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Defense AT&L
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Reimagining Defense Business Acquisition

Making DoD an Employer of Choice

Renovating the Senior Executive Service

Budget Forecasting and Procurement Dynamics

Are We There Yet? The Unfinished Journey to DoD Auditability

The Cybersecurity and Acquisition Life-Cycle Integration Tool

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Reimagining Defense Business Acquisition

Dewey DuHadway ■ Howard Harris ■ Melissa Naroski Merker ■ Scott Smith

The Department of Defense (DoD) has spent billions of dollars annually to either modernize existing business systems or procure new business systems, yielding uneven results. The milestones, models and documentation driven through the traditional DoD acquisition process have not provided a flexible enough structure for managing business systems. And, in practice, tailoring for a business system has often taken more time and effort than the benefits it produced.

History has shown that:

- The requirements, acquisition and investment review functions necessary for a successful program operate as separate processes, and the key players in each area do not work closely enough.
- There is a tendency to jump to an information technology (IT) solution to the business problem without fully understanding the underlying capability need.

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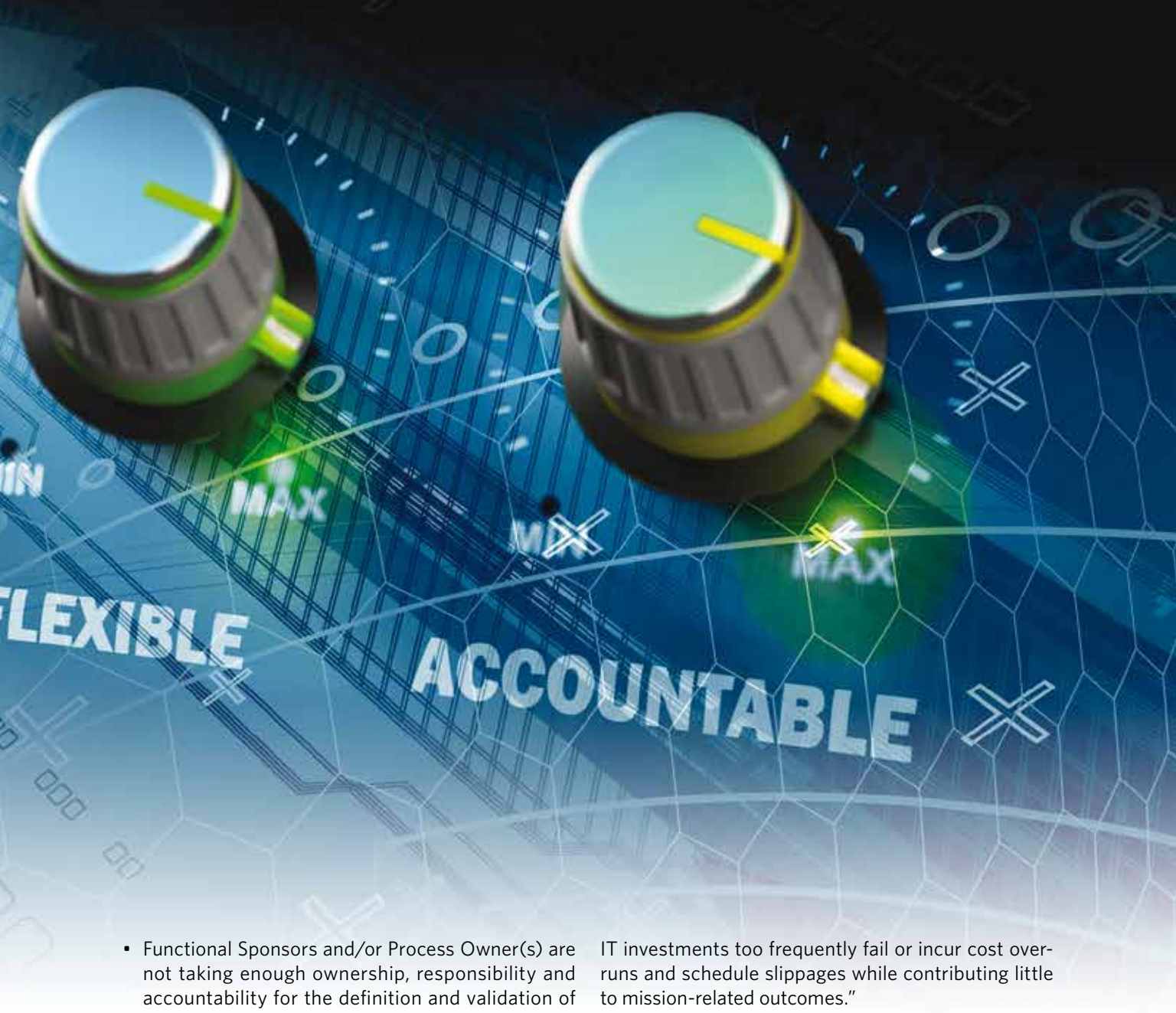


- Functional Sponsors and/or Process Owner(s) are not taking enough ownership, responsibility and accountability for the definition and validation of the capability need and/or do not perform a broad enough analysis of all Doctrine, Organization, Training, materiel, Leadership and Education, Personnel, Facilities, and Policy (DOTmLPF-P) solution options beyond just materiel (IT).
- The current acquisition culture, models, procedures, documentation requirements and oversight expectations do not align with commercial best practices for implementing commercial-off-the-shelf (COTS) products and are neither agile nor flexible.

Unfortunately, many of these challenges are not new. In 1995, the General Accounting Office (renamed in 2004 as the Government Accountability Office [GAO]) designated the DoD's multibillion-dollar business systems modernization program as high risk, and it has been on the GAO's high-risk list ever since. In 2015, GAO added to the list Improving the Management of IT Acquisitions and Operations, recognizing that "federal IT investments too frequently fail or incur cost overruns and schedule slippages while contributing little to mission-related outcomes."

Acquiring defense business systems (e.g., health care, finance, contracting, human resources, logistics, and training) are obviously quite different than acquiring weapon systems (e.g., Joint Strike Fighter aircraft, nuclear aircraft carrier, or a tank), as shown in Table 1. DoD Instruction (DoDI) 5000.02's milestones, models and documentation did not provide the proper structure for managing business systems. And, in practice, tailoring for a business system often took too much time and effort, making it hard to justify the benefits produced.

A New Development Approach

Recognizing these uneven results and the unique nature of Defense Business Systems, Congress in the Fiscal Year (FY) 2016 National Defense Authorization Act (NDAA) required the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L]), the Deputy Chief Management Officer (DCMO), and

Table 1. Weapon System vs. Defense Business System

Category	Weapon System	Defense Business System
Requirements	JCIDS process; KPPs; KSAs; ICD, CDD and CPD documents	Does not follow JCIDS process unless it is a special interest to JROC
Engineering Efforts	Competitive prototypes; technology readiness levels; detailed design; and technical reviews	Limited development effort, COTS/GOTS software; software available in the commercial market place
Testing	Detailed DT and OT Full-up LFT&E as required Demanding IOT&E with warfighters operating the system and in realistic operating environment	Full-up LFT&E not required; very limited environmental testing; operational testing in office setting
Production	Start new production facilities; train the new workforce; ramp up production and material in LRIP after Milestone C; full rate production	No production; No Milestone C. Emphases on COTS/GOTS integration coding
Sustainment	Field environment; expensive O&S costs; all Integrated Product Support elements considered	Office environment; updating/batches/additional increments of software; priority on training

Key to abbreviations: CDD=Capability Development Document; COTS/GOTS=commercial off-the-shelf/government off-the-shelf; CPD=Capability Production Document; DT=Developmental Testing; ICD=Initial Capabilities Document; IOT&E=initial operating test and evaluation; JCIDS=Joint Capabilities Integration Development System; JROC=Joint Requirements Oversight Council; KPP=key performance parameter; KSA=key system attribute; LFT&E=Live Fire Test and Evaluation; O&S=Operations and Support; OT=operational test.

Source: The authors

the DoD Chief Information Officer (CIO) to collaborate on a new requirements, acquisition and investment review process for business systems. The USD(AT&L), DCMO, and DoD CIO viewed the FY 2016 NDAA requirement as an opportunity to build a framework to resolve discrepancies and other challenges between acquisition policy in DoDI 5000.02 and DCMO guidance on business systems requirements and the investment review process. A team of subject-matter experts (SMEs) from across the DoD gathered and determined that a new business systems process must:

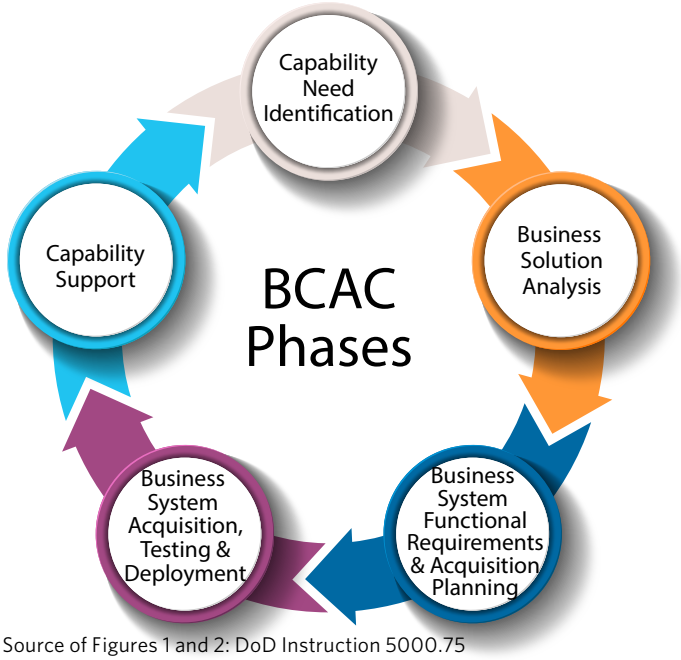
- Align to Commercial Best Practices: Enforce the mindset that "Industry is the Innovator" in the business systems product market and the need to customize COTS products should be minimized as much as possible.
- Provide Complete Solution Coverage: Cover IT business capabilities and business change across the DOTmLPF-P spectrum and must emphasize consideration of all other nonmateriel options before determining an IT (materiel) solution is needed.
- Maximize Process Efficiency: Reduce process overlaps, clarify oversight roles, and streamline documentation requirements to reduce total life-cycle time (and thus, cost)—from identifying a business capability need to delivery of a solution.
- Enforce Compliance: Address FY 2016 NDAA Section 883
- Provide Flexibility: While enforcing compliance, provide a more useful common ground for process tailoring and allow for multiple implementation approaches (i.e., Agile, incremental, etc.).

The team's work culminated in the business capability acquisition cycle (BCAC) process and supporting policy in the form of the DoDI 5000.75, approved for release on Feb. 2, 2017, by the USD(AT&L), DCMO, and the DoD's CIO. The purpose of the BCAC is to rapidly deploy business capabilities which address identified mission and capability needs within approved cost, schedule and performance parameters. The BCAC addresses in part past recommendations by the Defense Science Board and requirements of Section 804 of Public Law (P.L.) 111-84 to establish a new acquisition process for information technology.

BCAC Process Overview

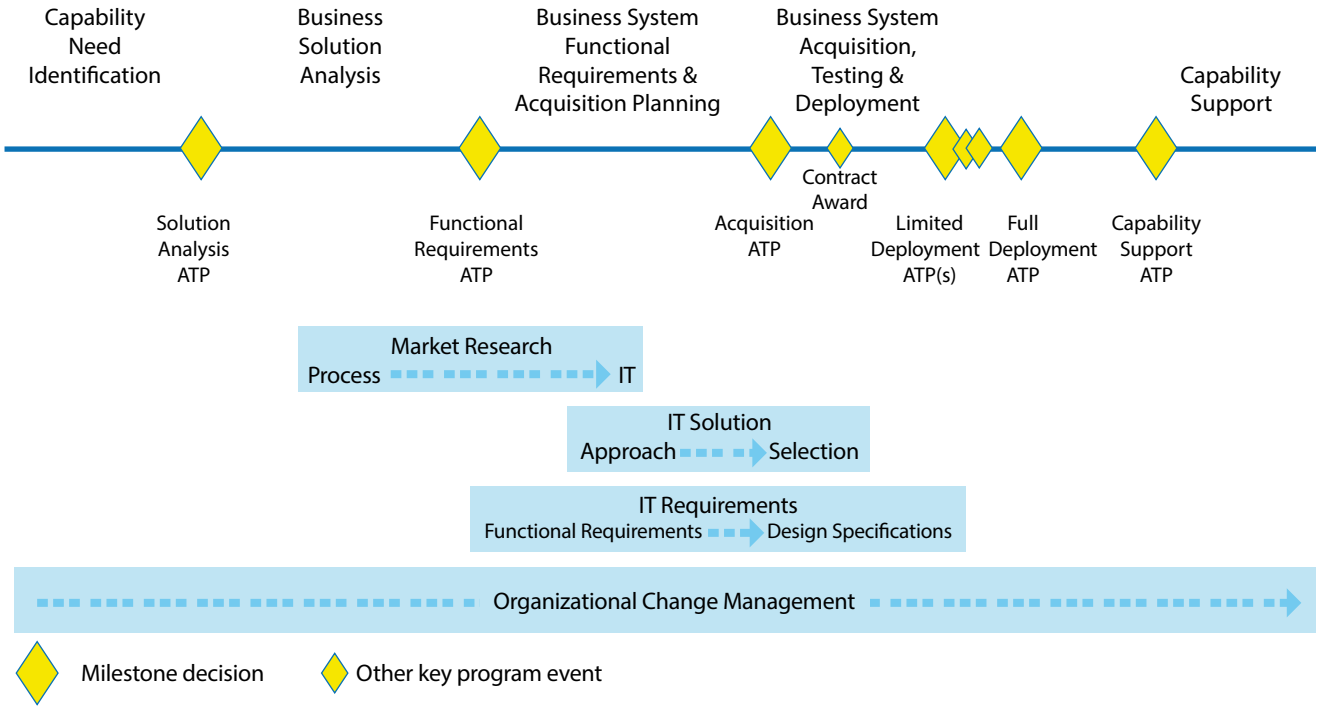
As shown in Figure 1, the BCAC has five phases and is intended to be cyclical and flexible with steps repeating as necessary

Figure 1. BCAC Model



Source of Figures 1 and 2: DoD Instruction 5000.75

Figure 2. BCAC Linear Model with Decision Points



ATP=Authority to Proceed

to drive more rapid achievement of intended outcome(s). The BCAC implements a governance and management structure; assigns responsibilities of the functional and acquisition communities; provides direction for the identification of business needs, development of capability requirements and supporting IT; and introduces continuous improvement as part of ongoing business capability support.

The linear version of the BCAC is shown in Figure 2 and reflects phases with associated decision points. The process steps, decision points, and roles and responsibilities affiliated with each BCAC step and decision are detailed in DoDI 5000.75.

Finally, Figure 3 summarizes key activities in each of the cycle's phases.

The BCAC unifies existing processes for business systems into one policy as directed by DoDI 5000.75. The BCAC enables users to more quickly implement capabilities by emphasizing the importance of results rather than static documentation.

The defense business systems investment review process implements Title 10 United States Code (U.S.C.) Section 2222 and involves an approval of funds certification. This process is intended to enable the management of a well-defined IT investment portfolio for the DoD Business Mission Area (BMA) by enforcing the business enterprise architecture (BEA), business process reengineering (BPR), and portfolio management. The investment review process is integrated into the BCAC with appropriate decision makers (depending on the level of the program) participating throughout. The first certification to allow the obligation of funds will occur at the Acquisition Authority to Proceed (ATP).

