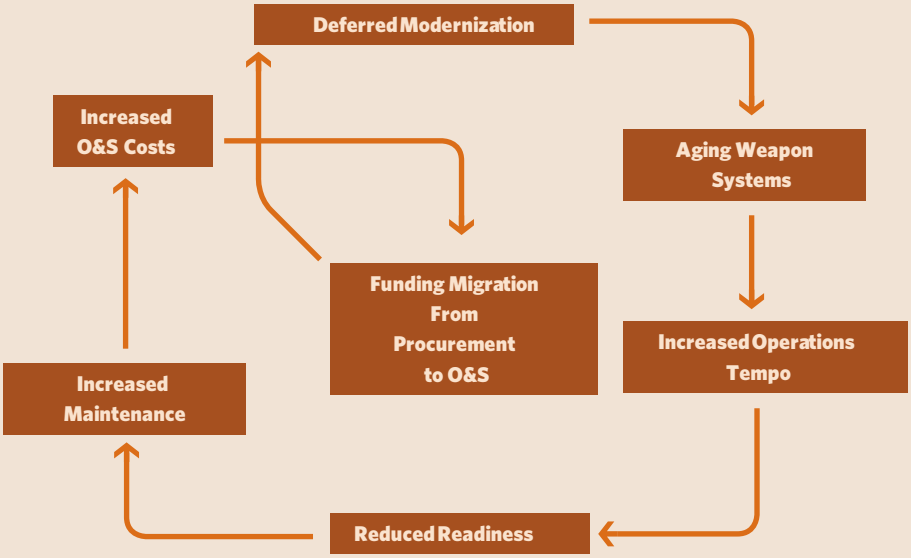
administrations, through the 1990s, responded to this shift in focus through force reductions, base closures, and industrial consolidation (GlobalSecurity.org, 2003).

SPECIFICATIONS AND STANDARDS REFORM

In 1994, Secretary of Defense William Perry issued DoD policy to increase access to state-of-the-art technology and adopt the same business practices as world-class commercial suppliers. The directive attempted to reduce the complexity and costs that DoD incurred when purchasing major weapon systems and their numerous maintenance requirements.

Secretary Perry chartered a detailed cost analysis allowing the DoD to determine the most important cost drivers in the quest for standards reform. The study concluded that, on average, the DoD paid a regulatory cost premium of approximately 18 percent. The study also indicated that significant cost savings were achievable through reductions in DoD regulation and oversight (Coopers & Lybrand/TASC Project Team, 1994). Since Secretary Perry introduced his plan to reform the acquisition process, over 1,200 commercial standards have been adopted by the DoD; however, DoD has not fully capitalized on commercially available solutions (Office of the Secretary of Defense, 1994).

FIGURE 2. THE DoD "DEATH SPIRAL"



(Gansler, 1998)

The procurement accounts declined in the late 1990s, with fewer new systems under development and existing weapons platforms continuing to age and remain in service well past their intended life cycles. This extended use resulted in increasing operations and maintenance (O&M) costs, which contributed to a life cycle "Death Spiral" of further deferred modernization, as shown in Figure 2 (Gansler, 1998).

