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The Challenges of Being Agile in DoD

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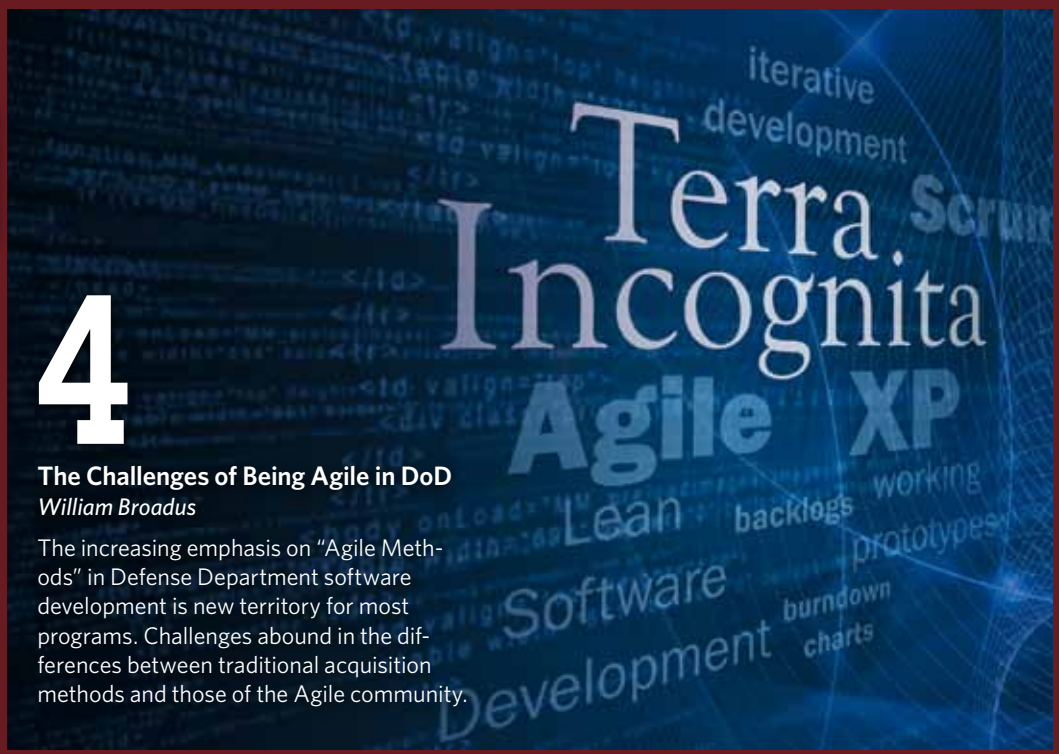

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Moving Forward

Frank Kendall

I wanted to take this opportunity, with the general election now behind us, to give *Defense AT&L* magazine readers a sense of what we can expect during the next few years. First of all, we can expect to be challenged. Budgets are shrinking and threats to our national security are not. The department has articulated a sound strategy, and, unless there are major budget reductions to come and we are forced to make revisions, we will be charged with supporting that strategy through effective acquisition of products and services across the full spectrum of Defense Department needs. We must do everything we can to execute effectively—to extract full value from the money with which we are entrusted. Over the next several years, I will do everything I can to help you perform that challenging duty.

When I replaced Dr. Ashton Carter in an acting capacity over a year ago, I articulated six priorities: support ongoing operations, achieve affordable programs, improve efficiency, strengthen the industrial base, strengthen the acquisition workforce, and protect the future. You can expect those priorities to remain in place.

I recently introduced the "for comment" version of Better Buying Power (BBP) 2.0. BBP 2.0 is the next step in a process of continuous improvement. Like BBP 1.0, it is not intended to be a "school solution" or a checklist of ideas for you to unthinkingly "check off." BBP 2.0 is consistent with my goals and priorities, and it is designed in large part to drive critical thought in the daily execution of our work. BBP 2.0 will help improve our effectiveness in the tradecraft of acquisition. There is no single "schoolbook" answer in this business, and as we move forward on BBP 2.0 over the next year or two, we will learn from our joint experiences and make adjustments as necessary. We will identify and share new best practices, and we will reject or modify the ideas that turn out to be impractical or ineffective. You can expect future versions of BBP as together we learn about and discover what works and what doesn't.

Increasingly, we will measure our own performance and try to learn from those who are most successful at acquiring products and services for our warfighters. This winter I will publish the first edition of what I intend to be an annual AT&L publication on "The Performance of the Defense Acquisition System." For the first time in my experience, we will begin to measure the trends in our own performance and to understand, through data and analysis, the root causes of superior performance. You can expect that this report will be updated annually and that it will contain increasingly sophisticated assessments of our ability to execute programs of various types, of the productivity of Department of Defense institutions, and of the firms in the defense industrial base.

This winter, hopefully before this article goes to press, I will issue the coordination draft of the new DoDI 5000.02. This draft will update 5000.02 to be consistent with current law. It also will provide a range of models for structuring programs, and it will emphasize the need to tailor our acquisition approaches to the natural work flow and decision points for the product being developed and fielded. I will expect the principles embodied in the new 5000.02 to be used immediately while the document goes through the standard review cycle.

The process of rewriting DoDI 5000.02 has made clear to me that over the years an increasingly complex web of statutory direction has significantly complicated the lives of our key leaders, particularly our program managers. As a result, I have asked my chief of staff, Andrew Hunter, to form a team with other stakeholders, working with interested parties from Congress, to prepare a legislative proposal that would provide a single coherent and simplified body of law to guide the defense acquisition system. The goal is to have this completed and submitted to Congress within one year.

Finally, you can expect my continued support and dedication to giving you all of the tools you need to be effective. You, the total acquisition workforce—and I include in this grouping all of you who are involved in technology development, logistics, and sustainment activities of all types, as well as those working in the traditional product development and production activities—are the key to our success.

The next few years are not going to be easy. I expect that the Department will be stretched significantly as we attempt to retain the force structure needed to execute our national security strategy while simultaneously maintaining readiness, sustaining infrastructure, recapitalizing or modernizing aging equipment, introducing innovative technologies, preserving our industrial base, and ensuring the continuing technological superiority that our forces have every right to expect. Our success depends on your ability to execute the overall AT&L mission: supporting the warfighter and protecting the taxpayer. I look forward to meeting this challenge with you.


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The Challenges of Being Agile in DoD

William Broadus

In today's acquisition environment, it no longer is unusual for your program to award a product or service development contract in which the vendor intends to utilize "Agile Methods" for its software development efforts. In fact, the official push for Agile within the Department of Defense (DoD) came from Congress in Section 804 of the Fiscal Year 2010 National Defense Authorization Act: Implementation of New Acquisition Process for Information Technology Systems.

This section directed the Department to report to Congress on how DoD planned to meet the intent of the law. The key elements of the response from the Office of the Secretary of Defense ("A New Approach for Delivering Information Technology Capabilities in the Department of Defense,"

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November 2010) focused on the following: (1) Deliver Early and Often, (2) Incremental and Iterative Development and Testing, (3) Rationalized Requirements, and (4) Flexible/Tailored Processes (see Figure 1). Also, both the DoD Chief Information Officer in the Department's modernization plans and the White House CIO in the FY 2013 budget priorities clearly identify the government's need to establish processes and "agile teams" to achieve secure, efficient, and effective IT for DoD.

For most programs, using Agile is approaching new territory, full of unfamiliar processes, lacking clear alignment to existing expectations, and/or one in which program stakeholders are unprepared to adapt to their changing roles. As is illustrated in Figure 2, researchers reviewing Agile projects and programs within the DoD environment have identified a number of key barriers that could create major challenges to achieving successful outcomes. Unsurprisingly, these challenges are rooted in the differences between the traditional acquisition methods of DoD and those practiced within the Agile community. Programs intent upon success must realize that the benefits of Agile can be achieved in the DoD environment only through thoughtful planning, preparation, and implementation focused on acknowledging differences, adapting to the new methodologies, and not expecting the Agile approach to fit into an "acquisition development box." As one expert in the field stated, ". . . to become Agile is to migrate from Work Breakdown Structures (WBSs) to backlogs and from Gantt charts to burndown charts."

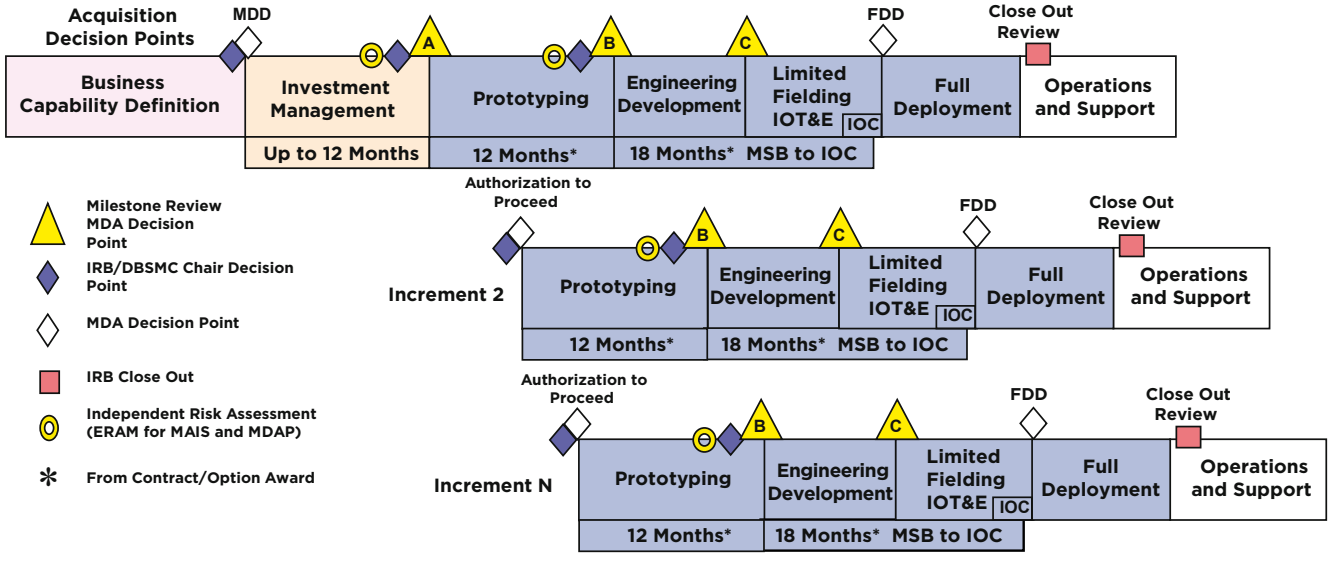
Multiple studies of the DoD 5000 series by organizations familiar with DoD acquisition and Agile Methodologies have concluded there are no direct policy or practice issues that would preclude or limit the use of Agile methods within the DoD. A very important conclusion of these studies on Agile methods is that they can provide both tactical and strategic benefits for the organization. The tactical benefits of lower cost within schedule and increasing quality are important. However, the strategic benefits of being responsive and being able to adjust to the current situation more rapidly might be of even greater value.

Adopting Agile within the DoD still presents a number of concerns even with the additional direction provided by recent policies and statutory changes. The key challenge, which will be addressed from numerous perspectives in this article, is how to implement a new set of management and technical approaches necessary for the advantages of Agile to be fully leveraged.

Agile in Context

In this article, the term "Agile" will serve as an overarching term to represent all forms of iterative development whether Scrum, Lean Software Development, extreme programming (XP), or others. The discussion will focus on the common root cause challenges and not the unique, specific details of the various methodologies. The idea for "Agile" began 12 years ago when a small group of software gurus brought forth the

*Figure 1. Business Capability Lifecycle Acquisition Business Model**



Guiding Principles:
- Deliver early and often
- Incremental and iterative development and testing
- Rationalized requirements
- Flexible/tailored processes
- Knowledgeable and experienced IT Workforce

Key Attributes:
- Streamlined capability documentation
- Streamlined governance and tiered accountability
- Independent risk assessment
- Flexibility in capability implementation strategies
- Emphasis on the use of mature technologies
- Use of "time constrained" process management and program execution
- Capability delivery in increments of 18 months or less
- User and test communities engagement throughout the life cycle

*OSD Report to Congress #13744-10, "A New Approach for Delivering Information Technology Capabilities in the Department of Defense," November 2010 (Pursuant to Section 804 of the National Defense Authorization Act for Fiscal Year 2010).

"Agile Manifesto" (2000), posing a radical approach to software development.

Agile is as much a philosophy as a modern development methodology. This philosophy focuses on value to the customer and efficiency in the approach to delivery, a key friction-point when working within the significant structure of the typical DoD program.

Agile focuses on better collaboration, satisfied customers (short-term feedback) and higher-quality software. This approach has gained significant "traction" against more traditional waterfall or "phase-gate" development processes, which are the traditional DoD planning paradigms as highlighted in Figure 3. The generally agreed-to benefits a program can achieve by incorporating Agile include:

- Ability to stay nimble and responsive to constantly changing customer needs
- Faster time to market of products (reduced cycle-time)
- Meaningful collaboration between all stakeholders

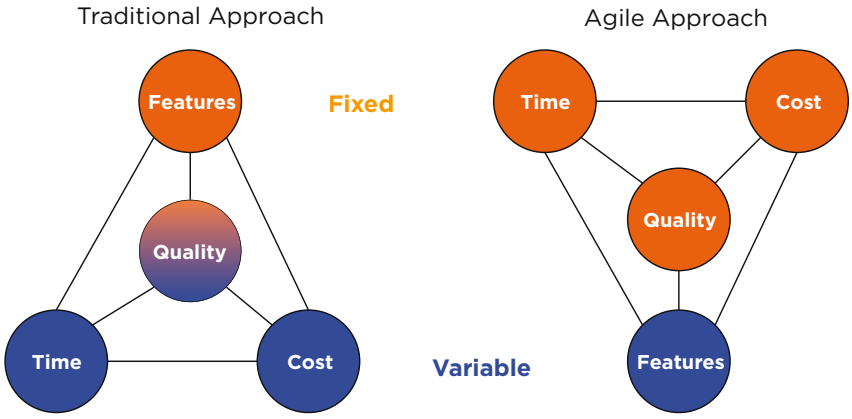
Agile requires new skills by all those involved in the process in order to be successful; development team, customers, product owners, and other stakeholders. This point and its implications will be addressed in several ways later in the article.

Questions that arise from non-Agile aligned stakeholders will include items such as:

- What are we really building? What happens to the requirements?
- How do we keep everyone in the loop when we're not in the same office for the "daily standup"? (An Agile process of daily discussions on planning and implementation activities that is significant to the development process and feedback to all involved).
- How do we control scope and communicate changes when they occur?
- How do we know what the development team will deliver at the end of the Sprint? (A basic unit of development in Scrum that lasts for "time-boxed" or restricted durations of from 24 hours to an entire month.)

Given the above context for Agile, the remaining portion of the article will identify and discuss the likely barriers and challenges a DoD program will face in embracing Agile as a both a philosophical and developmental paradigm.

Figure 2. Approach to Project Variables



Customers tend to remember slipped dates more than they remember slipped features or functionality

Barriers and Challenges

This article will use a draw upon numerous research efforts to identify and discuss key focus points for the gov-

Figure 3. Traditional Waterfall vs. Agile

Process	Waterfall Approach	Agile Approach
Planning and Scheduling	Pert/Gantt, detailed and upfront; fix scope, estimate time, and resources	Release and iteration plans updated throughout; fix date, estimate scope
Requirements and Design	Detailed and upfront	Continuous, emergent, last responsible moment
Implementation	Code in parallel, follow plan, change control, deliver at end of phase; test afterward	Code and test; deliver incremental working software each iteration
Test/QA	Detailed test plans; test after implementation phase	Continuous integration, build, and test
Management Culture	Hierarchical and contractual, "command and control"	Servant leadership, collaboration, flat organization
Measures of Success	Conformance to plan or contract	Working software, satisfied customers and team

Adapted from: Leffingwell, D., *Scaling Software Agility,* Addison-Wesley, 2007.

ernment and vendor team to consider in incorporating Agile methods into their overall acquisition strategy and programmatic approach.

The DoD Life Cycle and Major Events

Some of the DoD life-cycle phases lend themselves to the use of Agile methods better than others. It is important to plan on how you will include Agile processes into your contractually binding documents (request for proposals, statements of objective or work, etc.) to achieve the benefits of those processes and practices. An area where this planning is most critical is setting proper expectations around technical review events such as the Preliminary and Critical Design Reviews (PDRs and CDRs). Agile methods do not deliver the types of supporting documentation expected at these events. They do deliver working prototypes that may provide for a subset of stated requirements in the form of usable software. Clearly, the expectations and criteria for acceptance will need to be established and reflected in the contract language. The primary point is that Agile produces the final product iteratively, and this will require managing expectations related to acceptance and decision-making activities to ensure compatible outcomes.

Your Team Environment

A central concept to Agile methods is the use of small, focused, cross-functional teams. As a practice, testing is done concurrently with the development and iteration efforts. This requires significant access to the end users (or likely their designated representatives) throughout this process. This will require the members of the government team (the end-user representatives) to understand and participate in this significantly more hands-on approach to development.

"End-User" Access and Involvement

A key tenet of the "Agile Manifesto" is the concept of "Customer Collaboration over Contract Negotiation." The primary way this is accomplished is through continuous contact between the Agile development team and the end user. This requires the government and vendor to agree upon an appropriate proxy who will be the voice of the end user in their daily interactions with the Agile team. This practice will require the program office to plan and conduct ongoing activities that are, fundamentally, tailored Early Operational Assessments (EOAs).

Agile Knowledge and Training

The concepts of Agile are based upon sound practices for software development and therefore are not new in nature. This drives a demand for training for all the government program office as appropriate for their role. Support for this will require both upfront and ongoing planning and resources. Vendors may also need to take part in some of this training in order to understand how to improve the interface between their Agile approaches and the government's management systems. Having an "Agile advocate" on the government program team who is empowered to work with both the government and vendor teams is considered a best practice.

For most programs, using Agile is approaching new territory, full of unfamiliar processes, lacking clear alignment to existing expectations, and/or one in which program stakeholders are unprepared to adapt to their changing roles.

Balancing Stakeholder Insight/Oversight

DoD programs rely heavily upon milestone reviews, documents, reports, and selected metrics to monitor and assess vendor progress and/or assess aspects of the proposed technical solution.

Agile methods use a similar process. However, the documentation generated for Agile is tailored to meet the minimum necessary for the programmatic and technical needs of the development team. This documentation normally is insufficient to support typical DoD milestone/capstone events. During the proposal and negotiation processes, what is acceptable for the program and will work with the Agile environment needs to be determined and captured in the contract. The tailoring process to meet this need should focus on:

- Confirming that all participants are truly program stakeholders and are committed to achieving the contract outcomes
- Establishing how all regulatory and policy documentation that does not directly contribute to Agile will be developed
- Reaching clear agreement on the intent and content of all contract elements
- Achieving all the nontechnical requirements placed upon the program

The analogy frequently used to explain oversight within the Agile community originated with military leaders in the field and is called "Commander's Intent." With Agile, it is all about the intent when it comes to planning. If the plan does not work as expected, the team will alter its plans while clearly keeping the original intent in mind. Agile programs tend to be

less formal contractually, but are highly disciplined in process and practice.

Team Composition

Agile development team composition is different than traditional development teams. In this case, the government program team needs to flex toward the vendor and strongly consider changing its composition. The two positions that would be necessary to add to the government team are the Agile Advocate and the end-user representative. The end-user representative must represent the software/system user's perspective but also have the technical authority from the Procurement Contracting Officer to direct contractor activities within specific limits. Both these key government team positions require that those serving in them possess skills in modern software development approaches associated with Agile as well as knowledge and application of best acquisition practices. Staffing these two roles likely will be one of the most difficult challenges for the government to overcome.

Shifting Cultures

All organizations have a culture based upon their knowledge, beliefs, displayed behaviors, and traits. In the traditional DoD organization, the focus is on following the plan with minimal change. In Agile, the focus is on adapting successfully to inevitable change. The goal is not just to "do Agile" but to "be Agile." Simply utilizing an Agile process, and following each step dutifully, will yield some benefit. However, if being Agile is the goal, "a culture of agility" needs to be created.

Integration and Test

Agile uses a significantly different approach to integration and testing than is employed in most DoD development programs. In Agile, integration and test are continuous activities, contrary to the traditional approach where they are completed at the end of a release cycle. This does not negate the need to have an independent external team conduct a system assessment for effectiveness or suitability as is done in Operational Testing. What this continuous integration and test approach does promote is a reduction in the risk as more issues are identified earlier in the life cycle. Since Agile puts the activity of validation (involvement of the end-user representative) before the activity of verification, there is less risk that the end user will not accept the product upon delivery.

Conclusions and Summary

Currently within DoD there are three main reasons programs are shifting toward an Agile approach to development: insufficient progress and performance using the traditional model, inability to provide urgent responses to evolving mission needs, and the advent of Section 804 of the National Defense Authorization Act for Fiscal Year 2010. In the case of Section 804, there are four directives on evolving the design approach for software information systems: (A) early and continual involvement of the user; (B) multiple rapidly executed increments or releases of capability; (C) early, successive prototyping to support an evolutionary approach; and (D) a modular open-systems approach. Agile methods are very compatible with achieving all four of these directives much more than traditional acquisition practices.

Observations gathered from government teams that have already begun embracing Agile methods in their programs have identified several very encouraging common themes. These include:

- Increased sense of accomplishment for delivered releases due to clear alignment to user needs
- Shorter time between initiation and delivery to the end users
- Positive user feedback that clearly highlighted the value of Agile approach
- Consistent and predictable ability to meet end-user expectations
- Prior inability to deliver above values with previous approaches

Upon reviewing the research on successes and issues associated with adopting Agile methods and the organizational change management necessary to implement them, the following are offered as an initial set of "takeaways" for the planning process by the government team:

- Understand your "adopters": Determine the characteristics of the individuals and the group who will be affected by moving to Agile methods. The key to success is understanding how to work on Agile in a traditional environment.
- Allow the time for change to work: Consider the time necessary to implement your Agile approach and don't be unrealistic with your schedule. Consider adopting an iterative approach to rolling out your Agile methods and identifying the key roles of Agile Advocate and end user representatives.
- Understand the risks associated with adopting Agile: Focus is on the knowledge, skills, and practices of the involved stakeholders. Consider leaning heavily on external training and coaching to mitigate your risk in this area.

Implementing Agile methods in your government program can provide the benefits of being responsive and able to adjust more rapidly to changes in the current environment than when relying upon more traditional methods. A government team must overcome significant challenges and barriers to effectively adopt Agile. These include dealing with the demands of the acquisition life cycle, assessing and addressing the composition and training needs of the team, understanding clearly the needs of the end user, effectively satisfying the needs of stakeholders related to programmatic insights, effectively integrating multiple testing approaches, as well as exercising the management and leadership necessary to drive culture change while building team trust. Agile implementation requires a significant undertaking but holds the potential for significant positive future outcomes for your team.

