2020

Major General Harold J. "Harry" Greene Awards *for* Acquisition Writing

An Inspirational Leader and a Great Communicator

by Lt. Gen. Robert L. Marion

"What I'll always remember about Harry is that he was a true patriot and the epitome of what we hope and expect of our senior leaders—a leader who is competent, able to do whatever job is given to him and to do it to the best of his ability with commitment to Soldiers, the Army, the nation, the mission and able to balance that with commitment to his family."

—Army Chief of Staff General Ray Odierno (2011-2015)
Aug. 14, 2014

In his 34 years of distinguished service to the Army and the nation, Maj. Gen. Harold J. "Harry" Greene left a lasting impression on everyone who came in contact with him and especially those of us who served with him. He was an inspirational leader and a great communicator, with a unique blend of humor and humility. He brought out the best in people.

Harry always put Soldiers first. He was passionate about providing our men and women in uniform with the most technologically advanced equipment available anywhere on Earth so they could deter conflict or return safely from war. I know firsthand, because while he served as the deputy for acquisition and systems management to the assistant secretary of the Army for acquisition, logistics and technology at the Pentagon, I was privileged to serve as his deputy. I witnessed his dedication to mission and commitment to excellence every day.

I also witnessed his genuine care for others and the work they do. He always made time to talk to members of his team, or anyone for that matter, who sought him out. He was a great listener who gave great advice. He often challenged others to accomplish things that they thought were completely outside their capabilities. He knew they could do it. When they did it, he was overjoyed by their success.

Harry would be extremely proud of the success of our writing competition in his honor. The Major General Harold J. "Harry" Greene Awards for Acquisition Writing is in its seventh year. It continues to challenge prospective authors to think critically and write persuasively on topics in one of four categories: Acquisition Reform, Future Operations, Innovation, or Lessons Learned.

This special supplement of Army AL&T magazine showcases the 2020 winners and honorable mentions. The difficult task of selecting the absolute "best of the best" is made easier by the expertise of our senior military and civilian leaders who so honorably serve as our judges. They spend a lot of time reading, reviewing and ranking the submissions, and we are grateful for their time and talent.

My congratulations to the winners and honorable mentions, and my very best wishes to all who participated in the seventh annual Major General Harold J. "Harry" Greene Awards for Acquisition Writing competition. I also want to express my sincere thanks to the family, friends and colleagues who supported the authors in their important work.

2020 Major General Harold J. "Harry" Greene Awards for Acquisition Writing

The winners and honorable mentions are:

Category: Acquisition Reform

Winner: Evolutionary Acquisition: Closing the Loop and Fulfilling the Promise of Rapid Cyber Acquisition

Authors: **Fianna Litvok** is the Communications Lead for Applied Cyber Technologies, within the Program Executive Office for Enterprise Information Systems (PEO EIS). She also serves part time as a military intelligence chief warrant officer in the U.S. Army National Guard's 91st Cyber Brigade. She holds an M.A. in English from Stony Brook University, and is certified in Scalable Agile Frameworks for Program Owners/Program Managers and Information Technology Infrastructure Library.

Bonnie Evangelista is the Deputy Product Lead for Applied Cyber Technologies, leading efforts to provide the infrastructure and environments necessary for defensive cyber innovation and integration. In her previous role, she served as the senior contract specialist with Army Contracting Command – Rock Island, leading all Other Transaction Authority prototype project awards in support of the Project Manager Defensive Cyber Operations within PEO EIS. She has an MBA from Liberty University and B.As in political science and Spanish from Virginia Tech.

Abstract: The cyber domain is a fast-paced, constantly evolving battlefield. Threats, tactics and even threat actors themselves, change rapidly. The only way to fight—and defeat—these threats is to provide the U.S. Army's world-class cyber defenders with the best technology as quickly as possible. Applied Cyber Technologies (ACT), a product office within Defensive Cyber Operations (DCO), in U.S. Army's Program Executive Office Enterprise Information Systems (PEO EIS), was stood up in 2018 specifically to find ways to rapidly develop, deliver, field and sustain advanced defensive cyber capabilities. Unfortunately, at the time, DOD's acquisitions guidance was still steeped in linear, encumbered processes, which don't work for the cyber domain. In the absence of existing agile frameworks, ACT looked for ways to fulfill its mission. The group developed an unprecedented model to provide cutting-edge defensive cyber capabilities to cyber defenders, much more quickly and much more cost-effectively than ever thought possible. This essay describes how the integration between development and delivery, and fielding and feedback, provides the speed and agility required by dynamic domains such as cyber.

Honorable Mention: Transition to Sustainment, Not a One-Time Baton Toss

Author: **Nicholaus Saacks** is Director of the Readiness Management Division for the Program Executive Office for Command, Control and Communications – Tactical (PEO C3T). He holds an MBA and a B.S. in marketing from Spring Hill College. Mr. Saacks is Level III certified in life cycle logistics, Level I certified in program management, and is a member of the Army Acquisition Corps and a DAU Senior Service College Fellowship graduate.

Abstract: Many Army stakeholders mistakenly perceive a system's transition from a program office to its sustainment command as a one-time baton toss, focusing on the final transition to sustainment (T2S). In order to effectively plan, execute and monitor T2S, we must reach common agreement on its very definition. Exist-

ing regulations and budgeting guidance provide clarity on T2S, what actually transitions, how it is resourced, and when the transition can happen in a program's life cycle. This clarity lays the framework for the gradual transition of sustainment functions from the Project Manager (PM) to the sustaining organization over time, beginning as early as first unit equipped. The sustaining organization is able to budget for fiscal and personnel resources throughout this gradual transition, so the final T2S serves as an administrative check instead of the focal point of transition. Using this construct of T2S, the Army enterprise should focus on the four primary sustainment funding types to gain a better indication of the sustainment level of effort and resources needed throughout the life cycle and not just at the final T2S. In doing so, the Army enterprise gains a more accurate view of each system's transition to sustainment, which results in better knowledge of the timing of sustainment requirements and responsibilities.

Category: Future Operations

Winner: Maximizing Commercial-Off-the-Shelf (COTS) Technology in Army Acquisition: The Impact of Army-Unique Requirements on Program Executive Office Combat Support and Combat Service Support's Ability to Field 'Best Value' COTS in the Future

Authors: **Erin Tromley** is the Systems Engineering (SE) Lead for the Program Executive Office for Combat Support and Combat Service Support (PEO CS&CSS), responsible for the staff-level systems engineering support to 150-plus active programs of record, including technical documentation and artifact reviews, as well as the development of SE policy, training, and tools. Prior to joining PEO CS&CSS, she served as the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)) System of System Engineering and Integration (SoSE&I) Deputy Division Chief for Integration and Planning, charged with developing an ASA(ALT) IMS supporting Capability Set evaluation, Army modernization, technology maturation, and fielding efforts. She earned a bachelor's degree in industrial and operations engineering from the University of Michigan and is pursuing a master's degree in engineering management from Kettering University. She is DAWIA Level III-certified in Program Management and Engineering.