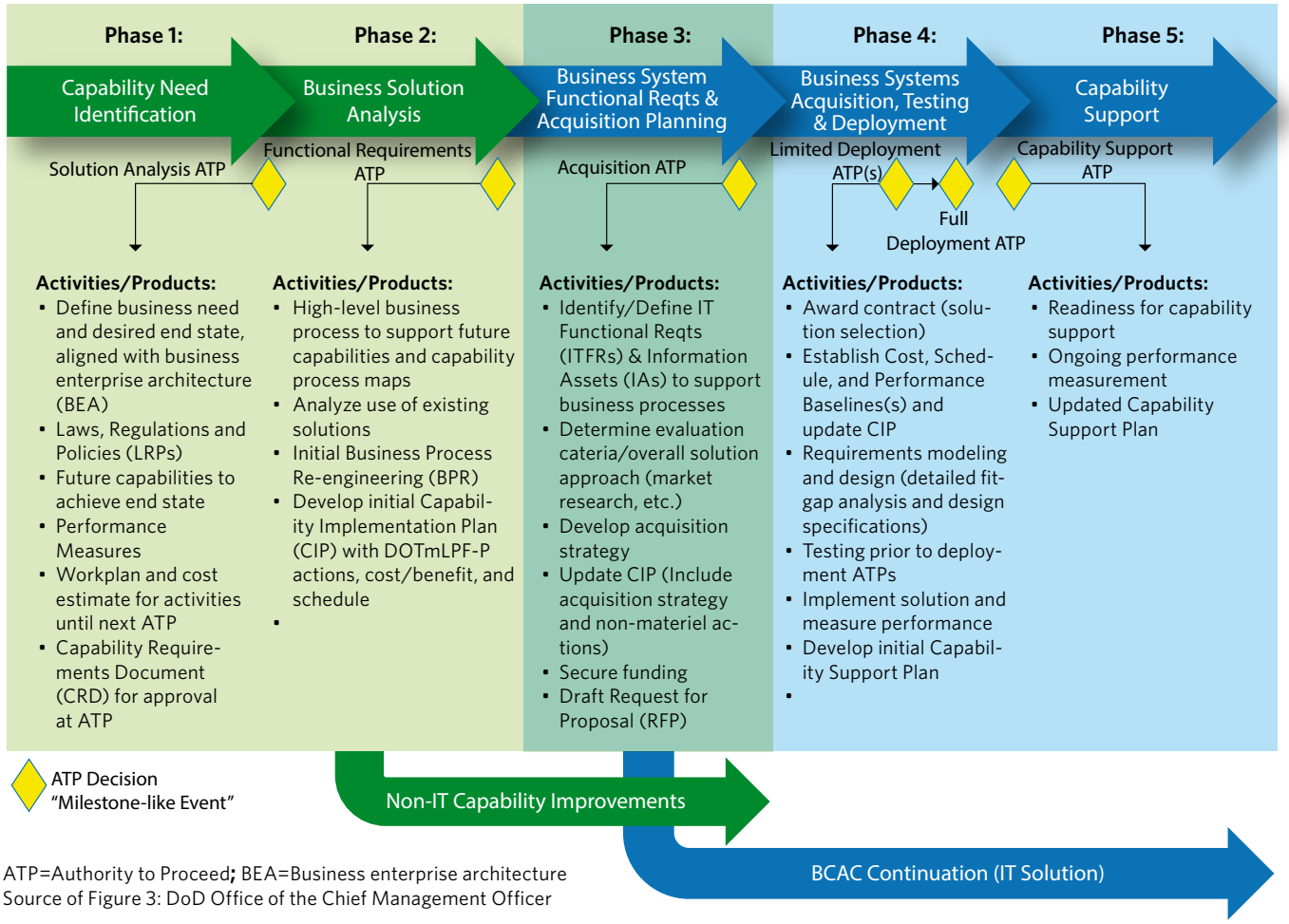
The Clinger-Cohen Act (CCA), or Subtitle III of Title 40, U.S.C., applies to all IT investments, including National Security Systems (NSS). One BCAC benefit is its streamlining of traditionally duplicative CCA confirmation processes. The intent is that any requirement for CCA confirmation is validated during existing BCAC processes, eliminating the need for a separate CCA review.

Guiding BCAC Principles

In the BCAC, success and readiness to move to the next phase will be measured on a "team" basis by acquisition, functional and IT professionals to streamline decision making and allow a quicker transition between phase activities. The BCAC focuses on the following core Guiding Principles to enable success:

- Work as a team: Key constituencies work together as one team with functional, acquisition and IT members involved throughout the life cycle.
- Plan to evolve: The life cycle is continual. Sustainment requires criteria and triggers that define on-ramps back into business need analysis to restart the cycle.
- Adopt best practices: Don't reinvent the wheel. Be willing to prioritize requirements, deploy the 80 percent solution, change processes to minimize customization, and stop the effort if it will not achieve the desired outcome.

Figure 3. Key Process Activities



ATP=Authority to Proceed; BEA=Business enterprise architecture
Source of Figure 3: DoD Office of the Chief Management Officer

- Show the money: Increase transparency by allocating and tracking funding for all activities across the DOTmLPF-P spectrum, including the cost of requirements development and sustainment.
- Do work once: Avoid bottlenecks and eliminate competing processes. Work products are for the use of the process operators—eliminate extraneous documentation for documentation's sake.
- Deliver value: This would be a capability that addresses the entire DOTmLPF spectrum—not just a system. Increase value by reducing the time required to deliver capability.

What's So Different?

The biggest differences from the previous state of practice for business systems operating under the DoDI 5000.02 and supporting guidance and now operating under the BCAC are that it:

- Utilizes ATP decisions in lieu of traditional acquisition milestone decisions for maximum flexibility. ATPs are tailored as necessary, and the decision authority may vary depending on the type of activity being authorized (e.g., acquisition activity would be authorized by a Milestone Decision Authority [MDA] whereas requirements activities would be authorized by a Functional Sponsor). DoDI 5000.75 defines the decision authority at each ATP.
- Emphasizes change management throughout the process—from beginning to "end"—recognizing that there is no true "end" to IT programs and/or their underlying processes.
- Focuses on a thorough analysis of capability needs vs. wants or "nice to haves." Performing this analysis upfront allows for identification of potential non-IT paths that may prove less costly and more effective in addressing an organization's requirements.
- Dictates early examination of existing solutions in use around the DoD in order to avoid creating new solutions where sufficient ones may already exist. These reuse considerations apply not only to minimizing the customizing of commercial software to accomplish functional objectives but also to leveraging existing IT solutions, hosting and infrastructure.
- Takes a dynamic, information-centric approach to evaluating programs rather than focusing on static documentation.
- Provides great encouragement to tailoring both process and documents. Artifacts are intended to be virtual in nature (i.e., not traditional "paper documents") and will be used to support program execution. Programs may choose to

develop any other artifacts or documents that they wish in order to execute their programs.

Keys to Implementation Success

The following section provides keys to success that are leveraged from industry research and support the BCAC guiding principles, further enhancing the driving factors that enable BCAC users to successfully execute the process.

Continuous process improvement is a way of life. Therefore, actively manage business processes throughout the life cycle to ensure they can be adapted and optimized. And remember that continuous process and systems improvements also occur after the go-live stage.

Try before you buy. Conduct use case demonstrations, pilots and prototypes prior to acquisition. Use market research, analysis and ratings to narrow viable options in advance. Leverage domain expertise and know the Art of the Possible.

Manage the change. Know your customer—the organization, culture and people. Involve end users throughout the project. Tailor development and deployment strategies to fit the culture and the product. Understand that commonly used methods—such as agile development and cloud—are gaining traction.

Embrace the COTS/Government OTS mindset. Minimize customization and ensure vigorous change control governance. Only customize if there is an advantage or efficiency to be gained. Focus COTS testing on integration points and enhancements.

Resources

As the DoD transitions to this new approach for business systems requirements and acquisition, lessons will be learned, best practices adopted and a body of knowledge and experience will emerge. Under the sponsorship of the DCMO, DoD CIO, and USD(AT&L), a community of practice has been established to serve the workforce as its authoritative source for guidance, advice and information regarding the successful acquisition of a business system or capability and application of the BCAC. See https://www.milsuite.mil/book/groups/bcaccommunity.

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Defense Acquisition University

2017

Learning Organization of the Year

"All organizations change over time, and learning organizations have to make sure they're still serving the right people the right way as those changes happen."

– James Woolsey, President, DAU

DAU competed against more than 200 public and private institutions and, after seven years in the top ten, was recognized as the first place leader in benchmarking strategy, best practices and principles.

Making DoD an Employer of Choice

René Thomas-Rizzo

Now, more than ever, the Department of Defense (DoD) needs to attract the nation's top talent to be part of the uniformed and civilian DoD team. The United States faces new and unpredictable global threats to its security. As emphasized by Secretary of Defense James Mattis in a Jan. 20, 2017, memo when he came on-board, we will ensure that our military is ready to fight today and in the future; and we are devoted to gaining full value from every taxpayer dollar spent on defense. We absolutely need the very best people to join the uniformed warfighter ranks. We also need the nation's top talent for critical civilian support missions—such as acquisition. A highly capable acquisition workforce, comprised of the nation's top talent, is critical to ensuring that our military is equipped and ready to fight and that DoD gets full value for every taxpayer dollar spent.

Today's acquisition workforce professionals are more capable than ever before. Workforce certification credentials and education levels are at an all-time high. Recent analysis shows that DoD is effectively controlling costs on acquisition programs better than at any time in the last 35 years—the highly capable acquisition workforce contributes to that success.

Thomas-Rizzo *is the director of Human Capital Initiatives in the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics.*

However, our work is not done. Thirty-five percent (about 40,000) civilian members of the acquisition workforce are eligible to retire or will be within the next 10 years. While DoD has strategically rebuilt the early and midcareer workforce, we must do more to strengthen the new-hire pipeline—attracting the nation's top talent to join the civilian acquisition team. DoD offers a wide variety of career opportunities in support of acquisition—including program management, engineering, contracting, logistics, financial management, science and technology, information technology and more. While the nation is very familiar with the Army, Navy, Air Force and Marines, observers commonly associate the Services with a uniform. Unfortunately, they are not nearly as familiar with the great DoD civilian career opportunities in positions that support our men and women in uniform. Therefore, our goal is to make DoD an employer of choice. We are launching a branding campaign to communicate and educate the public about DoD civilian career opportunities in acquisition.

Our Challenge and Opportunities

We absolutely must answer the following three questions:

- How can we familiarize the nation's top talent with the great civilian opportunities across DoD and how can we compete more effectively for that talent?
- How do we communicate the exciting opportunities to the next generation of acquisition professionals?
- How do we attract seasoned professionals with key skills from the private sector who are looking for ways to serve their nation; and, how do we attract college students to DoD?

During my recent visits to colleges and universities, from the East to the West Coast, I found a clear, significant and broad lack of understanding of the DoD organization and of awareness about the multitude of DoD civilian career opportunities. Again, when most people think of DoD, usually through films, advertising and news media, they think of warfighters on the front line defending our freedom every day. However, our civilian workforce designs, procures, tests, delivers and sustains the most technologically advanced warfare systems in the world to ensure the warfighters win and come home safely. Helping the nation understand the great ways civilians can contribute to our national defense—for instance, in acquisition—is an opportunity we must not miss.

While we must do a better job in promoting public awareness of the abundant available civilian opportunities, we must combine that success with attracting and then competing with industry in hiring that talent. Today, industry proactively exercises its advantage in hiring top talent. Industry has aggressive marketing and outreach programs, robust college student internship programs, the ability at college recruitment events to make on-the-spot job offers with competitive salaries and modern workplace environments. DoD is working hard to increase its hiring, compensation and benefits flexibilities to become more competitive. It is most important that we communicate the incredible opportunities we offer for prospective employees to serve our nation and make a difference. We can and must compete successfully for top talent.

The DoD acquisition mission is the largest buying enterprise in the world. The acquisition workforce will invest more than $1 trillion in taxpayer dollars to equip and sustain the warfighter over future years, with employment opportunities in 6,000 locations and 163 countries. Civilian members of the Defense Acquisition Workforce will have access to excellent educational and professional development, tuition reimbursement, student loan repayment, worldwide travel, superb health care and generous amounts of leave and retirement options. Simply stated, DoD has great benefits and a great acquisition mission—we have the tools and programs in place to compete for top-notch talent. We must seize the opportunity—and we can do so, by strategically leveraging industry best practices, such as improved branding of DoD acquisition civilian opportunities, implementing student internships and new hiring authorities, and continuously improving our approach to taking care of today's acquisition workforce.

Of course, this must all follow from a thoughtful human capital strategy. This past year, DoD released the 2016–2021 Acquisition Workforce Strategic Plan. This plan was developed through a collaborative effort across the DoD that included the military departments and our Defense agency partners. Leadership across the board is very enthusiastic about the plan as

it provides strategic goals that all components and functional leaders can use to strengthen and shape their workforce.

The plan establishes four strategic goals:

- Make DoD an employer of choice.
- Shape the acquisition workforce to achieve current and future acquisition requirements.
- Improve the quality and professionalism of the acquisition workforce.
- Continuously improve workforce policies, programs and processes.

Goal No. 1 is the cornerstone of the strategic plan. Attracting the best possible talent, including those experienced in the private sector with critical in-demand skills, is the foundation for shaping the acquisition workforce to meet current and future requirements (Goals 2 and 3). Branding, getting the word out on the rewarding acquisition civilian career opportunities, and leveraging other industry best practices are keys to achieving this goal.

Branding and "Getting the Word Out"

The first and most important step in making DoD an employer of choice is to "brand" the acquisition workforce's profession and mission. Effective branding helps the audience understand who we are, what we do and what they can expect from the organization. It's a promise of sorts that helps establish a reputation and differentiate us from other brands in a crowded marketplace.

Our brand will convey that a career in DoD acquisition means working in support of our men and women in uniform, gaining value from every taxpayer dollar, designing and developing dominant warfighting capability, and ultimately contributing to our national security. By associating a career in acquisition with excellence, professionalism and service to the nation, we believe we'll draw top talent to apply for student internships and jobs in the Defense Acquisition Workforce.

Our branding plan is designed to target three primary audiences: college students and recent college graduates looking for a rewarding career, civilians experienced in private sector careers and interested in public service, and current DoD employees.

College Students: Industry is offering internships as early as the sophomore year. DoD branding needs to reach college students who are interested in internships. Also, Congress has provided new hiring authority for student internships through the Fiscal Year (FY) 2017 National Defense Authorization Act (NDAA). In combination with using this authority and expanding college student internships, DoD can better compete with industry for talent—attracting and hiring students who will gain experience and be better prepared upon graduation to join DoD's acquisition team.

Combined with a robust internship program, a highly effective hiring pipeline must include broad awareness of DoD acquisition job opportunities by other talented college students who will soon or already have become graduates. We can do so by adopting an aggressive regime of campus visits that tell the DoD acquisition workforce story in a compelling way. We must also continue efforts to improve use of direct hire authorities and reduce the time-to-hire so we can effectively compete with others for the top talent. Our next steps include leveraging social media across all audience demographics; continued implementation of the 2018 college campaign and engagement plan; improving our measures of outcomes and adjusting messaging as appropriate. We also are researching ways to establish a College Acquisition Internship Program to leverage the FY 2017 NDAA college student direct hire authority, provide centralized support to components using and then hiring interns, and support a significant expansion of acquisition college student internships across DoD components.

Private Sector-Experienced Professionals: Our nation's defense needs industry professionals' experience! We seek professionals who wish to answer the call to public service and support the critical mission to equip and sustain the warfighter by contributing their expertise and experience. Doing this requires a strategic communications plan to leverage recent NDAA hiring and exchange authorities. We also need to leverage the opportunities afforded by our presence at selected job fairs and recruiting events. We also must establish a robust social media presence that gets the DoD acquisition story to this audience.