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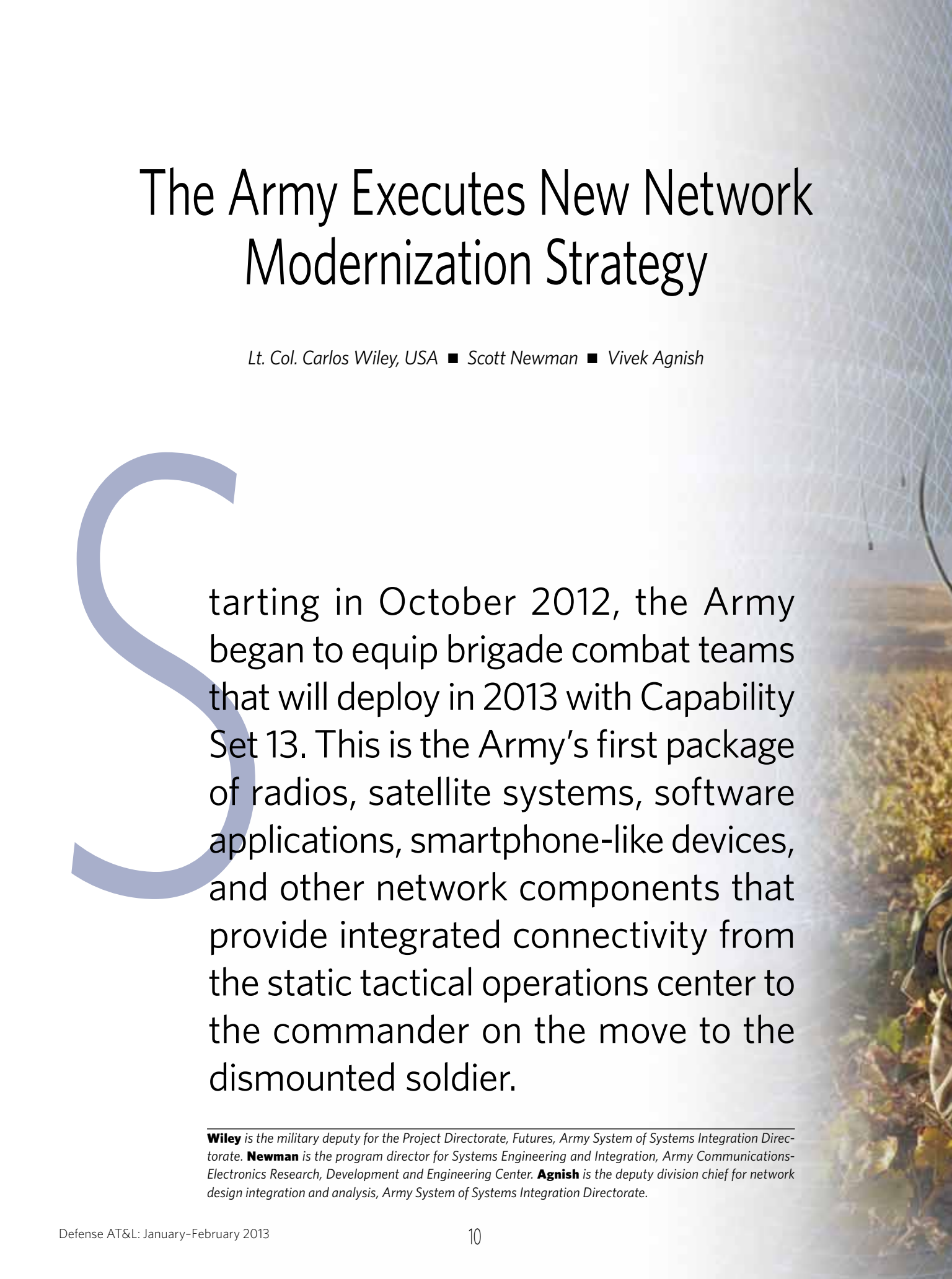
The Army Executes New Network Modernization Strategy

Lt. Col. Carlos Wiley, USA ■ *Scott Newman* ■ *Vivek Agnish*



Starting in October 2012, the Army began to equip brigade combat teams that will deploy in 2013 with Capability Set 13. This is the Army's first package of radios, satellite systems, software applications, smartphone-like devices, and other network components that provide integrated connectivity from the static tactical operations center to the commander on the move to the dismounted soldier.

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A soldier uses Capability Set 13 equipment at Fort Drum, N.Y., in October 2012. The Army's new Capability Set 13 network will reduce units' reliance on fixed infrastructure, extend the range of communications, and improve battlefield awareness at the lowest levels.

This capability set is the first fielded as part of the Army's new Agile Capabilities Life Cycle Process, or "Agile Process" for short. Rather than develop network systems independently and on their own timelines, the Army is integrating capabilities upfront in government-owned laboratories, having soldiers test-drive them at Network Integration Evaluations and delivering complete capability sets aligned with the Army Force Generation cycle. As one capability set is fielded, the Army, through the Network Integration Evaluation, is developing and evaluating the next capability set.

This process allows the Army to assess capability gaps, rapidly form requirements, solicit mature industry solutions, and perform integrated developmental and operational tests. To date, the Network Integration Evaluations have yielded more than $6 billion in cost avoidance from the restructure of Army programs and the consolidation of test practices.

Although the Network Integration Evaluations themselves are conducted every 6 months at Fort Bliss, Texas, and White Sands Missile Range, N.M., they rely on a constant churn of activity in Army laboratories more than 2,000 miles away. This lab-based risk reduction, conducted in new facilities at Aberdeen Proving Ground, Md., is critical to the successful execution of the evaluations, which involve 3,800 soldiers, more than 300 vehicles and dozens of networked systems spread over hundreds of miles of mountain and desert terrain. By replicating the Network Integration Evaluations network in the lab environment, engineers can resolve integration issues before systems get to the field—reducing test costs and sparing soldiers from trying to troubleshoot technology in the middle of the exercise.

For the first two Network Integration Evaluations, held in 2011, the Army was just beginning to implement the Agile Process and stand up its laboratories, and therefore could conduct only limited risk reduction before the operational exercises. Most network integration took place in the field, which meant there was less time available for running mission threads. However, for Network Integration Evaluations 12.2 and 13.1 in 2012, the Army was able to complete all phases of the Agile Process prior to beginning the evaluations.

Under the Agile Process, companies respond to a "sources sought" notification detailing the Army's defined capability gaps, and then enter the laboratories for technology evaluation, assessment, and integration. The lab assessments inform the Army's choices on what systems will participate in the semi-annual Network Integration Evaluations and provide detailed "score cards" to industry on how the technologies performed and what could be improved in the future.

The Agile Process gives the Army a unique opportunity to evaluate vendor systems early and provide technical recommendations to validate the claims vendors make on their products. Each vendor receives a detailed score card and technical report explaining what tests were performed and the results of the tests. This allows the vendor to see what the Army is looking for and make potential improvements to their products.

Once systems pass this phase, they enter C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance0 Systems Integration Lab (CSIL) to perform Lab-based Risk Reduction activities, where the NIE network is replicated in a lab environment. All systems—both programs of record and industry solutions—going to the NIE must first go through Lab-based Risk Reduction at the CSIL, where system functionality, interoperability, all configuration settings and mission threads are validated prior to going to NIE.

Lab-based Risk Reduction gives the Army a venue to measure technical maturity in a system-of-systems context, and also benefits industry by allowing companies to plug their systems into the Army network baseline and discover any interoperability challenges before soldiers encounter them during the Network Integration Evaluation.

For the last two evaluations, the Army has taken an innovative approach to come up with a quantifiable measure called the Network Integrated Readiness Level to assess the integrated readiness of the system within the relevant Army network. This is similar to a Technical Readiness Level (TRL) but instead evaluates how the system integrates into the bigger network. This helps measure various systems on equal footing. For example, some systems coming into Lab-based Risk Reduction with a high TRL rating only managed a marginal Network Integrated Readiness rating due to interoperability issues.

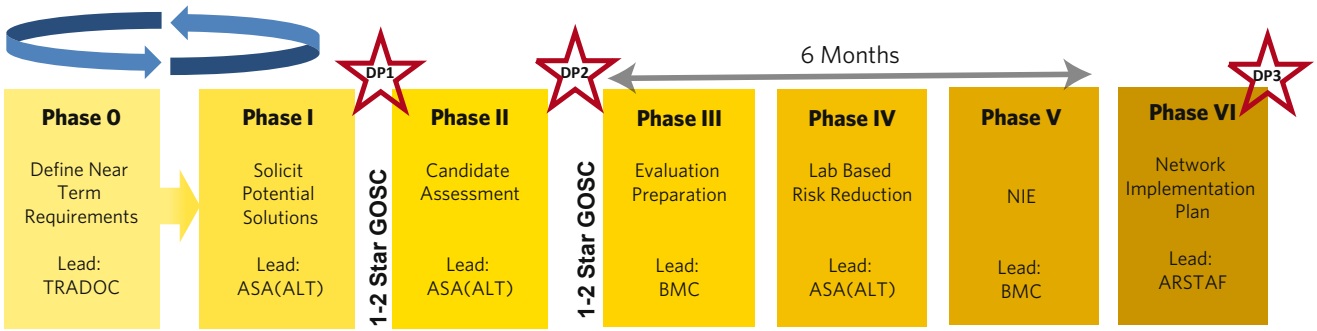
Lab-based Risk Reduction is the first time the vendors enter the Army ecosystem and have the opportunity to test and integrate their system within the end-to-end network construct. By participating, vendors increase their chances to be in NIE and work well, rather than dealing with integration issues in the field. This helps the vendor as well as the Army to be able to evaluate the solutions on their DOTMLPF [doctrine, organization, training, materiel, leadership and education, personnel and facilities] and technical merits.

With a brigade's worth of hardware and software in close proximity, the lab is a more cost-effective environment to isolate and fix a problem than Fort Bliss and White Sands. The configuration changes, software and firmware updates, added encryption, and other fixes applied in the CSIL also save valuable time. For example, an integration problem between handheld devices and Army mission command software for Network Integration Evaluation 13.1 was discovered within two hours after installation and quickly resolved—something that would have taken weeks in the field.

In all, more than 150 issues were identified and fixed in the lab prior to Network Integration Evaluations 12.2 and 13.1, resulting in a more stable network for evaluation by the 2nd Brigade, 1st Armored Division (2/1 AD), the operational brigade combat team that conducts the evaluations. Those improvements also will pay off with the fielding of an integrated, validated Capability Set 13/14 network. Using the lab to measure and improve interoperability between different network systems saves on test costs, reduces risk for the system owners, and ultimately creates a more seamless user experience for the soldier.

The CSIL is just one of several laboratories at Aberdeen Proving Ground built as part of the recent Base Realignment and Closure move of C4ISR organizations to Maryland. The laboratories are linked through direct fiber optic connectivity—creating an integrated environment for government and industry

Figure 1. The Army Agile Process Life Cycle



- Enables the Army to keep pace with industry and technological advances
- Accelerates network modernization to a rate unachievable by traditional acquisition strategies in a more cost-effective manner
- Provides deploying units better capabilities more quickly
- Incrementally improves the overall Network over time
- Directly supports capability set management in identifying critical operational gaps and solutions
- Provides operational validation of these solutions and the Network architecture baseline for inclusion in current or future capability sets

to measure system performance and interoperability. The facilities that support the Network Integration Evaluation, Agile Process, and capability set fielding include settings focused on tactical radios, satellite communications, intelligence, mission command applications, and the integration of C4ISR equipment onto various vehicle platforms.

This distributed lab environment, organized by function, provides a controlled setting in which the Army can conduct developmental tests both on individual systems and on an integrated network. The Army test community has also embraced the Lab-based Risk Reduction concept, using the new facilities to evaluate different data collection methods and determine the best approach for each system prior to operational tests.

The lab work pays dividends at the Network Integration Evaluations, where Army engineers apply the validated network designs as they integrate the fleet of tactical vehicles used by 2/1 AD. Additional risk reduction and verification also are conducted in the Integration Motor Pool at Fort Bliss, prior to handing over a stable network to the brigade.

The unit then evaluates network performance by executing various Training and Doctrine Command-developed scenarios, in varying environmental conditions, against a "hybrid threat" opposing force. Upon conclusion of the Network Integration Evaluations, the Army provides feedback to programs of record and industry partners so they can make necessary adjustments to their technologies.

The reports produced out of Network Integration Evaluations not only address technical performance, but also systems' impact on other areas such as doctrine, training, and basis of issue—who in a unit receives the capability and how it will be used. Army leadership then uses these recommendations to make fielding decisions, beginning with Capability Set 13 as the inaugural output of the Agile Process.

Capability Set 13 marks the first time the Army is delivering network systems as an integrated communications package that spans the entire brigade combat team formation. That has required a new, highly synchronized approach to production and deliveries of CS 13 equipment, aligned with unit training schedules and deployment dates. However, the lessons learned during Lab-based Risk Reduction and Network Integration Evaluations—from software interoperability to vehicle integration to soldier training—are paving the way for successful fielding of the capability set. CS 13 is on track to field to up to eight Infantry Brigade Combat Teams—with priority to units deploying or preparing to deploy to Operation Enduring Freedom—from 2012–2013.

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Our Troops Need Your BRAINPOWER

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A project of Acquisition, Technology and Logistics, Defense Research and Engineering, Defense Technical Information Center, Networks and Information Integration and Department of Defense Chief Information Officer, and Rapid Reaction Technology Office

Panetta Announces 2012 David Packard Excellence in Acquisition, Better Buying Power Efficiency Award Winners

This year's David Packard awards for Excellence in Acquisition and a new Better Buying Power Efficiency award were presented Nov. 2 at the Pentagon by The Honorable Leon Panetta, secretary of defense, joined by The Honorable Frank Kendall, under secretary of defense for acquisition, technology and logistics.

The Packard award winners are:
The Project Manager Combat Ammunition Systems (Army) team for an efficient new approach to buying ammunition and the DDG 51 Shipbuilding Program Office (Navy) team for its competitive procurement of three guided missile destroyers.

The winner of the first-ever Better Buying Power Efficiency Award is:
The Acquisition Rapid Response Medical team for Tactical Combat Casualty Care and Casualty Evacuation team of the U.S. Special Operations Command (USSOCOM) for a new Casualty Evacuation System.

The Army Ammunition Systems team receives its award. From left to right: Lt. Gen. William N. Phillips, principal military deputy to the assistant secretary of the Army (Acquisition, Logistics and Technology); Donna Ponce, procurement contracting officer, Army Contracting Command, Rock Island; Maryellen Lukac, director of business management and project manager, Combat Ammunition Systems; Rene Kiebler, deputy project manager and program manager (PM), Combat Ammunition Systems; Under Secretary Kendall; Martin Moratz, conventional ammunition division, PM, Combat Ammunition Systems; Aaron Rappaport, acquisition manager, PM, Combat Ammunition Systems; and Ronald Rapka, retired acquisition manager, PM, Combat Ammunition Systems.

Bottom right: Secretary Panetta, with Rene Kiebler, team leader.

.

The Navy shipbuilding team, from the left: Pat Potter, DDG 51 Class Ship design manager; Todd Hellman, DDG 51 shipbuilding technical director; Chuck Teichert, deputy director, Acquisition Management, PEO SHIPS; Jim Day, DDG 51 New Construction Ship integration and test manager; Neal White, DDG 51 shipbuilding operations director; Capt. Mark Vandroff, DDG 51 shipbuilding PM; Under Secretary Kendall; Lisa Radocha, DDG 51 shipbuilding deputy PM; Martha Rouse, DDG 51 shipbuilding business financial manager; Megan Moore, DDG 51 procuring contracting officer; Sam Galbo, DDG 51 program legal counsel; The Honorable Sean Stackley, assistant secretary of the Navy (research, development, and acquisition).

At left: Secretary Panetta with Capt. Vandroff, PM.

The USSOCOM team receives the Better Buying Power Efficiency Award. From left to right: Col. Joseph Capobianco, program executive officer, Special Operations Forces (SOF) Warrior Systems; Tom Mills, PM, SOF Survival Support and Equipment Systems; Leatrice Frederick, contract specialist; Under Secretary Kendall; Stephanie Elder, Assistant PM, Tactical Combat Casualty Care; James Cluck, USSOCOM acquisition executive; and Master Sgt. Kyle Sims, medical combat developer.

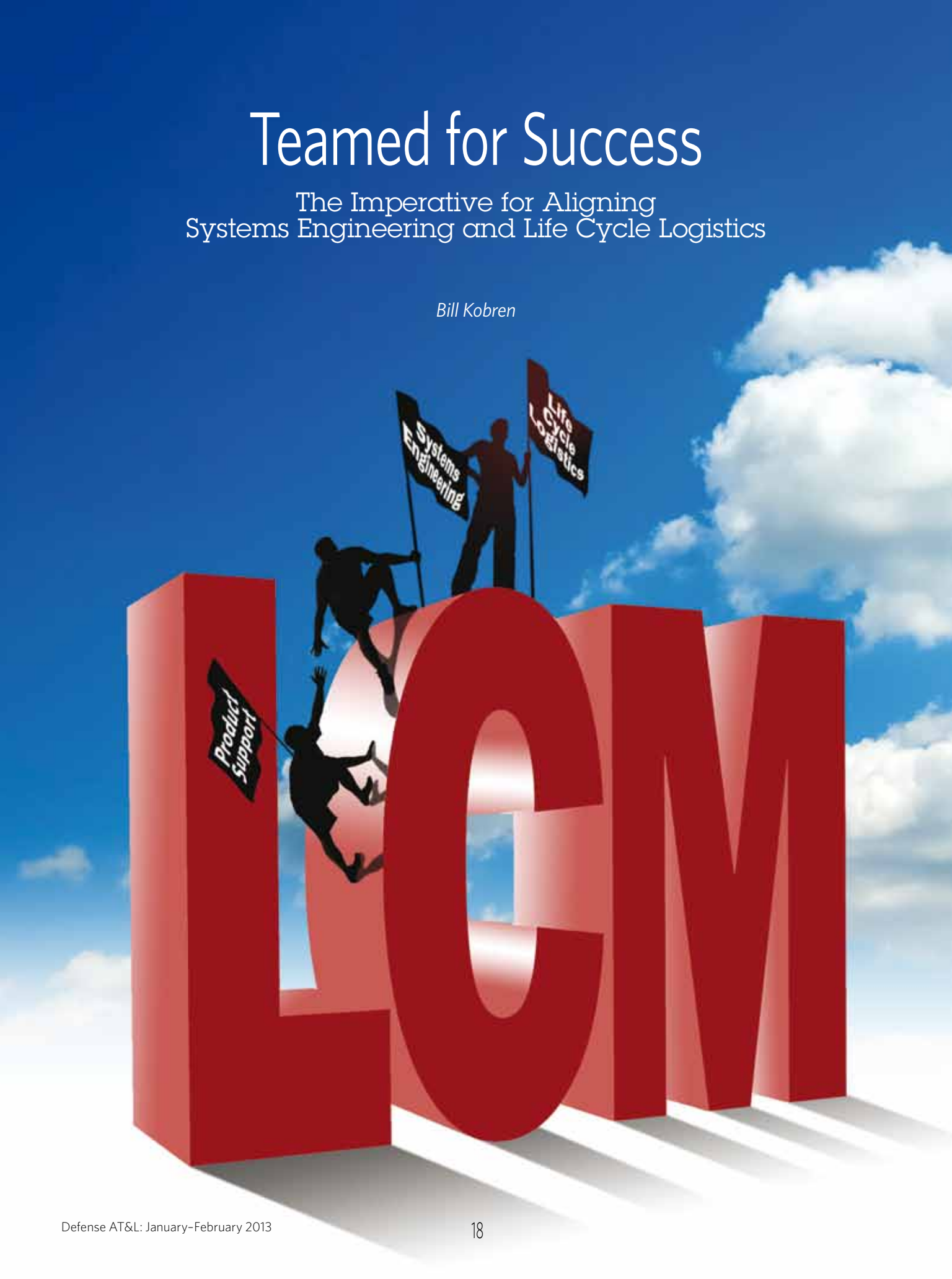
At left, Secretary Panetta with Col. Capobianco, PEO.

Defense Department photos by U.S. Navy Petty Officer 1st Class Chad J. McNeeley

Teamed for Success

The Imperative for Aligning Systems Engineering and Life Cycle Logistics

Bill Kobren



Supporting systems across their life cycles is an often expensive proposition. Early design decisions have major ramifications on future operating and support costs. Hence, the Department's Better Buying Power (BBP) initiatives highlight what we all know well: Targeting affordability and controlling cost growth across the life cycle is absolutely crucial. Tight alignment of the requirements, acquisition, and sustainment communities across the life cycle is essential.

Kobren *is director of the DAU Logistics & Sustainment Center, and the DoD Product Support Assessment Human Capital IPT lead.*

Given our common commitment to life cycle management (LCM), shared technical competencies, and collective responsibility to develop, field, and sustain affordable and effective weapon systems, the Life Cycle Logistics and Systems Engineering communities are—and by definition must be—inextricably linked. It is thus imperative that members of each recognize and understand what the other is all about. A few thoughts follow on the matter for members of both functional communities to ponder.

Starting with our systems engineering colleagues, here are 10 key life-cycle logistics, product support, and system sustainment tenets to be cognizant of:

Decisions You Make Will Be Felt for the Life of the System

Early engagement with your life-cycle logisticians is crucial. Participate in and support the development of and updates to the Life Cycle Sustainment Plan (LCSP). A vast majority of a weapon systems' total ownership costs are determined by decisions made early in the life cycle, which have profound ramifications for long-term product support and sustainment strategy development. As the director of the Cost Assessment and Program Evaluation (CAPE) so eloquently said, "The cost of operating and maintaining a system over its useful life is driven primarily by system design and reliability & maintainability decisions, which are typically made before production."

Design Systems with Supportability in Mind

Open systems architecture, well thought out technical data management strategies, continuous modernization, technology insertion, reliability centered maintenance, prognostics and health management, advanced diagnostics, and embedded training, are among many powerful supportability enablers. In fact, some would contend that along with Product Support Management and Design Interface and Sustaining Engineering are two of the most critical Integrated Product Support (IPS) Elements. Read through the JCIDS Manual "Guide for the Sustainment KPP" to better understand the nuances of the life-cycle sustainment outcome metrics—availability (materiel availability and operational availability), materiel reliability, ownership cost, and mean downtime. And don't forget that for the life cycle logistician, system design decisions can dictate maintenance, facilities, packaging, handling, storage and transportation, and supply support requirements, which in turn lead to support equipment, technical manual and training requirements. The integrated product support elements are "integrated" for a reason!

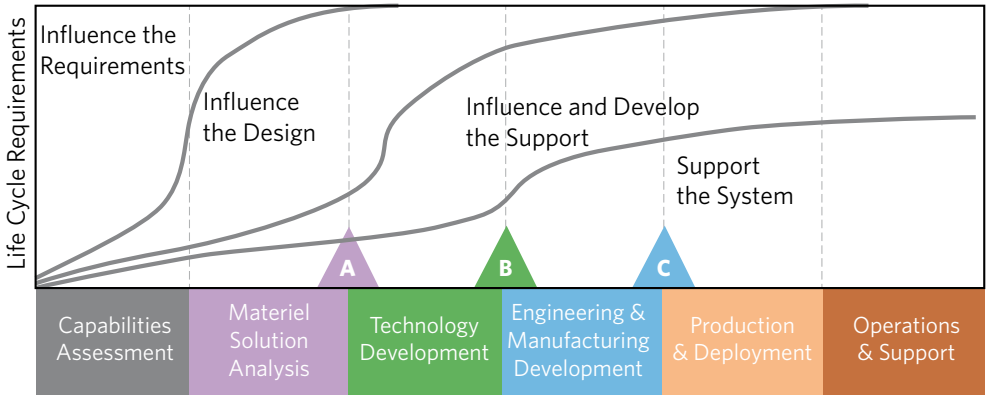
We Share More in Common Than You May Think

Life-cycle logisticians and systems engineers share multiple key technical competencies, including supportability analysis, reliability and maintainability analysis, technical/product data management, and configuration management, to name just a few. Numerous Defense Acquisition University training courses have been collaboratively developed and designed for students from both communities, including LOG 103–Reliability, Availability and Maintainability, LOG 204–Configuration Management, the new LOG 211–Supportability Analysis, and a Technical Data Management course now being planned for the future. As one of my systems engineering colleagues sagely observed, "This is akin to a three-legged race that our two communities must run together." In many respects, it's perhaps more appropriate to even call it a "three-legged marathon." Either way, successful life-cycle logisticians and systems engineers must serve together in lock-step!