Dr. Peter Schihl is a member of the Scientific and Professional (ST) cadre of the Senior Executive Service and serves as the United States Army's Senior Research Scientist in Ground Vehicle Propulsion and Mobility at the U.S. Army Combat Capabilities Development Command (DEVCOM) Ground Vehicle Systems Center (GVSC). His current research interests are internal combustion engines, powertrain systems, power generation devices, power pack systems, energy storage devices, and power transfer elements. He first joined the Army civilian workforce at the Tank Automotive Command Research, Development and Engineering (TACOM RD&E) Center in 1991 and has worked in the GVSC Propulsion Laboratory since 1993.

His research throughout the last 20-plus years has concentrated on developing and experimentally validating simplified combustion and ignition models for military relevant diesel engines, including a focus on combustion characteristic differences between diesel fuel and JP-8. To date, many articles have resulted from his work and he has received the "Best Paper in Session" award at the 1996, 1998, 2000, 2004, 2006, 2008, and 2010 Army Science Conferences and twice has received Department of Army Research and Development Achievement Awards (2005 and 2009). He also received an Arch T Colwell award from the Society of Automotive Engineers (SAE) for one of the best published papers during 2013 and has published in venues such as Combustion and Flame, the International Journal of Engine Research, the International Journal of Fuels and Lubricants, and the Journal of Engineering Gas Turbines and Power. Dr. Schihl is a reviewer for SAE, the American Society of Mechanical Engineers (ASME), and the International Journal of Engine Research in his subject field of expertise, and since 1998 has been an invited reviewer at various Department of Energy (DOE) Advanced Compression Ignition Engine Technology National Lab reviews. He additionally serves as a review editor for the Frontiers in Mechanical Engineering Journal with a focus on specialty engine and automotive engineering and has been a member of the original DOE Partnership for a New Generation Vehicle 4SDI engine team and then the following FreedcomCAR and US DRIVE Advanced Combustion and Emissions Control team since 1998.

Dr. Schihl also has supported numerous ground vehicle product managers addressing development and production engine issues along with lending expertise toward

finding engine repower solutions for various wheeled vehicle platforms. After the onset of Operation Enduring Freedom, he was the Army's engine technology lead on obtaining national security exemptions from EPA emission standards for both wheeled vehicles and stationary power sources, and today is still active in aiding various product managers sorting out complex engine emission issues. During this same timeframe, Dr. Schihl spearheaded modification of the AEP-5 NATO engine durability certification test to both properly address real world ground vehicle jet fuel use policy and desert operating conditions facing Army ground systems, and this modified test protocol is currently being used by product managers and GVSC to assess the fitness of production intent engines for Army ground vehicle platforms.

Dr. Schihl earned a Ph.D. from the University of Michigan that was focused on high pressure spray combustion and has M.S. and B.S. degrees in mechanical and systems engineering from Oakland University, where he additionally played on the men's basketball team for four years. He also is a licensed professional engineer in the state of Michigan. Previous to the Army, he worked as a graduate research assistant at Oakland University studying a non-destructive optical technique for assessing thin coating thermal properties and also was a research assistant at the General Motors Research Laboratory studying the use of telemetry for indirectly measuring tappet stress in a 3.1 liter Chevrolet engine.

He is an adjunct faculty member at Lawrence Technological University, where he has taught heat transfer, advanced thermodynamics and combustion courses and has been a member of various doctoral committees in the area of diesel engine combustion research at Wayne State University, University of Michigan and Lawrence Technological University. Dr. Schihl is also a special lecturer at Oakland University, where he teaches internal combustion engine courses and is a part-time faculty member at Wayne State University, specializing in internal combustion engines and combustion processes.

Dr. James Dusenbury is the Senior Technical Expert for U.S. Army Combat Capabilities Development Command Ground Vehicle Systems Center Force Projection Technology Area and has been involved in research and development in this area for over 23 years. He has a B.S. in chemical engineering from Worcester Polytechnic Institute and a Ph.D. and an M.S. in environmental engineering from Pennsylvania State University. As the Force Projection Technology (FPT) Senior Technical Expert he is responsible for providing technical and programmatic expertise to the Associate Director, Division Chief, Branch Chiefs and Engineers for the development and execution of strategic plans, program plans and technology development projects, for combat support and combat service support technologies and systems.

He shapes the research and development (R&D) program by coordinating efforts with combat developers and PM offices to develop an integrated, strategic R&D plan for new and improved Force Projection Technology systems and capabilities. FPT covers a wide range of technology areas including water treatment, storage, distribution, monitoring; petroleum storage, distribution and monitoring; fuel and lubricant technology; military bridging technology; material handling equipment; and construction equipment. FPT provides life cycle support in these areas to the Product Manager for Petroleum and Water Systems, Product Manager for Bridging, and Product Manager Combat Engineer/Material Handling Equipment. FPT is also the life cycle manager for all Army ground systems fuels and fluids. Current areas of research and development within FPT include gray water reuse for laundries and showers, wastewater treatment and energy scavenging, development of a system to produce water on the move, defining a military brake fluid for anti-lock brake and stability control systems, development of a fuel efficient gear oil, studying and improving the lubricity of jet fuel, defining fuel contamination limits, studying tribofilms formed by nanoparticle tribosintering, molecular dynamics modeling of tribology and coatings, and studying the impact of ionizing radiation on water treatment membranes.

Joseph Keusch is the Engineering Division Chief for Project Manager, Transportation Systems. He has a B.S. in electrical engineering and an MBA from Wayne State University. He is a member of the Army Acquisition Corps and is Level III certified in System Engineering and Program Management.

Timothy Kler retired in March 2020 after 39 years of federal service. He was the senior system engineer for Project Manager, Transportation Systems focusing on trends in the commercial truck industry's plans for power trains and connectivity. Mr. Kler has a B.S. in mechanical engineering and is Level III certified in Engineering & Test as well as Program Management.

Thomas Banks entered civil service in 2009 and is currently the Technical Integration and Program Management Division Chief for DEVCOM GVSC Ground Vehicle Survivability and Protection. Prior to assuming his position as Division Chief, Mr. Banks has held a broad range of acquisition assignments including: Chief Integration Engineer Project Manager Transportation Systems/ Force Protection, Chief Engineer Bridging, Assistant Program Manager, and Lead Platform Engineer.
He attended Kettering University, where he earned a bachelor's degree in mechanical engineering. Later, he attended Lawrence Technological University, where he earned an MBA. Thomas is a member of the Army Acquisition Corps and is Level III certified in SPRDE and Program Management

Rakesh Patel is the Assistant Associate Director for the Ground Vehicle Robotics (GVR) at the Ground Vehicle System Center (GVSC) of DEVCOM. Mr. Patel leads the advancement of the ground vehicle robotics technologies portfolio which includes manned and unmanned teaming, autonomous logistic resupply, dismounted systems, robotics human machine interaction, robotics control systems, autonomy architecture, agile software development, and artificial intelligence-based capabilities.

Prior to joining the GVR organization, he was responsible for developing and transitioning propulsion system, auxiliary power, energy storage, power and thermal management, and vehicle electronics technologies to both current and future ground vehicles. His engineering work experience at GVSC spans 29 years in the following organizations: Ground Vehicle Robotics, Ground Vehicle Power and Mobility, Software Engineering Center, Intelligent Systems, and Vetronics Technology Area.

He holds his BSEE from University of Illinois and MS in EE/CS from Oakland University. He is a member of the Army Acquisition Corps.