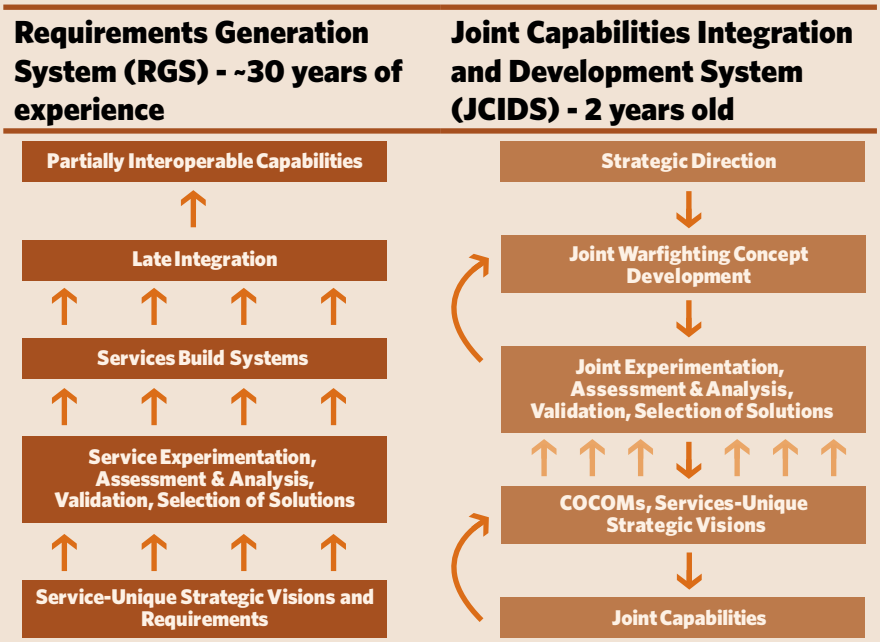
To attack this "death spiral," Secretary Gansler launched an aggressive acquisition and logistics reform effort (Gansler, 1999). Key initiatives included increased use of commercial items, evolutionary acquisition, streamlined acquisition documentation, and performance based logistics. These initiatives emphasized greater civil-military integration and were directed towards increasing acquisition and logistics agility.

JOINT CAPABILITIES INTEGRATION AND DEVELOPMENT SYSTEM (JCIDS)

The Joint Capabilities Integration and Development System (JCIDS) was created in 2003 to address shortfalls in the DoD requirements generation system. Identified by the U.S. Joint Chiefs of Staff, these shortfalls included not considering new programs in the context of other programs, not sufficiently considering combined service requirements, not effectively prioritizing joint service requirements, and not accomplishing sufficient analysis.

The JCIDS process codifies a DoD policy shift away from threat-based assessments to capabilities-based assessments of warfighter needs. As

FIGURE 3. THREAT VS. CAPABILITY-BASED PLANNING



a replacement for developing, producing, and fielding systems based on perceived threats to the nation, JCIDS policy enables the development of capabilities based on strategic direction and priorities defined in the National Military Strategy and National Defense Strategy, as shown in Figure 3 (Chadwick, 2007).

THE GLOBAL WAR ON TERROR

Despite the perceived "peace dividend," the migration from a bi-polar world to a multipolar world proved more challenging than anticipated. The DoD continued to rely on acquisition processes, organizations, and infrastructure largely developed in the years following World War II. Technical superiority had proven successful against a peer competitor; however, rapid advancement in commercially available computing and telecommunications empowered multiple new threats; e.g., transnational terrorism and rogue state actors. This multiplicity of threats demanded greater agility and innovation at the same time DoD acquisition and its associated industrial base were contracting. The Global War on Terror (GWOT) has provided the United States lessons directly related to DoD acquisition and sustainment. These lessons include:

- Our requirements process is slow to react to a rapidly adaptive adversary.

- Our acquisition process consumes billions of dollars against threats generated at a fraction of that cost.
- Our mass logistics structure is insufficient to support rapid, dispersed forces.

In September 2008, Secretary of Defense Robert Gates spoke at the National Defense University and addressed these issues:

> The need for the state-of-the-art systems—particularly longer range capabilities—will never go away, as we strive to offset the countermeasures being developed by other nations. But at a certain point, given the types of situations we are likely to face—and given, for example, the struggles to field up-armored HUMVEES [High Mobility Multipurpose Wheeled Vehicles], MRAPs [Mine Resistant Ambush Protected (vehicles)], and ISR [intelligence, surveillance, and reconnaissance] in Iraq—it begs the question whether specialized, often relatively low-tech equipment for stability and counterinsurgency missions is also needed.