DoD Employees and Veterans: Effective branding of DoD careers will boost awareness within DoD of the opportunity to contribute through the acquisition mission. In addition, the branding will motivate the current acquisition workforce, as it brings together the big picture story on the great acquisition mission and the workforce's contribution to the warfighter and taxpayer.

Continuous Improvement—Taking Care of Today's Workforce

It is clear that DoD must become more competitive with the private sector in attracting, hiring and retaining the nation's best talent. But, it is also important that we take care of today's workforce professionals—which in turn will improve recruitment and retention, not to mention workforce esprit de corps and satisfaction. As described above, we will improve both our branding and outreach. We will also work hard to continuously improve our development strategies for today's acquisition workforce. We will seek ways to offer competitive compensation and incentives and reward outstanding talent by promoting initiatives such as tuition reimbursement and student loan repayments. We can help improve work-life balance by developing, implementing and promoting policies and programs that improve the workforce quality of life. Finally, we will strive to ensure that our workforce has the skillsets to achieve technical excellence through training, proper job

placement, advanced educational opportunities and thoughtful succession planning.

We will work tirelessly to sustain our recent workforce investments and resulting quality and capability improvements. We will improve analytics for acquisition workforce planning and decision making. We are working to continuously improve management and the investment in acquisition professionals using the Defense Acquisition Workforce Development Fund. We also will continue efforts to expand and provide the DoD civilian acquisition professionals with a premier, contribution-based, personnel management system through the DoD Civilian Acquisition Workforce Personnel Demonstration Project.

Our nation expects the acquisition workforce to successfully equip our military to fight and win today and in the future and to gain full value from every taxpayer dollar spent on defense. To ensure that success, we can and must strengthen our efforts to attract and hire the nation's top talent to be part of the civilian DoD acquisition team. We can do this by making DoD an employer of choice.

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Defense AT&L Honored Again for Excellence

Defense AT&L magazine in June 2017 received an APEX Award for Publication Excellence, its fourth consecutive annual APEX award.

Defense Acquisition University (DAU) President James Woolsey congratulated the magazine staff for its consistent commitment to making *Defense AT&L* an award- winning magazine and a powerful communications tool for getting information directly to the Defense Acquisition Workforce.

"*Defense AT&L* magazine is instrumental disseminating important information throughout the Defense Acquisition Workforce," Woolsey said. "In the coming months, the magazine will also be an invaluable tool for new Pentagon leaders as they take advantage of the magazine's reach to communicate directly with the workforce. I am proud to let them know that this award-winning, high-quality magazine is one of the many communication tools we can offer them."

APEX 2017—the 29th APEX Competition Annual Awards for Communications Professionals—received nearly 1,400 entries, for work published in 2016 or early 2017. There were 304 entries in the category of magazines, journals and tabloids. Entries in this category, among others, included the *AARP Magazine;* the American Council of Engineering Companies; Amtrak; the Medical Association of Alabama; the University of Alabama; the American Bankers Association; Disneyland Resort, Anaheim, California; Walt Disney World Resort in Orlando, Florida; Drexel University in Philadelphia; and the *Journal of Financial Planning.*

The APEX awards are an annual event sponsored by the editors of Writer's Web Watch, published by Communications Concepts Inc., a consulting group in Springfield, Virginia. The judges included editors, publishers and consultants.

Defense AT&L was recognized for its September-October 2016 special issue, which featured a wide range of expert authors and was devoted to the various programs and institutes developed and promoted by the Department of Defense to promote Advanced Manufacturing capabilities—including additive manufacturing, or "3D printing."

The award names Benjamin Tyree, *Defense AT&L* magazine managing editor; Tia Gray, *Defense AT&L* magazine art director; and the editing and production team of the DAU Visual Arts and Press. Contributors to the magazine's regular work include Debbie Gonzalez, Frances Battle, Nina Austin, Noelia Gamboa, Michael Shoemaker and Collie J. Johnson. DAU Visual Arts and Press is led by Randy Weekes.

The outstanding articles contributed by DAU faculty, military Service experts, industry partners and the Office of the Secretary of Defense make *Defense AT&L* magazine the "go to" journal for the Defense Acquisition Workforce. The magazine's body of work includes 27 columns by Frank Kendall, former Under Secretary of Defense for Acquisition, Technology, and Logistics, written from 2012 through early 2017. For his outstanding contributions to improving acquisition outcomes and enhancing workforce communications, Kendall was inducted into DAU's Hall of Fame on June 15. (See article on Page 42).

From the editors and staff of Defense AT&L *magazine.*

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Renovating the Senior Executive Service

Don O'Neill

As more senior executives retire, the principal challenge confronting the Senior Executive Service (SES) is to bridge the growing experience gap with collaborative leadership skills. As I noted in a May–June 2015 *Defense AT&L* magazine article, collaborative leadership skills are greatly needed—particularly in acquiring high-risk mission-critical software-intensive systems where programs face dire difficulties. This challenge can be met using established methods of software engineering and thinking in a systems context.

One-fourth of experienced senior managers are expected to retire by 2017 after a 36 percent increase in departures since 2009. Because of a lack of interest on the part of workers outside the federal workforce, the government must promote from within and develop its senior executives internally.

The result, according to a 2014 George Washington University study, promises to be a less experienced senior management corps facing ever more complex challenges.

O'Neill *was president of the Center for National Software Studies from 2005 to 2008. Following 27 years with IBM's Federal Systems Division, he completed a 3-year residency at Carnegie Mellon University's Software Engineering Institute (SEI) under IBM's Technical Academic Career Program and has served as an SEI Visiting Scientist and a Justice Department Litigative Consultant. A seasoned software engineering manager, technologist and independent consultant, he has a Bachelor of Science degree in Mathematics from Dickinson College in Carlisle, Pennsylvania.*

And there is no greater challenge than that of software program acquisition management, oversight and supply chain risk management assurance. Here the Department of Defense and the Department of Homeland Security face a particular challenge. The antidote must be a government initiative to broaden the systems skillsets of senior federal managers.

Whether criteria are established at the beginning of a project or not at all, there are objective industrial strength criteria for learning the status of a project and pointing the way forward. These criteria can be found in the Software Engineering Method and Theory (SEMAT) formulation and its Essence Kernel framework, the essence and common ground of software engineering. SEMAT is a giant step toward coping with the complexity of software engineering projects. It truly represents the refounding of software engineering and the basis for collaborating across Senior Executive, Systems Engineering, and Software Engineering boundaries where there are myriad complex challenges. SEMAT is a framework that accomplishes insightful management oversight and control without intruding on how teams actually perform the work.

A Globalized Industrial Base

U.S. defense superiority depends on the knowledge, skills and behaviors of both government and industry personnel involved in program acquisition. For government, the SES personnel capability is the point of the spear. Yet it is being blunted and hollowed out through increasing retirements. Replacements need to possess knowledge in science, technology, engineering and mathematics—especially engineering and mathematics—as well as liberal arts such as languages, and cultural and historical knowledge, along with a new way of thinking in order to cope with continual disruption.

Not everyone can know everything in the complex world of technology, so government needs to master what is needed and locate where it can be found in the global technological ecosystem. And industry needs to be expert in how the technology can be provided and incorporated into the defense supply chain at

zero marginal cost. Both industry and government personnel need to possess and use superior skills and behaviors in working collaboratively and managing team innovation.

Refounding the Software Engineering Profession

The SEMAT vision is the refounding of software engineering as a rigorous discipline based on a general theory of software engineering, a unifying process framework and industrial strength. The profession needs objective criteria for determining the status of a project and pointing the way forward based on the following concerns:

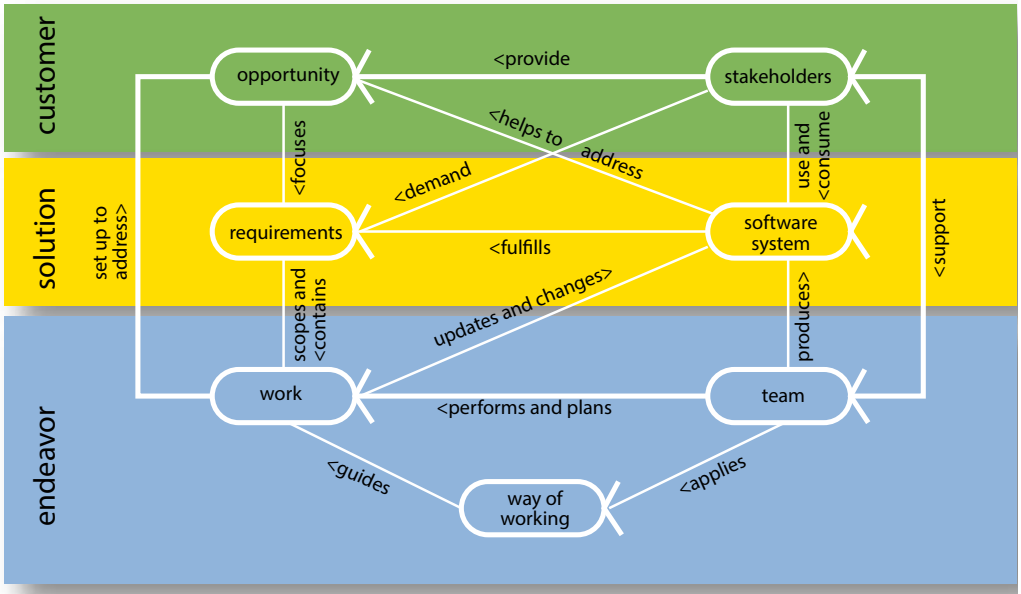
- The customer space is framed by a shared stakeholder vision of a well-conceived value proposition for the opportunity that offers convincing and consequential outcomes.
- The solution is bounded by stakeholder agreed-upon requirements and user stories and a software system architecture that facilitates development of a usable software product.
- The work is performed by a well-selected and prepared team and a way of working based on established principles and methods.

In providing the long-awaited bridge between managers and software engineers, the overarching framework of the SEMAT Essence Kernel encompasses a useful and strategic way of thinking. It is capable of extending the range of SES personnel needed to level the playing field with the industry systems and software engineering technical practitioners on which they depend. If SES personnel can master the SEMAT Essence Kernel, the impact of the impending experience gap can be mitigated and we can be better prepared to meet current software challenges.

SEMAT Essence Kernel

The common ground of seven dimensions termed alphas and the sequential states of progression associated with each alpha provide the basis for the refounding of software engineering as a profession. The alphas and the alpha states are intended to be independent of particular methods, practices and tools, thereby to have the ability to guide the progress and assess the status of any software project regardless of method and practice selections. Drawn from the book, "Software Engineering in the Systems Context" (edited by Ivar Jacobson and Harold "Bud" Lawson, College Publications, Kings College, London), the SEMAT Essence Kernel Alphas and their relationships are shown in Figure 1.

Figure 1. The SEMAT Essence Kernel Alphas—The Project Proceeds From Initiation to Conclusion



Source: The author

Understanding the Seven Alphas and Alpha States

Abstract Level Progress Health Attributes (ALPHA) are intended to represent essential dimensions of a project that must be present and attended to, and beyond that must progress satisfactorily through a sequence of alpha states as a software development.

Whether using Agile, Traditional Waterfall or some other development paradigm, expectations must be set and evidence sought on the following assertions. There must be stakeholders. There must be an opportunity or purpose to the project—hopefully one with a well-stated value proposition. Of course, there are requirements to specify and architectural decisions to make. A team must be selected and assembled, and its way of working established. Finally, work must begin, and work products must be inspected. All this happens, or doesn't happen, on a project as it progresses. The alpha state transitions in Table 1 characterize and trace that progress.

These simple yet powerful and sensible alphas and their natural states of progression are very useful in guiding a project. As an example, let's review the states of the stakeholder alpha. First a role—whether buyer, user or customer—is recognized as a stakeholder. Then stakeholder representatives are named. These representatives are encouraged and required to get involved, for example, with requirements. They then are expected to seek agreement on requirements—become satisfied with early product increments and with the completed product

in use. A similar sequence of state expectations is associated with each alpha.

Common Expectations

To get your project started on the right foot, expectations should be set and evidence sought on the following assertions and principles based on the alpha state checkpoints. Stakeholders are in agreement and share a vision for the project. An opportunity value proposition has been established, and there is a shared stakeholder vision for achieving it. Requirements or user stories are coherent and acceptable, and there is stakeholder shared vision for them.

The software system architecture is selected and comprises a domain-specific architecture to guide software system implementation, and the software system implementation is made ready and operational with no Technical Debt. As discussed in the March-April 2013 issue of *Defense AT&L* magazine, Technical Debt is the organizational, project or engineering neglect of known good practice that can result in persistent public, user, customer, staff, reputation or financial cost. In truth, most Technical Debt is taken on without strategic intent, without even knowing it and without the capability or capacity to do the job right.

The team operates in collaboration, shares a vision for the project and is ready to perform with respect to shared vision, software engineering process, software project management, software product engineering, operations support, and domain specific architecture processes, methods and tools. The team's way of working sets the foundations for the software engineering process, software project management, software product engineering and operations support. The work is started only when all is prepared—including coherent requirements and acceptable user stories, stakeholders' agreement, and an established foundation for the way of working.

These simple yet powerful and sensible alphas and their natural states of progression are very useful in guiding a project.

All work products are prepared and inspected in accordance with a defined standard of excellence assuring completeness, correctness and consistency. The Essence Kernel is extensible. For example, the addition of the work product alpha and its alpha states strengthen product focus on perfection and work product expectations. The work product is identified as part of the way of working; it is produced, shared with the team and inspected; it is complete and its parts are traceable to predecessor work products; it is correct and its parts are verified and provably correct; it is consistent in style and form of recording and with the software system architecture and its rules of construction; and it delivers value-added benefits, traceable to user stories and the "done" criteria for the way of working.

Sequencing Alpha States With Stage Alignment

Alpha state stage sequencing presents a dynamic, operational view that is useful in analyzing project effectiveness and anticipating and avoiding project risk that could lead to stakeholder dissatisfaction and Technical Debt.

Table 1. Alpha State Transitions

Alphas and Alpha State Transitions	a	b	c	d	e	f
1. Stakeholders	Recognized	Represented	Involved	In Agreement	Satisfied with Deployment	Satisfied in Use
2. Opportunity	Identified	Software Needed	Value Established	Viable	Addressed	Benefit Accrued
3. Requirements	Conceived	Bounded	Coherent	Acceptable	Addressed	Fulfilled
4. Software System	Architecture Selected	Demonstrable	Usable	Ready	Operational	Retired
5. Team	Selected	Formed	Collaborating	Performing	Adjourned	
6. Way of Working	Principles Established	Foundations Established	In Use	In Place	Working Well	Retired
7. Work	Initiated	Prepared	Started	Under Control	Concluded	Closed

Source: The author

Table 2. Alpha State Sequencing With Stage Alignment

Alphas and Alpha State Transitions	Project Kickoff	Stage I	Stage II	Stage III	Stage IV	Stage V	Project Termination
1. Stakeholders	a. Recognized	b. Represented	c. Involved	d. In Agreement	e. Satisfied with Deployment	f. Satisfied in Use	
2. Opportunity	a. Identified	b. Software Needed	c. Value Established	d. Viable	e. Addressed	f. Benefit Accrued	
3. Requirements	a. Conceived	b. Bounded	c. Coherent	d. Acceptable	e. Addressed	f. Fulfilled	
4. Software System		a. Architecture Selected	b. Demonstrable	c. Usable	d. Ready	e. Operational	f. Retired
5. Team	a. Selected	b. Formed	c. Collaborating	d. Performing [Initial Release]	d. Performing [Incremental Releases]	d. Performing [Final Release]	e. Adjourned
6. Way of Working		a. Principles Established	b. Foundations Established	c. In Use	d. In Place	e. Working Well	f. Retired
7. Work		a. Initiated	b. Prepared	c. Started	d. Under Control	e. Concluded	f. Closed

Source: The author

Systematic rules of construction for tracing alpha state sequencing and reasoning about their stage alignment assist in this effectiveness analysis even pinpointing the selected milestones that are consequential markers of success and the risk triggers that threaten success and lead to accumulating Technical Debt.