Supportability Analysis and Maintenance Planning Really Matter

Supportability planning and executions are alive and well in both communities. The Supportability Analysis process informs and drives virtually every other logistics, product support, and sustainment decision and outcome that follows. It is arguably the linkage between user requirements and delivering supportable, sustainable weapon systems to our warfighters. Understanding not only how to conduct the analysis, but the ramifications of the decisions made during the process are essential to truly fulfilling the DoD Directive 5000.01 life-cycle management mandate. Understanding the linkages, interrelationships, inputs and outputs, and implications of the entire process—including product support requirements analysis, functional analysis, trade-off analysis, failure modes effects and criticality analysis (FMECA), fault tree analysis (FTA), reliability and maintainability allocation, modeling, prediction and analysis, reliability centered maintenance (RCM), and condition-based maintenance (CBM+), level of repair analysis (LORA) and maintenance task analysis (MTA)—is critical, as all are integral aspects of a supportability analysis

Figure 1. Supportability Analysis and the Life Cycle Management Framework

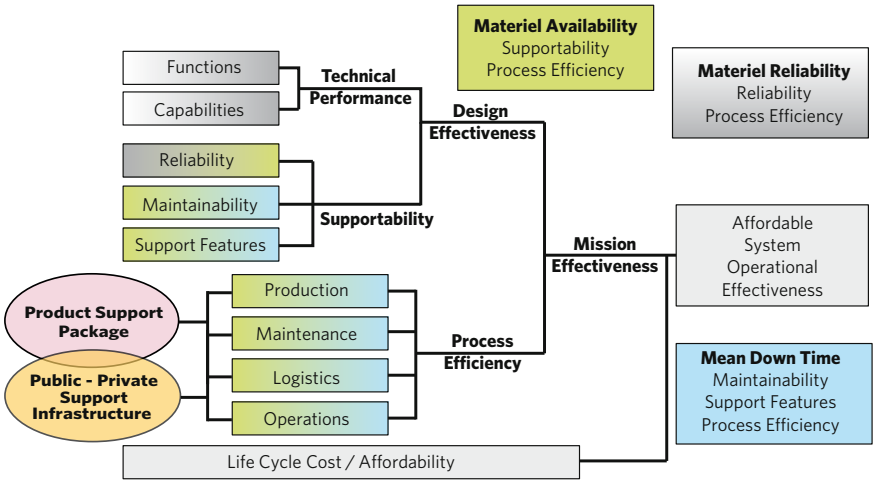


process that ultimately ensures our weapon systems are operationally suitable and sustainable.

It's All About the Warfighter

People are part of the system, and Human Systems Integration (HSI) matters. Think about how the human operates, interfaces with, and will actually use a weapon system. With experience, knowledge, skills, and abilities in mind, remain aware of what we're asking our young Soldiers, Sailors, Airmen, and Marines to do to support and maintain our weapon systems in the field—and in what environment they must do it. Take the time to talk to the users of the system. Understand the interrelationship between the system, its support system, and the personnel who must support, sustain, and maintain it. Take the CLE 062–Human Systems Integration continuous learning module. Maintainability and accessibility are important considerations throughout the design and development process. Organizational level maintenance is performed in all weathers, often in austere environments, and frequently in dark, hot, dusty, cramped, and otherwise difficult locations. Operators and maintainers very often operate in bulky protective gear, which also must be considered during systems design. And, by the way, weapon systems have a fascinating tendency to be operated and employed in environments and conditions and at rates that somehow seem to be different than originally anticipated. Plan on it. Incorporate it into your programmatic sustainment and risk mitigation strategies. As the old expression goes, "Your mileage may vary."

DAG Figure 4.4.F1. Affordable System Operational Effectiveness (ASOE) Diagram



More is Not Necessarily Better

Logistics is not merely ensuring the right parts at the right place at the right time. It's about designing suitable systems to be sustainable, maintainable, reliable, affordable, and transportable. It's also about developing and fielding supportable systems including ensuring mission capability of aging legacy systems. It's about designing, maintaining, and modifying systems to continuously reduce the demand for logistics. Parts management, standardization, use of common components, and enhancing energy efficiency are powerful enablers, and each can directly impact future logistics footprint requirements. Seek to avoid proliferation of peculiar support equipment wherever possible, and instead look to leverage as much common support equipment, and common hand tool requirements as possible. Each of these in turn will have profound ramifications on future maintenance requirements and operations and support cycle costs—often for many decades into the future.

Technical Data are More Than Engineering Drawings

The vast majority of acquisition professionals intuitively know this, of course, but it is worth collectively reminding ourselves every now and again. MIL-STD-31000 Technical Data Packages defines the Technical Data Package (TDP) as "A technical description of an item adequate for supporting an acquisition strategy, production, and engineering and logistics support." The description defines the required design configuration or performance requirements, and procedures required to ensure adequacy of item performance. It consists of applicable technical data such as models, drawings, associated lists, specifications, standards, patterns, performance requirements, quality assurance provisions, software documentation, and packaging details. Because nearly every acquisition discipline has a role to play and stake in technical data development or management, you are encouraged to check out Chapter 7 of the *DoD IPS Element Guidebook* (https://acc.dau.mil/ips-guidebook) for further insights.

Life Cycle Management is a Shared Responsibility

Life-cycle management (Figure 1), while officially a responsibility of the program manager, is key for systems engineering and life-cycle logistics as well. As the *Defense Acquisition Guidebook (DAG)* so eloquently states, "A life-cycle approach to system planning, development, and sustainment is fundamental to systems engineering." The integrated, multifunctional, interdisciplinary nature of life-cycle management is clearly illustrated in the *DAG*, which states that life-cycle management encompasses "Single point of accountability, evolutionary acquisition, modifications and upgrades, supportability and sustainment as key elements of performance", including "... performance-based strategies, including logistics, increased reliability, improved maintainability, and reduced logistics footprint, and continuing reviews of sustainment strategies." In case you were wondering, these words came directly from the systems engineering chapter of the *DAG,* although they could just as easily (and appropriately) have come from the logistics chapter. Shared, integrated, cross-functional ... where have we heard those words

"Life Cycle Logistics spans the entire system life cycle from concept to disposal, encompassing both acquisition logistics and sustainment activities, and includes professionals responsible for planning, development, implementation, and management of effective and affordable weapons, materiel, or information systems product support strategies.

—DAU Catalog

before? With this in mind, the 12 Integrated Product Support (IPS) Elements are similar to any another tactical mission thread through the system. You can't leave out one part of the thread and have the Technical Performance Measurements (TPM) of the other 11 have real meaning.

Performance Based Life-Cycle Product Support (PBL) is a Powerful Force Multiplier

Speaking of performance-based strategies, PBL is a big deal. Defined as "An outcome-based product-support strategy that plans and delivers an integrated, affordable performance solution designed to optimize system readiness," when properly applied, PBL support strategies have repeatedly demonstrated the ability to improve system availability, drive reliability improvements, enhance warfighter support, tackle process inefficiencies, proactively mitigate obsolescence and diminishing manufacturing sources and material shortages issues, and reduce operating and support costs in the process. According to a recent *Defense AT&L* magazine article, "The Department spends more than $90 billion on sustainment every year. A conservative estimate of savings that could result from broadly transitioning to PBL sustainment across the DoD ranges from 10 percent to 20 percent—every year!" This compelling data is an important reason the Under Secretary of Defense for Acquisition, Technology and Logistics said in his recent "Endorsement of Next-Generation Performance-Based Logistics Strategies" memo that "Appropriate use of Performance-Based Logistics will help to achieve affordable sustainment strategies and is a method for achieving our Better Buying Power goals." Systems engineering in general, and sustaining engineering in particular are integral to designing, developing, fielding, and executing your program's long-term weapon system product support strategy.

Demand Excellence

Make your life-cycle logistics and Product Support Manager (PSM) colleagues part of your team, and, at the same time, be an integral part of theirs. Coach them, mentor them, and facilitate their understanding of the systems engineering process—and why it matters. While they may not necessarily always be technical experts, or even have a systems engineering background, ensure that they are part of key system design and design trade decisions, technical reviews, and configuration management decisions. Remember: We're all in this together. Engage and challenge each other. Keep it simple. Collaborate. And perhaps most important of all, communicate, communicate, and communicate!

This is by no means a one-way street. There is much about systems engineering that life cycle logisticians and product support managers need to be aware of as well, including:

Logisticians are Part of the Systems Engineering Process

Realize it or not, the *DAG* makes it clear that life cycle logisticians have a direct role in the systems engineering process, stating "Participants in systems engineering include but are not limited to … (the) Program Office Level Lead Logistics Manager" and that "… systems engineering is typically implemented through multidisciplinary teams of subject matter experts (SMEs), including the life-cycle logistician." Successful life cycle logisticians must therefore understand basic systems engineering practices, processes, and principles. We must understand the integrated nature of key programmatic technical activities, deliverables, and outcomes.

To Be a Successful Life Cycle Logistician, You Must Understand the Tenets of Systems Engineering

Designing for support is a foundational aspect of our business, and you simply cannot successfully serve in this capacity without a basic understanding of systems engineering processes. Among several other reasons, this is why the course SYS 101–Systems Program Research, Development and Engineering Fundamentals is a mandatory Life Cycle Logistics Defense Acquisition Workforce Improvement Act training requirement. Don't stop there, however. Take other systems engineering courses and continuous learning modules offered by the Defense Acquisition University. Read *DAG* Chapter 4. Because "Systems engineering offers a technical framework to enable sound decision making relative to trade studies, system performance, risk, cost, and schedule," one of your many critical roles and responsibilities is to collaboratively support, advise, and actively engage with your systems engineering (and program management) colleagues in key systems design decisions. When design trades are being made, you need to be there as a credible subject matter expert. Speak the language, and understand your roles and responsibilities in the process.

A Single Integrated Team

Early, regular, and continuous engagement with your systems and sustaining engineers is crucial. Tackle the tough issues together. Strategize as a team. Bounce ideas off of each other. Participate in and support the development of and updates to the Systems Engineering Plan (SEP), and seek to facilitate reciprocal engagement and support in crafting, updating, and implementing the Life-Cycle Sustainment Plan (LCSP). The SEP and LCSP are not stand-alone documents that can be developed and executed in isolation, any more than they can be divorced from the system Acquisition Strategy, Technol-

ogy Development Strategy, Test and Evaluation Master Plan, or any one of the myriad other required systems acquisition documents. As the *DAG* points out, because "A life-cycle approach to system planning, development, and sustainment is fundamental to systems engineering", " ... under the life-cycle management concept, systems engineering should frame the decision making for sustainment logistics." Acquisition is a team sport, and the logistics and engineering communities play for the same team.

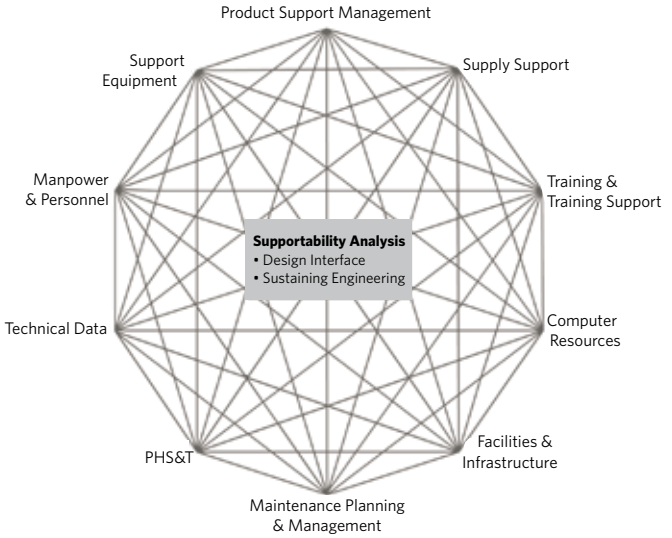
Reliability and Maintainability (R&M) Really Matter

R&M are key inherent system design characteristics. Subsequent product support, sustainment, logistics footprint, and indeed operations and support cost requirements are largely a result of these key design decisions. R&M allocation, modeling, prediction, analysis, assessment, and identification of corrective actions are critical aspects of the supportability analysis and sustaining engineering processes. Understand not only how R&M are derived, but why, when, by whom. Take ownership for your professional development in this realm. Oh, by the way, re-read the pearls of wisdom for the engineers on this subject in the section above titled "Decisions You Make will be Felt for the Life of the System." Participate in engineering trade studies. Systems engineers frequently have to trade off requirements, reliability vs. system operational performance, for example. By providing to the systems engineers quantitative data which objectively capture the key elements of the trade decision, you can help ensure superior outcomes when difficult design choices have to be made.

The Integrated Product Support (IPS) Elements are Integrated for a Reason

Why do so many life-cycle logistics expert practitioners believe that, along with product support management, the Design Interface and Sustaining Engineering elements are the most critical elements. Think about it for a moment. Where do maintenance requirements originate? Supply requirements? Transportation? Packaging? Training? Support equipment? They all link back first and foremost to the original system design, which ultimately translates warfighter requirements as articulated through the Availability Key Performance Parameters (KPP), Reliability and Cost Key System Attributes, and the Mean Downtime sustainment outcome metrics.

DAG Figure 5.1.1.F1. Linkage Between 12 Integrated Product Support (IPS) Elements



Logisticians Serve as Key Interdisciplinary Integrators

As the logistics expert, very often you will be called upon to serve as the systems and sustaining engineer's eyes and ears to the health of the supply chain, including maintenance, supply, and transportation issues. You often will be aware early of supportability, availability, and reliability issues through engagement with the warfighters, testers, and our industry partners, and can proactively engage your systems and sustaining engineering teammates sooner rather than later. The logistician's contact with the supply chain is vital to provide a heads-up on potential counterfeit parts, corrosion control, obsolescence, or diminishing manufacturing sources and material shortages, not to mention conveying to your engineering colleagues the importance of parts management, especially what parts are already in the inventory so the engineers don't design a new part that is already in the supply system. While there always will be some unique applications requiring specific designs, we don't need, nor can we afford, 250 different types of the essentially the same part! To succeed, however, systems/sustaining engineers and life-cycle logisticians must engage in frequent, if not constant, dialogue.

Know What is Expected of You During Key Program and Systems Engineering Technical Reviews

Be familiar with each of the technical reviews, their purpose, timing, entry criteria and expected outcomes, as well as your role and responsibilities as a member of the government program team. Several outstanding references to enhance your understanding include CLE 003–Technical Reviews and CLL 033–Logistician's Responsibilities During Technical Reviews continuous learning modules, *DAG* Figure 5.1.1.F1, which depicts the sustainment thread in the defense acquisition management system, and the very handy Technical Review Slide Rule, Program Review Checklists, and the Technical Review Checklists, which are available at https://acc.dau.mil/setools.

Understand and Implement Risk Management Across the Logistics Domain

Risk management, according to *DAG*, "Is the overarching process that encompasses identification, analysis, mitigation planning, mitigation plan implementation, and tracking ..." and " ... should begin at the earliest stages of program planning and continue

throughout the total life cycle of the program." (There's that life-cycle management emphasis again!) It is " ... effective only if it is fully integrated with the program's systems engineering and program management processes ... " and " ... is accomplished through the identification of risk drivers, dependencies, root causes, and consequence management." Check out the risk management Community of Practice at https://acc.dau.mil/rm, as well as the CLM 017–Risk Management continuous learning module. Don't mistakenly assume risk management is merely a systems engineering process or responsibility. It is so critical, and so interdisciplinary in nature, that the DAG goes as far as to stress that "Risk management is critical to acquisition program success. Because risk can be associated with all aspects of a program, it is important to recognize that risk identification is part of everyone's job, not just that of the systems engineer or program manager."

"Systems engineering is an interdisciplinary approach and process encompassing the entire technical effort to evolve, verify and sustain an integrated and total life cycle balanced set of system, people, and process solutions that satisfy customer needs. The systems engineering processes should be applied during concept definition and then continuously throughout the life cycle."

—Defense Acquisition Guidebook, Chapter 4

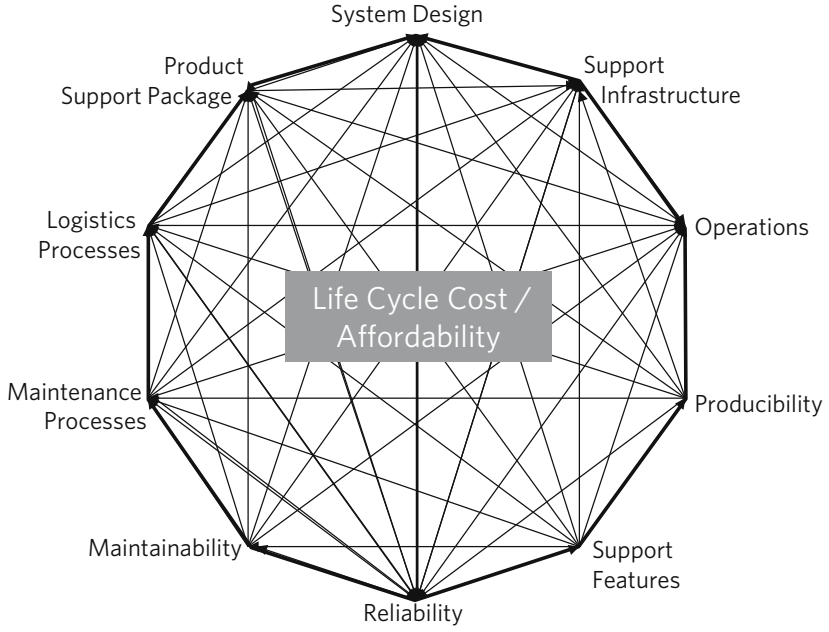
Link Systems Engineering Processes to Life Cycle Sustainment Outcomes

Read Section 5.2 of the *DAG*. Become familiar with the Affordable System Operational Effectiveness (ASOE) model (*DAG,* Figure 4.4.F1.) Take the time to understand its relationship to the product support strategy, supportability and system sustainment. The ASOE Model, " ... provides a framework that describes how design and process efficiencies relate to achieve mission effectiveness," and is achieved by influencing early design and architecture and focusing on supportability outputs (*DAG* Figure 5.2.F.3). Reliability, reduced logistics footprint, and reduced system life-cycle cost are achieved by being included from the very beginning of a program—starting with the definition of required capabilities. In all cases, full stakeholder participation is required in activities related to designing for support, designing the support, and supporting the design.

And Finally, If You Don't Already Have a Background in Systems Engineering ...

For our logisticians, if you don't have a mentor in SE, get one. The same goes for systems engineers who don't already have a life-cycle logistics mentor. Systems engineers should welcome—indeed, should demand—their life cycle logistics colleagues' participation in system design, development, manufacturing, and supporting engineering processes. Likewise, life-cycle logisticians must do the same for product support planning, implementation, and execution. And together, they must collaboratively conduct supportability analysis, drive reliability and maintainability into system design, jointly perform configuration management activities, leverage value engineering to improve system performance while reducing life-cycle costs, and manage technical and logistics product data.

DAG Figure 5.2.F3. Affordable System Operational Effectiveness Interrelationships



I would contend you simply cannot be a great systems engineer without understanding life-cycle logistics. Even though I am not an engineer, I would contend you also cannot be a great life-cycle logistician (or product support manager) without understanding systems engineering. Some might argue that, if this is indeed so, it should rationalize the formal establishment of a new logistics engineering or supportability engineering career field within the Defense Acquisition Workforce. Establishing new functional disciplines should not be construed as a panacea. Instead, developing qualified, capable, experienced, well-trained personnel possessing the right skill sets and experience, coupled with a vision of success, a passion for interdisciplinary integration, and an understanding of roles, responsibilities, and required outcomes of this business of ours is what is needed to carry the day.

The author can be contacted at **bill.kobren@dau.mil**.

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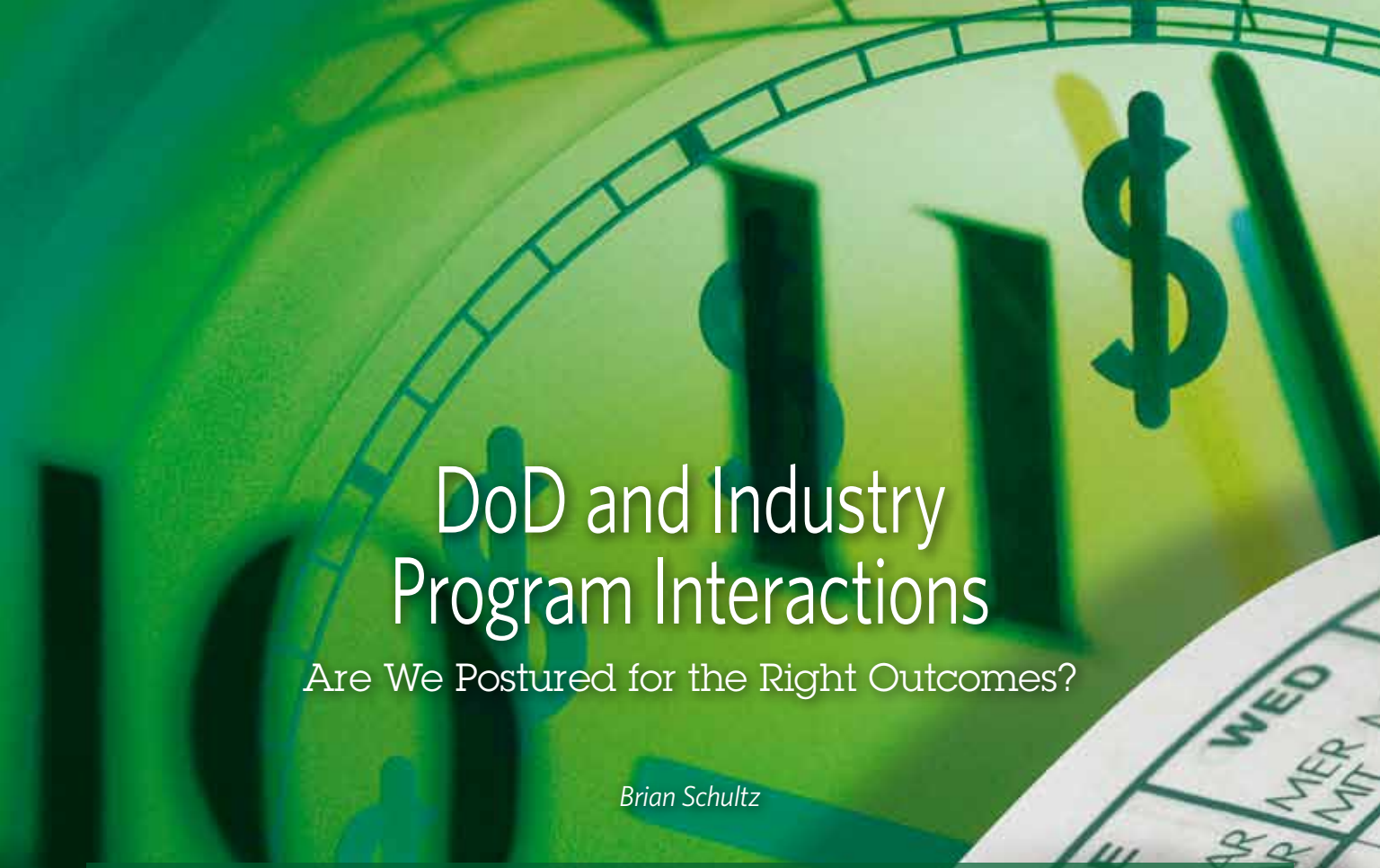


DoD and Industry Program Interactions

Are We Postured for the Right Outcomes?

Brian Schultz

While much has been written regarding government and contractor interactions, (including statutory and policy guidance), there is no single "one size fits all" model governing this important relationship. There are, however many dynamics, events, and lessons learned that both parties should consider in the context of a program office environment.

Pre-Award Phase

Government-industry interaction typically begins in a pre-award environment where a notice of a potential contract opportunity (e.g., sources-sought synopsis, request for information) is published online on a website like www.FedBizOpps.gov. Organizations may also hold periodic conferences to alert industry of upcoming projects and points of contact. It's important to note that industry often will be aware of the opportunities well in advance of the first official communication of the requirement to industry. Companies not only track the Department of Defense budget process but also maintain liaison with various requirements organizations to understand the future pipeline of needs that may fall within their corporate domain.

The pre-award phase of interaction is critically important since it lays the foundation for future acquisition outcomes. This foundation is documented with the acquisition strategy and Request for Proposal (RFP). Program managers (PMs) should invest their full attention to these documents and ensure that even minor errors and inconsistencies are resolved. I remember one program on which we issued several RFP amendments to correct errors we should have caught upfront but were in a hurry to get on contract. Fixing these errors (and

Schultz *is a DAU Mid-Atlantic Region professor of program management. He has extensive experience as a program manager in the Defense Department and in industry.*

"The universe never did make sense; I suspect it was built on government contract."

—Robert A. Heinlein

Cost overruns and schedule slips, regardless of contract type or cause, typically lead to serious consequences for both parties.

the associated proposal due date revisions) ended up costing us a lot more time and effort than if we had allocated more front-end time to ensure we had a quality RFP.

While DoD program offices often are very busy in this pre-award phase with internal actions such as developing the acquisition strategy and RFP, communication with industry should be a priority. PMs should consider several mechanisms to facilitate this communication, including activities such as Requests for Information (RFIs), industry days, pre-proposal conferences, one-on-one meetings, draft RFPs, and should allow adequate time for proposal submissions.