Secretary Gates continued:

> Why did we have to go outside the normal bureaucratic process to develop counter-IED [improvised explosive device] technologies, to build MRAPs, and to quickly expand our ISR capability? In short, why did we have to bypass existing institutions and procedures to get the capabilities we need to protect our troops and pursue the wars we are in? Our conventional modernization programs seek a 99 percent solution in years. Stability and counterinsurgency missions—the wars we are in—require 75 percent solutions in months. The challenge is whether in our bureaucracy and in our minds these two different paradigms can be made to coexist.

TIME FOR CHANGE

The answer to Secretary Gates' question can be found in the historic evolution of our nation's DoD life cycle process. Since the end of World War II, the DoD developed and refined an acquisition process focused on responding to a predictable, monolithic threat. This process built upon several underlying principles, including a desire for U.S. technological superiority, a competitive industrial base, and a relatively long planning and requirements horizon.

Over the course of 60 years, DoD attempted to improve its acquisition and life cycle process through a series of incremental changes to address requirements creep, cost growth, funding instability, and technical risk. Despite numerous studies and reforms, these incremental efforts did

TABLE 2. GEOPOLITICAL DIFFERENCES

1945—1990	Today
Threat: Bipolar threat. Enabled the United States on relatively stable and predictable requirements (Soviet Union)	**Threat:** Multipolar threat. Transnational terrorism, near-peer competitors, and rogue state actors
Technology: A national decision to capitalize on technology to seize and maintain qualitative superiority led DoD and industry to concentrate on equipment performance. Military technology as the driving force	**Technology:** DoD no longer the catalyst driving the development of new revolutionary technology. Commercial technology the driving force
Requirements: Concentrated on relatively stable and predictable requirements. Match or counter Soviet weapons systems	**Requirements:** Unpredictable and unstable with the multiplicity of threats and behavior. Adversaries with current events driving requirements
Acquisition & Sustainment: A robust set of conventional industrial competitors enabled DoD to experiment, develop, and prototype needed technologies while capitalizing on competitive market forces. Incremental change	**Acquisition & Sustainment:** Systems and cost demands of the Global War on Terror, increasing Congressional oversight, and a shortage of skilled acquisition and sustainment professionals. Significant cost and scheduled growth of major defense programs, extended development cycles, schedule slips, elongated logistics response times, and increasing backorders
National Will: A national will that supported DoD efforts and provided funding at approximately 5—15% of the Gross Domestic Product	**National Will:** National will skeptical and increasingly unwilling to accept continued rampant defense spending

not improve cost/schedule control nor provide the inherent agility that is required.

The geopolitical environment that underlies DoD's acquisition and logistics processes has fundamentally changed over the past 60 years, as summarized in Table 2. These dramatic changes dictate that DoD develop an acquisition and life cycle process that is efficient and agile to respond

to current threats. Such changes cannot be achieved via incrementalism because the fundamental—the underlying principles—have changed.

Over the last two decades, the nature of conflict has fundamentally changed, and much of America's defense establishment has yet to adjust to the security realities of the post-Cold War world and the complex and dangerous new century. The acquisition and logistics environment of the 21st century needs a course of action that will decisively enable greater agility and efficiency. Such agility might be achievable by returning to our historic reliance on a competitive, integrated industrial base (such as we enjoyed prior to and during World War II). That reliance could be enhanced by:

- Establishing a top-down, competitive requirements process that fosters competing alternative solutions and industrial innovation
- Implementing a product development process that builds upon inherent industry incentives and product investment
- Defining a product support logistics model that is focused on readiness and capitalizes on best-in-class practices in government and industry.

The potential effects of these changes are contrasted to incremental efforts in Table 3.