Sequencing alpha states in accordance with an ordered baseline of states provides the means to detect root causes even before measurements are done. Simply put, the focus is on anticipation and avoidance. The preferred sequencing of alpha states by stage shown in Table 2 reflects a risk adverse baseline of expectation.

Alpha State Stages, Effectiveness and Risk

Sequencing alpha states hinges on the effects of incomplete predecessor states on successor states not yet begun or in progress. The rules of construction for tracing alpha state sequencing and reasoning about their stage alignment include the following:

- The sequence of alpha states is followed with no skipping.
- If all predecessor alpha stages are complete, then there is no risk.
- If the predecessor alpha stage just prior contains any incomplete alpha state, then there is risk.
- If the predecessor alpha stage occurs more than one stage prior to any incomplete alpha state, then there is a problem.

Risk involves uncertainty and the prospect for either loss or gain, depending on an event outcome. The risks considered here are those incurred by performance associated with alpha state transitions and their orderly achievement. The baseline alpha state stages used in sequencing alpha states by stage represent a risk-adverse expectation. A project wishing to make an explicit decision to depart from the baseline may choose to do so by constructing an ad hoc project baseline of alpha state stages and sequences. This departure from the preferred baseline is risk by design and may possess additional built-in risk. In any event, the basic rules of construction governing risk by performance still apply.

Conclusion

The SEMAT formulation and its Essence Kernel framework, together, constitute a giant step toward coping with the complexity of software engineering projects that truly represents the refounding of software engineering. Instead of focusing on the technical and management capabilities, processes, methods practices and tools, the focus is operationally riveted on the consequential outcomes of project execution. SEMAT pivots away from the arcane details of how things are done to deciding whether they should be done at all. This operational way of thinking makes all the difference to senior executives and their need to fully participate in software project management and oversight.

With a less-experienced senior management corps facing ever more complex challenges and the prospect of increasing staff promotions from within the federal workforce, the U.S. Government can now turn to the SEMAT Essence as the foundation for an initiative to broaden the skill sets of its senior managers.

If SES personnel can master the SEMAT Essence Kernel's useful way of collaborative thinking in a systems context, the impending retirement-induced experience gap can be mitigated and government managers can meet future software challenges.

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BUDGET FORECASTING and Procurement Dynamics

Claude L. Cable, DBA, CFCM

Many Department of Defense (DoD) acquisition professionals believe or at least agree that a cost estimate or Independent Government Cost Estimate (IGCE) has no value or is unrelated to determining a budget forecast. Additionally, industry articles and publications show inconsistent thought on this topic. The AACE International's *Cost Engineering Journal* said that an IGCE, as a tool for budget forecasting, is speculative at best.

Does an IGCE or cost estimate have any value or relationship in budget forecasting? During my 30 years in the acquisition workforce, many of my mentors or supervisors taught me the importance of developing clear, crisp and correct cost estimates that facilitate knowing expected contract costs and eliminating cost overruns.

As a DoD contract manager and an interpreter of public contract law, I have a few more questions: Why does understanding elements of budget forecasting—i.e., cost estimates—assist in controlling cost? Furthermore, do procurement dynamics provide a structure for IGCE and budget forecasting?

Budget Forecasting

In 2015, the *Australian Accounting Review* noted that budget forecasting is the essential part of any governmental fiscal strategy. Also, a leader's standing or success depends on budgetary policy and procurement dynamics enforcement. Public sector budget cuts have been a common occurrence in the last several years. DoD's Acquisition

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Workforce professionals and leaders unmistakably need to obtain more goods and services with lower budgets.

Unlike a "guesstimation," an IGCE is considered unbiased per the governance of the Federal Acquisition Regulation, which is the essential part of budget forecasting, comparing costs and total cost estimates of a possible award. For DoD leaders and acquisition workforce professionals, it is imperative that the scope, cost and duration of any project be forecast as precisely as possible. A difficulty faced in comparing the contract cost between an IGCE and a contractors' estimate is that the actual contract cost can deviate from what is expected. Estimated costs are uncertain under the best of conditions. Cost estimation standards set a baseline that all federal agencies should follow to mitigate the risk of change.

Cost estimates, contract costs and cost overruns are strongly related. This relationship is an empirical concept in obtaining a good budget forecast. Accurate forecasts of the scope, cost and duration are vital to the survival or success of any project or business. Like any other profession, cost estimators need constant training and keeping up to date with the advances in technology that assist the field.

Procurement Dynamics

Procurement Dynamics is the process used to obtain services or supplies to support an organization's mission, and includes the budgetary projection. Researchers note that Defense Acquisition Workforce members struggle with the procurement dynamics of budget forecasting. Typically, budget forecasting usually occurs through a structured estimation of possible future need and wants.

Discussion

For nearly 70 years, DoD suffered inaccurate cost estimations on operating support in systems service contracts. The *International Journal of Forecasting* noted in 2015 that the United States' deficit from 2008–2012 was more than $1 trillion each fiscal year. Many agencies such as the Veterans Administration (VA) have struggled with capricious cost estimates. For example, the VA cost estimating methods are proven inaccurate to the tune of $2.5 billion. Typically, contract cost overruns are associated with technical errors in design or estimating; decision-making incompetence, doubt based on the risk of foul play; dishonesty and disenchantment; and even corruption.

In 1997, *The Washington Post* noted the FBI had $200 million in cost overruns in the 1990s, which brought into question the credibility of the FBI's budget forecasting process. In 1980 through 1990, millions of overstated cost estimates on DoD contracts were discovered. DoD has experimented with many reporting and monitoring tools to improve cost estimates and eliminate cost overruns. DoD pays little attention to factoring in support costs, including those of service contracts.

In 2012, the Association of Budgeting and Financial Management's *Public Budgeting & Finance* quarterly stated that budgetary forecasting dynamics are broken and that many leaders and acquisition workforce members do not understand them. Countless Defense Acquisition Workforce professionals struggle with the procurement dynamics involved in budget forecasting. Federal agencies such as the Government Accountability Office (GAO) and the Congressional Budget Office use budgetary models to confront growing operational shortfalls. GAO's *Cost Guide* publication set the standard for estimating cost on contracts, primarily the relationship between cost and price data. The *Cost Guide* provides best practices for the use of agencies' acquisition personnel to ensure that a cost estimate is precise and reliable.

In 2013, the Program Management Institute's *Project Management Journal* stated that DoD contracts from 2000–2008 had more than $200 million in cost overruns, a growth of more than 702 percent from the previous decade. GAO said that federal agencies do not provide the control and oversight needed to eliminate U.S. Government service cost overruns.

In 2014, the libertarian Cato Institute's *Cato Journal* noted that projections of impending economic activity trigger any budget revenue. Furthermore, many federal agency forecasters struggle with incentives or other forces that introduce a conjectural bias. This bias can be common in a political environment, but can be eliminated by structured processes or procurement dynamics.

In 2015, *Public Budgeting & Finance* noted that DoD's annual fuel costs for 2000 to 2011 were estimated at between $1 billion and $9 billion. This swing was attributed to cost variances in the fuel industry. Determining costs, especially over the long term, in such a volatile market is very challenging for acquisition workforce professionals.

Annual budgets are a mechanism or dynamic of public finance management, which goes back to the foundation of the United States. Accurate budgets and cost estimations are forecasting models used by the U.S. Government for services delivered to the American people as a social contract, and, therefore, the expenditures should be transparent. Given present economic conditions and federal appropriations shortfalls, more attention is needed on the government's process for estimating its expenditures. Economists always consider revenue and receipts initially in the budget forecasting process, but DoD's leaders and workforce professionals should always address the estimated cost of contracts and cost overruns.

And budget forecasting challenges include gathering the right information and understanding the complete process. Obtaining reliable and valid cost estimation through procurement dynamics is an important key to improving the reliability of organizational budget processes, especially in the public sector, so that a proper budget can be planned. A precise cost estimate guarantees that the actual costs are not missing or duplicated. A clear and concise cost estimate should be unbiased and neither too conservative nor

overstated. The cost estimate should show the basis of the most probable price. A carefully documented and detailed estimation includes data and their meanings, very meticulous computations, expected outcomes and justifications for selecting a certain technique or source. A credible estimate reviews all restrictions from the analysis, indecision, favoritisms, proximate facts or expectations.

In order to provide trustworthy cost estimates, GAO's *Cost Guide* clarifies the important cost elements in the cost estimation process, which includes considering any expected threat, insecurities, and comparing the body of work and provide an unbiased third party review to illustrate how outside estimates compare to the original. Using cost estimating in preparing proposals benefits both the agency and the contractor through the resultant improvement in the proposals' accuracy and reliability.

The ability to develop an accurate cost estimate is an important duty and responsibility and is essential in assisting the Office of Management and Budget's work. Without this capability, federal agencies risk cost overruns, missed targets and deficient execution, all of which occur too often and are important to program estimations. Organizations, institutions and businesses should analyze the cost of services to stay competitive. Federal agency leaders are struggling with cost controls, especially when the service or product comes from one source, or from leadership and policy decisions, such as wartime single-source contracts that drive up spending.

DoD's weapons projects have multiple stages of expansion and must establish an accurate estimation to assist budget forecasting and control. DoD has developed structured methodology and procurement dynamics in creating an IGCE or cost estimate. A cost and price analyst can use various cost estimating methods or tools, depending on the product or service needed.

Conclusion

As stewards of taxpayer dollars, all acquisition professionals need to ensure that we use budget forecasting methodologies and tools, understand procurement dynamics, and employ Better Buying Power practices to facilitate clear budget forecasting. It is essential that we constantly evaluate the budgetary forecasting procurement dynamics and fiscal shortfall environments. Passing on a little knowledge provides us with purpose and direction.

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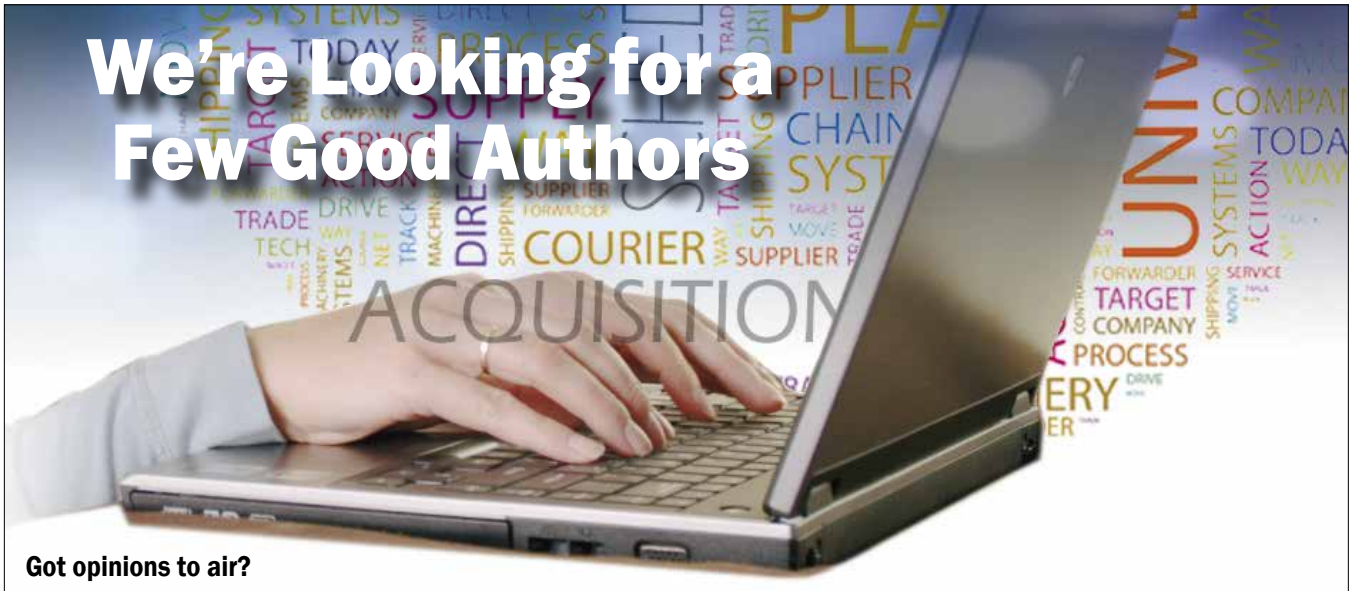

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Are We There Yet?

The Unfinished Journey to DoD Auditability

Jennifer Miller, DBA

Like the summer road trip with children riding in the back seat, the question lingers. Amid the Marine Corps accomplishment and subsequent withdrawal of a clean audit opinion, the Department of Defense (DoD) still, as a whole, is not yet there in terms of being auditable. Former DoD Comptroller Robert Hale advised in a May 13, 2014, congressional hearing that not all DoD budgets would be ready for audit by the end of Fiscal Year (FY) 2014.

Hale was correct—what we have seen comes as little surprise for most observers. Progress was promising for the 2017 deadline, but Congress' 2013–2017 partisan run-ins, featuring government shutdowns, numerous continuing resolutions (CRs), hiring freezes and furloughs have hampered efforts. It seems each time I consider DoD's status as it moves toward undergoing a full-blown independent public accounting firm's review, the DoD is continually distracted by threats of government shutdowns, CRs, hiring freezes and continued implementation of the world's largest enterprise resource planning (ERP) system. There truly does seem to be a point at which bone is cut and doing more with less really means doing less. Senators and Representatives at the May 2014 hearing made valid points about the benefits of audits for decision support and stewardship of funds: The fragmented, duplicative and

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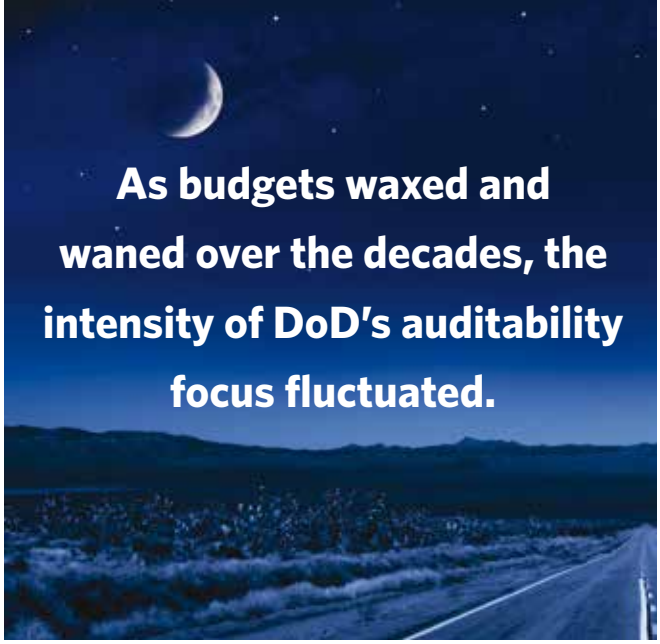
overlapping DoD programs and services for which alternatives exist are viewed as easily cut in contrast with the more singular and mission-critical programs. Congress also is not alone among the three branches of government in seeing its value. Plenty of my executive branch peers readily admit the benefits of and need for auditable financial statements.