As a contractor, I attended many pre-award planning conferences. These sessions were very beneficial in identifying potential business partners for subcontracting opportunities. Developing these teaming arrangements with other companies can take weeks if not months, so DoD PMs should consider the timing of these events as well as business lead-times with requirement need dates.

Understanding industry motivations is also important in the pre-award phase. PMs should not assume that profit on a particular contract is the only or most important incentive for a contractor. Industry may have several motivations for winning a contract and earning a reasonable profit is not necessarily the driver. A company may decide to invest in an opportunity to position itself for future business or to even keep a business unit in business. So why should the DoD PM care if the contractor assumes responsibility for the contract costs and schedule?

The DoD PMs should care because this investment situation can negatively affect the program outcomes for which they are responsible. Cost overruns and schedule slips, regardless of contract type or cause, typically lead to serious consequences for both parties. As a contractor, I was able to observe a buy-in situation where our company wanted to gain traction in a particular market segment. Our management decided we would "invest" in a program by proposing a price that would be a break-even at best and we accepted a lot of schedule and cost risk on a fixed-price contract.

We won the contract but the program was over budget, late, and the customer was not happy with the outcome. In hindsight, we should have managed the customer's expectations upfront and ensured that the key stakeholders understood the risks we signed up for. The lesson learned is that identifying and mitigating this buy-in risk in the pre-award phase by DoD and industry should be a priority if we want a successful outcome in the post-award phase. Buy-ins are not necessarily bad, but they can be risky for all parties involved if not managed upfront.

In late 2011, several news reports covered a company's "lowball" price, which was instrumental in winning a highly visible and important Air Force contract. This company reportedly proposed costs that were significantly lower that what it actually believed would be required to complete the work. If this was the case, the fixed-price incentive target price was unachievable and offered little chance of DoD reaping any savings from an underrun. The target price also becomes meaningless for any cost incentive in this situation. DoD will be obligated to pay its share of the "cost overruns" up to ceiling price. Any costs over the ceiling price must be absorbed by the company.

Several questions come to mind in these situations such as: If costs were underbid, how realistic is the proposed schedule? How do we incentive the contractor to perform? What is the real target cost and real plan?

On the positive side, both parties understand and acknowledge the situation at the beginning of the program. The DoD PM can plan and budget to the ceiling price, knowing the contractor's spend plan to complete the contract will exceed the

target price. Further, a solid basis for credible execution can be established once the performance plan is understood and baselined by both parties, avoiding surprises that can quickly erode credibility.

Another factor to consider in pre-award planning is the requirement for and scheduling of DoD program office and contractor program workshops and including them in the RFP and Statement of Work. This ensures that the events are within the scope of the required contractual effort. It also sends a clear message that these events are important.

One workshop, the Acquisition Program Transition Workshop (APTW), was started by the Defense Acquisition University in 2004 to assist DoD and contractor program teams in obtaining alignment of expectations and processes. Feedback suggests that these APTWs are well worth the time and effort for both parties. Note that an April 1, 2011, memorandum from the Under Secretary of Defense for Acquisition, Technology and Logistics (USD [AT&L]) recommends that PMs of Acquisition Category (ACAT) 1D, 1AM, and special interest programs conduct this workshop within the first month following contract award or re-baseline action. Once the contract is awarded, PMs should be ready to execute the plan.

Post-Award Phase

For purposes of this discussion, the post-award phase of DoD-industry interaction assumes that a significant contract (dollar value, risk, urgency) is awarded and involves a complex weapons system, services effort, or information technology project. A smaller, less complex effort may not require the same level of interaction. Given the complex type of environment, DoD and industry PMs need to plan for contractually required events as well as start the dialogue on how the teams will interact.

The following is a list of some of the key items that should be considered at the outset by the PMs in planning the execution of the contract and the initial APTW:

- Teaming: How can we build a team framework built on trust? What team-building activities may be appropriate to get the teams off to a good start?
- Organizational structures: How are the teams organized? How do different teams interact? To whom do they report? What is their charter?
- Lines of communication: How does information flow? How often? How is sensitive or protected information handled?
- Metrics: What metrics will the team capture and track? How often will they be reported and to whom?
- Joint Governance: How is program status reviewed? What level in the organization? How often and what kind of meeting? How will issues be resolved?
- Supplier management: How will supplier actions be tracked? What subcontract articles have the greatest risks and how will these be mitigated?
- Risk management: What process will we use to manage risks? How will we track mitigation strategies?

The initial APTW should be one of many post-award events conducted to improve teamwork. Others may include team effectiveness workshops, working together team events, and climate survey workshops intended to build a cohesive and effective team. Using professional, third-party facilitators also is a good practice as it can prevent the appearance of bias if either the DoD or contractor team leads the event. The respective teams need to work together and understand that their effectiveness in solving problems can be greatly diminished if teamwork issues are not resolved early.

Both parties should make these teaming events a priority. Years ago as a contractor PM, I experienced an "awkward" situation in which my DoD PM counterpart was genuinely interested in teaming but several members of his DoD team had a different view of how contractors should be treated. Unsurprisingly, we encountered issues with expectations on contract deliverables, teamwork, and contract performance. In hindsight, this disconnect should have been identified and resolved early on in a team workshop, but our contract did not include provisions for this type of event.

Using professional, third-party facilitators is a good practice as it can prevent the appearance of bias if either the DoD or contractor team leads the event.

Lessons Learned

There are some other important questions that I believe PMs should consider in the context of this DoD-industry relationship. These questions are based on my lessons learned and experiences in managing many programs.

What factors motivate the contractor to perform on this contract? Profit? Revenue? Noncontractual factors?

As discussed earlier in the context of buy-ins, contractors have many motivations in pursuing DoD contracts. Getting access to new mission areas, keeping employees on the payroll, growing future business opportunities, and keeping a good record of performance could be additional considerations along with financial performance on any one contract. PMs need to understand what is driving the company team behavior and not assume that making a big profit is the biggest or only incentive.

DoD PMs should understand the accounting calendars and company financial metrics of their industry counterparts. Booking the sale at the end of the year or quarter can be a big deal for the company as it seeks to achieve its financial targets and keep the shareholders happy. This also can mean some leverage for the DoD PM in the context of encouraging certain behaviors or other desired outcomes.

How will we hold each other accountable?

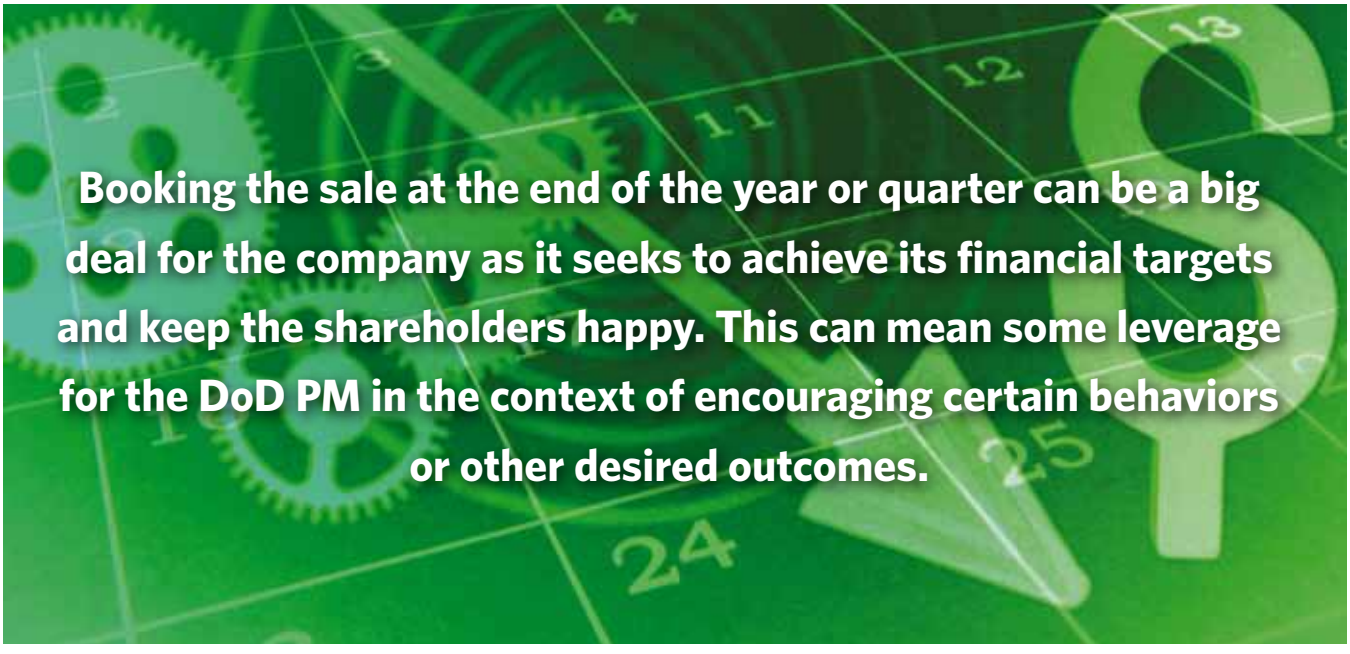
If credible contract execution performance is important, DoD must ensure that contractors are accountable to provide it. DoD teams send a clear message by enforcing the terms of the contract. Providing the expectation upfront that deviations from contractual requirements are considered very serious by the government and should be addressed prior to the actual occurrence is a good practice. Contractor past performance assessment reports should be generated and include adequate narrative of product/service quality, schedule, cost control, and other areas of performance. Note that a Feb. 24, 2011, memorandum from the director of defense procurement and acquisition policy indicates that DoD conducted evaluations on only (approximately) 50 percent of eligible awards. DoD PMs can help resolve this issue by ensuring this mechanism is being used on eligible contracts.

On the other hand, the DoD team must be accountable for its responsibilities in the process. The DoD team has an important role to play in reviewing and approving technical progress, deliverables, and payments in timelines specified in the contract. The industry PM should monitor this performance and identify any issues in a timely manner for quick resolution. If issues are not resolved, contractor PMs should take proactive measures to ensure an equitable outcome. Effective communication and teamwork between the parties can potentially solve these issues before they become major problems.

Are we collecting the right data? How is it adding value to us?

The use of metrics in assessing a program's health, getting insight into problem areas, and predicting future outcomes are important for most complex programs. While these metrics can take many forms, PMs should assess the value of the data and if it is providing useful information. The metrics should be compared to previous reports and trend data should be looked at and analyzed. The projections for closing out and completing open tasks should be included and monitored by both teams. Individuals responsible for the metrics and actions should be identified clearly.

DoD program teams should not always assume that the contractor will develop or provide the right data needed to give the team adequate insight into the program's health. This does



not preclude the DoD team from gathering data, analyzing it, and reporting on various program areas, assuming access to the data. The DoD team should work with the contractor to ensure both teams are using the right information to enable effective insight, oversight, and control of the program. This may take a few iterations before the teams find the right mix of data and metrics that add value to the respective teams.

How can we ensure we are getting best value in a sole source environment?

Although similar, the best value definition in this context is not the Federal Acquisition Regulation (FAR) Part 15-based definition used in competitions as a means to select the most advantageous offer by evaluating and comparing factors in addition to cost or price. The best value referred to in this discussion means industry is working not only to provide a high-quality technical solution that meets requirements but also to look for efficiencies that make efforts more affordable and cost-effective.

One approach DoD and industry PMs should consider in a sole source procurement is use of the "Alpha contracting" method. This method differs from the traditional approach in that RFP and proposal processes are integrated and run concurrently vice sequentially. From solicitation development through proposal preparation, evaluation, negotiation, and award, Alpha contracting relies on a team approach to concurrently develop a scope of work, price that scope, and prepare the contract to execute the scope. The basic idea is to get team buy-in throughout the process, thereby minimizing rework of proposal and contract file documents. This also can foster better teamwork and IPT alignment based on the robust communication and team involvement required for this type of approach.

Given the current and projected fiscal realities, the imperative for better solutions and reduced costs may drive how acquisitions are conducted and even what programs will survive. Sole-source proposals should expect additional scrutiny from DoD and contractor PMs to ensure they are providing value commensurate with a competitive environment.

To the extent practical, the message to sole source contractors should be: Don't expect future contracts to be awarded on a sole source basis—competition is good for both DoD and industry (and taxpayers). It's how we do business, and we are always looking for new and innovative solutions. PMs should also ensure that the appropriate level of data rights is acquired to support follow-on competitions, assuming the business case supports it.

Another approach to consider in executing the contract is the use of stretch goals. The stretch goal may represent an earlier delivery or a cost goal that beats the contractual date or target price. It is considered ambitious but achievable, and the teams will work to achieve the stretch goal, recognizing that even if they don't meet it, there is still some buffer to enable meeting the contractual date or cost. My experience suggests that teams like to be challenged and meeting the stretch goal gives the joint DoD/contractor team a clear incentive to push hard to meet the goal. Note that with the recent USD(AT&L) guidance on establishing both a "will-cost and a "should- cost" estimate, all programs should be now be establishing a cost stretch goal ("should-cost").

Be careful with this goal setting, though, because, if you ask for too much too often, you can burn the team out. This will defeat the purpose of using the stretch goal and could result in lost productivity, poor morale, and other unintended consequences.

Final Thoughts

The importance of understanding industry and what drives companies in the defense arena is widely recognized as fundamental knowledge that DoD PMs should possess. To that end, new course content, including a new DAU course (ACQ 315, Business Acumen) is under development and planned for roll-out in fiscal 2013.

DoD and industry program teams operate in a challenging and dynamic environment with lots of scrutiny. These teams that plan and execute acquisition programs must understand the dynamics of working with each other and look for opportunities to be more effective and efficient. Understanding each other, making this relationship a priority, and developing a thorough plan of action are good steps to help foster successful outcomes.

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Public-Private Partnerships

The Key to Retaining Government and Industry Capabilities

Dave Floyd ■ *Tom Gorman*

The current DoD budget uncertainty highlights the necessity of leveraging the best capabilities of the public and private industrial base across government and industry to optimize weapon system product support at best value cost. Public-Private Partnerships (PPPs) are a key component of DoD product support strategies assuring synergistic application of these critical capabilities to achieve affordable operational readiness for the warfighter.

Indeed, PPPs are a fundamental element of DoD's primary product support strategy—Performance-Based Logistics (PBL). In the years ahead, PPPs promise to be a keystone of DoD's pursuit of broader and more effective implementation of PBL through its recently initiated "Next-generation PBL" initiative.

A PPP is defined in the DoD *Public-Private Partnerships for Sustainment Guidebook*, Feb. 1, 2012, as "a cooperative arrangement between an organic product support provider and one or more private sector entities to perform defense-related work utilizing DoD facilities and equipment, or both. Other government organizations, such as

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program offices, inventory control points, and sustainment commands, may be parties to such agreements."

DoD Policy on Public-Private Partnerships

DoD policy on public-private partnerships is reflected in DoDD 5000.01, *The Defense Acquisition System*, paragraph E1.17, certified current as of Nov. 20, 2007, which states: "Sustainment strategies shall include the best use of public and private sector capabilities through government/industry partnering initiatives, in accordance with statutory requirements."

DoDI 4151.21, *Public-Private Partnerships for Depot-Level Maintenance*, April 25, 2007, states: "Public-private partnerships for depot-level maintenance shall be employed whenever cost effective in providing improved support to the warfighter, and to maximize the utilization of the government's facilities, equipment, and personnel at DoD depot-level maintenance activities."

It adds: "Performance-Based Logistics implementation strategies shall consider public-private partnerships to satisfy the core capabilities requirements of section 2464 and the limitations on the performance of depot-level maintenance and materiel requirements contained in section 2466."

It's clear that public-private partnering is not only encouraged by DoD but consideration also is directed in policy.

Governance

An important body in shaping DoD policies and guidance for PPPs is the Industrial Integration Integrated Product Team (IIIPT), a joint government-industry IPT co-chaired by the Offices of the Deputy Assistant Secretary of Defense for Maintenance Policy and Programs (ODASD/MPP) and the Deputy Assistant Secretary of Defense for Materiel Readiness (ODASD/MR). The IIIPT was chartered in 2008 in response to the Weapon Systems Acquisition Reform Act.

The charter includes the following objectives:

- Align and expand the collaboration between government and industry that produces best value partnering practices.
- Support the capture of a broader set of baseline data, including types, size, structure, and characteristics of partnering agreements.
- Establish policy and training to expand partnering beyond maintenance.
- Drive standardization across Services.
- Promote proactive establishment of single-source repair capability.
- Identify opportunities to improve policy to enable maximum implementation of industrial integration.

In its pursuit of these objectives, the IIIPT was instrumental in the development and publication of the DoD *Public-Private Partnering for Sustainment Guidebook* (February 2012). The guidebook provides a wealth of information on PPP law, strategies, and best practices.

As the depot maintenance budget cuts and corresponding capability reductions are realized, it is critical that the process be proactively managed by the DoD depot maintenance enterprise to ensure retention of an optimal defense industrial base, both public and private.

Another major initiative by the IIIP is the strategic approach of conducting a series of Public-Private Partnering Workshops and Conferences for working with the depots and the PPP community in sharing and capturing issues, lessons learned and best practices

This strategic approach was validated during a recent (OSD) PPP workshop held at Layton, Utah, Aug. 21-23. The workshop was hosted by John Johns (DASD/MPP). John Sutton (ODASD/MPP), and Mark Gajda (ODASD/MR) co-chaired the meeting. More than 150 representatives from Office of the Secretary of Defense, the Services and industry participated in identifying issues, lessons learned, and best practices for effective public-private partnering.

Public-Private Partnership Categories

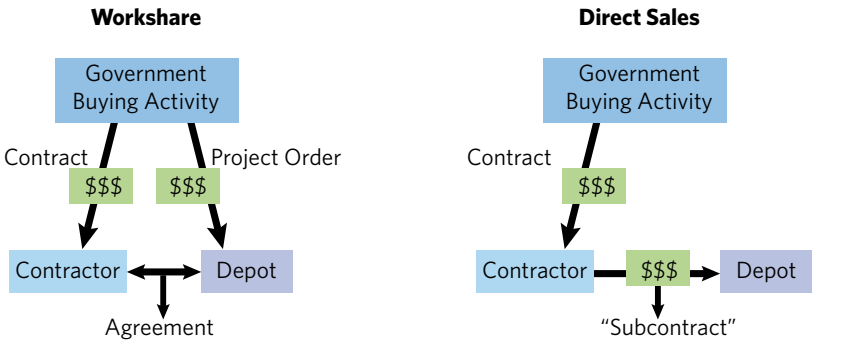
PPPs are predominately depot maintenance-oriented and typically fall into one of three categories:

- Workshare: An arrangement in which a government buying activity, in collaboration with a contractor and an organic depot, determines the optimal allocation of workload between the depot and contractor. The buying activity funds the commercial provider through a contract and funds the depot separately through a project order or work order. Each provider then performs its allocated portion of the workload. The partnering agreement between the contractor and depot (often in the form of a Memorandum of Understanding or Agreement) defines the roles and responsibilities of each.
- Direct Sales: An arrangement under which an organic depot enters into a contractual-type relationship with

a contractor to sell articles or services to the contractor. Direct sales agreements are pursuant to higher-level agreements between a government-buying activity and a contractor for provision of articles and services to the government. The commercial firm, in turn, concludes an implementation agreement with the depot to obtain articles and services in support of its contract with the government buying activity. Funding for direct sales PPPs flows from the government buying activity through the contractor to the depot.

A side-by-side contrast between Workshare vs. Direct Sales PPPs is illustrated in Figure 1.

Figure 1. Comparison of Workshare vs. Direct Sales Public-Private Partnerships.



- Contractor and Depot establish a partnering agreement
- Each is paid separately
- May do Workshare or Teaming
- "Hold Harmless" not applicable unless inserted in partnering agreement

- Contractor "subcontracts" with Depot
- Depot executes workload
  — Compliance with Core, 50-50
  — Paid by contractor
- Contractor is "accountable" for end item in outcome-based support contract
- Depot accountable via "Hold Harmless"

- Lease: An arrangement that provides a contractor access to and beneficial use of an organic depot's facilities and/or equipment, so long as the arrangement does not preclude the depot from performing its mission. Leases promote efficiency through better utilization of depot facilities. Contractor payments can be made in cash or via "in kind" consideration.

U.S.C. Title 10 Statutes

Major factors affecting the governance of public-private partnerships are the U.S.C. Title 10 statutes, which provide a framework and boundaries for workload allocation in these partnerships.

Figure 2 summarizes the key U.S.C. Title 10 statutes and their impacts on PPPs.

Critical Success Factors

There are several critical success factors that facilitate long term PPPs including the following:

- Long-term committed relationships, executed with flexibility and integrated across organizational boundaries, with complementary skill sets and abilities.
- Shared vision and objectives with the right metrics and incentives to drive alignment, supported by a clear delineation of complementary roles and responsibilities.
- Full coordination with all stakeholders, supported by transparency, open communication, and the flexibility to change relationship scope.
- Clearly documented objectives to support alignment through incentives that drive desired outcomes and are supported by sound economic analysis.
- The use of outcome-based product support strategies that support construction of a sustainment strategy that can fall anywhere along a continuum from wholly DoD to wholly contractor, with an unlimited amount of mixed support in-between.
- More heavily leveraged industry capabilities of the commercial sector, organic government capabilities, or an integrated best-value mix of commercial and organic-sector competencies, capabilities, and expertise.
- Outcome based support is not outsourcing. The blend can evolve over time.

Public-Private Partnering Issues

A number of issues need to be addressed to improve public-private partnering. These issues include the need for additional PPP education and training, especially PPP statutes, best practices, Business Case Analyses (BCA) and metrics, contracts and partnership agreement negotiation, documentation and implementation. This training could include online and classroom courses, as well as targeted "just in time" training for organizations considering embarking on PPPs. Specific issues that need to be addressed fall into the following categories: BCAs, Metrics, and Contracts as described below:

- BCAs:
  — High-quality BCAs need to be identified for benchmarking purposes in order to develop a scalable and flexible BCA process.
  — Existing product support BCA guidance needs to be updated and strengthened to ensure proper consideration of PPPs in the sustainment decision-making model.
  — Ways to consider and address external variables that affect BCAs need to be determined.

Figure 2. Key U.S.C. Title 10 Statutes That Impact Public-Private Partnerships

Section	Known as:	Addresses:	Workload Allocation Impact
2460	Depot Mx	Defines depot level maintenance as "touch labor".	Provides the conceptual basis for other statutes that govern depot maintenance.
2464	CORE	Requires DoD to maintain core depot-level maintenance and repair capabilities in support of mission-essential weapon systems needed to support combatant command operations and DoD strategic, contingency, and emergency plans.	DoD depots must maintain core capability sufficient to accomplish core requirements calculated in accordance with DoDI 4151.20. Depots must be in place NLT 4 years after IOC."
2466	50/50	Limits the funds spent on depot maintenance and repair workload by nonfederal employees to 50 percent of the total annual spending calculated at the Service level by fiscal year.	Computed at military Service level annually.
2474	CITE	Adoption of "best business practices" at all organic depots requires SECDEF to designate each depot as a Center of Industrial and Technical Excellence (CITE).	Authorizes and encourages public-private partnerships with CITE. Provides exemption to 2466 limitation on contract work for contractor depot maintenance performed at a CITE pursuant to a PPP. Enables depot activities to become subcontractors to commercial Product Support Integrators (PSI), thus incorporating repaired items in an overall PBL contract.

  - A RASCI (responsible, accountable, supporting, controlling, informing) index needs to be developed to clarify accountability and ownership among the various BCA stakeholders.

- Metrics:
  - A PPP metrics framework needs to be developed that links PPP metrics to PPP objectives and expected benefits.
  - A standard balanced scorecard format for reporting PPP benefits needs to be created.
  - An automated PPP metric toolbox needs to be established. Features would include aligning PPP metrics to PPP objectives identified in 10 U.S.C. 2474 and DoDI 4151.21 and providing the means of tracking and reporting on actual progress of specific PPPs.