Abstract: For Program Executive Office for Combat Support and Combat Service Support (PEO CS&CSS), technology planning means something quite different than the technology planning and development conducted within other PEO organizations. Those organizations are typically developing military-unique requirements with limited commercial applications. For PEO CS&CSS, equipping the Soldier means leveraging commercial technology. With limited Army Science and Technology (S&T) efforts or Army Cross Functional Teams (CFT) aligned directly with the PEO CS&CSS portfolio, and the majority of its new programs entering at Milestone C, acquisition strategies rely heavily on Industry research and technology development to procure the best value materiel solution for the Army. That is why the PEO CS&CSS Vision is: "We are the Army's Acquisition experts for Commercial and Non-Developmental Items—rapidly delivering capabilities that reduce Soldier exposure, optimize manpower, and enable sustained mobility, lethality, and the network." Systems using Commercial off the Shelf (COTS) components and technology means that PEO CS&CSS' focus shifts from design to integration. The procurement of COTS components and technology allows PEO CS&CSS to procure and field the best and latest technology, paid for by Industry Research and Development (R&D), faster and at a lower cost to the Warfighter. This is critical as the Army aligns its S&T and program dollars to Army priority efforts and away from the combat support and combat service support portfolio. Commercial requirements, not Army requirements, are driving COTS technology advancements. Therefore, Army requirements for militarization or commonality may require costly military upgrades to COTS technology. Further, some of the Army requirements force PEO CS&CSS away from COTS altogether, requiring development programs for systems that have otherwise acceptable COTS solutions. As the pace of Industry technology continues to outrun Army requirements development, budget planning, and acquisition timelines, PEO CS&CSS must remain aware of the risk of Industry technology divergence from Army requirements. This paper examines specific technology focus areas that put the Army on a clear path of divergence from COTS in the future, adding cost and schedule to future programs and limit our ability to take advantage of COTS technology improvements.

PEO CS&CSS and CCDC GVSC, in partnership with Industry partners, are working to ensure the next generation of power generation sets and tactical wheeled vehicle systems maximize the usage of COTS, are compatible with Industry Standards, are supportable, and have growth potential to meet the needs of our Soldiers. Increasing regulations on emissions worldwide will impact commercial availability of high sulfur fuel / Jet Propulsion (JP)-8 compatible engines. It is recommended that the Army relook its regulation for JP-8 as the single fuel on the battlefield, in comparison to

the potential cost of modifying COTS powertrains or procuring military unique engines in the next generation of tactical wheeled vehicles and power generation sets. The Army will realize additional performance with the ability to procure modern commercial powertrain technology, including improvements in power density, vehicle thermal management, and fuel efficiency. The Army should also consider operational requirements that may allow for vehicle electrification, hydrogen fuel cell technology and hybrid solutions for specific applications. Lastly, requirements best practices must be followed by the combat and materiel developer to ensure that the Army is able to take advantage of the latest in commercial technology at the lowest cost to provide the best value solution to meet Warfighter needs.

Honorable Mention: Navigating the Readiness and Modernization Conundrum

Authors: **Lt. Col. Sarah Forster** is currently serving as the Director of Defense Contract Management Agency, St. Louis. She holds a B.S. in civil engineering from the United States Military Academy, an M.S. in engineering management from Missouri University of Science and Technology, and an MBA from George Mason University. She is Level III certified in program management and is a member of the Army Acquisition Corps.

Maj. Hassan Kamara is an Acquisition Officer serving as the Assistant Executive Officer to the Assistant Secretary of the Army for Acquisition, Logistics and Technology. He holds an M.A. in Strategic Studies from the U.S. Naval Postgraduate School, and an M.A. in Acquisitions and Procurement from Webster University. He is an honor graduate of the U.S. Naval War College Command and Staff Course. Kamara commanded a Stryker infantry company at Fort Bliss, Texas, and an Armor company in Kirkuk, Iraq.

Abstract: Military transformation under relative peacetime conditions presents a challenging dilemma: the conundrum of military readiness and modernization. Relative peacetime brings additional challenges to decision-makers on whether to focus our constrained resources on modernization or on readiness. To best navigate this conundrum, the Army must develop effective models that will also ascertain the long-term economic implications of funding readiness versus funding modernization. These models will provide critical data to better inform decision-makers on the long-term economic ramifications of weighting resources more heavily in the direction of readiness or of modernization.

Category: Innovation

Winner: How Relevant is Speed? The Global Dynamics of the Twenty-First Century

Author: **Dave Riel** serves as Professor of Acquisition Management for Defense Acquisition University's Midwest region developing curriculum, teaching classes and providing consultation on the latest defense acquisition policies, program management principles, and production, quality and manufacturing matters.

Abstract: Growing tensions between China and America, along with burgeoning Chinese assertiveness and military capabilities, propels us with an urgency to emerge from what the National Defense Strategy (NDS) describes as "a period of strategic atrophy" and "a security environment more complex and volatile than any we have experienced in recent memory." The world has changed and is more complex than the Cold War era. Unlike two clenched fists, America and China have a much more complex relationship, tightly intertwined economically, while separated doctrinally. Also, no longer is it predominant for technological advances to derive from the military-industrial complex and pollinate commercial enterprises, such as the internet and GPS. If our Nation is to maintain technological superiority, we must capitalize on commercial advances. Since the early 2018 release of the NDS, the acquisition community's focus, characterized by the Adaptive Acquisition Framework, has been established as producing war-winning capabilities at the speed of relevance. But the question remains, how do we tap into, adapt, and adopt the innovation being developed by commercial entities at a rate faster than our adversaries can? The answers lies in developing ways that not only allow commercial innovators to do business with the DOD, but actually encourages it. We must go from simply "lowering the barriers" to "greasing the skids". This article suggests several possible initiatives, but more importantly, calls on you, the reader, to innovate ways that shifts us from allowing leading technology companies to contract with DOD, to pursuing, attracting, encouraging and incentivizing them to do business with us. How relevant is speed? It's critical!

Honorable Mention: A New Benchmark for Transit Case Acquisition: Drop Testing

Author: **Mark DuBose** is a Systems Engineer at the Program Executive Office Simulation, Training and Instrumentation (PEO STRI), currently supporting the Joint Readiness Training Center Instrumentation System Life Cycle Support program (JRTC-IS LCS). His 20 years of industry hardware design experience combined with 15 years of Army Acquisition experience has surfaced many innovative ideas for consideration. Mr. DuBose holds B.S. degrees in Mechanical Engineering Technology and Electrical Engineering from the University of Central Florida. He is Level III certified in Systems Engineering and is a member of the Army Acquisition Corps.

Abstract: The MIL-STD-810H is the environmental testing standard for DOD programs, but it can be tailored. The current transit drop test is evaluated and shown to be over-testing and under-testing transit cases. Engineering reasoning, math and research dissects the current drop testing standard and makes a case for a new standardized transit drop test to streamline acquisition and control industry cost. Finally, an argument is made for eliminating the transit case drop test as a program option and is evaluated for cost and associated risk. The analysis illustrates a potential cost avoidance of $65 million to over $500 million.

Category: Lessons Learned

Winner: FWS-S (Family of Weapons – Sniper) and the OTA (Other Transaction Authority) Process

Author: **Elliott J. Bird** is the Assistant Program Manager for the Family of Weapons Sights – Sniper. He recently completed a Developmental Assignment as a Department of the Army Systems Coordinator for the HQDA Assistant Secretary of the Army for Acquisition, Logistics and Technology Office.