The difficulty in becoming auditable has been an obstacle for several years and originated in the early legislation regarding comptroller activities. The Chief Financial Officer's (CFO) Act of 1990 was arguably the most comprehensive and far-reaching legiation in 40 years for improving financial management. That single law was the original source of an accountable CFO for the country. Government-wide conformity and standardization of financial statements emerged, and the annual independent audits of federal financial statements were mandated. There was even some consideration about the need for appropriate practices applicable to the federal government's circumstances. The CFO Act was followed by a series of other acts such as the Government Performance and Results Act (GPRA) of 1993, Government Management and Reform Act (GMRA) Act of 1994, the Federal Financial Management Improvement Act (FFMIA) of 1996, the GPRA Modernization Act of 2010, the Budget Control Act (BCA) of 2011, and the Bipartisan Budget Act of 2013, to name a few prominent ones. While the BCA may be less memorable, the Bipartisan Budget Act of 2013 probably rings with a word we all continue living with: sequestration.

As budgets waxed and waned over the decades, the intensity of DoD's auditability focus fluctuated. The focus now is stringent: Reports, attestations and audits reveal programs are ripe for reduction even before the DoD is auditable. In recent years, Congress identified the priorities of the Financial Improvement and Audit Readiness (FIAR) initiative. These included (a) strengthening processes, controls and systems that produce budgetary information and support the DoD's Statement of Budgetary Resources and (b) improving the accuracy and reliability of management information on mission-critical assets—including military equipment and real property. FIAR priorities directly connect to the intentions behind the CFO Act.

In sorting the people, placement and priorities, the terms used should be reviewed. The nonpartisan Government Accountability Office (GAO) 2014 *Annual Report for Improving Efficiency and Effectiveness* stated that overlap "occurs when multiple agencies or programs have similar goals, engage in similar activities or strategies to achieve them, or target similar beneficiaries," whereas duplication "occurs when two or more agencies or programs are engaged in the same activities or provide the same services to the same beneficiaries." Completing the triad of efficiency and effectiveness improvement definitions, the GAO report provided that fragmentation "refers to those circumstances in which more than one federal agency (or more than one organization within an agency) is involved in the same broad area of national need, and opportunities exist to improve service delivery." I submit that, given better internal controls, DoD would have less overlap, duplication and fragmentation and that this would make it easier to produce auditable financial statements.



Throwing more terms around, there are the "leaders" and "managers." Expert researchers of each group captured the mire of definitions in comparison to the nature of management and managerial work in the book *Leadership: Building Sustainable Organizations* by Gary A.Yukl, Jennifer M. George and Gareth R. Jones, published in 2010 by Pearson Prentice Hall. Leaders and managers often are identified as separate individuals despite the mutually beneficial combination of the roles, as found in government. Both managers and leaders serve a critical role in internal control in the federal government, especially the control environment let alone the "tone at the top." In Jayme Baumgardner's April 29, 2014, article in *Government Executive*, "Why Leader-Managers Are the Key to Thriving Organizations," leader-managers were identified as the key to organizational success, because the leader role infuses the organization with influence and innovation while the manager role provides traditional structure devoted to planning, execution and achieving goals. From the capacity and toolsets available to leader-managers, it is possible to institute successful change through control and delegation of authority among DoD personnel. Specifically, 5 U.S. Code Section 1104, "Delegation of authority for personnel management," provides for a window of opportunity to delegate and control authority among government personnel. As DoD's preparatory audit exercises continue, delegation of authority is a key focus.

An increasing number of mission and support services are transformed to reduce duplication and overlap and achieve efficiencies and effectiveness. This sharing and better controlling of authority supports leadership and management goals. Reasons for such transformations include vulnerabilities, legislative mandates, regulatory compliance and a wish to fulfill customer demands. Successful recommended transformation efforts may utilize:

- Objective business cases
- Identification of commonalities across agencies
- An invitation for the submission of ideas
- Cultivation of organization-wide governance
- Securing of early stakeholder buy-in—and caring for people and organizational cultures
- Monitoring of implementation and accountability and making applicable adjustments
- Allowing for the recognition of "change leaders"

Internal control components, objectives and all levels of organizations are involved here, too. DoD services are leveraging lessons learned. One notable tactic for controlling the delegations of authority is the inventory of such delegations utilized by the Housing and Urban Development Department.

What are managers and leaders to do with the pressures and punts? Press on. The President's Budget for FY 2015 included proposals for pinpointed reductions and consolidation of more than 130 programs. This spurred government leaders and managers to embrace an immediate attack on duplication and overlap of programs and services. Just as Rome wasn't built in a day, all of those reductions and consolidations were not accomplished in a single year and many of them were rolled into the President's Budget for FY 2016. In their effort to rapidly respond to the recommendations and requests from leadership and management, intermediaries and citizens have been actively prodding for results, such as a National Public Radio (NPR) report of disputes among the Life Science Laboratory and the Joint Prisoners of War/Missing in Action Accounting Command in identifying the nation's fallen soldiers. That report, "Pentagon Reorganizing: How It Brings Home America's War Dead," exposed delays and bureaucratic tendencies that contributed to former Defense Secretary Chuck Hagel's decision to order streamlined and single office efforts as an immediate way to reduce these delays. To accomplish short-term or progressive and long-term management-directed changes, collaboration is required throughout organizations. Collaboration may come in various forms through internal information and communication.

Techniques for overcoming audit-related challenges include involving the right people in a position with appropriate power to apply knowledge and expertise and foster connections. Also, the tangible and intangible benefits for the agencies participating should be specified since streamlining commonly reduces personnel and budgets in the interest of mission effectiveness and efficiency. A third recommendation is that interagency collaboration be fostered by requiring managers to lead the effort and affirm its relevancy and value through monitoring and repeated articulation of the end goal. This aspect was reviewed in an April 14, 2014, *Government Executive* article by Clare Gallaher, "3 Tips for Effective Interagency Collaboration." Finally, leveraging GAO's Standards for Internal Control in the Federal Government (also known as the *Green Book*) would be helpful, given the five useful components applicable to staff members at all levels of organizations and all categories of objectives.

Figure 1 shows the five sweeping components and a handy acronym you can begin touting in your workplace. Just remember CRIME—Control Activities, Risk Assessment, Information and Communication, Monitoring, Control Environment. Then, there are the objectives in operations, reporting and compliance. Finally, the third internal control aspect includes the levels of organizational structure: function, operating unit, division and entity. After all, audit is everyone's objective, and we all have a stake in achieving the goal. Defense managers and leaders may have tackled low-hanging fruit during the past 3 years, but the steps needed to eliminate the remaining auditability barriers will be steeper as deadlines approach. Thus, there will be great demand for successful interagency collaboration through leveraging managers' and leaders' personal and positional power. We also will need the right people at the right time to support internal control and eventual auditability.

We are not yet auditable. Some within the DoD see the department reaching an auditable state in another decade or two. However, Congress—which holds the purse strings—hasn't sent us out to hitchhike our way to that destination. Moving from a crawling pace to walking and then sprinting is building our progress, which Congress has promised to watch for. Studies, reports and resulting decision support that are developed from endeavors to address issues also provide recommended techniques to combat our timeline tardiness and excess activities.

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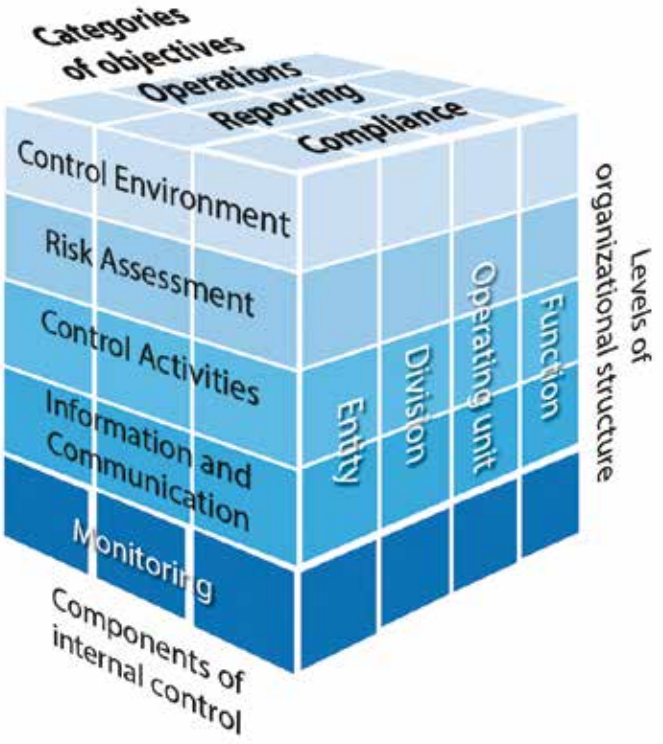
Figure 1. Federal Standards for Internal Control



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The Cybersecurity and Acquisition Life-Cycle Integration Tool

Steve Mills ■ *Tim Denman*

Cybersecurity is a critical component of the systems engineering process for Department of Defense (DoD) acquisition systems. Failure to integrate cybersecurity into our systems across the entire acquisition life cycle introduces exceptional risk to the system and the warfighter. Cybersecurity plays an extremely important role in the user requirements, design, development, operations, sustainment and disposal of DoD Systems. Cybersecurity has many unique attributes when viewed from the acquisition lifecycle perspective.

Cybersecurity is first and foremost system engineering—system security engineering (SSE), to be exact. Too often, cybersecurity is viewed as an afterthought in the acquisition process. Secondly, cybersecurity has a specific process to address cybersecurity risk called the Risk Management Framework (RMF) for DoD Information Technology (IT). The RMF approach is a separate and complementary process to traditional DoD Risk Management as outlined by the January 2017 *Risk, Issues and Opportunity Management Guide*.

Next, cybersecurity testing is executed via a six-phase mission-focused process across the acquisition life cycle. Finally, an ever-changing cyber threat must be integrated into the systems engineering process. The complexity of managing all of these processes drives the need for an interactive and highly informative tool that helps users understand, visualize and begin to integrate cybersecurity across the acquisition life cycle to achieve better acquisition outcomes.

A team at the Defense Acquisition University has developed such a tool—the Cybersecurity and Acquisition Lifecycle Integration Tool (CALIT). CALIT went "live" in June 2016 and has been downloaded more than 5,000 times by members of the Defense Acquisition Workforce. CALIT has been used extensively by members of the DAU Cybersecurity Enterprise Team to deliver numerous cybersecurity related workshops to Defense Acquisition Workforce members. CALIT has also been used in development of the Cybersecurity and Acquisition Integration Workshop. This 1- to 2-day

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workshop is currently being offered across all DAU regions to both government and industry partners several times a year.

Simple Approach to a Complex Challenge

CALIT was designed with simplicity and familiarity in mind. The Defense Acquisition Workforce is very familiar with the DoD acquisition life-cycle chart, often referred to as the "wall chart" or the "horse blanket." A cursory walk around a program management office or program executive office may result in seeing several versions of the wall chart in employees' work spaces. CALIT adopts this same approach, but depicts the key cybersecurity-related processes as "swim lanes" and orients them across the acquisition life cycle.

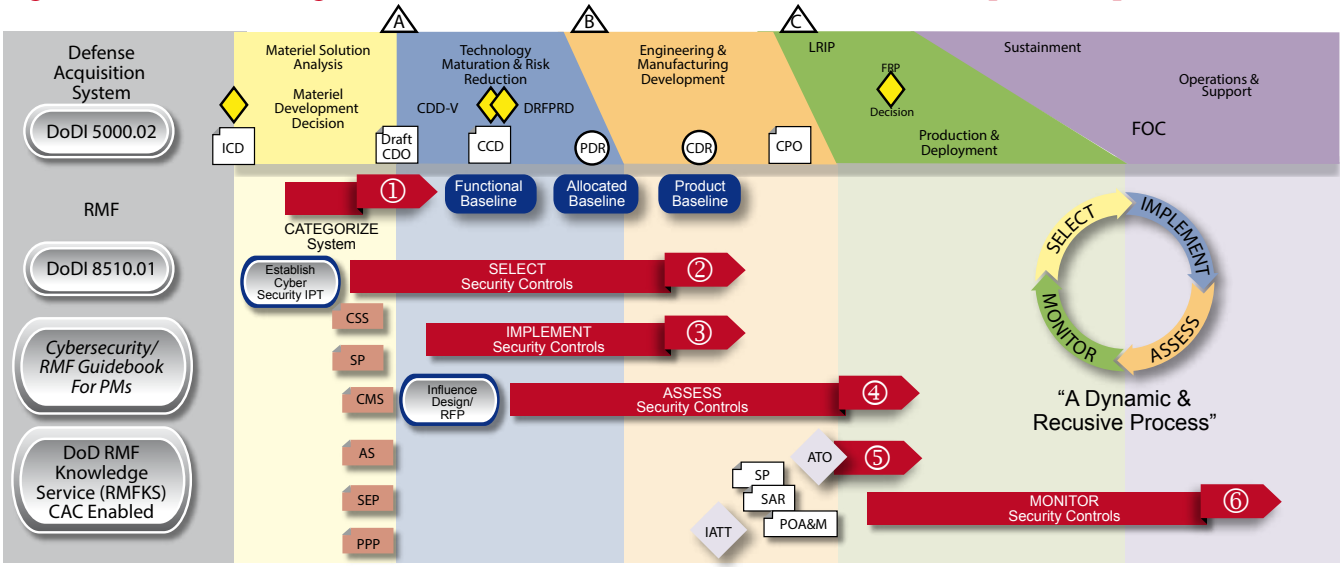
CALIT was developed on the premise that effective integration of cybersecurity into the DoD acquisition life cycle encompasses several different processes, including:

- DoD Instruction (DoDI) 5000.02, Operation of the Defense Acquisition System

Key to Abbreviations in Figures 1-4

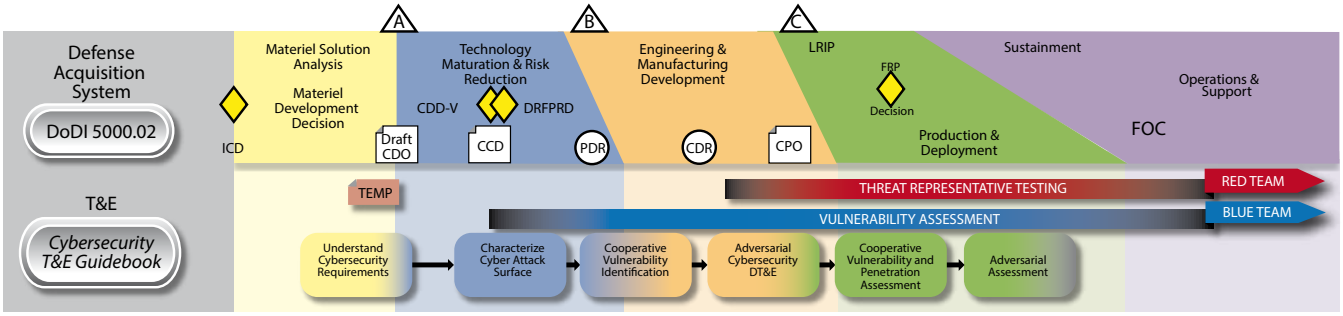
AS=access security; ATO=authority to operate; CAC=common access card; CDD=Capability Development Document; CDD-V=validation of CDD; CDR=critical design review; CMS=configuration management system; CPD=Capability Production Document; CPI=critical program information; CSS=contractor support services; DRFPRD=development request for proposal release decision; DT&L=developmental test and evaluation; EMD=engineering and manufacturing development; FOC=full operational capability; FRP=full-rate production; IATT=interim authority to test; ICD=Initial Capabilities Document; IPT=integrated product team; ITEA=Initial Threat Environment Assessment; LRIP=low-rate initial production; P&D=production and deployment; POA&M=plan of action and milestones: PDR=preliminary design review; PPP=program protection plan; sar=safety assessment report; SE=systems engineering; SEP=Systems Engineering Plan; SP=start point; SSE=system security engineering; STAR=System Threat Assessment Report; T&E=test and evaluation; TMRR=technology maturation and risk reduction; TSN=trusted systems and network; VOLT=validated online life-cycle threat.