- Contracts
  - An OSD-level PPP automated knowledge management system needs to be developed to capture PPP lessons learned and best practices.
  - PPP guidance needs updating to promote early collaboration on PPPs.
  - A toolbox of aids for relationship-fostering and management of PPPs needs to be established. Tools would promote standardization of PPPs and could include standard processes, language, and templates.
  - Standard indemnification language for use in contracts and partnering agreements needs to be created to ensure consistency across application in the DoD.
  - A standard, transparent depot source of repair (DSOR) assignment process needs to be developed. The process needs to provide for consistent application of statutory law (e.g., 10 U.S.C. 2464, depot-level maintenance core) to the DSOR assignment process.

What's Next?

The IIIPT is overseeing and guiding project teams that have been formed and aligned to follow up on public-private partnering issues. These teams are already holding separate meetings to come up with action plans to resolve issues. The target date for completion of the project initiatives is August 2013.

The PPP workshop is an annual event in a process that pursues long-range programmatic objectives. As part of this process, project teams presented this year's status updates on their activities at the AIA Fall Product Support Conference (Charleston, Oct. 29-31), and again at the DoD Maintenance Symposium (Grand Rapids, Nov. 13-16).

IIIPT work also is being overseen by the Product Support Executive committee, a senior management activity formed in response to the Weapon Systems Acquisition Reform Act. The next PPP Workshop is tentatively slated for September 2013 in Warren, Mich., with the U.S. Army Tank-automotive and Armaments Command serving as site host.

Conclusion

As the depot maintenance budget cuts and corresponding capability reductions are realized, it is critical that the process be proactively managed by the DoD depot maintenance enterprise to ensure retention of an optimal defense industrial base, both public and private. The collaboration of both sectors will be crucial to promoting and enhancing public-private partnerships as a way to provide effective product support and ensure the survival of key capabilities within the industrial base, improve public depot performance, and reduce costs.

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Up and Away: The Market for Helium

Retaining the Government's Strategic Reserve

BG John G. Ferrari, USA

"I have this one little saying, when things get too heavy just call me helium, the lightest known gas to man."

—Jimi Hendrix

Most people know helium as the gas that makes balloons float and your voice sound like Donald Duck's. What most do not understand is how crucial this nonrenewable, finite natural resource is to our economy and national security. The 90-year old helium market has, at different times, been dominated by the government as a monopoly supplier, a monopsonist buyer, or a regulator. However, over the past decade, the government has been in the final stages of a long helium privatization effort. This paper will describe how the market for helium functions, and, as a result of this analysis, will recommend that the U.S. Government reverse its decision to sell the nation's strategic helium reserve. Before we begin, let's first examine the characteristics of this crucial and unique gas.

Background

Helium is the second element of the periodic table and is one of the most abundant elements in the universe, yet it is fairly rare on Earth. On Earth, the gas is found in only two places: (1) as a byproduct of natural gas extraction at a few sites around the world, and (2) as a trace element in the atmosphere such that extraction at this time, and probably in the future, is uneconomical, as noted by Z. Cai, et al., of Cambridge University, in their 2007 report, *Modeling Helium Markets*.

Helium's unique properties make it an essential ingredient for electronics, medical devices, industrial application, and cutting-edge research and development. For the U.S. Government, helium is critical in space, defense, and advanced energy systems—there is no substitute if temperatures below minus 429 degrees Fahrenheit are needed. Since 2003, the private sector price for helium has increased by more than 100 percent, according to a U.S. Geological Survey fact sheet. Let's begin by examining the demand for helium.

Demand

While historically the demand has grown about 8 percent yearly, many analysts expect that growth will slow to under 5 percent yearly because of the recent doubling in price. As of 2007, the derived demand for helium was 162 million nanometers (nm) and, according to the paper delivered that year by D. M. Smith, et al., *Challenges to the Worldwide Supply of Helium in the Next Decade*, could be broken out as follows:

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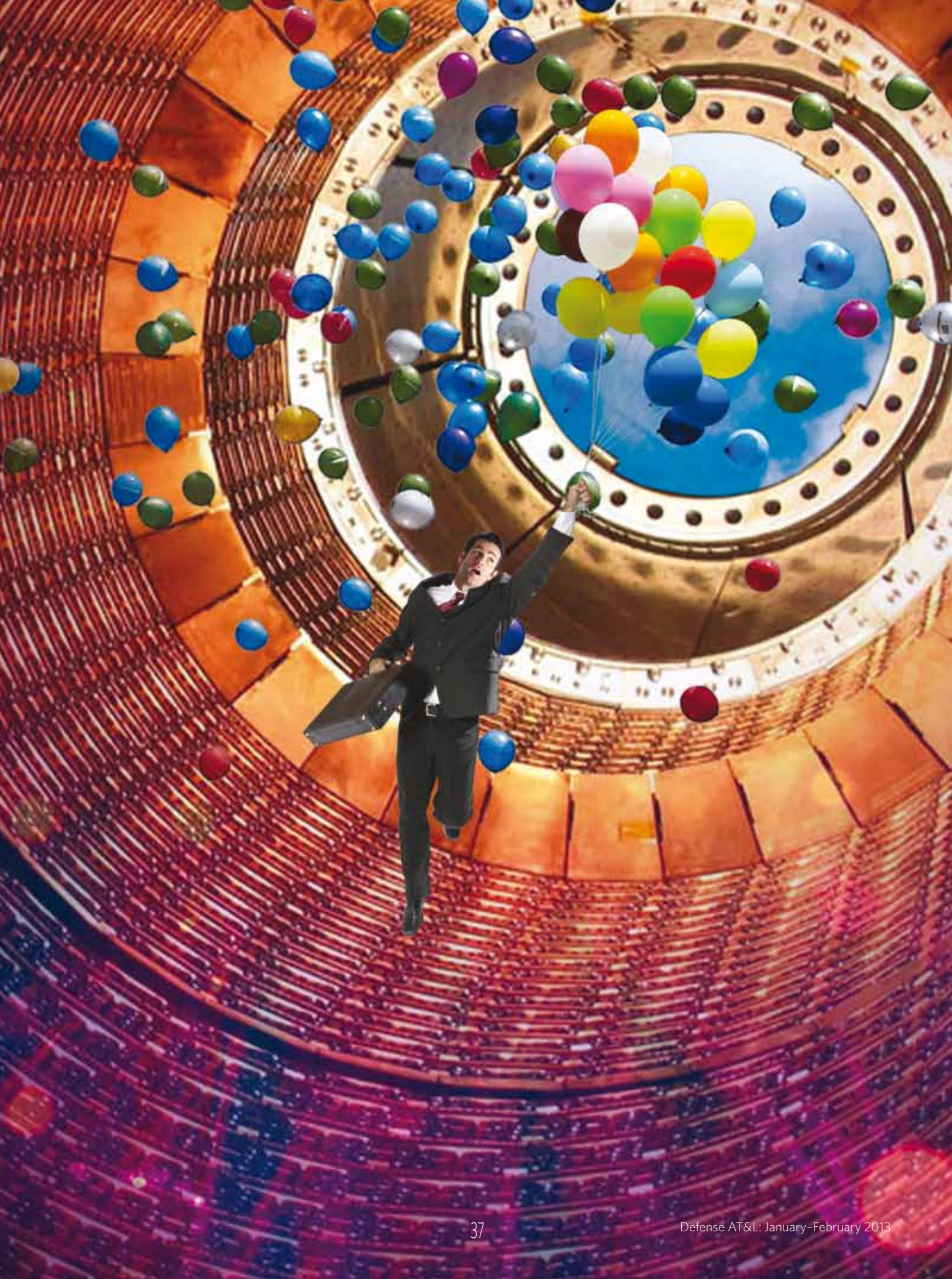

While the idea of eliminating the government's stockpile of helium seemed like a cost-efficient winner more than a decade ago, we can see this is not the case today.

- Superconductors and MRI (28 percent): MRIs (more than 14,000 machines globally) account for 75 percent of this market segment. This segment is fairly inelastic and is expected to grow based upon increased use of MRIs and future use of superconductors for electricity storage. Higher costs will force equipment manufacturers to make more efficient use of helium.
- Lifting (20 percent): Balloons and blimps comprise this market segment. This is primarily a United States market, and demand is expected to remain constant over time. Hydrogen is a substitute, but it is highly flammable (think Airship Hindenburg).
- Welding (12 percent): Historically, this demand has been only in the United States as foreign markets rely on other gases. Argon is a suitable substitute, but technical changes in many codes and regulations will be required. In the short run, demand is fairly inelastic.
- Instrumentation and Leak Detection (12 percent): The need for higher levels of quality control in manufacturing will drive increased growth in this market segment.
- Fiber Optics (7 percent): This market segment reached its peak in 2001. Since then, demand has dropped by 50 percent but now is relatively constant. Recycling will reduce future growth.
- Semiconductors (5 percent): Helium is crucial in semi-conductor manufacturing; demand will grow.
- Other (20 percent): This market includes space, deep-sea diving, plasma furnaces, and other research-driven applications. This segment probably will drive future demand.

Supply

Helium is a commodity product whose supply on Earth is fixed and finite. The worldwide in-ground reserve is estimated at 39 billion nanometers (nm) located in: Qatar (10 billion); the United States (8.2 billion); Algeria (8 billion); Russia (7 billion); Canada (2 billion); and China (1 billion). Of course, this is just what is believed to be in the ground. What really counts is production capacity and in 2007 capacity was about 173 million nm—according to the paper by Smith, et al., which implies that the industry is working at an extremely high level of 93 percent capacity (demand was cited as 162 million nm). Since helium is a commodity, firms are price-takers. However, in view of a looming production shortfall, prices are expected to continue rising until more capacity becomes available.

Fourteen helium-producing plants operate at 12 locations throughout the world. Two new production plants with a capacity of 17 million nm, one each in Qatar and Algeria, were due on line in 2005 but remain plagued by delays. Within the United States, production sites that have been operating for decades are becoming depleted and bringing on new capacity will be costlier. Today, the domestic private sector production sites meet the entire domestic demand. Constructing new global production capacity will face two challenges: (1) they will cost more to ship to the United States than domestic sites, and (2) they are mostly in the hands of foreign governments, rather than the private sector, thereby creating a very large political risk. In short, global supplies will remain tight well into the next decade and the production capacity will shift from domestic private production to a reliance on foreign governments.

"Once, our defense and aviation industries had a strong need for helium and the nation lacked a market to supply it. A government program was appropriate. But today ... a government-operated program is no longer needed."

—President William Jefferson Clinton, 1996

Role of the U.S. Government

Helium was used by the Army and Navy in aerial balloons during World War I. Believing that helium was crucial to national defense, the Helium Act of 1925 nationalized all existing private industrial production in the United States, making the federal government a monopoly supplier for the next 40 years. In 1960, believing it was time to stimulate private sector involvement, Congress passed the Helium Amendment of 1960 (PL 86-777) that committed the government to buying virtually all excess private sector helium production for 22 years. As expected, the private sector flourished, selling the government all excess helium supplies at a fixed cost.

By 1973, only 13 years into the 22-year program, Smith, et al., noted that the government had an excess stockpile of almost 1 billion nm and canceled the buy-back program. The stockpile however, continues to exist. Since helium is a byproduct of natural gas production, all excess extraction now simply vanishes into the air. In 1996, as part of the government's privatization efforts, the Helium Privatization Act directed the government to sell off the strategic helium stockpile (1 billion nm) beginning in 2005 and completing the sale by 2015.

Private Sector Response

The private sector is responding to the current shortage of helium in several distinct ways. First, helium conservation employs new technologies to conserve helium through products such as leak-proof containers and the capability to capture residual helium during transfer. Remember, helium is an extremely small molecule, so preventing its loss is very difficult. Next, recycling technologies in industries such as fiber optics have proven 95 percent effective in recycling helium within a closed system. Also, research is ongoing to recover helium in applications such as MRI machines after each use, though many challenges remain, as noted by Michael Richey, in *Serv-I-Quip Industry Update: The Helium Market* (2007). Finally, substitutes such as argon or hydrogen are used whenever possible. The next time you think you see balloons floating, check to see if they are really floating or if they are tethered from the ceiling.

Public Policy Recommendation

Helium is a critical input to scientific research, industrial processes, space, and the needs of the Department of Defense. It is therefore in the interest of the U.S. Government to maintain a free and open global market for helium as the most efficient way of ensuring future helium needs. However, there are two important risks that must be addressed: (1) helium exists in a finite amount and if not captured during the natural gas extraction process, it is lost forever; and (2) most of the global helium supply is in nations whose governments control the production process and could disrupt the marketplace as a matter of political or economic warfare.

To mitigate and hedge against these risks, the government should repeal the 1996 Helium Privatization Act requirement that the strategic helium reserve be sold off. The reserve is a critical hedge for the United States against market disruptions. The government also should procure and store excess domestic helium production during periods where supply exceeds demand and the gas is left to vaporize into the air. The government in effect becomes a low-cost helium bank. Taken together, these two actions will provide a robust strategic reserve that both conserves helium from being lost forever and also provides a hedge against market disruption.

Conclusion

The helium market is a fascinating case study in how imperfect markets operate: Helium is a commodity in high demand; it has limited production capacity; and government involvement swings from nationalization to complete privatization. While the idea of eliminating the government's stockpile of helium seemed like a cost-efficient winner more than a decade ago, we can see this is not the case today. With prices rising and supply disruptions possible, the strategic reserve provides the nation with a hedge that, if needed, gives us a buffer for several years, to increase domestic production capacity. For this reason, the U.S. Government should cease the sale of the helium reserve and actually begin plans to increase the strategic reserve by serving as a helium bank for the domestic private sector.

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Going The Distance

Leveraging the Benefits of Competition Throughout the Life of a Program

Mike Janiga ■ *Su Chang* ■ *Lt. Col. Rodney Stevens, USAF*

The Joint Direct Attack Munition (JDAM), often referred to as the "Warfighter's Weapon of Choice," is a low-cost guidance kit that converts existing unguided free-fall bombs into accurately guided, near-precision "smart" weapons. Today the JDAM acquisition is considered highly successful, but in its early years the program ran into trouble. The per-unit cost of each JDAM kit was projected to be as high as $68,000—a 70 percent increase over the $40,000 per-unit cost originally budgeted for the program.

The JDAM program reversed this trend by implementing an acquisition strategy that emphasized competition throughout its life cycle. The program used a competitive dual source strategy to award two contracts for developing guided munitions. According to Dominique Myers in a 2002 *Acquisition Review Quarterly* article, the results included a 33 percent reduction in development time, a 42 percent reduction in development cost, and a greater than 50 percent reduction in the per-unit cost.

The JDAM experience clearly demonstrates the critical role of an enduring competitive environment in motivating outstanding contractor performance over the life of a program. So why has the government not carried forward

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this important lesson from the JDAM example and applied it throughout today's acquisition environment?

Continuous Life Cycle Competition Is Not Common Practice in the DoD

The Department of Defense (DoD) strives to foster competition; however, like many government agencies, the DoD tends to view competition as occurring only during the contracting process, rather than as a dynamic tool for achieving success over the life of a program. Most DoD programs today award development and production contracts to a single prime contractor or contractor team. Using this single-provider approach, the DoD fails to maintain "continuous life-cycle competition"—the use of competition to motivate contractor performance throughout the life of a program.

Several factors drive the DoD toward a single-provider model and reduces continuous life-cycle competition. The first is a mistaken belief that ongoing competition will increase costs. Thus, fiscal constraints (or budgetary pressure) force programs into a single-development/production environment in order—it is believed—to get the most "bang for their buck." Second, there is a concern that awarding contracts to more than one source will consume significant contracting and program management resources and that this would outweigh any benefits gained from competition.

Third, once a prime contractor is selected for initial award, government program offices have strong disincentives to switch contractors, even for poor performance. They have a well-founded concern that oversight bodies may cancel a program if there is a need to change prime contractors, since this often indicates poor program performance. Additionally, program managers fear that reporting negative contractor performance will reflect badly on their ability to manage the program. This situation creates a mutually dependent environment where the success of the program office is tied closely to the success of the prime contractor, ultimately reducing the government's ability to objectively evaluate and report contractor performance. Moreover, the costs of switching to a new contractor during program execution have become prohibitive. In addition to the funds and time required to solicit and award a new contract, the effective technical and programmatic transition to another contractor is a high-risk, resource-intensive activity.

Last of all, federal contracting processes have become so drawn-out and cumbersome that programs try to minimize the number of competitions and contract actions. Today's processes make it extremely difficult to re-compete contracts. The lead-time needed to solicit proposals and award a contract is frequently as long as 12 to 18 months. As a result, contracts are pushed to their maximum periods of performance, further reducing opportunities to hold competitions over long program periods. Even when a contractor performs poorly, government programs often push forward with the current contractor instead of initiating difficult and expensive termination proceedings and starting the contracting process anew.

Given that the government has entered a period of fiscal austerity due to the heavy federal debt, it is more important than ever that an alternative to the current single-provider model be found—one that incentivizes cost efficiency, innovation, and transformative solutions.

After initial award, the barriers to entry for a program are so high that subsequent competitions provide an unfair competitive advantage to the incumbent. The single-provider model gives the incumbent contractor monopoly-like powers that negatively impact DoD programs through all acquisition phases. It is in the prime contractor's best interest to follow a long-term strategy of becoming entrenched in all aspects of a program's operations. To do so, contractors build proprietary solutions, or posture themselves to maintain much of the day-to-day program knowledge, and in this way essentially become indispensable to the program. In addition, most contractors seek to integrate the products or services they develop within the broader system of systems, or enterprise, to better align their efforts and position themselves for future work. Once a prime has established a long-term dominant position on a program, the prime contractor has little incentive to innovate, lower costs, or increase productivity. As a result, many DoD acquisition programs encounter schedule delays and cost overruns, and fail to meet performance objectives.

How Do We Fix This Problem?

Given that the government has entered a period of fiscal austerity due to the heavy federal debt, it is more important than ever that an alternative to the current single-provider model be found—one that incentivizes cost efficiency, innovation, and transformative solutions. The key is to employ an acquisition strategy based on continuous life-cycle competition by using a dual- or multi-provider approach. Under this strategy, more than one contractor is selected to develop, produce, and sustain a program throughout its life cycle. In addition to the benefits of competition, having more than one contractor

provides the program with an "insurance policy" if the primary contractor fails to perform adequately. Thus, it reduces single points of failure—a critical advantage in today's increasingly complex and interdependent acquisition environment. Also, the risks inherent in contract transition are minimized if a viable second source already is knowledgeable about program's day-to-day operations and can quickly ramp up to fill the primary contractor's obligations.

Several contracting approaches can be used as building blocks for dual- or multi-provider strategies. Listed below are a few examples:

Commercial Model: This open-market strategy encourages all contractors to develop products at their own cost. The government has the option to buy these products at a per-unit cost once the items are fully developed and ready for production. Firms will be willing to fund the development if they believe the government will choose to buy their products at a price and quantity that enables them to recoup costs and earn a reasonable profit in the production phase. This approach is best suited to IT systems that allow contractors to develop applications on an existing infrastructure. However, it also can be used in developing components on top of open hardware platforms. For instance, airframes, ships, and vehicle classes present a standard platform, but there could be competitions for the various subsystems (e.g., avionics, navigation, fire control systems).

Competitive Orders (Indefinite Delivery/Indefinite Quantity): The government awards contracts to multiple qualified vendors to meet a broad set of requirements. The government pre-negotiates pricing as well as terms and conditions with each vendor. The multiple awardees vie for task/delivery orders in a post-award competitive environment, keeping competitive pressures in play throughout the life of a contract. This strategy works best when requirements can be broken into several manageable tasks that different contractors can perform over a given time.

Competitive Dual Sources: The government fully funds two contractors to execute their designs or solutions to meet a capability need. The vendors fully develop and produce their designs, thus providing the government with two viable solutions to a requirement. The two sources continuously drive down prices while also improving the performance and reliability of their products over time. Of the continuous competition strategies, this approach requires the greatest upfront investment by the government, but also creates the most competition and the greatest probability of meeting program mission needs on schedule.

Competitive Multi-Sourcing with Distributed Awards: The government awards contracts to two (or more) sources, with a primary contractor receiving the majority of funding. A second contractor also is selected to create a continuous competitive environment and to provide a viable back-up if the primary contractor fails to meet program objectives. The second source receives significantly less funding than the primary contractor, but enough to gain program expertise and to develop plans and concepts to meet program requirements (e.g., a 90/10 split).

Competitive Multi-Sourcing with Distributed Awards in Detail

Each of the above options can form the basis for a continuous competition strategy extending over the full life cycle of a program. Competitive multi-sourcing with distributed awards merits particular consideration, because this innovative strategy carries significant potential, but has not been widely used across the DoD.

Under this model, the government awards the majority of funding to a prime contractor, with smaller funding levels provided to a secondary source. Keeping a second source under contract at even a low level (e.g., 5 percent to 10 percent of prime contract costs) maintains significant competitive pressure on the prime by greatly reducing the barriers of entry into the marketplace (i.e., lowering the switching costs). It also allows the second source to refine and mature its technical approach and gain familiarity with the program's operations. The cost of implementing this competitive multi-sourcing approach can be relatively small when compared to the benefits of competition that it provides.

The DoD can use this approach in several ways to maintain continuous competition in all acquisition life-cycle stages.

Percentage-based Distributions—A set percentage of funding is allocated to each source. For example, Vendor A submits the best offer and receives the majority of funding (e.g., 90 percent) as the primary source. Vendor B submits the second-best offer and receives a smaller percentage of funding (e.g., 10 percent) to partially develop its design or to work on a particular subset of the contract requirements. This strategy keeps a second viable source in play during the prototyping, development, production, and sustainment phases, which will provide competitive pressure to motivate the primary contractor.

Full Development with Scaled Production—Under this strategy, the two or more contractors are completely funded to develop prototype products. After the two prototypes have been completed, the government selects one contractor for full-scale production and a second source for limited production. This strategy works best for complex systems that carry significant risk during the design phase of the program.

Next Increment Prototype Model—The DoD uses a primary source to maintain engineering capability for the current production unit. Less funding is provided to a secondary source to build a prototype for the next program increment. In addition to getting a head start on the next spiral of development, the DoD has introduced a second

capable source and positioned it to compete with the prime for the next program increment.

Partial Contractor Funded Development Model—The DoD caps the amount of development funding to a second contractor for a limited amount (e.g., 30 percent of proposed costs). The contractor has the option to invest its own funding to fully develop its proposed design and has the potential to recapture these development costs during the production phase if the government decides to pursue production of the second contractor's design.

Benefits Outweigh the Cost of Competition

In this period of fiscal austerity, funding a second source may appear to be a luxury. However, the benefits of competition greatly outweigh the additional costs. To maximize the benefits of continuous life-cycle competition, the DoD needs to adopt a dual- or multi-provider strategy from the outset of the program planning process. While these approaches may require greater upfront funding, they have the potential to save far more over the long term and to provide nonmonetary program benefits.

As an example, according to a 2001 study "Assessing Competitive Strategies for the Joint Strike Fighter" by the RAND Corp., the introduction of a second source during the production of the Tomahawk missile led to estimated savings of $630 million, while improving the missile's reliability from approximately 80 percent to 97 percent. The same study also revealed that the 10 DoD aircraft programs that involved no competition during the production phase experienced an average 46 percent increase in cost over the original budget.

Before adopting continuous life-cycle competition, programs should conduct a formal cost-benefit analysis. This will help to ensure that a continuous competition strategy will pass the "Washington Post Test" (i.e., avoid public perception that funding a second source will waste taxpayer dollars). Aside from the monetary cost of introducing a second source, such an analysis should consider additional factors such as impacts on schedule, innovation, technical integration, and interoperability. Programs should adopt a continuous competition strategy only if the analysis concludes that the advantages of competition will exceed the costs of identifying, sustaining, and managing a second source to develop products.

A continuous competition strategy may create additional workload for a program management office, at least at the start of a contract. However, this burden should be more than offset by shorter development and production schedules driven by competitive pressures. Competition is an extremely strong motivator: the forces of competition act as an "invisible hand" to self-regulate contractor performance. Contractors tend to keep each other in check, and the government greatly benefits from, and is protected by, the nature of competition.

Extensive historic data on DoD programs have shown that costs consistently decline in a competitive environment, while performance and reliability increase. By contrast, a single-provider environment produces smaller performance improvements, longer schedules, and higher costs. Schedule delays and cost overruns consume significant resources; for example, a 2010 Center for Strategic and International Studies (CSIS) report titled *Cost and Time Overruns for Major Defense Acquisition Programs* found that 32 percent of the single-award contracts, awarded after full and open competition with multiple offers, experienced overruns at a net cost to the government of $19 billion. Since programs experience fewer overruns and delays in a continuous competition environment, the DoD can invest less time and money overall in managing its programs.