Abstract: The Family of Weapons – Sniper (FWS-S) program successfully implemented a complete Other Transaction Authority (OTA) Process to award two OTA authorizations to vendors. In this article, the Assistant Program Manager for the FWS-S program explains the decisions and processes the team executed for the OTA Process. There was a series of decisions the FWS-S team made and also procedures that we implemented to make the program a success. These decisions and procedures are explained here to show a framework for completing a successful OTA Process for a program entering the Engineering and Manufacturing Development Phase.

Honorable Mention: Streams Theory: A Policy Enactment Tool for Army Materiel Development

Author: **Maj. Steven R. Cusack** is an Army Acquisition Corps officer with operational experience as an attack helicopter pilot and aviation maintenance manager. He is the Attack Chief for the Army Capability Manager – Reconnaissance and Attack.

Abstract: The acquisition life cycle model depicts high-level decisions that move materiel development projects through their milestones to support warfighting. The acquisition model does not depict smaller, supporting decisions to reach cost, schedule, and performance compromises, among others. Streams Theory, a political science theory that explains policy enactment, provides a framework that can help an acquisition professional identify impediments in acquisition. Acquisition decisions must address a problem, have a solution to the problem, and have support from someone with authority to move forward. Furthermore, the problem, solution, and authority streams for acquisition must align with a window of opportunity (such as fiscal decision to support program objective memorandum goals). Attention to streams and opportunity windows improves a manager's ability to identify obstacles, address problems, and achieve support for deserving programs.

Major General Harold J. "Harry" Greene Awards for Acquisition Writing Distinguished Judges

Vincent E. Boles, Maj. Gen. USA (Ret.), Defense Acquisition University (DAU) professor of life cycle logistics

Charles A. Cartwright, Maj. Gen. USA (Ret.), DAU faculty member and former program manager, Future Combat Systems

Professor John T. Dillard, Col. USA (Ret.) and recently retired senior lecturer, Graduate School of Engineering and Applied Sciences, Naval Postgraduate School

Professor Raymond D. Jones, Professor of practice and academic associate, Defense Acquisition and Program Management Curriculum, Naval Postgraduate School

Roger A. Nadeau, Maj. Gen. USA (Ret.), Senior Vice President, American Business Development Group and former commanding general, U.S. Army Test and Evaluation Command

Gary Martin, president of GPM Consulting LLC and former program executive officer for Command, Control and Communications – Tactical

Kris Osborn, Editor-in-Chief, Warrior Maven and Defense Editor, The Center for the National Interest

Dana J.H. Pittard, Maj. Gen. USA (Ret.), vice president, defense programs, Allison Transmission

Ken Rodgers, Col. USA (Ret.), Director, Strategic Defense Systems and C4I, Cypress International

Rickey E. Smith, Former deputy chief of staff, G-9, U.S. Army Training and Doctrine Command

Richard G. Trefry, Lt. Gen. USA (Ret.), Association of the United States Army senior fellow and former Army inspector general

Michael A. Zecca, chief futures officer, U.S. Army DEVCOM Armaments Center

Category: Acquisition Reform

WINNER

Evolutionary Acquisition: Closing the Loop and Fulfilling the Promise of Rapid Cyber Acquisition

By the following authors:

Bonnie Evangelista

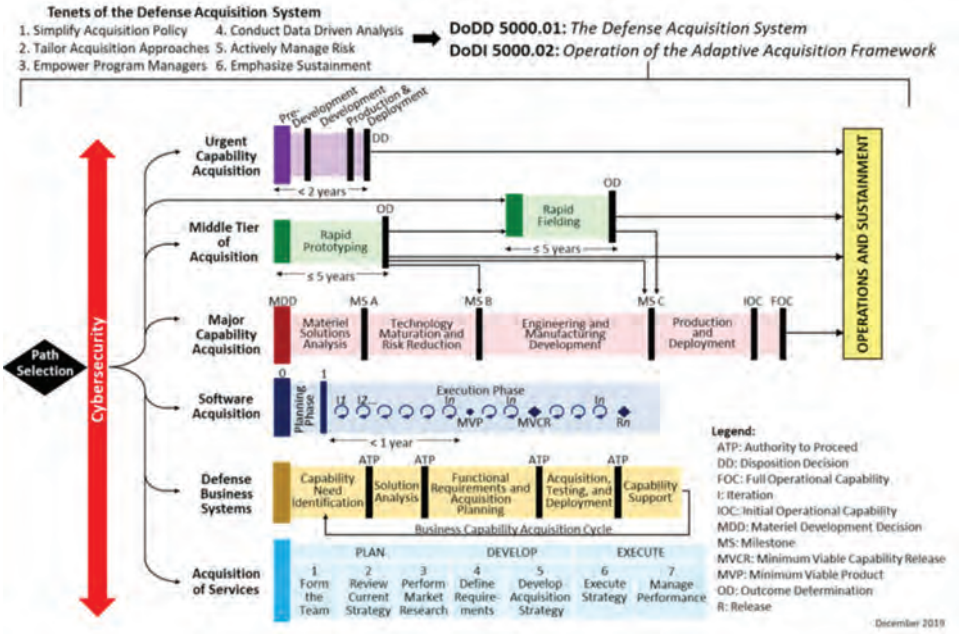
Fianna Litvok

The defense acquisition community eagerly awaited updates to the 5000 Series acquisition guidance, originally published in 2015. The nation's threat landscape has accelerated exponentially over the past few years, and it was clear we needed acquisition policies that allowed for more flexible and accelerated programs. The Department of Defense's (DOD) January 2020 revision of the 5000 Series was welcomed by program managers (PMs) and acquisition professionals alike. The revised guidance speaks directly to challenges programs across the Department have faced, specifically with regard to assessing and acquiring systems with speed and agility.

The Department's "transformational tool," the Adaptive Acquisition Framework (AAF) (Figure 1), and its associated pathways give programs agile, area-specific frameworks that promise to enable the delivery of warfighting capabilities "at the speed of relevance." Critically, the new guidance represents a concerted effort by the Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD A&S) to change the acquisition culture by "simplifying policy, empowering PMs, tailoring acquisition approaches, conducting data driven analysis, actively managing risk and emphasizing sustainment."[1]

The revised policies offer guidelines, while encouraging

FIGURE 1 DOD's Adaptive Acquisition Framework



Adapted from DOD 5000 Series, Acquisition Policy Transformation Handbook, Multiple Pathways for Tailored Solutions, January 15, 2020, pg. 8

PMs to "tailor" solutions to best suit program needs. Understandably, there is no precedent for this framework, and hence, no clear sense of how to realize its promise. While sustainment was emphasized in the new doctrine, there was little offered in the way of specific guidance or best practices. Additionally, the revised doctrine doesn't provide a clear paradigm for integrating customer feedback into the acquisition process, a critical component to innovation and mission success.

Adaptive Agile Framework and the Cyber Domain

In recent years, the U.S. Army's Defensive Cyber Operations leadership has become increasingly committed to overhauling cyber acquisitions. The Army recognized that in order for its Cyber Mission Forces (CMF) to maintain a competitive advantage in a highly dynamic threat landscape, it needed to create an environment that could deliver capabilities at speeds never realized before. CMF are actively engaged in missions on the nation's behalf around the clock. In the cyber domain, speed exceeds the issue of "relevance." Speed makes the difference between winning and losing, so it is absolutely critical to deliver defensive cyber capabilities to cyber Soldiers as soon as they become available.