Figure 1. Risk Management Framework Swim Lanes and Six-Step Life-Cycle Process



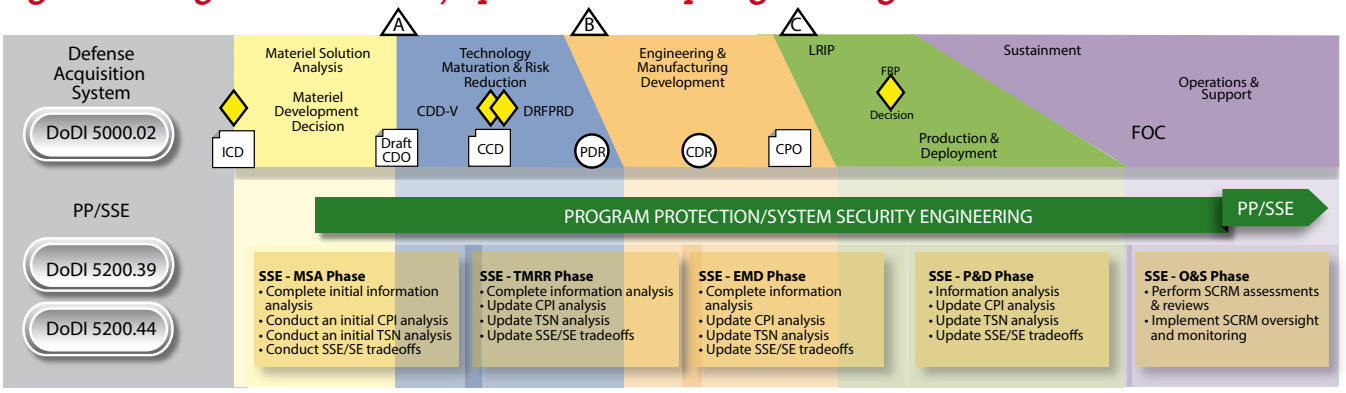
Source: CALIT Version 2.03, DAU (https://www.dau.mil/tools/t/Cybersecurity-and-Acquisition-Lifecycle-Integration-Tool-(CALIT)

Figure 2. Cybersecurity Test and Evaluation Swim Lane



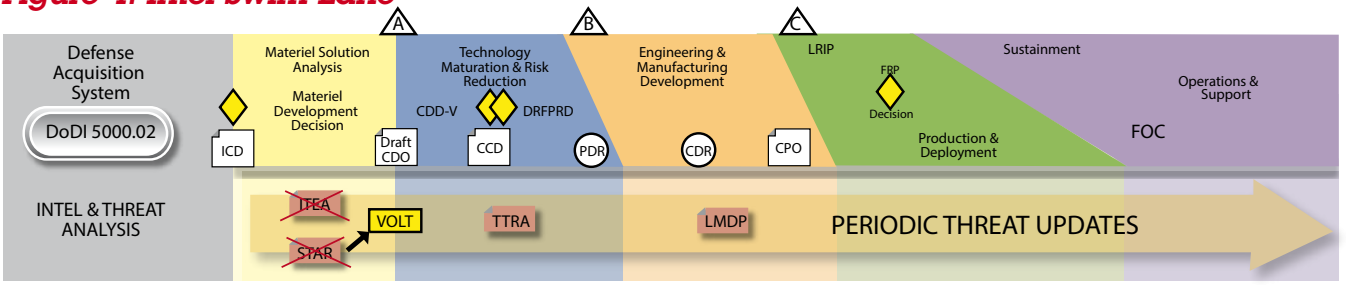
Source: CALIT Version 2.03 (https://www.dau.mil/tools/t/Cybersecurity-and-Acquisition-Lifecycle-Integration-Tool-(CALIT)

Figure 3. Program Protection/System Security Engineering Swim Lane



Source: CALIT Ver 2.03 (https://www.dau.mil/tools/t/Cybersecurity-and-Acquisition-Lifecycle-Integration-Tool-(CALIT)

Figure 4. Intel Swim Lane



Source: CALIT Ver 2.03 (https://www.dau.mil/tools/t/oDisecurity-and-Acquisition-Lifecycle-Integration-Tool-(CALIT)

- DoDI 8510.01—RMF for DoD Information Technology (IT)
- Cybersecurity Test and Evaluation
- Program Protection/SSE
- Cyber Threat Analysis
- DoDI 5200.39, Critical Program Information Identification and Protection Within Research, Development, Test and Evaluation
- DoDI 5200.44, Protection of Mission Critical Functions to Achieve Trusted Systems and Networks

The CALIT provides the user insight into these supporting processes and the ability to visualize how these processes work together to promote cyber-resilient weapon systems. Figure 1 depicts the four individual "Swim Lanes" oriented under the Hardware Intensive acquisition model.

The RMF swim lane in Figure 1 show the RMF six-step process across the life cycle.

A central role of the DoD RMF for DoD IT is to provide a structured but dynamic and recursive process for near real-time cybersecurity risk management. For example, the assessment of risks drives risk response and will influence security control selection and implementation activities, while highlighting a need to reconsider information and communication needs or the entity's continuous monitoring activities. RMF is not a strictly linear process, where one component affects only the next. It is a multidirectional, iterative process in which almost any component can and will influence another.

The Cybersecurity Test and Evaluation (T&E) swim lane (Figure 2) depicts this unique six-phase process across the acquisition life cycle.

Compliance with traditional cybersecurity policy has proven insufficient to ensure that systemic vulnerabilities are addressed in fielded systems used on the battlefield. A broader cybersecurity T&E approach that focuses on military mission objectives and their critical supporting systems is needed to fully address the cyber threat. Cybersecurity is an integral part of developmental and operational T&E. Cybersecurity T&E planning, analysis and implementation constitute an iterative process that starts at the beginning of the acquisition life cycle and continues through maintenance of the system. Cybersecurity T&E is performed in conjunction with the RMF as defined in DoDI 8510.01, RMF for DoD IT. The use of both Blue Teams and Red Teams as part of a robust cybersecurity T&E effort is a key component of an effective cybersecurity effort.

The Program Protection (PP) and SSE swim lane in Figure 3 depicts the key engineering related processes across the acquisition life cycle.

Program protection is the integrating process for managing security risks to DoD warfighting capability from:

- Foreign intelligence collection
- Hardware exploitation
- Software vulnerabilities
- Cybersecurity vulnerability (Yes, cybersecurity is a subset of Program Protection!)
- Supply chain exploitation
- Battlefield loss throughout the system life cycle

Figure 4 addresses the intelligence threat swim lane.

SSE is the discipline that implements program protection. SSE is a specialty discipline of systems engineering with several components:

- Cybersecurity (That's right, cybersecurity is a form of Systems Engineering too!)
- Hardware Assurance
- Software Assurance
- Anti-tamper
- Supply Chain Risk Management
- Defense Exportability
- Security Specialties (Personnel Security, Physical Security, Information Security, etc.)

A cursory review of the PP/SSE swim lane reveals the two primary PP/SSE-related activities occurring across the acquisition life cycle. The activities are the Criticality Analysis and the Trusted System and Networks Analysis. Both of these analyses are key components of the overall cybersecurity effort.

A discussion about cybersecurity on DoD acquisition programs would not be complete without addressing the impact(s) of the cyber threat on the system.

The primary document that provides the program specific threat assessment is the System Threat Assessment Report (STAR), which provides a holistic assessment of enemy capabilities to neutralize or degrade a specific U.S. system by addressing both threat-to-platform and threat-to-mission.

The STAR is intended to serve as the authoritative threat document supporting the acquisition decision process and the system development process. The STAR can also be used to guide test planning. Due to the static nature of the STAR, a more "real time" threat assessment is needed. To address this shortcoming, the Validated Online Lifecycle Threat (VOLT) tool will supersede the STAR. Transition to the VOLT Tool is mandated in Better Buying Power 3.0 Implementation Guidance. As of the time of this article, the VOLT tool has not been fully implemented.

Conclusion

The Defense Acquisition Workforce requires real time visualization tools that help them understand and apply key DoD related policies and processes more easily. CALIT is a new, interactive capability that focuses on the cybersecurity component for DoD acquisition programs. The CALIT can be found at https://www.dau.mil/tools/t/Cybersecurity-and-Acquisition-Lifecycle-Integration-Tool-(CALIT). Another key tool just released is the Interactive Defense Acquisition Life Cycle Chart which can be found at https://www.dau.mil/tools/t/ILC. Better understanding of the key cybersecurity processes and how they integrate across the acquisition life cycle is critical to engineering cyber resilient systems that must operate effectively in a cyber-contested environment.

DAU will continue to deliver quality interactive tools to help the Defense Acquisition Workforce achieve better acquisition outcomes.

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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 lists all such changes of leadership, for both civilian and military program managers for May-June 2017.

Army

Col. Roger D. Kuykendall assumed responsibilities of program manager for Improved Turbine Engine and Future Vertical Lift Programs on May 30.

Col. Gregory S. Fortier relieved **COL William D. Jackson** as project manager for Cargo Helicopter on June 29.

Col. Robert J. Mikesh relieved **COL Harry R. Culclasure** as project manager for Army Enterprise Systems Integration Program on June 29.

Navy/Marine Corps

CAPT Matthew Commerford relieved **CAPT Albert Mousseau** as program manager for the Direct and Time Sensitive Strike Program (PMA-242) on June 29.

CAPT John Keegan relieved **CAPT Michael Ladner** as program manager for the Surface Ships Weapons Program (IWS 3.0) on June 2.

Air Force

Col Daniel N. Marticello relieved **Col Amy J. McCain** as program manager for the Presidential Aircraft Recapitalization Program on May 22.

Interoperability Testing

Thomas L. Conroy II, Ed.D.

What is interoperability? How do you measure and then test it? Interoperability is a difficult concept to understand and test. First, we have to define interoperability. Interoperability is the connectedness of systems and components to provide end-to-end operational effectiveness. But how is that interconnectedness defined within the system? The best way to understand it is through architecture.

Architectures define the way systems fit together like puzzle pieces. Think of your house. There are many layers of systems working together, such as the plumbing, heating and electricity sub-systems to make the house as a whole operate as one system. Each of those sub-systems is a layer, or view, of the entire house architecture. The places where the pieces of the architecture components fit together to interact are called the interfaces within the architecture. The interfaces must work in certain ways to perform the overall mission, and this is the crux of interoperability.

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The interfaces must have well-defined functions for how the coupling between the components perform to ensure that the overall functions of the system work correctly. Think of it as a series of messages along a telephone system. If the message breaks down or is corrupted by one part of the system interfaces, then the message will be jumbled at the other end and the interoperability will be corrupted. To keep the interfaces working correctly, most interfaces follow a standard for their operations. The standard defines how the interface will perform its operations to function between the multiple components in the same way every time. For example, a power wall outlet is an interface, and its operation is defined by electrical codes or standards to ensure it performs its function correctly.

There are three main attributes to the NR KPP. They are: Support to Military Operations, Entered and Managed on the Network, and Effectively Exchanges Information. The NR KPP is an interesting KPP because it is not defined by a standard set of rules but rather is developed in accordance with the way the system's network infrastructure is expected to perform the mission. So the NR KPP must be defined very early in the requirements development process to ensure the network is designed and developed with well-defined and controlled interfaces for network performance. Those interfaces will form the backbone of the system and how it interoperates. The performance of the system will be built on top of that infrastructure architecture to perform its mission with well-

The interfaces must have well-defined functions for how the coupling between the components perform to ensure that the overall functions of the system work correctly.

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An important aspect of interoperability is that it comes in the form of both internal and external system interfaces. Internal interfaces are those that connect component to component and sub-system to sub-system. External interfaces connect one system to another and a system to the infrastructure. External components are more difficult to work with because, unlike the usual internal interfaces, they are not controlled by one system program. This leads to imposing greater workloads on understanding who defines those external interfaces and who has responsibility for them in terms of configuration management and control. This greater workload is also seen in the testing of the interfaces because there are more entities and programs to work with to ensure that the interfaces perform effectively. To accomplish this for external interfaces, we must ensure that we are involved in the design, development, testing, control and configuration management of those interfaces to the greatest extent possible.

To ensure that interfaces are well-defined in their operations, we must shift the development of the interfaces as far left in the acquisition development timeline as possible, allowing for early development (prior to Milestone B) of interface definition and standards in conjunction with development of the requirements. Additionally, interoperability requirements for network interfaces must be defined in accordance with the mandatory Net-Ready (NR) Key Performance Parameter (KPP) that defines the way network interfaces will operate for the system's performance.

defined interoperability across the network interfaces. So, how do we test or verify that the system is interoperable? We have interoperability requirements in terms of the NR KPP and other technical interface requirements. But how do we verify that they perform correctly?

The Department of Defense Instruction (DoDI) 5000.02 states that "program managers will design, develop, test and evaluate systems to ensure IT [information technology] interoperability requirements are achieved." Additionally, DoDI 8330.01 states: "All IT, including defense acquisition and procurement programs and enterprise services, must have a net ready key performance parameter (NR KPP) as part of its interoperability requirements documentation. The NR KPP consists of measurable and testable performance measures and metrics derived from associated DoD architectures, and is used to assess both the technical exchange of information, data, and services, and the end-to-end operational effectiveness of those exchanges." This ensures that the requirements exist for interoperability across network interfaces and testing or that verification is performed against the requirements.

The Joint Interoperability Test Command (JITC) is the lead Operational Test Agency for interoperability and testing against the NR KPP. The best way to get involved with JITC to develop test plans and procedures is to work with JITC early in the requirements development process to ensure that the requirements developed are verifiable. JITC should then

continue to be involved in the development and testing of the system for interoperability across the network.

To perform effective testing for interoperability, developmental and operational testing should be performed across the interfaces and from end to end to ensure mission effectiveness. The testing should follow the requirements set forth in the NR KPP as well as any other interoperability requirements and standards developed for each interface in the system architecture. Testing should be performed in accordance with the associated standard and requirements for each interface as soon as possible in development to ensure problems are identified and fixed early rather than later. Many problems within interface performance can cause major problems for the total system performance as well as ripple effects throughout the system across components. It is important to root out these issues early in the development life cycle.

Metrics and Measures of Performance should be established for each interface and controlled through an associated standard or requirement. They will help establish correct operation of the system across each interface and will ensure that testing is performed against a performance standard or requirement.

Ultimately, testing of interfaces for interoperability as well as testing end-to-end performance can be a time-consuming and daunting task. It is important that JITC be involved up front and early and that developmental rigor are followed in the systems engineering processes to ensure good development and management of the interfaces throughout requirements generation, development and testing. If developmental processes, requirements and standards are designed early and followed throughout the development timeline, the interfaces will be well defined and controlled throughout the life cycle. This will ensure that testing is performed early, consistently, continuously and rigorously to ensure that there is a well-defined and managed interface control scheme throughout development and testing of the system and its architecture.

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Scrum of Scrums

Scaling Up Agile to Create Efficiencies, Reduce Redundancies

Maj Stephanie "Jill" Raps, USAF

In the complex world of medical logistics, the innovative team at the Joint Medical Logistics Functional Development Center (JMLFDC) recently adopted a new collaborative approach for managing the Defense Medical Logistics Standard System (DMLSS). The JMLFDC team drew inspiration from the Web design and programming worlds and implemented the Scrum process, a strategy of implementing the iterative and incremental Agile project management philosophy.