In addition to the benefits of competition, having more than one contractor provides the program with an "insurance policy" if the primary contractor fails to perform adequately.

Conclusion

The value of competition has been incorporated into every major piece of legislation on acquisition reform and is touted continually in political speeches and public engagements. However, the vast majority of DoD programs continue to rely on a single-provider acquisition approach and spend most of their life cycles without real and enduring competition. As a result, too many DoD acquisition programs fail to achieve their cost, schedule, and performance objectives.

Continuous life-cycle competition offers the DoD a valuable tool to achieve success over the life of a program. The benefits gained from competition often vastly outweigh the initial costs. The DoD needs to redefine competition so it is no longer viewed merely as an upfront activity limited to the contracting process. The new definition should focus on ongoing competition, and competition should be the rule, not the exception. Instituting continuous competition throughout DoD acquisition programs could replicate the success of the JDAM model at a far grander scale, yielding significant benefits to our nation's warfighters as well as to the program offices that deliver capabilities to them.

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A Cost-Efficient Approach to Inventory Management

Using IUID to Meet an Organization's Specific Requirements

Mindy Rash-Gehres ■ *Jerry Decker* ■ *Mike Kotzian*
Duane Mallicoat ■ *Tim Simpson* ■ *Robert Landry*

Members of the Department of Defense (DoD) acquisition workforce are very familiar with the "S-curve" that describes a weapon system's life-cycle costs; they also know that approximately 60 percent to 70 percent (or more) of a weapon system's life-cycle costs are typically associated with day-to-day operations and support (O&S) costs. In other words, O&S costs comprise more than half the total ownership cost (TOC) of most programs, and for this reason O&S costs have become the target of many proposed savings initiatives. One projected savings area within the O&S budget is "better inventory management." Inventory management is the focus of this article—in

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particular, the efforts of the Naval Surface Warfare Center (NSWC) Explosive Ordnance Disposal Technology Division (EODTECHDIV), Indian Head, Md.

EODTECHDIV is one organization that has made serious strides to tackle the issue of inventory management and rising O&S costs by exploiting technology—namely, item unique identification (IUID) and radio frequency identification (RFID).

EODTECHDIV, as one of DoD's premier organizations responsible for Explosive Ordnance Disposal (EOD) mission-related requirements, is at the forefront of U.S. efforts to counter improvised explosive devices (IEDs). The organization is responsible for the repair, inventory control, and shipment of numerous EOD robots designed to support the warfighter's stand-off capability to counter the IED threat. As a result of the Iraq and Afghanistan wars, demand for counter-IED robotic capabilities has grown significantly. In addition, due to its outstanding reputation in the industry, EODTECHDIV increasingly became a focal point for the other Services to seek out robotic counter-IED support.

Background

The DoD never has experienced a shortage of honest and well-meaning attempts by individuals and integrated product teams to find better and more cost-effective approaches to weapons system acquisition and services acquisition. Truly motivated and analytical minds, in a continual stream, have wrestled with how to better enable the DoD acquisition process to develop and deliver products that meet the warfighter's performance requirements while remaining within cost and schedule requirements—and the EODTECHDIV is no different.

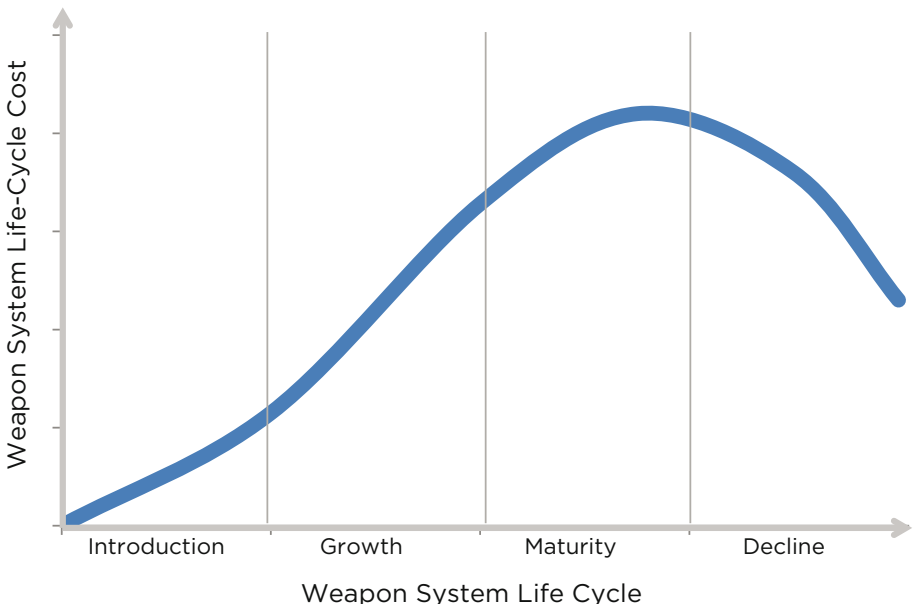
While DoD program managers have always focused on achieving cost-schedule-performance, the pressure to increase efficiencies in DoD acquisition programs has never been so impassioned. DoD no longer expects a "budget growth" business environment. As a means to satisfy such expectations for acquisition efficiencies, DoD launched a number of best business practices intended to ensure the Department's ability to "do more without more." Assembled under the mantle of "Better Buying Power" are principal actions forming a foundation of proven lessons-learned, whereby DoD program managers are expected to use their creativity and innovation to identify program efficiencies.

When outlining budget priorities and choices for Fiscal Years 2013 through 2017, DoD calls for a "more disciplined use of defense dollars" by reducing excess overhead, operations expenses, and personnel costs across the enterprise as well as achieving Better Buying Power in the acquisition of systems and services. Through using improved business practices across the enterprise, DoD has tentatively targeted several areas to achieve approximately $60 billion in new projected savings over FY 2013 through FY 2017. EODTECHDIV is a prime example of how an organization can capitalize on one of these particular areas—inventory management.

Current DoD documentation reflects the increased focus on O&S cost and specifically inventory management. The Office of the Secretary of Defense's *Operating and Support Cost-Estimating Guide* (https://acc.dau.mil/CommunityBrowser.aspx?id=187960), dated October 2007, takes inventory control into account. In addition, the DoD Logistics Strategic Plan identifies a number of business process initiatives to realize effective, efficient, and secure supply chain management operations (http://www.acq.osd.mil/log/sci/DoDLogStratPlanFinalSigned-100707.pdf). One of the business process initiatives called out in response to FY 2010 National Defense Authorization Act direction is inventory management. *The Product Support Manager Guidebook* (https://acc.dau.mil/psm-guidebook), dated April 2011, also addresses key requirements to manage product support across the entire life cycle of a weapon system, and one of the 12 integrated product support elements is supply support, which includes inventory management.

In the private sector, where maximizing the bottom line is of utmost importance, inventory management has been a constant focus. Historically, inventory management has been a manpower-intensive undertaking with the potential of prob-

Figure 1. Life Cycle Cost Diagram



Inventory management technology has evolved from manually tracking the movement of materials in and out of the stockrooms to one of reliance upon a sophisticated integration of hardware and software specifically built to provide real-time inventory management that uses minimal manpower.

lematic results, such as "lost" inventory. This problem only escalates as industry grows and inventory size increases. From a business perspective, such lost inventory equates to increased costs (i.e., resources to track down or replace if the item is not located) and late customer deliveries. For the private sector, inventory management technology has evolved from manually tracking the movement of materials in and out of the stockrooms to one of reliance upon a sophisticated integration of hardware and software specifically built to provide real-time inventory management that uses minimal manpower.

Item Unique Identification

One answer to the problem of inventory management is IUID, an identification system created by DoD that enables tangible items to be identified from one another. IUID requires four steps: (1) Mark Items; (2) Scan the Mark; (3) Update Automated Information Systems; (4) Reengineer Business Processes to Use the Mark.

1. Mark Items

IUID includes the process of assigning a unique identifier to qualifying personal property items in the DoD inventory and physically marking the items with a two-dimensional (2-D) data matrix mark that contains a unique item identifier (UII). Personal property includes material systems, equipment, materials, and supplies. (See DoDI 8320.04 and DoDI 5000.64.) The UII is a unique data string assigned to a single item and is never reused. All UIIs are to be registered in the DoD IUID Registry once assigned to an item and upon government acceptance. Think of how U.S. citizens receive their unique Social Security number that follows them forever and is never reissued to a different individual. UIIs are associated with an item via a 2-D data matrix. This 2-D data matrix is a machine-readable representation of the UII. The data matrix then is permanently affixed to any item deemed worthy of being tracked. An item meeting any of the following criteria should be tracked via IUID:

- All items that cost more than $5,000
- All items that are serially managed
- All items that are deemed mission essential
- All items that are considered controlled inventory

2. Scan the Mark

Once an item is marked, the 2-D mark can be scanned with an Automatic Identification Technology (AIT) device.

3. Update Automated information Systems

The scanning process allows the item to be linked to its data within an automated information system (AIS)—once the AIS has been modified to support IUID. As information flows from AIS to AIS, this allows the UII to associate data about the item throughout the item's life cycle for improved product life cycle management, property accountability and management, financial transparency, and valuation.

4. Reengineer Business Processes to Use the Mark

Programs engage in business process reengineering (BPR) to make use of the new data availability, item traceability, and inventory management.

From a DoD perspective, the IUID implementing policy is DoD Instruction 8320.04, *Item Unique Identification (IUID) Standards for Tangible Personal Property*, dated June 16, 2008 (http://www.dtic.mil/whs/directives/corres/pdf/832004p.pdf). The Services then augment this instruction with implementing policies of their own; in the case of the Department of the Navy, such a Service-specific implementing policy is Secretary of the Navy Instruction (SECNAVINST) 4440.34, *Implementation of Item Unique Identification within the Department of the Navy*, dated Dec. 22, 2009 (http://doni.daps.dla.mil/Directives/04000%20Logistical%20Support%20and%20Services/04-400%20Supply%20and%20Material%20Services/4440.34.pdf).

NSWC EODTECHDIV Story

Naval Surface Warfare Center (NSWC) EODTECHDIV is a field activity that reports to the Naval Sea Systems Command as a division of the NSWCs. It is a unique support activity administered by the U.S. Navy working together with all of the Services to determine and address joint service EOD requirements.

In 2005, the Man Transportable Robotics System (MTRS) Abbreviated Acquisition Program (AAP) was elevated to an Acquisition Category (ACAT)-IV program because of the increased requirement of systems due to the increased IED threat in Operation Iraqi Freedom and Operation Enduring Freedom. As an ACAT-IV program, one of the key requirements was an independent logistics assessment (ILA). One of the findings from this ILA was that there was no plan or

contract for IUID for the MTRS. The MTRS consists of two different platforms by two different manufacturers. During the same timeframe, the logistics manager began looking into a Supply Chain Management (SCM) system that would be flexible enough to manage the MTRS in both theaters and other venues. The system would track shipping and receiving, track assets (i.e., total asset visibility), manage configuration changes, track maintenance actions, and allow government and the original equipment manufacturers (OEM) access to the data. This led to a specific commercial-off-the-shelf database tool called Catalog Ordering Logistics Tracking System (COLTS).

Mark Items

In the meantime, the MTRS Contracting Officer had the MTRS OEMs provide the EODTECHDIV with a cost to implement IUID for their respective platforms, which resulted in only one OEM being given the task of providing IUID-marked items. To include IUID requirements, the second OEM wanted $250,000 for nonrecurring engineering, another $4,000 annually for recurring engineering, plus $80 per label. This was unacceptable, so EODTECHDIV researched and gained the capability to produce IUID labels itself. As a result, the EODTECHDIV team was able to produce all the labels for their legacy systems and have their parts marked prior to a DoD December 2010 deadline, at a cost of about $1.50 per label. Thus EODTECHDIV has addressed the first element of IUID—mark items.

Scan the Mark

EODTECHDIV's marked parts (2-D matrix) are read with a scanner upon introduction to its warehouse and when parts exit the warehouse. The information is fed into the SCM database and, along with other data linked via IUID, provides data points needed to support metrics such as Operational Availability, Mean Time Between Failures, Mean Logistics Delay Time, and failure trend analysis, and OEM depot performance (including price to repair). EODTECHDIV has addressed the second element of IUID—scan the mark.

Update Automated Information Systems

To address the third element of IUID—update the automated information systems—EODTECHDIV worked with the vendor of COLTS to incorporate IUID into the database toolset. EODTECHDIV worked hard to create an environment where data are paramount and readily accessible. When the very first MTRS went on its first mission with an EOD Technician in Iraq and encountered the explosive end of an IED, the MTRS sustained damage and needed repair. From that very first failure and every subsequent failure over the next 7 years, the EODTECHDIV has data on cost to repair, parts to repair, and time to repair, and, because of IUID, it is all located in a single database application for all to see. The next logical step was to use IUID to gain efficiencies in inventory management.

Reengineer Business Processes to Use the Mark

The EODTECHDIV began an investigation into inventory process improvements to decrease the turnaround time between stocking inventory assets (such as systems, critical repair parts/components, etc.), and those same inventory assets being shipped to customers. To those familiar with "just-in-time" logistics, initiatives frequently are considered in efforts to decrease a systems logistics footprint and to minimize the Work in Progress (WIP) in the system and items on the shelf. If an organization can control these two factors, the result often is cost savings and customers receiving their assets quicker.

This process improvement investigation led EODTECHDIV to the realization it could improve on its method of tracking inventory. Part of the investigation was conducting two separate Lean Six Sigma events, where EODTECHDIV discovered it averaged 30,000 pounds of inventory movement per week, mostly in packages of 150 pounds or less. To conduct its annual inventory, EODTECHDIV had to literally shut down operations for an entire week. Despite the inventory manager's

From that very first failure and every subsequent failure over the next 7 years, the EODTECHDIV has data on cost to repair, parts to repair, and time to repair, and because of IUID it is all located in a single database application for all to see.

best efforts, these inventories had a 20 percent to 25 percent discrepancy rate of "lost" or "misplaced" items. With one robot arm valued at $43,000 and the potential for significant cost impact for lost or missing items, the current system obviously was not working. In addition, it took one full-time person more than 2 months to account for the discrepancies. EODTECHDIV tried replacing the annual inventory with a quarterly inventory in order to cut down on inventory discrepancies, but this did not result in an improvement. It actually meant that EODTECHDIV's warehouse was shut down for 4 weeks per year, which was not a viable option in the midst of an ever-increasing demand to support the warfighter.

Radio-Frequency Identification (RFID) and a Real Time Locating System (RTLS)

EODTECHDIV turned to technology in an attempt to solve some of its inventory management challenges. Specifically, EODTECHDIV decided to make an additional financial investment into radio-frequency identification (RFID) and a real time locating system (RTLS). RFID is a technology that transmits the identity of an object wirelessly and RTLS is a system that tracks the RFID tags. The fact that EODTECHDIV's items were marked via IUID allowed for an easier adaptation to the RFID system. Each RFID tag is assigned a number when the tag is activated. EODTECHDIV uses this tag number as a unique identification and associates the RFID number to the IUID information. Every IUID-marked part's shipping container is marked with an RFID tag. As long as the shipping container (with its RFID tag) is in the warehouse and its IUID-labeled part is in the container, the part is tracked via the RTLS. Once the part and its shipping container are sent out for repair, they are no longer tracked in the RTLS. Shipping containers are reused to send broken parts to the OEM for repair and to send ready-for-issue parts to the warehouse. When a shipping container is received at the warehouse with a different part than it left with, as is usually the case, the RFID tag on the case is removed and the part currently in the container is scanned via the IUID. A new RFID tag is printed and attached to the shipping container, completing the new association and letting the RTLS know the part has returned and is ready for processing and tracking.

RFID technology removes the need to physically scan the mark repeatedly in the warehouse because it does not require contact or direct line of sight for communication. The data held in the RFID tag can be read through the human body, clothing, and nonmetallic materials.

RFID technology is not new. In fact, RFID is in use in our everyday lives, for example: animal ID chips, the E-ZPass electronic toll-collection system, or the SpeedPass electronic gas-payment system. This technology relies on radio waves to transfer information from the RFID "tagged" item, to an electronic reader.

EODTECHDIV employed "passive" RFID (pRFID) tags that receive energy from the electronic reader itself, so there's no need to provide an external energy source (i.e., battery). The technology for pRFID also is able to instantaneously detect readings from numerous tags by the electronic reader while in a box, carton, case, etc. Finally, this technology is readily linked to commercial tracking systems such as Federal Express in order to maintain 100 percent in-transit visibility.

To implement pRFID technology, EODTECHDIV used the RTLS. As with other pRFID-based architectures, the RTLS relies on a series of antennas that "cover" the warehouse footprint with an RF pulse every 7 seconds. The antenna pulses are combined by the RTLS software to provide a 24-hour/7-day-a-week picture regarding the location of every RF tag within the warehouse. The RTLS information is automatically fed into COLTS, the commercial off-the-shelf, Web-enabled capability used for supply chain management. EODTECHDIV uses COLTS to maintain a logistics "picture" of the on-hand inventory for all Programs of Record. With the addition of RTLS and pRFID, instead of shutting down the warehouse to do an "all hands wall-to-wall inventory" EODTECHDIV has a complete inventory of the entire warehouse automatically once a day with no human intervention. The combined picture is displayed on a big-screen "status board" so EODTECHDIV can visualize individual or all RFID tags (i.e., robotic assets) to within 3 feet inside the warehouse. EODTECHDIV claims: "We can actually watch items moving in the warehouse. We watched one item being removed from the warehouse after normal work hours and followed it to another room in the building." The big status board also identifies any discrepancies from the daily inventory, allowing the warehouse manager to resolve them daily vs. quarterly or annually. This alone drastically reduces the "touch time" associated with reconciling inventory discrepancies. Instead of taking months of dedicated effort, inventory reconciliation is accomplished in a few minutes daily.

Use the Mark—Results

Because of the ability to incorporate the IUID elements to meet its organization-specific needs, EODTECHDIV was able to maintain 100 percent supply accuracy for forward deployed units. "We actually monitor the number of items at each site and adjust as necessary to keep no more than a 7-day supply of parts on the shelf. A couple of times in the past 2 years we have adjusted the supply and got inquiries from the receiving end as to why we increased their stock. We noticed they needed the parts before they did." When compared to the previous manually intensive approach to inventory management, the use of an IUID-enabled process (modified via technology to meet specific organizational requirements) was found to significantly increase the chances of 100 percent accountability for all assets identified within the inventory. This "shrinkage avoidance" resulted in less inventory lost or misplaced, which translated to lower costs either through avoiding use of manpower to find lost/misplaced assets and/or the need to reorder replacements of ensure inventory maintenance at prescribed levels. EODTECHDIV reports: "Because of our aggressive failure identification program and resolutions, I now have over 2 months additional spare parts on my shelves with a corresponding increase in probability of a spare on the shelf of 99 percent, with no additional funding required from the Services. In addition, I have reduced the 12.5 percent sparing requirement to about 4 percent on all current and future orders."

Prescribed levels of inventory assets are able to be maintained by the RTLS, providing a picture of the EODTECHDIV warehouse to the COLTS AIS. With an initial goal of 90 percent in-theater operational availability for robotic IED assets, EODTECHDIV was able to achieve a greater than 95 percent in-theater operational availability through the implementation of IUID utilizing pRFID, RTLS, and COLTS to meet the specific needs of its organization. According to EODTECHDIV, "This integrated effort enabled better maintenance, supply, transportation, and acquisition decisions that increased production throughput and system operational availability, and decreased carry inventory and operating costs over the last 7 years."

EODTECHDIV's implementation of the IUID process of associating the item and the data about the item to the inventory management of robotic assets has enabled numerous value-added benefits.

- More accurate supply-chain management and operations costs based on actual data collected by the RTLS, which provides a cumulative "tracking" of life-cycle costs associated with robotic repairs and upgrades resulting in an increased mission performance capability to the warfighter.
- 100 percent inventory control on all IUID RF-tagged assets every 7 seconds, 24 hours per day.
- EODTECHDIV ability to submit budgetary requirements for its 6-year future years defense plan submittal based on actual data collected through its IUID-enabled processes.

A couple of times in the past 2 years we have adjusted the supply and got inquiries from the receiving end as to why we increased their stock. We noticed they needed the parts before they did.

- EODTECHDIV ability to make more precise customer funding requests based on cumulative tracking of actual life-cycle costs.
- Improved configuration management and asset visibility.
- Assistance to establish a Condition Based Maintenance Plus environment.
- Support of the next-generation "sense and respond" maintenance paradigm, which allows the supply chain to predict future demands and respond accordingly.
- Monitoring and better management of the financial transactions associated with more than 100 customer "checkbooks" (i.e., Is there enough money in the account?) used by all four Services.
- Improved quality assurance for inspections, reports, and repairs.
- Savings of approximately 1 full man year of labor using automatic vs. manual inventory methods.
- Improved data accuracy and speed of processing receipts and issues.

Ultimately, DoD continually seeks more cost-effective approaches across all programs to decrease total ownership costs. With an impact that resonates to upward of 70 percent of a program's total costs, logistics is "at the pointy end of the spear" in identifying cost efficiencies that allow the Department to "do more without more." One success story within the context of inventory management is EODTECHDIV's creativity and innovation in identifying program efficiencies by adapting the four elements of IUID: (1) EODTECHDIV identified a cost-effective method to ensure its parts are marked with IUID; (2) EODTECHDIV's marked parts (2-D matrix) are read with a scanner upon introduction to their warehouse; (3) EODTECHDIV modified its automated information systems to use IUID; and (4) EODTECHDIV reengineered its business processes to use the IUID mark and then layered RFID on top to better manage the warfighter's high demand for robotic assets.

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Good Contracts Start with Good Requirements

Lyle Eesley

Service requirements and their associated contracts account for more than half of the Defense Department's annual contract spending. A clearly written requirement is the key to meeting our customers' performance needs.

Contracting officers know that the best contract in the world cannot save poorly defined requirements. The opportunity for protest, claims, cost increases, and administrative nightmares all await those who can't define the results they need from their service contracts. Reports from the Government Accountability Office, the Defense Science Board, and Inspector General routinely identify poorly defined requirements as a common fault in services acquisition. So how can we define better requirements?

The Defense Acquisition University (DAU) has developed a job aids and training process to support the service requirements definition process. The Acquisition or Automated Requirements Roadmap Tool (ARRT) is a Better Buying Power job aid designed to help

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users improve service acquisitions by developing high-quality performance-based service requirements. ARRT is used in conjunction with the seven-step service acquisition process outlined in the DoD *Guidebook for the Acquisition of Services* (July 2011). (www.acq.osd.mil/dpap/cpic/cp/docs/Guidebook_for_the_Acquisition_of_Services_7_20_2011.pdf)

The *most important part of this process* is writing the requirement clearly and accurately. Requirements don't exist in a vacuum; there must be a sustaining mission need within an agency or organization for the service being acquired. The Performance Work Statement (PWS) must capture all the performance requirements necessary to meet the agency's or activity's need for the service. This requires a thoughtful, disciplined approach and not merely a cut-and-paste from the last effort. Your results can be improved by allowing enough time for customers' and stakeholders' input as well as building a solid acquisition team supporting the development, execution, and assessment of this requirement through the service acquisition life cycle.

Requirements for services are sometimes hard to define or articulate. You can see and understand the need for the services, but how do you describe them? Your requirements document is the most effective communication medium you have with your customers, industry, contracting community, and stakeholders.

As with all communications, the clearer you are, the fewer opportunities there are for misunderstanding. Clearly stated performance requirements will result in more competition, better pricing, and a greater likelihood you will get the results you need at a price you can afford. An added benefit is that the resulting contract also should be easier to administer and the contractor's performance easier to assess. So getting the requirement right is the critical part of this process.

The Process

Developing a performance requirement is like building an organizational chart. In the case of service requirements, we call it a work breakdown structure or WBS. Figure 2 illustrates a PWS WBS. A WBS can go down many levels, based on the nature of the requirement. It is important when developing any requirement to provide sufficient detail so potential contractors understand the results you need without telling them how to do it. So focus on results. The highest level of your WBS is your vision.