The AAF stresses shortening prototype, development and acquisition timelines, but cyber requires timelines that are much shorter than any indicated in the new guidance. According to the AAF, the "Urgent Capability" pathway aims to "fulfill urgent operational needs (UONs) or other quick reaction capabilities (QRCs) in less than two years." [2] For many systems and programs, shortening timelines to two years would be a much-needed improvement. However, two years is an eternity in cyber warfare, and giving our enemy that amount of time to build and deploy capabilities could result in unwanted consequences.

In 2018, Applied Cyber Technologies (ACT), a product office within Defensive Cyber Operations (DCO), in U.S. Army's Program Executive Office Enterprise Information Systems (PEO EIS), was charged with creating a framework to rapidly develop, assess, deliver and sustain advanced defensive cyber capabilities to CMF. The team focused on truncating the process at every turn. The emphasis was on minimizing the time and metaphorical "space" between development and deployment, and fielding and feedback. There was a significant appreciation for the important role customer feedback plays in providing the right capabilities, and it was clear we had to integrate a smart sustainment plan.

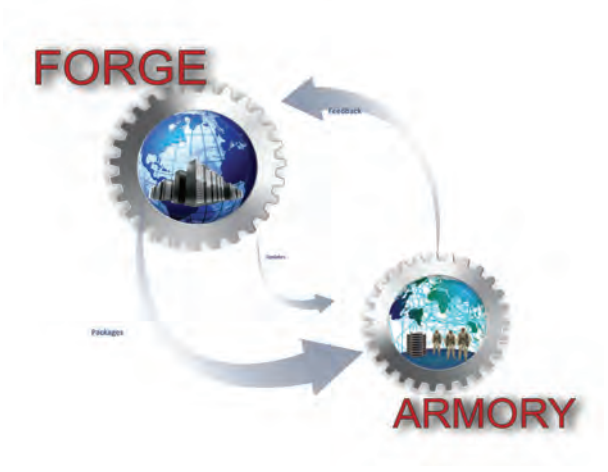
Forging Ahead

To realize its vision, ACT developed two separate but interdependent functions, indicated by a loop that encompasses critical features of the program (See Figure 2, below). While ACT's Forge ensures the rapid development, assessment, integration and acquisition of cyber solutions, its Armory serves as the systems fielding and sustainment hub. ACT's Forge and Armory are individual mission elements that are inherently interconnected and have a unique collaboration that changes the game for cyber acquisition.

The Forge and Armory exist to provide cyber Soldiers the tools, innovation and solutions to ensure they are ready to fight unseen and agile threats right now. The Forge and Armory were built specifically to:

- Facilitate rapid and agile acquisition solutions
- Close capability gaps when they are identified
- Provide collaboration and synchronization opportunity to the enterprise
- Leverage industry and academia expertise to solve problems
- Continuously innovate

FIGURE 2 Forge & Armory Continual Feedback Innovation Loop



ACT's Forge and Armory Concept provides a new paradigm for the delivery of leading cyber capabilities at the speed of relevance. (Graphic created by Applied Cyber Technologies)

At its core, the Forge is an innovation and integration center focused on the rapid development, assessment, integration and acquisition of new technologies for DCO platforms and capabilities. The Forge leverages Other Transaction Authority (OTA) to rapidly acquire technologies as prototypes and evaluate such technologies for limited or full deployment purposes. The Forge has invested in a groundbreaking, cloud-based innovation pipeline, which has shortened the time-to-prototype from months to weeks, and focuses heavily on collaboration with industry and academic partners to develop inputs and outputs of the Forge. The capabilities developed at the Forge are then provided to the Armory for deployment into the systems used by defensive cyber forces.

The primary mission of the Armory is to support the warfighter by optimizing current systems and capabilities in order to improve operational effectiveness and efficiency. To this end, the Armories are forward-deployed, regional hubs where cyber Soldiers can "check in" and "check out" ready-to-go cyber equipment complete with the latest software and configurations generated by the Forge. Much like a traditional "arms room" that issues Soldiers rifles and other kinetic weapons, the cyber Armory issues Cyber Protection Teams (CPTs) their requisite cyber equipment. By virtue of fielding these systems, the Armory plays a critical role as the customer feedback interface for DCO. And, by integrating the Forge with the Armory, the Forge can rapidly respond to warfighters' needs by continuously improving existing capabilities and developing new ones.

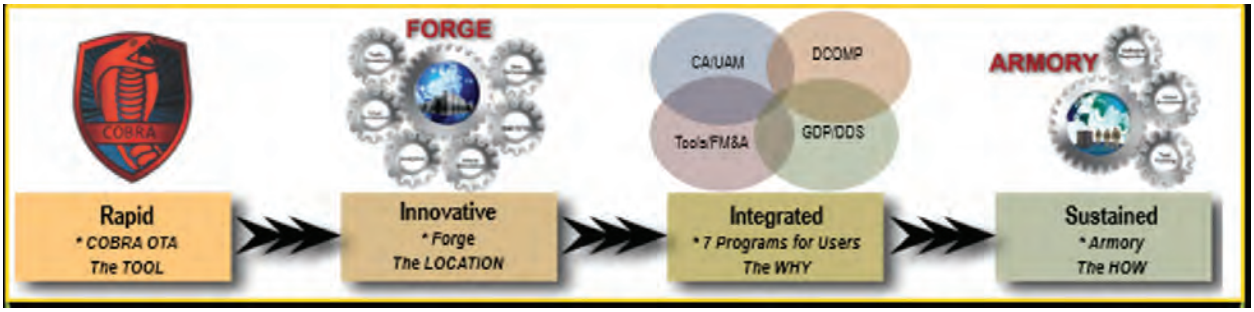
The Armory provides a sustainable approach to the deployment of DCO cyber platforms by providing a software repository with the latest updates, patches, licensing, support and mission-focused training. Instead of outfitting each individual CPT with equipment, the systems are housed within an Armory, where the equipment is continuously updated and maintained with the latest updates and outputs of the Forge.

The Armory enables ACT to sustain cyber systems within the regional Armory locations, eliminating the logistical challenges of updating across a global, disparate force. This significantly reduces the Army's cost of system sustainment. DOD's new guidance stresses the importance of "a supportability strategy that meets materiel readiness and operational support performance requirements, is safe and sustains the capability in the most cost-effective manner over its anticipated total life cycle."[3] The Armory falls neatly in line with that priority by offering the Army the most cost-effective way to sustain systems, particularly because the systems are inherently dynamic and require regular, ongoing updates.

Putting it All Together

So, how does it work? Before going on a mission, a CPT checks out the latest defensive cyber kit from the Armory. After the mission, they return the kit to the Armory. That's it. Cyber Soldiers never have to worry about installs, updates, patches, licensing or regular maintenance; the Armory takes care of all that. Once the equipment comes back, the Armory performs routine

FIGURE 3 DCO Evolutionary Acquisition Model



The Forge and Armory are part of the DCO's key pillars of defensive cyber acquisitions: Tools, Location, the "Why" and the "How." (Graphic created by Applied Cyber Technologies)

maintenance, installs the next batch of capabilities and prepares the equipment for the next CPT.