The activity, a component of the Solution Delivery Division (SDD) within the Defense Health Agency (DHA), has six teams that hold daily Scrum meetings focused on their area of the DMLSS application. Their weekly Scrum of Scrums meeting provides context for short updates that help the leadership track several complex projects and enables co-workers to collaborate more easily.

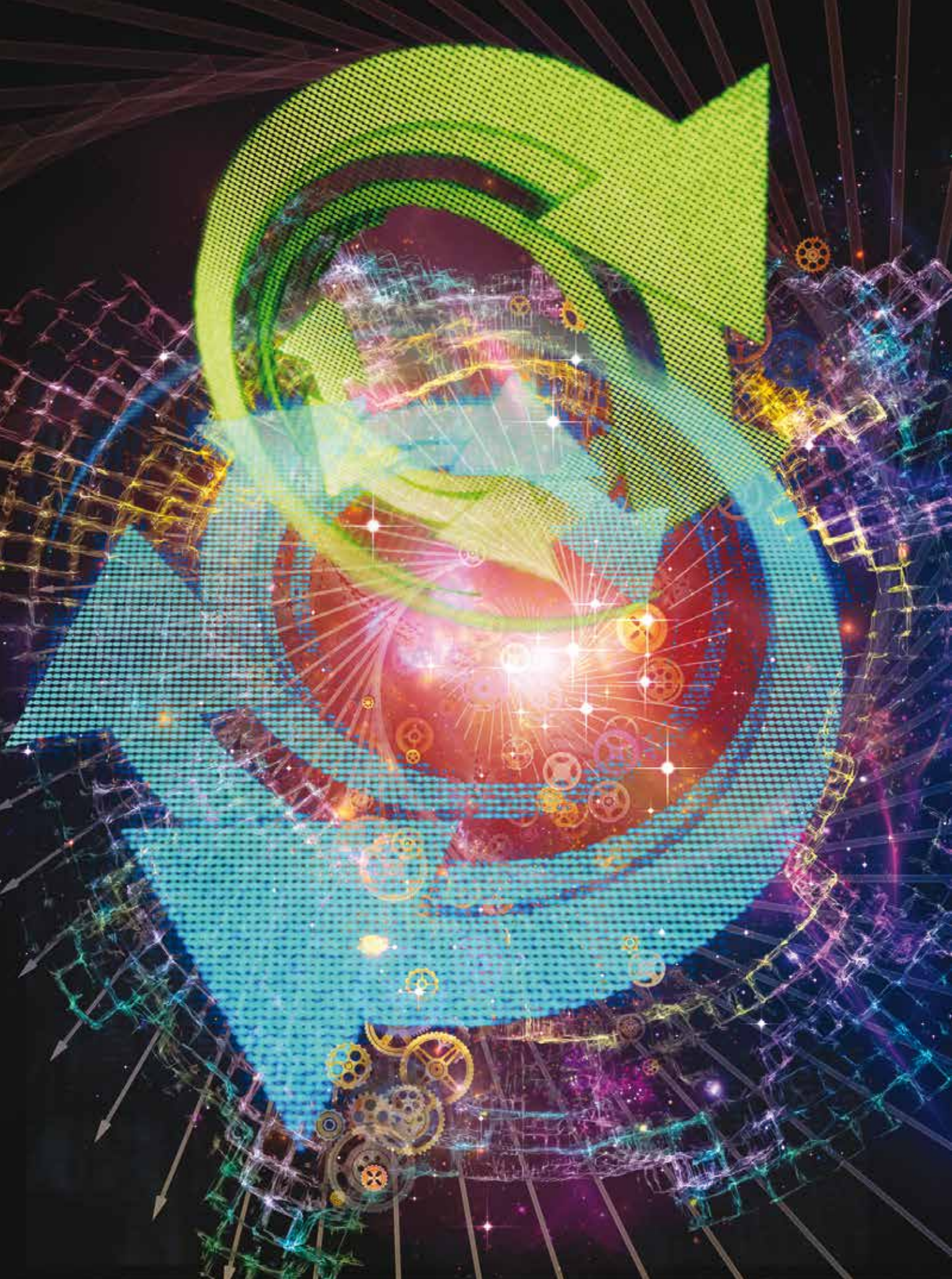
DMLSS is an information technology system within the Defense Medical Logistics—Enterprise Solution (DML-ES) portfolio. The DML-ES portfolio provides a continuum of medical logistics support for the Department of Defense. DMLSS delivers an integrated information system that allows customers to order medical supplies for the best value, implement just-in-time logistics, and helps hospitals and clinics manage facilities and maintain medical equipment.

What Is Scrum?

Scrum was first developed in the early 1990s in the Information Technology (IT) sector in response to failures of traditional project management techniques to factor in the complexity and unknowns that many knowledge creation fields such as IT have at their core. Scrum is part of the Agile movement and borrows many principles from lean manufacturing philosophy. Agile doesn't provide concrete steps that an organization can implement, but Scrum provides the concrete tactics necessary to successfully put into practice the Agile Methodology.

"Development was based on empirical 'inspect and adapt' feedback loops to cope with complexity and risk. Scrum emphasizes decision making from real-world results rather than speculation," explained Michael James, a Scrum expert who coaches companies on implementing Scrum methodology in his publication, *The Scrum Reference Card*. He

Raps *is chief of the Stakeholder Engagement Branch of the Solution Delivery Division within the Defense Health Agency's Health Information Technology Directorate.*



said that traditional project managers have known assumptions and production goals outlined in advance. But in a knowledge-creation field any uncertainties render constant assessments and modifications far more effective as management moves forward.

"Scrum is a simple set of roles, responsibilities, and meetings that never change," James said. "By removing unnecessary unpredictability, we're better able to cope with the necessary unpredictability of continuous discovery and learning." Each Scrum team maintains a list of items to be addressed at a future date, he added. This list, often called the project backlog, includes every request from the client, changes that were suggested in past review meetings and any other action item that would distract from the current set of priorities but should be addressed at a later date.

"Most project backlog items initially need refinement because they are too large and poorly understood," James said. "While backlog refinement is not a required event, it is a required activity."

Maintaining the organization of that backlog is an essential part of the groundwork for future development. James suggested keeping the items force-ranked (prioritized) based on feedback from key stakeholders. The order should consistently be revisited to make sure priorities haven't changed. The list should be visible to all stakeholders, any stakeholder (including the team) should be able to add items, and the items at the top should require less investment of time than items at bottom.

Scrum also has its own work cadence. In Scrum, time is divided into short work bursts, known as sprints, typically one week or two weeks long. The product is kept in a "finalized" (properly integrated and tested) state at all times. After each sprint, the team gathers to assess the updated, shippable product increment and plan its next steps. Change requests, and other feedback to come out of these assessment meetings then get added to a task list for later digestion and prioritization.

Scrum Adapted for the JMLFDC

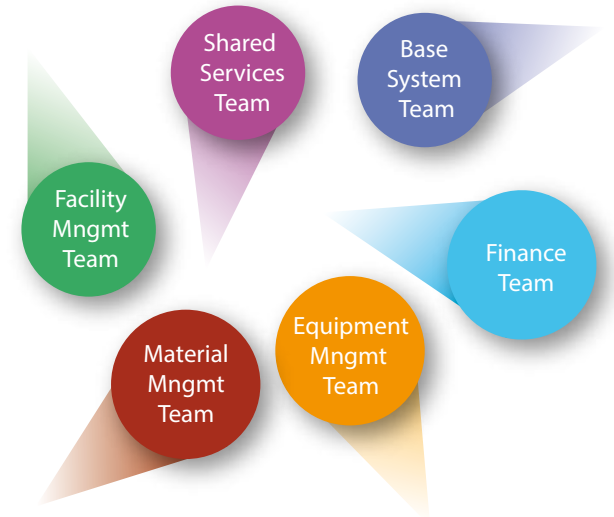
One of the drawbacks of the Scrum format is that it works best with a limited number of participants. Ideally, a Scrum team would have between five and nine members. That limitation has traditionally meant it is difficult to scale Scrum meetings in larger organizations, and that is the challenge faced by the JMLFDC team.

DMLSS Service Operations Manager Brenda Norris accepted the challenge and immediately adapted the Scrum model to the 40-member DMLSS project team by forming a "Scrum of Scrums" meeting made up of representatives of each of the six smaller Scrum groups, which continue their usual cadence and daily stand-ups.

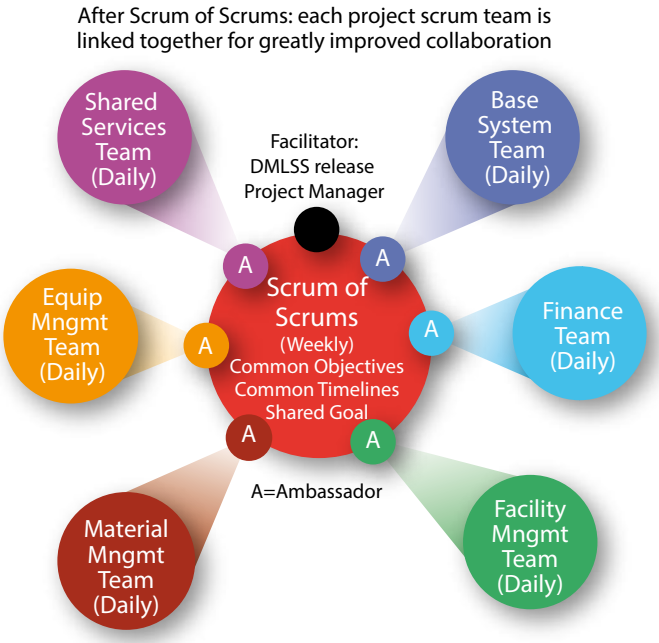
"The 'Scrum of Scrums' allows clusters of teams to discuss their work, focusing especially on areas of overlap and integration," Norris explained. "Each Scrum team has one member who is an 'ambassador' who participates in a meeting with ambassadors from other teams." She said the representative setup maximizes the efficiency of meetings by limiting the number of voices but also allows each Scrum group to provide an update on their progress and collaboratively discuss any challenges they're facing.

One challenge with scaling Scrum meetings for a large organization is that keeping the group small means that the organization can't hear from those best able to address certain

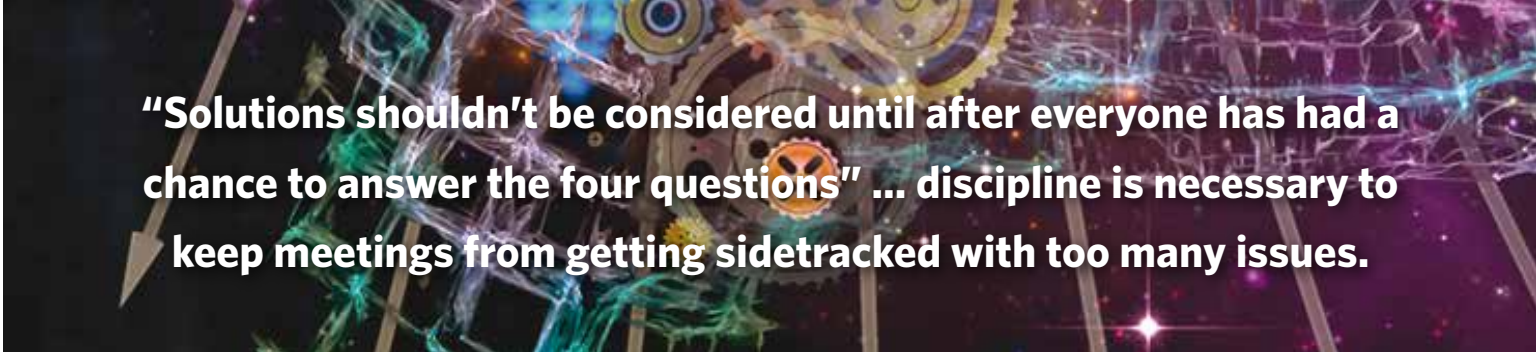
Figure 1. How Teams Work Before, After Scrums



Before Scrum of Scrums: each project scrum team work independently, often on duplicate initiatives or at cross purposes



Source: Defense Health Agency



topics that arise. This in turn means that it is crucial to have the right balance of technical expertise on the Scrum team. "When requirements are uncertain and technology risks are high, adding too many people to the situation makes things worse," James explained. "Grouping people by specialty also makes things worse. The most successful approach to this problem has been the creation of fully cross-functional 'feature teams,' able to operate at all layers of the architecture in order to deliver customer-centric features." (Figure 1.)

The Scrum of Scrums meetings are flexible and can bring the right voices to the table. According to Norris, "Attendees should change over the course of a typical project and should be in the best position to understand and comment on the issues most likely to arise at that time during a project."

The DMLSS Implementation

The DMLSS team's Scrum of Scrums is conducted weekly and usually lasts 30 to 60 minutes. The goal is to keep the meetings short and fast-paced. Meeting weekly allows issues to be discussed and resolved more consistently and helps keep the meetings short. Because the format is flexible, some teams choose to meet twice a week for 15 to 30 minutes.

During the meeting, one ambassador from each Scrum group provides updates and discusses areas of integration and overlap with other Scrum groups. "These meetings result in a more unified view of the product release," Norris said, "The Scrum of Scrums meetings eliminate the chance of redundant work being done in the same scope area."

Norris said during the first half of the meeting, each participant answers the following four questions:

- What has your team done since we last met?
- What will your team do before we meet again?
- Is anything slowing your team down or getting in its way?
- Are you about to put something in another team's way?

These questions usually spark discussions of problems and other points of friction, but "problems should be raised," Norris noted. "However, solutions shouldn't be considered until after everyone has had a chance to answer the four questions." She said discipline is necessary to keep meetings from getting sidetracked with too many issues.

After each ambassador has answered all four questions, Norris said the focus of the meeting shifts to resolve problems and discuss issues. Participants address any issues, problems or challenges raised during the initial discussion or previously identified and maintained on the master action item list.

Much like the daily meeting of the six project Scrum teams, the weekly Scrum of Scrums meeting also includes a list of items to be addressed at a later date, she added. These include any issues, problems or challenges not addressed during the meeting but managed and worked through a prioritized action item list.

Is Scrum Right for Your Organization?

James advised managers considering a Scrum approach to look seriously at the type of work their team does. "Scrum is intended for the kinds of work people have found unmanageable using traditional processes: uncertain requirements combined with unpredictable technology implementation," he said. He added that managers should emphasize that Scrum was not originally intended for established, repeatable types of production and services but rather for developing new paths through knowledge creation. He said managers should also "consider whether the underlying mechanisms are well-understood or whether the work depends on knowledge creation and collaboration."

Norris and the JMLFDC team found that scaling up Agile Scrum into a broader-view Scrum of Scrums proved to be an effective way of facilitating collaboration within a large team. She said the team has felt the positive impact of the Scrum method. "Since we implemented Scrum of Scrums, we were truly able to identify and eliminate redundant work and resolve interdependencies and/or roadblocks between product Scrum teams much earlier in the cycle," she explained. "Also, during each meeting we collectively discuss what 'done' means for the product as a whole, resulting in a more unified view of the product being released."

In situations of great uncertainty, Scrum is ideal, Norris suggested. Where new programs are being developed, or where knowledge is being created, she said Scrum's simple, flexible principles can be easily adapted for many different types of complex projects. Norris added that while many teams don't fully implement Scrum to its full extent and simply choose elements they like, their experience demonstrates that fully embracing the Scrum methodology can result in significantly greater clarity, collaboration and team cohesion in working toward a common goal.