In Step One of the service acquisition process, the acquisition team develops a vision statement for the requirement. The vision statement is a guiding goal. It should capture, at the

Figure 1. Services Seven-Step Acquisition Process

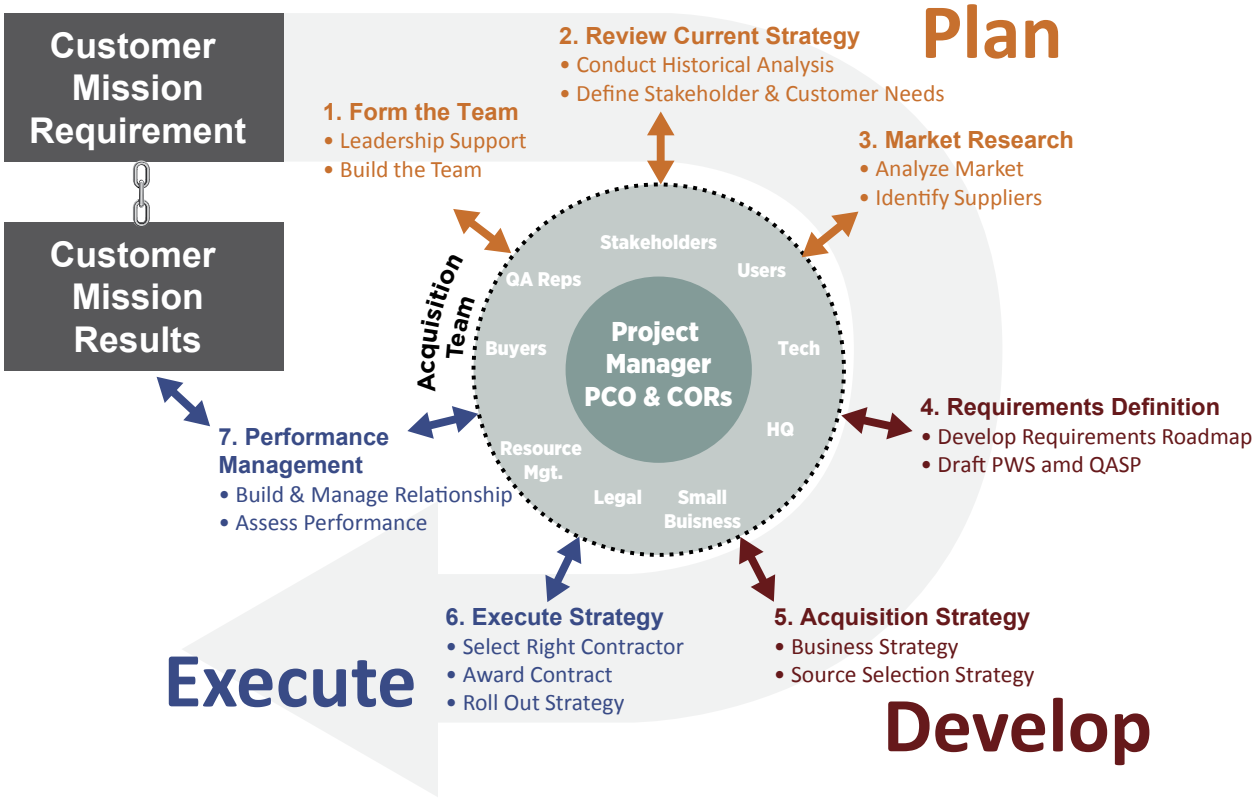
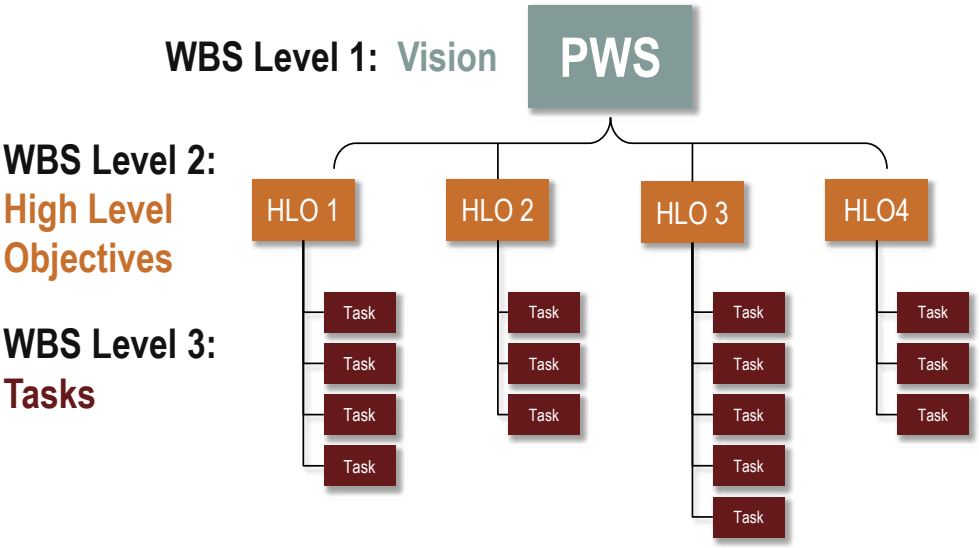


Figure 2. Work Breakdown Structure



highest level what you're striving to accomplish. The vision is not to develop a PWS or issue a contract or obtain 27 support engineers. Your vision and mission statement go together to set the cornerstone for the services you are buying and why they are important. At one time, a prominent U.S. airline's vision statement was to "move people, move cargo, on time, every time." If you've ever flown on that carrier, it did a pretty good job of achieving that vision because all its actions focused on the four elements of the airline's vision statement.

For example, if your requirement is to support an installation's transportation needs, your vision statement might be something like this: "Ensure our installation's mission success by providing reliable and effective transportation support 24/7." Do you see how this vision statement focuses on the higher order results, not just on the transportation function—in other words, how the transportation function will be an enabler for the broader organization's mission success?

High-Level Objectives

After you have developed your vision, define the High-Level Objectives or HLOs necessary to achieve this vision. For this example, the HLOs could be: Transport People, Transport Cargo, Fleet Maintenance, and Fleet Administration. This is WBS Level 2. HLOs are the organizing components for your requirement. An alternative to consider at this point is whether to use a Statement Of Objective (SOO) or continue to develop the PWS.

A SOO gives the widest possible latitude to the contractor in developing a comprehensive solution for your requirement. Developing broad performance outcomes and standards for your HLOs provides the foundation for the SOO. In their proposals, contractors will develop the tasks and standards as they create a PWS that captures how they will meet your HLO performance outcomes and standards. Choose the approach best suited for your requirement.

If using a SOO is not appropriate, once you have defined your HLOs you can begin an analysis of the tasks or results needed to support each HLO. This is WBS Level 3. The requirements roadmap organizes your work in a step-by-step process. The ARRT captures this information in a database by asking the user a sequence of questions (A-H) that walks you through the necessary thought process for documenting your requirement. Note that the roadmap includes not only the performance elements of task, standards, and Acceptable Quality Level (AQL) but also the inspection/assessment elements of monitoring performance (the Quality Assurance Surveillance Plan [QASP] portion). The reasoning is that, as you're defining the performance results and standards, you're in the best position to define how each task should be inspected and/or assessed. This ensures alignment of the requirement with the inspection/assessment approach. It also helps in developing tasks with inspectable standards.

Performance Tasks

The key in developing good task statements is to focus on results. Our experience has shown that defining results seems to be one of the hardest concepts to grasp. PWS Task Statements have three components;

A. The result(s)
B. The context for the result(s)
C. The actions the contractor is to take to achieve the results.

Follow this A, B, C process and you have the elements of your PWS Task Statement. The ARRT tool will automatically take your inputs and rearrange them (CAB) to form a clear requirements statement for you.

A result usually is a noun, describing the outcome needed. Context defines what the results apply to. Actions describe what the contractor has to perform to achieve the results (normally verbs). Let's look at a few examples. Can you find the results, context, and actions required in these statements?

1. The contractor shall provide and maintain taxi service within the XX installation.

2. The contractor shall perform and document initial inspections for newly received vehicles and equipment.

Use as many standards as necessary to fully define how well the task must be accomplished to meet your mission requirements. Remember: Standards are cost drivers, so avoid gold-plating standards, as this will drive up costs.

the D question: At what level of performance (standard) do you need to successfully achieve this task?

3. The contractor shall evaluate, participate, and prepare Program Management Reviews (PMRs), technical reviews, and audits for the transportation office.

A PWS task statement can have multiple results, but remember that all the results listed must relate to each other. They must also share the same actions, context, and performance standards. Try to limit the number of results per task statement to those that are truly integrated and related to each other. Create as many task statements as you need to fully support the HLO.

The Service Acquisition Mall (SAM) website includes a tool for you to practice this ABC process. (http://sam.dau.mil/skilldevelopmentcenter.aspx)

Videos also are available in SAM that will provide more detailed information on each step of the process using the ARRT.

Review some of the requirements documents you've already created. If you can easily find the results, context and actions, you probably have a well-written task statement. Each task statement requires performance standards and AQL to complete a PWS task statement. Remember that the requirement you are developing is a communication device, both to industry and to the COR. It should communicate clearly and accurately the required results necessary to support your customer's performance need.

Performance Standards and Acceptable Quality Level (AQL)

After you've defined a clear PWS task statement (steps A, B, C), the next step (D) is to define how well or what level of performance is required for this task to adequately meet the mission need. Performance standards fall into one of three categories: cost, quality (performance), and timeliness. ARRT asks

Each PWS task statement may have several different performance standards, but remember that each standard must be related to the actions and results specified by the task statement. For example, there may be standards such as regulations or technical orders compliance, quality or frequency standards, completion or timeliness standards, etc. Use as many standards as necessary to fully define how well the task must be accomplished to meet your mission requirements. Remember: Standards are cost drivers, so avoid gold-plating standards, as this will drive up costs.

The Acceptable Quality Level (AQL) recognizes that variations can happen and that 100 percent performance is not always possible. Use good judgment in determining if an AQL is appropriate. For example, a standard for on-installation taxi service is to pick up the passenger within 10 minutes of the call being received by the contractor; this means 100 percent of the time. Ask yourself if it is absolutely necessary to meet the 10-minute standard 100 percent of the time. What are the risks to the activity if the 10-minute standard is not met? These are questions you should consider when determining if an AQL is advisable. Using your risk assessment process should help in determining both standards and AQLs. In this case, perhaps meeting the 10-minute standard 80 percent of the time is acceptable performance. Then our AQL is 80 percent. There are many instances such as environment, technical orders, laws, etc., where 100 percent compliance is absolutely essential. Conducting a good risk analysis will help in determining if and at what level an AQL can be established.

Performance Inspection and Assessment

Now that you've defined your PWS task statement (ABC), and established standards for it (D), you need to capture the elements of your QASP to define who will inspect and assess performance and how this will be done. These issues are addressed by questions E-G. Question E focuses on what you will inspect. This should be directly related to the result of your task statement. If the "What" is a deliverable such as a report, you need to identify it as a data deliverable, capture a description of it and tie it to the task statement. ARRT ties

the deliverable to the task and also automatically creates the Deliverables Section of the PWS. After looking at your Task Statement, if you can't determine "what" you will look at, you should go back and work on the task statement to define a result that can be inspected.

Next, Question F asks "How will you inspect it?" There are several methods to inspect and assess a task such as: 100 percent inspection, periodic inspection, random sampling, trend analysis, customer complaints, and third-party audits. Since you've just defined the task, you're in a good position to specify how you intend to inspect and assess performance to determine if the contractor has met the performance standards. Remember that inspection requires resources. You should ask yourself whether you have the resources necessary to inspect everything that will be necessary for your requirement. Your risk analysis will be very valuable in helping you determine the level and frequency of inspections required for each task.

Question G asks: "Who is going to inspect this?" This responsibility normally falls on the Contracting Officer's Representative (COR), but it can also be a combination of a technical expert in coordination with the COR. You can be as specific as you need in defining the position responsible for conducting the inspections. This should be a position—not necessarily a person by name. Before contract award, you must identify the person responsible for inspecting and assessing contractor performance. Make sure that person completed the necessary COR training and is technically qualified to perform the function. Remember: The QASP is a government-developed document and is not included as part of the contract.

The last question to ask is, "Are there any incentives/remedies beyond documenting past performance for the contractor if it exceeds/fails to meet the performance standards for this task?" This is Question H in ARRT. Capturing and documenting contractor performance is a requirement for all government contracts and is reported and captured in our past performance system. This is always an incentive for a contractor to do well. Question H gets at the specifics for this task and can be influenced by the type of contract used for this effort. In a fixed-price contract, the contractor has agreed to meet all the performance standards for the price specified. If the contractor's performance fails to meet the standard, the government is entitled to a remedy such as having the contractor redo the task at no additional cost, or deducting money from the contractor's invoice if re-performance is not possible. If a cost-reimbursement type contract or time-and-material contract is used, be careful not to pay twice for the same service. The incentive/remedy information must be included in the contract and is captured in the Performance Requirements Summary (PRS) as part of the PWS. This ensures contractors are aware when they submit their proposals of any remedies that may be required of them for unsatisfactory performance.

Conclusion

Following a standard service-acquisition process to define and develop requirements has the potential of reducing acquisition lead times, obtaining better competition, reducing costs, and delivering better results. The ARRT will help you capture requirements more accurately and clearly. ARRT users have reported they have reduced acquisition lead times, received fewer RFP questions, and have better proposals to evaluate with less administrative work after contract award.

With the budget challenges facing the Department of Defense, we all need to work on improving the effectiveness and efficiency of the service acquisition process to "deliver more without more."

ARRT is a free, downloadable MS Access file that guides a user through a disciplined process to define the results, standards, and method of inspection using standard templates for the Performance Work Statement (PWS), Quality Assurance Surveillance Plan (QASP), and the Performance Requirements Summary (PRS). (http://sam.dau.mil/Content.aspx?currentContentID=arrt)

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Building Genuine Motivation

Stan Emelander

Motivating followers is part of a leader's role, but often both leaders and followers are confused about the nature of motivation.

Motivating followers is a leadership imperative for several reasons. Motivated, engaged employees are recognized as a strategic advantage, the engine that carries firms of all types toward their most important goals. Managers and executives, obliged to seek competitive advantage as agents of the firm's owners (including taxpayers) should attend to this advantage. In this era of budget constraints, with an emphasis on providing better services with fewer resources, building an engaged workforce is an ever greater imperative for leaders in the public sector.

Engagement with work is related to innovation and is considered an essential element of organizational success. Leaders, agents of change

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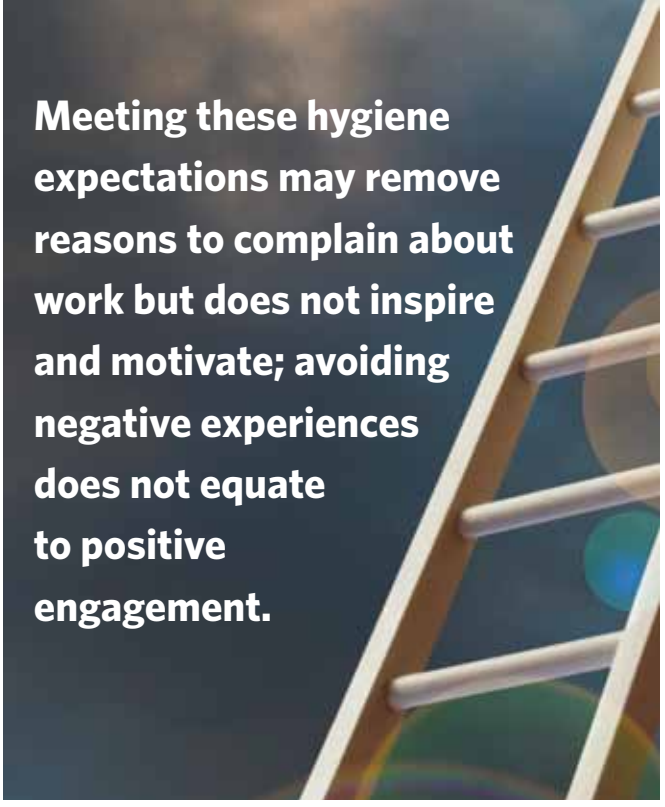
by definition, must motivate followers in order to accomplish innovative breakthroughs and exceed expectations in both the public and private sectors. Motivation matters to team leaders as well: The highest-performing teams are those with deeply motivated and engaged members—who are absolutely committed to success. These high-performance teams deliver the most creative solutions and can overcome obstacles to success, effectively providing more value to organizations. Often, though, both followers and leaders misunderstand the nature of motivation and heed information that may detract from attaining high worker engagement.

Some common workplace interactions show that motivation is misunderstood, sometimes confounding a leader's good intentions. Picture an acquisition program team leader, aspiring to develop a high-performance team, who calls a meeting and announces to the group, "I want to know what's keeping you from being motivated." The discussion begins slowly, then builds momentum as team members gain confidence to discuss what bothers them about work: "There's not enough meeting space; cubicles and work spaces are cramped; this place is noisy; we spent too much time dealing with rules, regulations, and bureaucracy." The leader carefully records the team's thoughts, and by the end of the meeting has a list of items for future action—mission accomplished! The team members leave feeling they finally have had an opportunity to express some grievances—well done! The problem, though, is that the leader and followers have not really discussed motivation. They may have been distracted because they did not understand the nature of motivation and how it can differ from addressing common workplace problems.

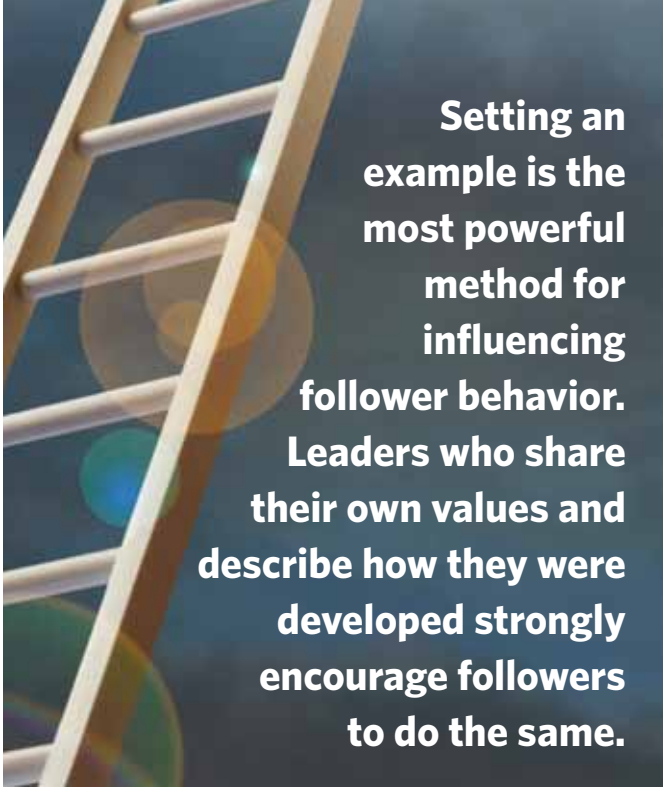
Motivation is a topic with significant benefits from understanding some behavioral science and theory. A key to fostering motivation is the recognition that there is a significant difference between eliminating reasons to dislike work and creating reasons to be engaged by it. Very often, problems with work are related to workers' concepts of minimally acceptable working conditions, termed hygiene factors. Hygiene factors are built around what we expect, feel we deserve, or think is fair. They include considerations such as physical comfort, pay and benefits, safety, and non-abusive interactions with others. These are workers' baseline expectations and must be met for them not to find the work environment objectionable. The learning point is that meeting these hygiene expectations may remove reasons to complain about work but does not inspire and motivate; avoiding negative experiences does not equate to positive engagement.

True motivation (also called "intrinsic motivation") relates to having positive experiences that give pleasure, support growth, and satisfy needs. The sources for healthy motivation are broad, including intellectual challenge, skills attainment, confirming or building a positive self-image, and developing relationships with others. Motivation is viewed as something that develops in stages throughout life (e.g., Maslow's hierarchy of needs) and as originating from universal needs that are parts of our mental makeup.



Research also supports the identification of distinct motivational needs related to satisfaction and well being. These needs are described by various drive theories, such as the three drives identified by Daniel Pink in his book *Drive: The Surprising Truth About What Motivates Us* (view his TED talk at www.ted.com/talks/dan_pink_on_motivation.html). These drive theories are closely related to Self Determination Theory, which holds that people have a need for autonomy (freedom to choose and act), competence (demonstrating mastery), and relatedness (engaging in significant relationships). While these drives can be hindered or misdirected through life experiences, normal and healthy development entails their fulfillment, and workplace activities that support these needs are thought to be intrinsically motivating.

While it is important to identify and eliminate hygiene-level problems, the quest for motivation goes deeper. Rather than focusing solely on problems with work, leaders, including program and project team leaders, can encourage discussion of experiences that provide development, satisfaction, and fulfillment. Because such conversations occur so rarely, workers may be unprepared for the encounter, requiring patience and persistence to advance the conversation. Leaders must be prepared to encounter and endure a "discomfort phase" that often occurs when people are presented with an unfamiliar task or new information that requires processing. Focusing on the areas suggested by motivation models, such as developing competence, exercising freedom of decision, and the opportunity to develop significant relationships, can help employees reflect on and identify engagement factors in those areas. For instance, acquisition team members may realize they highly



prize leading a portion of the effort, developing new professional contacts, or gaining competence in a new area. Conditions that interfere with satisfying drive-related goals, also may be identified as a part of this conversation. Decisions about eliminating these problems, along with providing opportunities for engagement, get to the heart of the discussion about motivation that leaders may really want.

Clarity about motivation opens other possibilities for building job satisfaction and growth. Identification and achievement of motivational goals can be an outcome of the firm's performance evaluation process. While the dominant goal of performance evaluation systems is to boost employees' contributions to the firm, managers also have an interest in using the process to build engagement with work, leading to higher productivity and lowering the potential for turnover.

There is room, when setting performance goals, to negotiate between the firm's priorities and the individual's needs. One challenge in fulfilling motivational drives is recognizing their existence. A supervisor or team leader may have to assume the role of a coach, encouraging employees to explore and understand their own drives and how they might be fulfilled at work. After employees have identified some engagement goals, work can begin on integrating them into a coherent development plan. Creativity and concentrated effort, as with all true negotiations, may be required to accommodate both the team's and the employee's needs, but that is part of the leader's responsibility. When the plan succeeds, the benefits will be worth the effort for all parties.

Intrinsic motivation and engagement at work are related to another often discussed, and often misunderstood, subject: values. Not to be confused with ethics or morals, values are the deeply held beliefs that guide our behavior and give life a sense of meaning. Similar to motivational drives, values usually require some introspection and self-observation to be clearly understood. Although the expression of values can be thwarted or obscured, people generally are capable of developing healthy values that support the growth of greater capabilities, expanded awareness, and richer relationships, thereby contributing to satisfaction with life.

Recognition of values also is important at work. Values such as a sense of adventure, prizing stability, or dedication to family can obviously affect career decisions and attitudes toward one's job. The first step toward integrating personal and professional development comes from knowing one's values. However, similar to awareness of factors related to intrinsic motivation, the identification of individual values can be a major challenge. Leaders and managers can begin to overcome the challenge by identifying values as an important aspect of work. For instance, because setting an example is the most powerful method for influencing follower behavior, leaders who share their own values and describe how they were identified strongly encourage followers to do the same. Recognizing values and what aspects of work provide intrinsic motivation can go hand-in-hand at the individual level, and the development and expression of values also are important for organizations.

Similar to individuals, organizations have values that reflect a collective understanding about what is most important and how to achieve goals. These values are reflected in many areas, including the firm's strategy, leaders' behavior, and the organization's culture. The culture is built around a common perception of "what works" and includes a variety of factors, such as processes, rewards, artifacts, and norms for behavior, all affecting what employees perceive to be the rules for success. For leaders and managers, two key questions arise from the connection between values and motivation: Does the organization recognize its values, and are they aligned with employee values?

While methods for organizational value assessment and alignment are beyond the scope of this article, their relationship to motivation is clear. In summary, intrinsic motivation is a source of true engagement with work that arises from fulfillment of deep-seated, drives or needs. These drives also are manifest through our individual values, the preferences that guide our behavior. Organizational values can be aligned with individual values, fostering intrinsic motivation, which results in higher engagement with work and performance. A leader's quest to learn what motivates workers can start with either values or intrinsic motivation, but ultimately will include both. A part of the leader's task may be to help employees identify their own drives and values, concepts with which many may be unfamiliar. The good news is that by focusing on the positive, enriching aspects of work, many negative hygiene factors will be addressed, as well.