At checkout, the Armory's technical team receives live feedback from users regarding kit capabilities and systems performance. That feedback is documented and integrated into the next iteration of kit enhancements. The Armory model creates a unique and consistent interface between DCO and cyber Soldiers, allowing ACT to gather feedback from users and adjust capabilities rapidly. While the Armory serves a critical role in the sustainment and fielding of defensive cyber systems, it's the Armory's ability to shrink the feedback loop between Soldiers, program office, requirements developer and industry that pays dividends for DCO.

Additionally, upon kit return, the Armory conducts a complete performance analysis, identifies and assesses systems issues, and provides continuous feedback to the Forge for evaluation on whether identified gaps can and should be addressed. This continual loop of fielding and feedback, and development and deployment are at the heart of ACT's ability to innovate and provide cutting-edge capabilities rapidly. It is this condensed loop that enables the program to provide defensive cyber capabilities at a speed relevant to cyber Soldiers.

From the Soldier's perspective, the Armory's fielding capability is efficient and critical. And, its sustainment function eliminates the Soldiers' burden of regularly maintaining equipment, thus freeing them up to focus on the mission at hand.

The Forge's innovation in acquisitions and technology (development and deployment), combined with DCO's programs, and the Armory's sustainment function (fielding and feedback), all work to encompass DCO's evolutionary acquisition model. The model represents how ACT aims to provide defensive capabilities to CMF quickly and seamlessly (See Figure 3).

DOD's updated AAF and associated pathways support accelerated timelines that better reflect the current threat landscape. Importantly, the AAF allows for the kind of flexibility that defensive cyber operations require. For organizations in the cyber enterprise, it is critical to tailor a model that best provides our cyber customers with the tools they need when they need them—which, of course, is as close to now as possible.

We've often heard it said: Necessity is the mother of invention. Not too long ago, it would have been unimaginable to develop a prototype within a week or two, acquire a capability within a few months and build a "smarter," more cost-efficient sustainment program that intimately integrates customer feedback, which in turn is used to improve systems almost immediately. But, that is what cyber warfare needs. By creating the Forge and Armory framework, we think the promise of rapid cyber acquisitions is being fulfilled right before our eyes.

ACT's Forge and Armory construct embody the rapid development, agile framework, adaptable processes and speed that supports and furthers DOD's AAF strategy. The Forge and Armory have the potential to create long-lasting, positive impacts for the cyber enterprise and for cyber Soldiers at large. Much like the cyber capabilities they deliver, the Forge and Armory processes are continuously being iterated to keep pace with cyber warfare's operational tempo. The cyber enterprise will never reach its full potential unless we fully adopt an agile way of operating, a flexible mindset and a willingness to step forward in a new way.

Notes:

[1] DOD 5000 Series, Acquisition Policy Transformation Handbook, Multiple Pathways for Tailored Solutions, January 15, 2020, at 3-5. https://www.acq.osd.mil/ae/assets/docs/DoD%205000%20Series%20Handbook%20%2815Jan2020%29.pdf

[2] Ibid, at 10.

[3] Ibid

HONORABLE MENTION

Transition to Sustainment, Not a One-Time Baton Toss

By the following author:

Nicholaus Saacks

Many Army stakeholders mistakenly perceive a system's transition from a program office to its sustainment command as a one-time baton toss.

However, rather than a final, singular transition to sustainment (T2S) date set on a calendar, the transition occurs gradually, throughout the system's development and fielding life cycle. As a former Army Materiel Command (AMC) and project manager (PM) logistician, I recognize that without a common understanding of the T2S and the timing of sustainment across various program milestones, budget and personnel requirements can become muddled.

Instead, if the enterprise would view T2S efforts as a group of functions, versus a hardline singular event, program offices and the AMC could better plan for resource allocation.

Recently, a great deal of T2S focus has been on the final program transition from full project management (PM) responsibility to full AMC responsibility, with Army stakeholders looking for a particular date to identify this passing of management responsibility for their systems. This singular transition view is reflected in the way T2S is tracked by Army senior leaders and the enterprise writ large. For example, in 2019 and 2020, the Army conducted all-encompassing T2S reviews, capturing each system's T2S timeline. (See Figure 1.)

This T2S model depicts the transition as a singular event, a specific mark in the sand, where the entire system transitions at once, leaving one to infer that all financial and personnel requirements transition on that date. In fact, after the 2019 review, resource managers attempted to match sustainment funding to the blue "final" T2S dates seen here, questioning why any sustainment funding was needed for those programs before those dates. This view ignores any sustainment execution prior to the T2S date. However, programs do not actually transition in this way. For example, our PEO fully transitioned eight systems into sustainment in fiscal year 2019. The sustaining organization was already budgeting and executing relevant Army sustainment dollars for these systems. Both organizations staffed memorandums of understanding, transition plans and acceptance memos through the program executive officer and the sustaining command's commanding general. Upon the sustaining command's signature on transition acceptance memos, nothing changed with respect to programmatics, manning, budgeting or execution. The sustaining organization was already executing sustainment.

Defining Transition to Sustainment

Current Army regulations clearly define what T2S is and what it is not. According to AR700-127, T2S is the transition of responsibility to execute sustainment. Subsequently, AR70-1:3–6., which outlines program management responsibilities, states that T2S is not the transition of overall program responsibility.

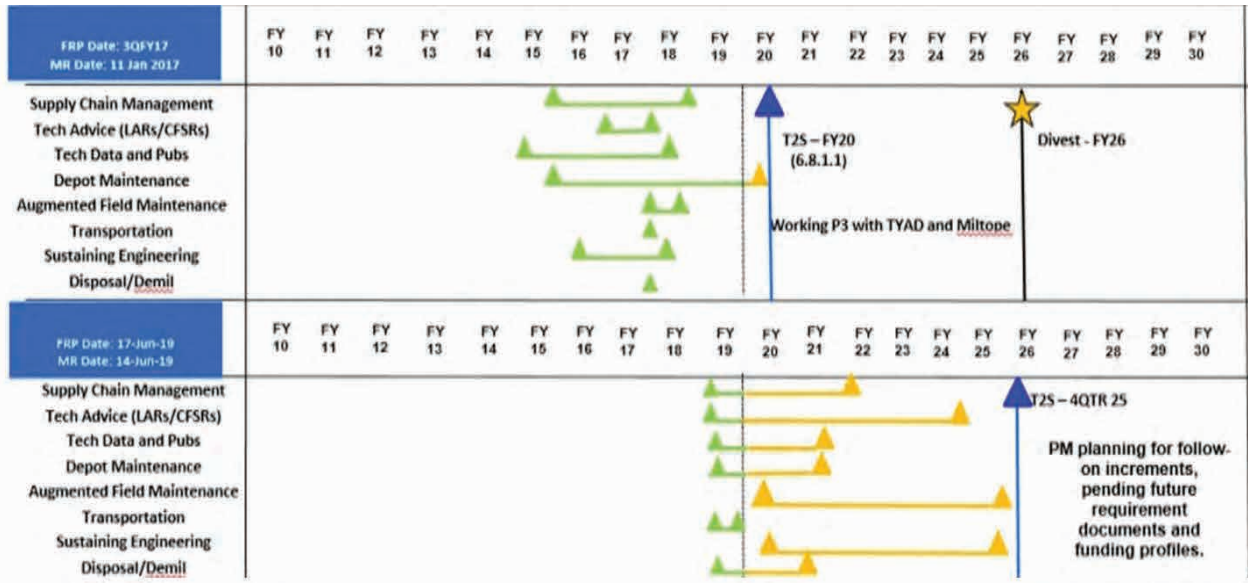
Based on these regulatory definitions, T2S should be looked at from a functional execution lens; we are simply transitioning the responsibility to execute sustainment, not transitioning a whole program. To clearly define the meaning of "execute sustainment," we must identify "what" transitions, "how" the transition is enabled (i.e. funded), and "when" in a system's life cycle the transition occurs.