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SURVEY

Rules Needed for Buying Pre-Owned Equipment

Tyler Turpin

The Federal Acquisition Regulations (FAR) and the Defense Federal Acquisition Regulations Supplement (DFARS) have no policies specific to purchases of pre-owned equipment. Some state governments do have policies in their equivalents of the FAR. Because the aircraft were in different configurations, there were production delays in two programs purchasing multiple pre-owned aircraft and converting them to Intelligence, Surveillance and Reconnaissance (ISR) uses.

The purchase of used equipment that has no or minimal condition issues and is suitable for agency needs can reduce the budgetary impacts of purchase price and costs that would result from delay while awaiting equipment delivery. In the case of equipment converted for specific purposes, the design cost and time also would be reduced.

Portions of Part A of FAR Part 7.105 "Contents of Written Acquisition Plans" are applicable in determining whether it is a sound business decision to purchase pre-owned equipment. An extract of that section follows:

Turpin *began his acquisition career with positions in the Federal government. He is a certified Virginia Contracting Officer who has worked for 11 years for local and state agencies in the Commonwealth of Virginia.*

(a) Acquisition background and objectives—
(1) Statement of need. Introduce the plan by a brief statement of need. Summarize the technical and contractual history of the acquisition. Discuss feasible acquisition alternatives, the impact of prior acquisitions on those alternatives, and any related in-house effort.
(2) Applicable conditions. State all significant conditions affecting the acquisition, such as—
(i) Requirements for compatibility with existing or future systems or programs and
(ii) Any known cost, schedule and capability or performance constraints.

Some states' procurement policy manuals set out the requirements for purchases of pre-owned equipment.

The Commonwealth of Kentucky's *Finance and Administration Cabinet Manual of Policies and Procedures* part FAP 111-53-00 allows for reconditioned, demonstrator or "factory-seconds" products or equipment if:

(a) The purchase is fully justified;
(b) The products or equipment are of proven value to and meet the needs of the agency;
(c) The products or equipment are available at fair market prices;
(d) An independent appraisal of the products or equipment, attesting to the current market value, accompanies the request;
(e) The purchase is in the best interest of the Commonwealth.

Section 4.17 of the Commonwealth of Virginia's *Agency Procurement and Surplus Property Manual* requires the following documentation for purchases of pre-owned and/or used equipment: price is fair and reasonable, verification of the condition of the equipment, its future usefulness, and that its purchase would be in the best interest of the Commonwealth.

There is a sub-factor not mentioned in the policies of Virginia and Kentucky for determining if the purchases are in the best interest of the agency. If several units of equipment of the same make and model are being purchased, the purchasing agency must verify that all are the same in every aspect of configuration. If they are not in the same configuration, maintenance process and parts inventory may require specific procedures and parts for each unit. If they are to be converted for agency use and are not in the same configuration, each unit may require a specific conversion plan to obtain that status—and that requirement will create added project cost and delays. This happened to the U.S. Air Force in 2008–2009 with the MC-12 Liberty aircraft program.

The MC-12 program was initiated in spring 2008 through findings of the ISR Task Force that the Defense Secretary had directed to address the ever-increasing Combatant Commander's requirements to satisfy ISR capabilities shortfalls in ongoing Overseas Contingency Operations. The first MC-12 combat missions were flown in June 2009 and the first what would eventually number 42 airframes were operational in March 2009. The MC-12W is the Air Force's multi-role, medium-altitude, manned aircraft system performing an ISR mission coupled with a target acquisition capability. Four-member MC-12 aircrews fly the aircraft, a modified King Air 350 commercial plane, to augment information gathered by other intelligence-collection capabilities operating in theater by providing real-time full-motion video and signals information to help military leaders make battlefield decisions.

The MC-12 program was dubbed the Project Liberty Program as a nod to a World War II effort that quickly modified for wartime needs a commercial ship design and brought it into large-scale production to carry personnel, equipment and supplies. The Liberty Ship program moved forward in much the same way as the Air Force had fielded the MC-12.

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A key aspect of this rapid process from identifying a need to operational use of a response was the selection of a commercial aircraft design already in production—the Hawker-Beechcraft King Air 350. Eight pre-owned aircraft were purchased from private sector owners to be converted at an L-3 Corporation facility from passenger to ISR use while a contract was negotiated with Hawker-Beechcraft for the manufacture and delivery of new aircraft to L-3 Corporation's facility without passenger compartments installed. One was not converted.

Because there were differences in their configurations, each of the seven aircraft had to have a conversion plan to an ISR aircraft custom written in order to standardize and convert them all. This delayed the program. Bob Spivey (in 2009, L-3 Corporation's vice president of special programs) said: "Each aircraft had a different story to tell. One had a special cooling system installed to transport many bottles of wine. All of that had to be ripped out and specially rewired to accommodate the sensor packages."

Only seven of the eight aircraft were converted. Retired Air Force Lt. Gen. David A. Deptula—during the MC-12 program's first 2 years the Air Force's first Deputy Chief of Staff for ISR—said: "Those initial hiccups in the program were because the first seven MC-12 planes were individually converted from commercial use. Each of them was a bit different, and it wasn't until airplanes started flowing off the Hawker Beech line that standardization could be implemented. But those difficulties were overcome quickly, and the completed aircraft were out to the field in record time."

The MC -12 program used the Fast, Inexpensive, Simple, and Tiny (FIST) process. FIST as "a decision-making framework" aims to facilitate good decisions by guiding them toward opportunities to streamline, accelerate and simplify various program dimensions. The MC-12 program shared elements with some of the most successful Department of Defense (DoD) programs over the past decade that operated outside the traditional acquisition framework to deliver warfighter capabilities rapidly. The elements were: Urgent warfighter needs, short operational timelines, senior leadership attention, and sufficient funding. In a 2010 interview, then Lt. Gen. Tom Owen, commander of the Aeronautical Systems Center and the Air Force's program executive officer responsible for buying and modernizing aircraft systems, said: "Despite its difficulties, when really tested, the acquisition community can perform with incredible agility. Some of our most successful programs [came about by being] challenged with doing something really quickly." The MC-12 Liberty is a notable ASC example, with an entire squadron of ISR aircraft fielded in less than 10 months from concept to combat.

The MC-12 program was a repeat from 43 years before. In 1965, while the United States and its allies had forces deployed in the Southeast Asian wars, DoD purchased a commercial-off-the-shelf (COTS) aircraft for battlefield reconnaissance to supplement those that were designed for Armed Forces use in the Forward Air Control role. In 1965, the Air Force did not expect to have enough OV-10s in Southeast Asia to replace the O-1 prior to 1968. It therefore chose the O-2, a Super Skymaster (Cessna Model 337 General Aviation aircraft) as a COTS interim replacement, because it was readily available and required no major modifications. Manufacturers supplied 532 O-2 aircraft to the DoD from 1967 to 1970 under an Air Force contract. DoD agencies operated some O-2 aircraft until 2010.

The first seven MC-12 are not the only pre-owned aircraft used for other than training or airlift roles currently in the DoD inventory.

E-8 Joint Surveillance Target Attack Radar System (JSTARS) aircraft were purchased in the 1990s as Boeing 707-300 series passenger and cargo aircraft that had seen 25 to 30 years of service by firms carrying passengers or cargo. The E-8C is a modified Boeing 707-300 series commercial airframe extensively remanufactured and modified with the radar, communications, operations and control subsystems required to perform its operational mission. The E-8C JSTARS, is an airborne battle management, command and control, ISR platform. Its primary mission is to provide theater ground and air commanders with ground surveillance to support attack operations and targeting that contributes to the delay, disruption and destruction of enemy forces. There were procurement cost overruns in the program partly because it required more effort and resources than expected to refurbish the 25- to 30-year-old 707 airframes.

The two non-DoD-owned U.S. Government aircraft most often seen on photo and video in the last quarter of the 20th and the early years of the 21st century were former airline aircraft used by the NASA Space Shuttle program. That program carried out many flights fully or partially dedicated to DoD. Two Shuttle Carrier Aircraft (SCAs) were used to ferry space shuttle orbiters and the nonspace-fight-capable test vehicle Enterprise from landing sites back to the launch complex at the Kennedy Space Center in Florida and to and from other locations too distant to allow delivery by ground transport. The performance of the two former airline plans was identical to that of the SCAs. Both were Boeing 747 aircraft purchased from airlines.

The policies of several states on purchases of pre-owned equipment and the lessons of the MC-12 and E-8 programs indicate that the Federal Acquisition Regulatory Council and the Defense Procurement and Acquisition Policy office should develop and implement policies on such. It should also be noted that a Department of Commerce report identified 83 nations that permit the unrestricted importation of pre-owned medical devices. Twenty-three of those nations have laws or policies that prevent or discourage government-operated health-care institutions from purchasing pre-owned equipment.

The author can be contacted at **tylerturpin@verizon.net**.

Kendall, Four Others Inducted into DAU Hall of Fame

McKinley Receives Acker Award

The Honorable Frank Kendall, right, former Under Secretary of Defense for Acquisition, Technology, and Logistics, accepts a 2017 Hall of Fame award from DAU President James Woolsey.

Frank Kendall, former Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L]), was the first of five new honorees inducted into the Defense Acquisition University (DAU) Hall of Fame on June 15, 2017, at DAU's Fort Belvoir, Virginia, campus. Kendall was a regular contributor to *Defense AT&L* magazine. At the same ceremony, Gen. Craig R. McKinley, U.S. Air Force-retired, received the DAU Alumni Association (DAUAA) 2017 Acker Skill in Communication Award.

Kendall was recognized for his steadfast commitment to the Department of Defense (DoD), the Defense Acquisition Workforce as well as the great support he provided DAU, often by engaging Defense acquisition students directly

in the classroom. Over 5 years, Kendall wrote 27 articles for *Defense AT&L* detailing acquisition policy during his term as Under Secretary. New approaches under Better Buying Power were a key focus of the articles, which appeared in every issue but one from the July-August 2012 issue through the January-February 2017 issue.

The articles, with later updates, formed the basis for his book, "Getting Defense Acquisition Right," published in 2017 by DAU Press. Kendall also initiated an annual *Report on the Performance of the Defense Acquisition Workforce* that has provided hard data on DoD's efforts to improve purchasing services and materiel for U.S. warfighters. The citation for Kendall's Hall of Fame award states: "He embodied the concept of 'leader as teacher' through his extensive participation in DAU classes and his many keynote addresses at acquisition events. Because of his strong support, DAU significantly expanded its mission assistance program to provide customized workshops to help field organizations improve acquisition outcomes. His strategic direction was crucial to DAU achieving international recognition as a premier training organization."

At the induction ceremony, Pat Wills, dean of the Defense Systems Management College, said of Kendall: "He has dedicated his life and his passion to commitment to this great nation and keeping it free. ... He has had an impeccable career in which he has spanned not only the service as a uniformed military member, as a senior executive within the defense industry and also as our Defense Acquisition Executive and in other roles as a member of this Senior Executive Service." Wills added, "It's an incredible testament to the passion that he personifies."

John Higbee, director of DAU's Professional Learning Directorate, said: "He has been somebody who has been able to communicate in an exemplary way, particularly with respect to using stories and personal experience to illuminate points that he's wanted to make, both in writing and speaking. I've never seen anybody do it better. ... He has basically taken the data that we have, worked to improve it, and then made it fundamental to the way that he and the leadership of the Services and DoD make decisions. ... Keeping the end in mind, Mr. Kendall has always had the welfare for the warfighter and the ability of the acquirer to support the warfighter as his core intent and his core motivation."

René Thomas-Rizzo, director of the Human Capital Initiatives in the Office of the USD(AT&L), said: "There is no greater advocate for the acquisition workforce than Frank Kendall. His commitment and his passion are the direct reasons why we have the most qualified acquisition workforce since the inception of DAWIA [the Defense Acquisition Workforce Improvement Act]. ... Our certification rates are at an all-time high. Our workforce is highly educated. We've almost doubled our bachelor's degrees across the acquisition workforce over the past few years. "Mr. Kendall's energy and untiring advocacy of the acquisition workforce and the acquisition professionals is his legacy," she said. "We miss him greatly, but the things that he has done for acquisition and the acquisition workforce will be around for many years to come. Thank you Mr. Kendall for all of your help and all of your support over these past few years."

A recording of these remarks about Kendall is available at the new DAU media site: https://media.dau.mil/media/Frank+Kendall+Hall+of+Fame+Induction+2017/0_xmmi8lqw.

The other four honorees were Dick David, former DAU director of workforce development; Michael Lacroix, former DAU department chair and international chair; Tim Shannon, former dean of DAU's Capital and Northeast Region, and former director of the Learning Capabilities Integration Center; Jesse Stewart, former director of Major Defense Acquisition Programs and former professor of Program Management.

David was recognized for expanding the professionalism of the university's faculty and staff and providing opportunities to capture knowledge and transfer key skills from veteran employees to future DAU leaders. Lacroix was "widely acclaimed for his teaching excellence and dedication to student success, leading to his selection as one of the first three professors to receive the DAU Distinguished Teacher Award." Shannon's award stated: "As faculty member, department chair, and dean, [Shannon] supervised the highly effective delivery of nearly 100 training courses to thousands of members of the acquisition workforce. Through his leadership and vision while serving as director of DAU's curriculum development organization, he evolved DAU's learning architecture to meet customer needs for training and continuous learning, as well as significantly enhancing the faculty development program." Stewart was honored for creating the worksite Mission Assistance programs that impacted numerous program managers and program executive officers, as well as developing learning products and information-sharing processes that improved teaching methods and learning capability for students. The award for his citation stated: "Stewart significantly improved course effectiveness and established functional integrated product team processes adopted by all functional areas. He also developed Acquisition Program Transition Workshops to achieve timely start-up of new programs and better collaboration between government and industry."

Gen. McKinley, a former president and chief executive officer of National Defense Industrial Association, received the DAUAA Acker Award in part for bringing together industry and government personnel to address national security issues and for effectively communicating with Defense Acquisition Workforce members.

For recordings of the full ceremony and awardee tribute videos, go to https://media.dau.mil and search "Hall of Fame." &

This article was compiled by the editors of Defense AT&L *magazine from the DAU Communications staff records.*

LETTER TO THE EDITOR

The article about workshops, "If Only Our Training Could ..." by Brian Schultz and Jeffrey Megargel in the July-August, 2017, issue of *Defense AT&L* magazine, reminded me of the "tabletop exercises" I developed working at the Center for Naval Analyses several years ago—and later as a management consultant.

With actual operators, engineers, logistics specialists and contracting officer representatives (CORs) around the table, we ran scenarios using the product/system in question. As the scenarios unfolded, the operators injected real-world events (based on their own experiences) impacting the operations and the efficacy of the product and/or system. Events involved security (e.g., sniper attacks and chemical and biological weapons sliming of roads, containers or cranes), logistics and port throughput, and personnel-related issues (strikes or other host nation support-related facts of life), just to mention a few. The active participation of operating personnel ensured credibility and focus.

Tabletops also were developed to train teams (often made up of military Reservists) prior to arrival in theater and are a source of potential benefit for CORs, who did not always appreciate the need for timely arrival of specialized repair parts in-theater and/or procurement in large amounts. Tailored checklists (e.g., for facilities hardening) and/or small field training manuals were prepared prior to or as a result of the sessions.

Sincerely,
Eugene A. Razzetti, CAPT, U.S. Navy (Retired)
Auditor and Management Consultant
Alexandria, Virginia

NOTE FROM THE EDITOR

Defense AT&L magazine encourages its readers to comment and contribute in these pages to the ongoing discussion of defense acquisition.

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@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. For each article submitted, please include three to four keywords that can be used to facilitate Web and data base searches.

Receipt of your submission will be acknowledged in 5 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 up 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 with 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 suitable for 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.**

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