Becoming Highly Agile and Responsive

EFFECTS-BASED REQUIREMENTS

"Requirements creep" has been a persistent problem within defense acquisition since World War II. This "creep" is driven by the DoD focus on technological superiority and the military services historic bias towards unique requirements. The JCIDS process (and subsequent portfolio management) was intended to correct these problems; however, the Joint Staff was never fully resourced to develop capstone and integrating concepts. As a result, the JCIDS process continues to be dominated by Service-driven requirements. The most recent Chairman Joint Chiefs of Staff Instruction (CJCSI) 3170.01G re-emphasizes those relationships by establishing the sponsoring agent (Services) as responsible for creating requirements documents, while the Joint Staff and Combatant Commanders (COCOMs) are responsible for review and coordination.

For DoD to enhance agility, it must begin with a *top-down* requirements process that is appropriately focused on the military effort that is required. Requirements would be characterized based upon desired effect

TABLE 3. SUMMARY TIMELINE FOR ACQUISITION AND LOGISTICS CHARACTERISTICS AND OUTCOMES

	Acquisition and Logistics Characteristics		**Acquisition and Logistics Outcomes**		
Reform Attempt	Strengths	Weaknesses	Capability	Agility	Efficiency
Packard Commission	Attention to acquisition streamlining	Expensive, lengthy acquisitions continue	Yes	No	No
Specifications/ Standards Reform	Best commercial practices	Modernization "death spiral"	Yes	No	No
Joint Capabilities Integration and Development System (JCIDS)	Capabilities based on joint warfighter needs	Disconnect between born joint and employed joint	Yes	No	No
The Weapon Systems Acquisition Reform Act of 2009	• Independent cost estimates • Strengthened oversight • Improved DoD workforce	No inherent performance incentive	Yes	No	No
		Future Strategies			
Effects-Based Requirements	Innovation and industry competition		Yes	Yes	Yes
Industry Driven Research & Development (R&D)	Leverage commercial R&D		Yes	Yes	Yes
Industry-Provided Life Cycle Process Services (LCPS)	Successful partnerships with DoD providers		Yes	Yes	Yes

or outcome, rather than as a specific system. The proposed top-down process would include the following:

- Functional Capabilities Boards would prepare the Initial Capabilities Document (ICD) based upon input from the COCOMs. By their nature, these ICDs would focus on military need and effect.
- The ICD would be approved by the Joint Capabilities Board (JCB) and the Joint Requirements Oversight Council (JROC).
- The ICD would then be provided to all DoD sponsoring agents to assess/consider alternative solutions to the ICD. These efforts would include competitive industrial participation during Material Solutions Analysis (MSA).
- The potential sponsoring agents would present the results of their efforts and a draft capability development document (CDD) to the JCB and JROC to select a preferred solution.
- Once approved, the CDD would form the basis for a Material Solutions Board (MSB) decision to proceed with a program.

This proposed process would strengthen the Joint Staff and COCOM role in requirements development and would require additional analytic resources within the Joint Staff. The process also would foster competitive evaluation of alternative solutions and enhance innovation.

Effects-based requirements would make maximum use of Joint Staff resources for integrated "Concepts of Operation," while fostering innovation within the Services and industry to develop competing solutions. Industry would be empowered to provide a specific capability rapidly, within the constraints of the Concept of Operations.

COMMERCIALLY DRIVEN RESEARCH AND DEVELOPMENT

The DoD acquisition process reinforces unique solutions via built-in-bias for large, long, cost-plus development programs. These programs inherently embody incentives for cost and schedule growth and limited incentives for efficiency. DoD and the Congress have attempted to regulate efficiency for 20 years via increased oversight and reporting, but the overall process is impervious to incremental change.

Currently, the defense industry develops a customized product with capabilities specified in advance for the individual Services. The DoD bears the up-front investment in development costs. This process incentivizes industry to pursue a technological track driven by projected performance, with limited incentives to enhance technology maturation or reduce risk. This is in stark contrast to the commercial product development process,

where industry invests in development costs with an equal emphasis on maturation and innovation (Dombrowski & Gholz, 2006).