"The What"—Sustainment Functions to Transition

During T2S, the PM transitions defined sustainment functions to AMC. The Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)) Transition to Sustainment Guidebook, developed in concert with AMC, defines eight of these sustainment functions: Supply Chain Management, Technical Advice, Technical Data and Publications, Depot Maintenance, Augmented Field Maintenance, Transportation, Sustaining Engineering, and Disposal/DEMIL. Not all of these functions are applicable to every system.

The T2S Guidebook also lays out common conditions the PM must typically meet for the execution of each sustainment function to transition to sustainment. For example, in order for a sustaining organization to successfully execute depot maintenance, the PM must train depot maintenance personnel and procure and install any new materials required to conduct depot

FIGURE 1 T2S Timeline



maintenance. It is critical that PMs properly position their systems for sustainment success by completing all applicable conditions.

Once the execution of one of these functions transitions to the sustaining organization, the system is considered "in" sustainment. That sustaining organization then has responsibility and accountability to successfully execute that sustainment function, which in this case is to maintain the repair capability at the depot, stock required depot repair parts, maintain depot test equipment and budget for maintenance dollars. Once all of the applicable functions are transferred and the system's baseline is no longer being modernized, the system is eligible to "fully transition" to sustainment.

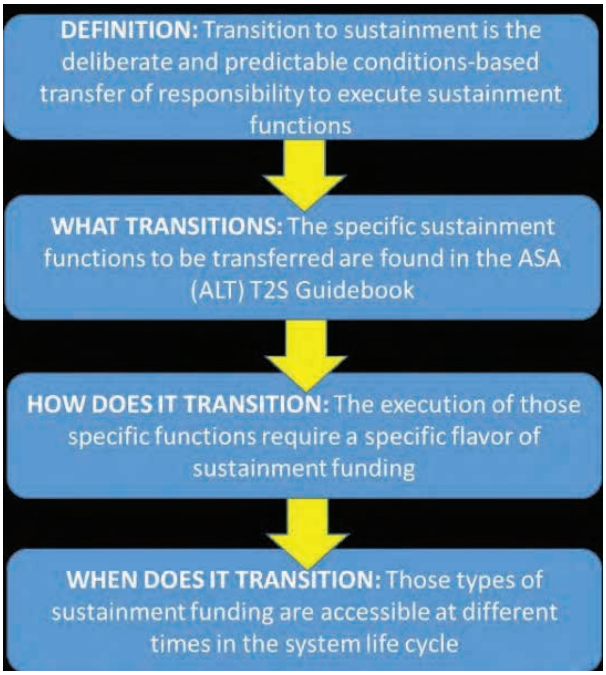
"The How"—Transition to Sustainment Funding

A sustaining organization requires resources to successfully execute sustainment. As the execution of sustainment functions transitions from the PM to AMC, the sustaining organizations must be resourced appropriately. Typically, sustainment execution is resourced in one of four funding streams: Operation and Maintenance Army (OMA) Depot Maintenance Support; OMA Post Production Software Support (PPSS); Army Working Capital Fund (AWCF) Supply Support and OMA Sustainment Systems Technical Support (SSTS). To be successful, each sustainment function requires one or more of these streams of sustainment funding. Not every sustainment funding type is applicable for every system. Once one sustainment funding type is being executed by the sustaining organization, the system is considered "in" sustainment. Once all of the applicable funding streams are being executed and the system baseline is no longer being modernized, the system is eligible to "fully transition" to sustainment.

"The When"—Transition to Sustainment Timing

Funding streams are available to AMC at different times in a system's life cycle. AMC sustainment funding may begin as early as first unit equipped. The annual Army G4 Program Resource Guidance sets conditions for when AMC can access and execute each type of sustainment funds. For example, the POM 22-26 guidance states OMA Depot Maintenance may begin immediately after first unit equipped, but OMA SSTS must wait until three years after initial operational capability. Funding transitions do not occur in any particular order, though SSTS is typically last. Additionally, not every funding stream will be applicable for every system. Again, once one of these transitions, the system is considered "in" sustainment. Once all of the applicable funding streams are executing and the system baseline is no longer being modernized, the system is eligible to "fully transition" to sustainment.

FIGURE 2 T2S Transition



The Big Picture

Pulling together the regulatory definitions, ASA (ALT) T2S guidance, and G4 OMA budgeting guidance we can cobble together T2S facts. (See Figure 2.)

These T2S facts can be extrapolated over notional program milestones to show the gradual, time-phased T2S, complete with when sustainment resources are available and what sustainment functions are transitioned. (See Figure 3.)

Note that sustainment personnel are available in addition to money for materiel. AWCF sales would generate the cost recovery rate needed to justify AWCF billets for the sustainment enterprise. Additionally, AMC can prepare a Program Objective Memorandum for personnel requirements via PPSS and SSTS. All money and people required for sustainment should already in place before "final" T2S. The final T2S is simply an administrative task to ensure applicable transition conditions are closed.

Recommendation

To better track the phased transition of sustainment functions and assumption of sustainment execution and responsibility, the enterprise should focus on the four primary sustainment funding types. Are they already being executed? When are they planned to begin? What risks to each funding type and/or sustainment conditions can be identified and briefed by exception? The below notional sample depicts phased sustainment transitions. (See Figure 4.)