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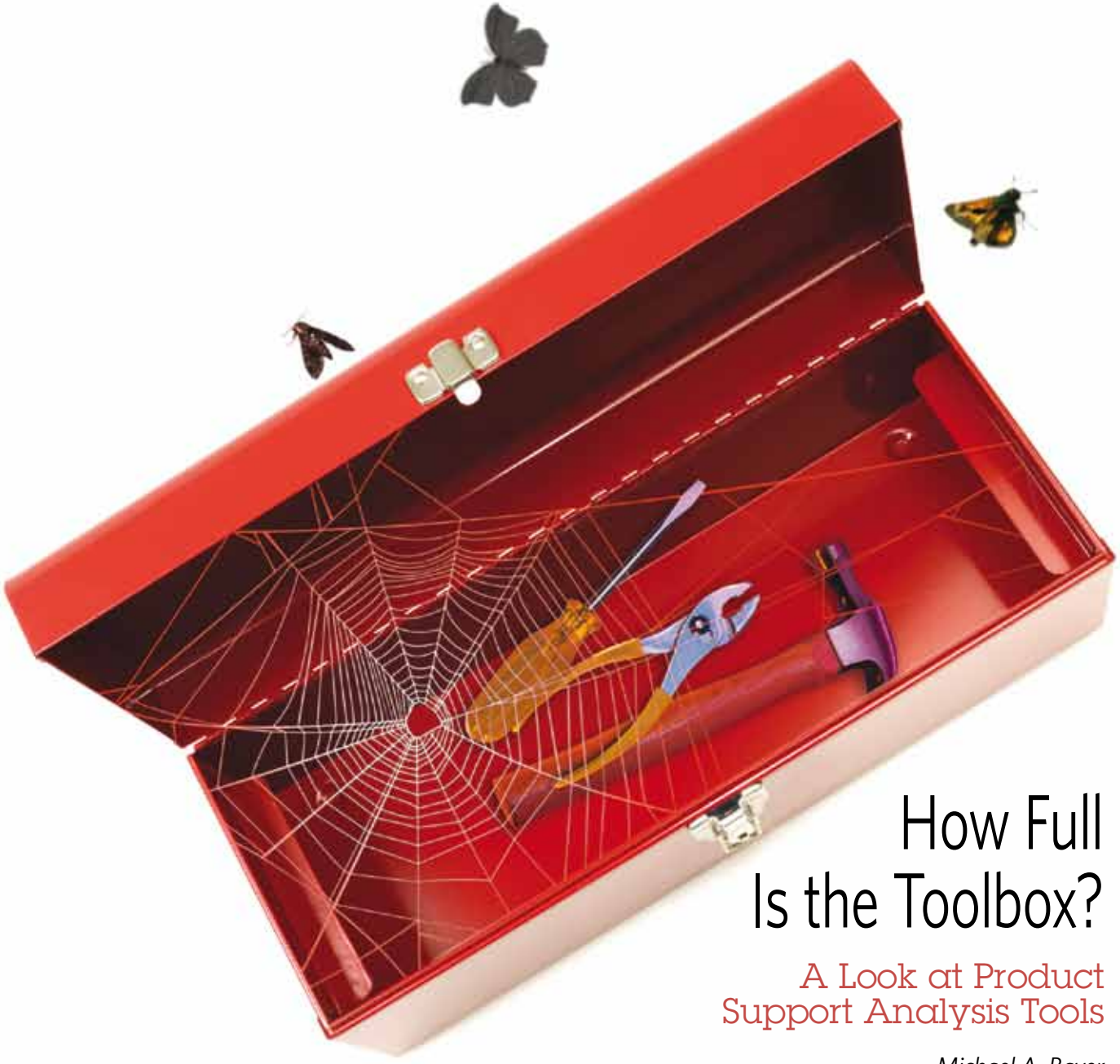

How Full Is the Toolbox?

A Look at Product Support Analysis Tools

Michael A. Bayer

We have long known the value of using tools to make our jobs easier, and our guidance and policy actually advocate the use of applicable tools. But when asked to do a task, does the logistician actually have the tools in the toolbox to help in accomplishing the task? Clearly the Government Accountability Office (GAO) didn't think so, based upon GAO Report-09-41, *Defense Logistics: Improved Analysis and Cost Data Needed to Evaluate the Cost-Effectiveness of Performance Based Logistics (PBL)*, which stated ". . . although DoD's guidance recommends that business case analyses be used to guide decision making regarding the implementation of PBL to provide weapon system support, the services are not consistent in their use of such analyses."

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The report went on to say "additionally, most of the services have not established effective internal controls to ensure that the analyses are prepared or that they provide a consistent and comprehensive assessment of weapons system support options."

The results published by the GAO were further substantiated when the DoD Weapon System Acquisition Reform Product Support Assessment Team (PSAT), a 65-member cadre of DoD and industry members, hypothesized, "If the DoD clarifies and codifies the larger group of analytical tools by which product support Business Case Analyses [BCAs]) are conducted, it will improve the effectiveness of the BCA as a decision-making tool."

While there were several lists of Product Support Analytical Tools, there was little guidance as to the applicability, appropriateness, and efficacy of the various tools based upon stage in the acquisition life cycle.

The Concern Demands a Response—Research Meets Application

The Office of the Assistant Secretary of Defense for Logistics and Materiel Readiness—ASD(L&MR)—suggested a deeper look into issues raised by both the GAO and the PSAT reports, soliciting the assistance from the Defense Acquisition University (DAU) to research the concerns. However, this was not just any research project where the goal was to support, or not support a hypothesis and later provide recommendations. Rather the results of this research were intended for use in spearheading a tangible solution to the crisis in Product Support Analytical Tools.

The Research Piece

Stage One consisted of an extensive literature review where the DAU research team scoured previously conducted efforts, examining sources of existing analytical tools and ferreting out bits of useful information about the tools to include their applicability, usefulness, ease-of-use, and accessibility to the workforce. Stage Two consisted of survey research and personal interviews. Program managers, product support managers, and financial managers from across the services, academia, and industry were asked if they used Product Support Analytical Tools during the course of their work; if so, for what purpose, if not, why not. Those who said they used Product Support Analytical Tools were asked to provide information regarding the specific tools they used.

So What's the Real Problem?

Typically, all research begins with a problem statement, defining the concern at hand and explaining the reason for the research. We at DAU found, along with the PSAT and GAO, that there had been inconsistent use of Product Support Analytical Tools in BCAs to determine the best product support option. Also, while there were several lists of Product Support Analytical Tools, there was little guidance as to the applicability, appropriateness, and efficacy of the various tools based upon stage in the acquisition life cycle. Oh, and there was no single, central repository with this information. We believed a central database could provide a key enabler in selecting the most cost-effective product support option and achieving greater affordability over the life cycle of a weapon system.

And Why Do We Care?

Another important piece of the research process is the statement of purpose, which tells what the research hopes to achieve. We hoped our project would identify what Product Support Analytical Tools were available and their applicability at various stages of the weapon system acquisition life cycle. To avoid reinventing the wheel, we chose to leverage any work previously conducted in support of ASD(L&MR) in examining various sources for analytical tools in hopes of establishing a body of knowledge/database to support weapon system program offices in their efforts to conduct BCAs, and specifically product support analyses as part of the BCA.

What Do We Really Need to Know

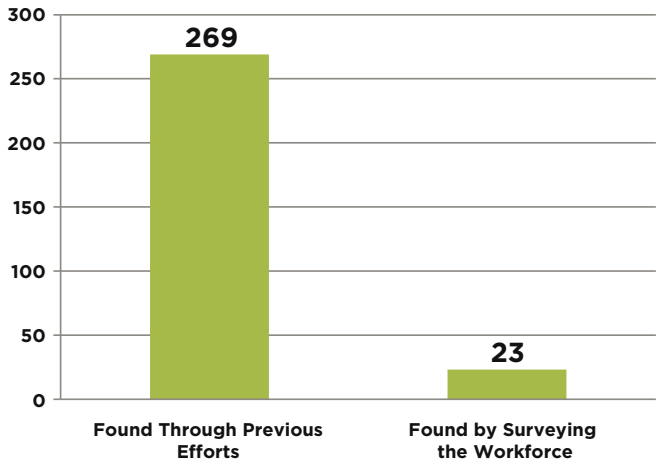
It was important to isolate exactly what we wanted to know and document our inquiries in the form of research questions. We hoped to answer the following four questions:

- What Product Support Analytical Tools are available?
- When in the product support life cycle are the tools used?
- How "user-friendly" are the tools?
- Is there an overarching awareness of available tools?

Where We Obtained the Data

The data for this research were gathered through various methods. As intended, this research leveraged previous work by Price Waterhouse, Logistics Management Institute, and other Defense Acquisition University efforts. This review revealed numerous tools previously identified for use by the Acquisition, Technology and Logistics (AT&L) workforce, but also revealed a lack of consistency in funneling information about the tools to that workforce. We then compiled, ana-

Figure 1. How the Tools Were Identified



lyzed, and organized the captured data into a form usable by the research team.

We also developed and distributed a survey to members of industry, academia, and select members of the AT&L workforce. The intent of the survey was to retrieve data pertaining to the tools used by product support workers, codified by the type of tool (product support, financial, BCA), type of user (Program Manager, Product Support Manager, Financial Manager, etc.), where in the life cycle the tool is used, ease of use, efficacy, and ease of access. The survey was offered to senior level officials in the fields of Program Management, Product Support Management, Systems Engineering, and Financial Management. Fifty-four individuals responded to the survey. While the limited number of responses would have significantly jeopardized a more formal research effort, given the purpose of this research, we were able to glean a substantial amount of information from the available respondents.

What We Found Out

Question 1—What product support tools are available?

The total number of product support tools located while reviewing the previous "product support analytical tool" efforts was 269, which included a previously collected listing of tools included in *Business Case Analysis Guidebook* and a listing of tools used by a defense industry product support provider. Only 23 were identified in the product support survey. This was an area of concern. More than 269 tools available according the initial review, but our workforce only identified 23. Perhaps the word wasn't getting out (See Figure 1. How the Tools Were Identified).

Question 2—When in the product support life cycle are the tools used?

There were 11 separate decision-making tools identified, many that covered multiple phases of the life-cycle framework. Six tools were identified for the Materiel Solution Analysis (MSA) phase, four for Technology Development (TD) phase, eight for the Engineering and Manufacturing Development (EMD) phase, nine for the Production and Deployment (P&D) phase, and seven for the Operations and Support (O&S) phase.

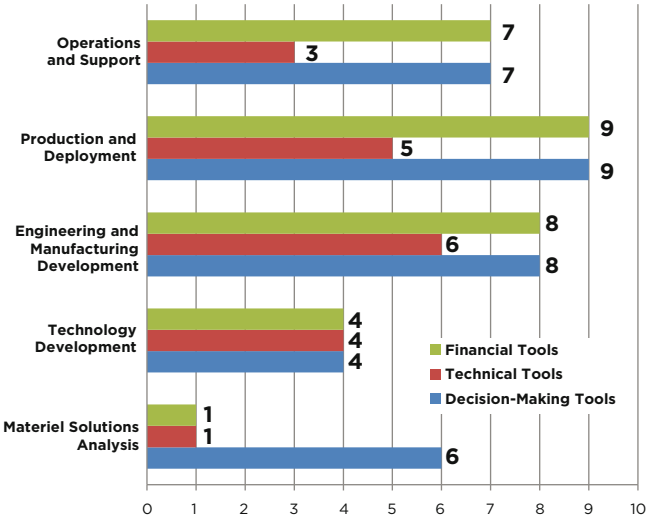
Similarly, eight technical tools were identified, many covering multiple phases of the life-cycle framework. One was identified for use in MSA, four in TD, six in EMD, five in P&D, and three in O&S. Finally, financial management tools were identified in the survey, but they also covered multiple phases of the life cycle. One was identified for use in MSA, four for TD, eight for EMD, nine for P&D, and seven for O&S (See Figure 2. When the Tools Were Used).

Question 3—How "user-friendly" are the tools?

Each survey respondent was asked why he or she was inhibited from using each of the categories of product support tools, along with reasons for choosing certain tools. There were 17 responses regarding why a person did not use decision-making tools, 17.65 percent citing lack of expertise. This reason can reasonably be translated as not understanding how to use the tool, and perhaps lack of familiarization. Consequently, there were 27 responses regarding why a decision-making tool was used, and 40.74 percent cited ease of use as a reason for choosing the tool.

As for the technical tools, 13 responses were captured regarding why a person did not use a tool; 7.69 percent citing lack of expertise as a reason. Twelve responses were captured for reasons that a technical tool was selected; 25 percent stated ease of use as the reason. Additionally, 14 answers were captured regarding the nonuse of financial tools, 14.29 percent citing lack of expertise as the reason. Seven responses were captured regarding why a financial tool was chosen with 28.5 percent citing ease of use.

Figure 2. When the Tools Were Used

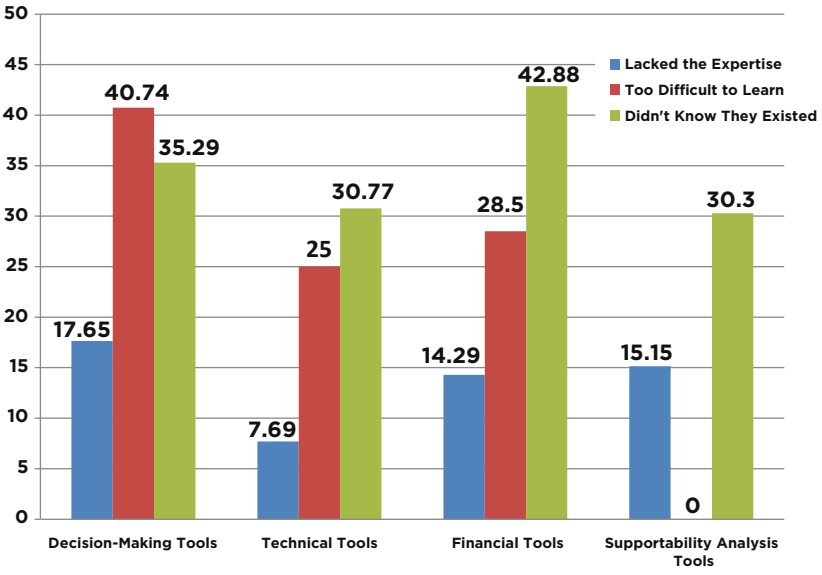


The previous paragraphs addressed the issues pertaining to the use of the categorized tools (decision-making, technical, and financial); however, there were also responses indicating that some respondents chose to use no tools whatsoever. In this case, 33 respondents stated that they have not used any supportability analysis tools, 15.15 percent citing lack of expertise as the inhibitor (See Figure 3. Why the Tools Were Not Used).

Question 4—Is there an overarching awareness of available tools?

In many instances, respondents were asked if they used product support tools, and they indicated that they had not used tools in performing their duties. In those cases, there was a follow-up question as to the reason a tool was not used. One of the available options was 'did not know there were applicable tools available.' Thirty-three responses indicated that no Supportability Analysis tools were used. Approximately 30.3 percent cited not knowing applicable tools were available as the reason. Similarly, when asked the same question regarding the use of decision-making, technical, and financial tools, 35.29 percent, 30.77 percent, and 42.86 percent, respectively, indicated there was a lack of knowledge regarding availability of the tools.

Figure 3. Why the Tools Were Not Used



The Results

This analysis revealed a number of tools are available for use. However, many of the tools are often unknown, require expertise, require special access, and/or are cost prohibitive. The DoD *Business Case Analysis Guidebook* provides a comprehensive list of tools known and at least marginally available to the workforce, but the list does not provide information regarding use or access. The tools identified during this study tended to be applicable for use in many phases of the product life cycle, and many tools had multiple applications.

During the course of this research, two significant aspects came to light. First, a substantial number of the responses indicated that lack of expertise was a reason for not using existing tools. A substantial number of the responses indicated that, where tools were used, the reason was ease of use. It could be easily inferred (though the external validity is limited due to the lack of respondents) that the respondents desire and require (and are most likely to use) easy-to-use, easy-to-learn tools.

Throughout the study, responses overwhelmingly indicated there is an overarching lack of awareness of the existing product support tools. Inasmuch the research results suggested there are numerous tools in use by the AT&L community, and confirmed the original assumption that, while the tools are available and in use, the community lacks awareness of which are available and when they should be used.

The Application

Research is most useful when acted upon. The application aspect of this effort was to develop a central repository, accessible by the AT&L workforce, that provides a current list of not only the tools available for use, but also where workforce members would find more information about the tool and how to obtain the tool for their own use. A "Product Support Analysis e-Toolbox" has been developed and fielded, accessible at https://acc.dau.mil/psa-tools.

Many tools are listed, each codified and filterable by Supportability Analysis Tools, Program Planning/Control Tools, Military Department, Integrated Product Support Element, and Licensing Requirements. When you click on one of the tools, you are immediately provided information regarding the tool's purpose, the type of process(es) it supports, military department(s) currently using the tool, fees associated with the tool, and where to go to get more information.

The Living Data Base

While this study culminated with a repository of product support tools, it must not only be advertised to the workforce but must also be maintained if it is to become and remain effective. The Product Support Analytical Tools data base needs to be an ever-maturing repository: living, breathing, and growing. This is our part. We need to use it, add to it, update it, and refine it. In the 3 months since its release, we've added more than 220 validated product support analysis tools, and the site has been viewed more than 36,000 times. I would say we're off to a great start. It's your toolbox, access it, use it, and add to it!

The author can be contacted at **michael.bayer@dau.mil**.

MDAP/MAIS Program Manager Changes

With the assistance of the Office of the Secretary of Defense, *Defense AT&L* magazine publishes the names of incoming and outgoing program managers for major defense acquisition programs (MDAPs) and major automated information system (MAIS) programs. This announcement will list all such changes of leadership, for both civilian and military program managers.

For June-October 2012

Army

Col. Terrence L. Howard relieved **Col. Warren N. O'Donell** as project manager for Cruise Missile Defense Systems in June.

Col. Jeffery E. Hager relieved **Col. Shane T. Openshaw** as project manager for APACHE Attack Helicopter in July.

Col. William R. Wygal relieved **Col. John Zavarelli** as project manager for JTRS Handheld, Manpack and Small Form Fit in July.

Col. Michael J. Thurston relieved **Col. Thomas Olsen** as project manager for Joint Battle Command-Platform in July.

Col. James S. Romero relieved **Col. Michael Cavalier** as project manager for Joint Attack Munition Systems in July.

Col. Michael E. Sloan relieved **Col. Stephanie Foster** as project manager for Soldier Sensors and Lasers in August.

Col. John Cavedo, Jr. relieved **Col. David G. Bassett** as project manager for Tactical Vehicles in October.

Marine Corps

Col. Rey Masinsin relieved **Capt. Patrick Costello** as the program manager for Common Aviation Command and Control System (CAC2S) in August.

Navy

Capt. David Goggins relieved **Rear Adm. Michael Jabaley** as the new program manager for VIRGINIA Class Submarine Program (PMS 450) in June.

Capt. William Brougham relieved **Capt. David Bishop** as the program manager for OHIO Replacement Program (PMS 397) in July.

Capt. Darren Plath was selected as the program manager for LPD 17 Class Amphibious Program (PMS 317) in August.

Capt. Douglas Oglesby was selected as the program manager for the CVN 79 Program Office (PMS 379) in August.

Capt. Joseph Reason was selected as the program manager for the Command & Control Program (IWS 6.0) in August.

Capt. Andrew Williams relieved **Capt. Scott Krambeck** as the program manager for the Joint Tactical Radio System, Multifunctional Information Distribution System (JTRS MIDS) in September.

Capt. Leon Bacon relieved **Capt. Andrew Hartigan** as the program manager for the Naval Undergraduate Flight Training Systems Program (PMA 273) in September.

Air Force

Col. Patrick C. Burke relieved **Col. Albert J. Anderson** as program manager of the Joint Direct Attack Munitions (JDAM) in June.

Col. Mark A. Baird relieved **Col. Arnold H. Streland** as program manager for the Joint Space Operations Center (JSpOC) Mission System Increment 2 (JMS Inc 2) and the Space Based Space Surveillance Block 10 (SBSS Blk 10) in July.

Maj. Gen. John F. Thompson relieved **Maj. Gen. Christopher C. Bogdan** as program manager of the KC-46 in July.

Col. Rodney L. Miller relieved **Col. Michael D. Sarchet** as program manager for the Advanced Extremely High Frequency (AEHF) in July.

Lt. Col. Kyle A. Reybitz relieved **Lt. Col. Christopher Greene** as program manager of the Air and Space Operations Center Weapon System Increment 10.2 (AOC WS Inc 10.2) in July.

Lt. Col. Brian A. Henson relieved **Lt. Col. Jeffrey E. Gates** as program manager of the Joint Air-to-Surface Standoff Missile (JASSM) in July.

Mr. David C. Garofoli relieved **Col. Brian Parker** as program manager of the Defense Enterprise Accounting & Management System Increment 1 (DEAMS Inc1) in July.

Lt. Col. Michael D. Harm relieved **Col. David W. Hiltz** as program manager of the Multi-Platform Radar Tech Insertion Program (MP-RTIP) in July.

Lt. Col. Jennifer M. Krolikowski relieved **Mr. John F. Dobbins** as program manager for the ITS Base Information Transport Infrastructure (ITS BITI) and Information Transport Systems Increment II (2GWLAN) in August.

Col. Carlin R. Heimann relieved **Col. Karl M. Rozelsky** as program manager for the Global Hawk Program in August.

Col. Shaun R. Stuger relieved **Col. Brian E. Fredriksson** as program manager for the Space Fence Program in October.

Col. Norman J. Leonard relieved **Col. Jimmie D. Schuman, Jr.** as program manager for the National Airspace System (NAS) in October.

Defense AT&L

Writers' Guidelines in Brief

Purpose

Defense AT&L is a bimonthly magazine published by DAU Press, Defense Acquisition University, for senior military personnel, civilians, defense contractors, and defense industry professionals in program management and the acquisition, technology, and logistics workforce.

Submission Procedures

Submit articles by e-mail to datl(at)dau.mil. Submissions must include each author's name, mailing address, office phone number, e-mail address, and brief biographical statement. Each must also be accompanied by a copyright release.

Receipt of your submission will be acknowledged in five working days. You will be notified of our publication decision in 2 to 3 weeks. All decisions are final.

Deadlines

Note: If the magazine fills before the author deadline, submissions are considered for the following issue.

Issue	Author Deadline
January–February	1 October
March–April	1 December
May–June	1 February
July–August	1 April
September–October	1 June
November–December	1 August

Audience

Defense AT&L readers are mainly acquisition professionals serving in career positions covered by the Defense Acquisition Workforce Improvement Act (DAWIA) or industry equivalent.

Style

Defense AT&L prints feature stories focusing on real people and events. The magazine seeks articles that reflect author experiences in and thoughts about acquisition rather than pages of researched information. Articles should discuss the individual's experience with problems and solutions in acquisition, contracting, logistics, or program management, or emerging trends.

The magazine does not print academic papers; fact sheets; technical papers; white papers; or articles with footnotes, endnotes, or references. Manuscripts meeting any of those criteria are more suited to DAU's journal, *Defense Acquisition Research Journal (ARJ).*

Defense AT&L does not reprint from other publications. Please do not submit manuscripts that have appeared elsewhere. *Defense AT&L* does not publish endorsements of products for sale.

Length

Articles should be 1,500–2,500 words.

Format

Send submissions via e-mail as Microsoft Word attachments.

Graphics

Do not embed photographs or charts in the manuscript. Digital files of photos or graphics should be sent as e-mail attachments. **Each figure or chart must be saved as a separate file in the original software format in which it was created.**

TIF or JPEG files must have a resolution of 300 pixels per inch; enhanced resolutions are not acceptable; images downloaded from the Web are not of adequate quality for reproduction. Detailed tables and charts are not accepted for publication because they will be illegible when reduced to fit at most one-third of a magazine page.

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Author Information

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Alternatively, you may submit a written release from the major command (normally the public affairs office) indicating the author is releasing the article to *Defense AT&L* for publication without restriction.

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