The "new normal" of persistent conflict and stabilization engagement demands a new normal research and development business model. Advances in technology research and development (R&D) are currently led by the commercial world, where R&D has increased steadily at a rate of about 5 percent per year for more than 20 years. During this same 20-year period, DoD and government R&D spending dropped 2.5 percent per year (DoD, 2000). For DoD to capitalize on commercial investment, it must actively engage the commercial market.

The new R&D business model would be more akin to the commercial development process, where industry manages product R&D (and is fully responsible for technology maturation of that product). DoD would continue to invest in basic research within the 6.1 and 6.2 accounts, and in test and evaluation of competing prototypes. This would incentivize the defense industry to control requirements creep, select mature technologies for product integration, and develop solutions in an incremental, timely fashion. The model naturally incentivizes industry, as defense companies would be funding product development versus the cost-plus development of today. The result is a solid, business-driven mechanism that both moderates technical risk and ensures technical maturity (Gholz, 2007).

A consequence of increased control of R&D investment by the defense industry is that there will be times when the warfighter customer will not be interested in the technological improvements the defense industry has developed and offers for sale. To offset this, the defense industry and the warfighter will have to develop a strategic planning process that recognizes warfighter requirements and identifies desirable product improvements *before* developing a particular platform (Gholz, 2007).

Additionally, defense-related companies would increase their technological and market risk as they assume more responsibility for investment decisions, as they will be required to *put their own money on the line* to advance their technological core competencies. Similar to the commercial industry, defense-related companies would offer the products they have developed, with the development cost already included in the price—*prior* to offering them for sale to warfighters. The warfighters would then bear little technological risk, due to basic product performance characteristics already having been developed and well understood at the time of the sale (Gholz, 2007). Such a model would include the following key attributes:

- DoD-funded basic research and technology maturation through 6.1, 6.2, and 6.3a
- Industry engagement in competitive concept development via the revised requirements process

- Industry-funded product development following an MSA/B decision
- Government-funded test and evaluation, which, if successful, enables a full production decision.

This model may not be appropriate for multifaceted, high-risk weapons platforms, such as aircraft carriers or nuclear submarines. However, it should be appropriate for the system of systems that comprise these platforms, information technologies, and the growing number of items required for "persistent presence." This approach will require fundamental change within DoD to accept industry-matured technologies and equipment built to commercial standards.

OUTCOME-BASED PARTNERSHIP LIFE CYCLE PRODUCT SUPPORT

In the 2001 Quadrennial Defense Review, the DoD mandated the implementation of Performance Based Logistics (PBL) with the goal to gain the most efficient and effective performance of weapon systems throughout their life cycles, and to build successful business partnerships that align with the goals of all involved parties for the duration of these programs (Berkowitz, 2005). PBL is a business partnership model designed to align the interests of both the DoD and the logistics service provider, creating value and the desired outcomes of both partners. This yields a more cooperative venture than merely achieving Service-level agreements or getting the lowest price from the provider.

PBLs are employed across a broad range of systems, such as aviation tires, subsystems such as engines, and complete weapon systems (e.g., F-22). More than 200 PBL efforts are ongoing DoD-wide that have demonstrated material availability above 95 percent and commercial response times of 2-4 days (versus a DoD average of 16 days) (Estevez, 2006).

The dramatic change in the U.S. security posture from 1997 to 2001 provided significant real-world observations associated with DoD's PBL efforts. These include:

- When appropriately incentivized, *industry-government partnerships* can provide improved material availability at reduced costs while mitigating obsolescence, reducing inventory, and reducing demand.
- Performance based arrangements are complex and require a knowledgeable DoD life cycle workforce that has core competencies in all product support functions and full insight/oversight of contract and agreement execution.

- Performance based arrangements are successful at the component, subsystem, and system level, depending upon the unique circumstance of the system.
- Government should procure access and rights to system technical data to enable long-term sustainment and competition.
- DoD employs forces in a joint and coalition environment; thus, sustainment strategies must reflect enterprise as well as weapon systems requirements.
- Depot partnering integrated industry and government resources; however, partnering across other aspects of product support is difficult.
- Long-term contracts limit government flexibility to adjust to real-world changes; therefore, sustainment strategies must be agile and sufficiently flexible to enable DoD to adjust to operational demands and budget realities.
- Performance based arrangements are incentivized for the contractor to engineer reliability improvements into the system. The benefits are twofold: fewer repairs for the contractor and less remove-and-replace actions for the flight line maintainer.

These key observations form the basis for a revised product support business model that is responsive to today's threat environment, builds upon the best from government and industry, and reinforces transparency and accountability. Key objectives of such a model include:

- Outcome and performance-based across the life cycle, with full cost and performance transparency
- Contractual relationships that inherently include flexibility to adjust to real-world operational and budget dynamics
- Government-industry partnerships that span all product support elements and foster shared responsibility for integrated outcomes
- Improved portfolio and enterprise integration led by government capabilities
- Clear government accountability with associated insight/oversight of industrial providers
- Appropriate balance of government and industry providers that enables development and retention of government capability.

Combining these emerging aspects with previously demonstrated successes and observations yields a product support model that is effective, efficient, and flexible. Key elements of the model include:

- The program manager is the life cycle product support manager and the single point of accountability for readiness and cost.
- PBL successes of the past decade are improved upon, with a broader tool box of partnering solutions and flexible contract strategies.
- DoD owns rights and has access to all technical data necessary to support the system through its entire life cycle.
- DoD retains responsibility for configuration management following final design review. Industry provides configuration management services and status accounting.
- Product support service providers are re-assessed on a 5-year basis following the rate production decision.
- Government-industry partnerships are established for *all* product support elements early in the life cycle.
- Initial integrated logistics support analyses explicitly consider enterprise assets.
- Weapon systems product support information is integrated into overall enterprise information systems.
- Closed-loop health monitoring and prognostic capabilities are established to enable effective fleet management.
- Integrated logistics support and level of repair analysis are continuously re-evaluated based upon field experience provided by the closed-loop system.

The proposed model is a hybrid of current promising practices and, therefore, is dependent upon several key enablers, including:

- Establishing a comprehensive capability for the program manager to function as the life cycle manager, consistent with PM accountability and responsibility (although this is designated in policy today, the program management curriculum includes very little formal training in sustainment)
- Developing a robust government workforce of life cycle product support professionals who support the program manager
- Implementing transparent cost accounting systems within the government that inherently enable capturing and reporting costs on a weapon systems basis

- Creating appropriate management and oversight structures that enable organic providers to commit to programmatic and system-level outcomes
- Creating contractual mechanisms that enable government-industry partnerships while ensuring effective government oversight
- Defining appropriate and necessary information system interfaces that enable enterprise-wide transparency and visibility
- Enabling more transparent product support to the warfighter and more warfighter advocacy for affordable, readiness-based product support objectives.

These enablers address significant structural issues that will require statutory, policy, and business process changes. These changes may span over a decade.

Conclusions

Despite fond memories of past glories, cost and schedule control has been a persistent problem within defense acquisition since World War II. The DoD acquisition and life cycle processes have proven to be impervious to incremental improvements, despite decades of study and recommendations. It is certain that for the foreseeable future we as a nation will face a severely constrained fiscal environment that will put added downward pressure on defense and other discretionary budget elements. This uncertainty requires an acquisition process that is *agile* and *efficient*, enabling the DoD to rapidly field and sustain capabilities.

This situation necessitates an enterprise-wide Defense Department application of the proven life cycle management practices that will ensure greater performance improvements and simultaneous cost savings. These significant savings opportunities in turn can be deployed to address the significant force modernization and recapitalization requirements that we face today and in the future.

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