FIGURE 3 T2S Sustainment Funding

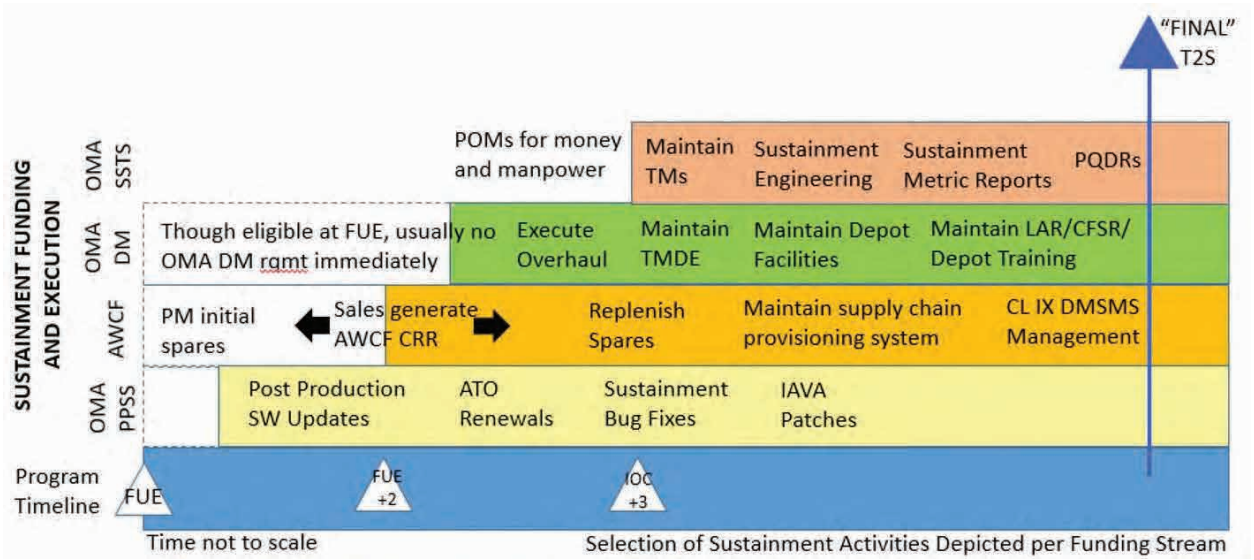
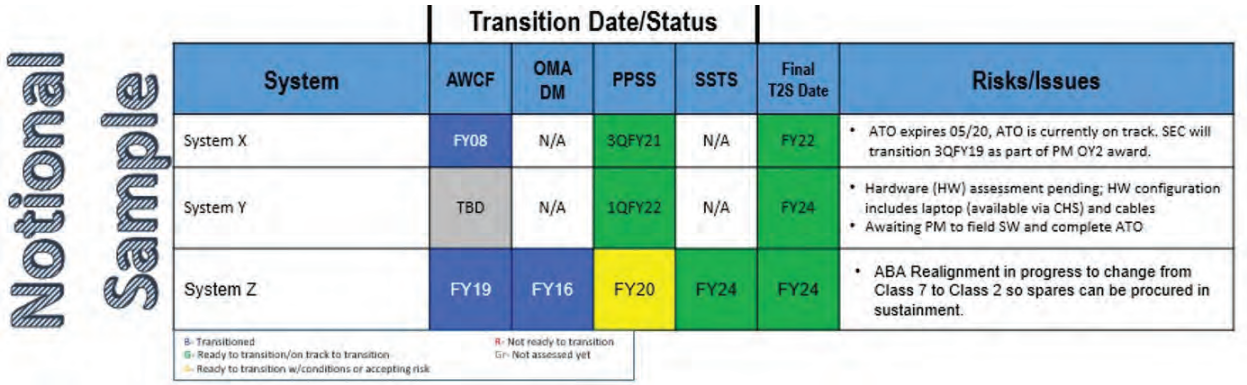


FIGURE 4 Notional Sustainment Transition



This view provides Army senior leaders with a better indication of the AMC sustainment level of effort and resources needed and executed prior to the "final" T2S. The budgeting for T2S resources needed, both monetary and human capital, is already captured in existing processes, such as OPS-29 and the AWCF Budget Estimate Submission. The amount of dollars and people needed can be linked in the background to support deep-dive questions. The status of specific sustainment functions and T2S condition completion is managed at the action officer level and rolled up to feed the senior leader report.

T2S visibility requires regular updates to Army senior leaders. Simplifying the meaning of T2S allows our organizations to better understand and operate under the same T2S construct. By tying a system's transition to its execution of sustainment funding, we gain a better common operating picture of when the responsibility to execute specific sustainment functions transitions from a PM to AMC. In doing so, the Army enterprise gains a more accurate view of each system's transition to sustainment, which results in better knowledge of the timing of sustainment requirements and responsibilities. This improved common knowledge will enable more seamless program transitions.

Category: Future Operations

WINNER

Maximizing Commercial Off-the-Shelf (COTS) Technology in Army Acquisition:

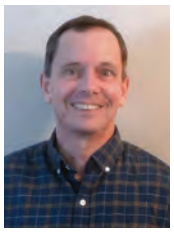
The Impact of Army-Unique Requirements on Program Executive Office Combat Support and Combat Service Support's Ability to Field 'Best Value' COTS in the Future

By the following authors:

Erin Tromley

Dr. Peter Schihl

Dr. James Dusenbury



Joseph Keusch

Timothy Kler

Thomas Banks

Rakesh Patel

Introduction

Program Executive Office Combat Support & Combat Service Support's vision begins: "We are the Army's Acquisition experts for Commercial and Non-Developmental Items." The focus on delivering Commercial off the Shelf (COTS) solutions to meet Warfighter needs is a best-value acquisition approach that saves the Army cost and schedule while leveraging Industry Research and Development (R&D) to field the latest technology. However, for many of the systems in the PEO CS&CSS portfolio, the Army is an extremely low-volume customer in a much larger market - so much so that some companies do not even bother to propose to develop or modify their COTS to meet Army requirements. The more Army-specific requirements for a system, the more the Army diverges from its ability to procure the latest, best-value COTS solutions.

Powertrain Technology

Fuel

Low-sulfur "clean" diesel fuel is mandated in the U.S. and Europe, where emissions are strictly controlled and monitored. The quality and sulfur content of diesel fuel varies significantly in other parts of the world—particularly in the Army's theaters of operation. Army Regulation 70-12 implements a single high-sulfur kerosene-based fuel (SKBF) for commonality (commodity management) and quality assurance: "continental United States (CONUS)-the fuel type F–24 (Jet A with status dissipater additive (SDA), fuel system icing inhibitor (FSII), and corrosion inhibitor/lubricity improver (CI/LI)) shall be used for operations, training, and testing, as appropriate for the ambient temperatures; outside the continental United States (OCONUS)-the fuel type Jet Propulsion (JP)-8 shall be used for operation, training, and testing as allowed when availability and costs factors are considered by the theater commander."

The future availability of military engines will be market- and business-case driven. As long as lesser emissions-regulated regions of the world continue to have a demand for high-sulfur-fuel-compatible engines, the Army can still expect to procure COTS engines produced for these lesser regulated regions for its powertrain and power generation needs. Currently, little to no engine modification is required to make the majority of COTS engines supplied to lesser regulated countries compatible with JP-8. However, as demand for high-sulfur-fuel-compatible engines are reduced, JP-8 compatible engines will require more and more modification of

current emission-compliant engines at higher cost and schedule. This involves heavy cost due to the removal of all sulfur-sensitive emissions control systems, recalibration, and reprogramming engine control modules for military use. Industry partners will need to sell enough of these engines to recover engineering and production costs.

As emissions regulations become more stringent and driving engine technology and emissions control become more and more integral to engine design, certain engine models may include base hardware that cannot be modified for military use without excessive cost per unit. It is expected that within the 10- to 30-year timeframe, some current manufacturers will no longer provide JP-8-compatible engines for Army use. It is also expected that some production of high-sulfur-fuel-compatible engines will move overseas.

Diesel Fuel Alternatives

Continued investment in next-generation fuel-alternative propulsion systems is market driven. Industry is investing heavily in electrification, battery technology and hydrogen fuel cell technology, and have technology roadmaps/strategies dedicated to diesel-alternative power. Fuel cells are viewed as the competitor to Battery Electric Vehicles (BEV), and many companies expect that battery technology improvements will outpace fuel cell improvements, but that neither are ready for line-haul trucking applications now. Both BEV and fuel cell costs are extremely high and projected to decrease based on volume. Therefore, it is still projected that 90 percent of commercial line-haul trucks will still have diesel internal combustion engines in 2030.

Although advancements in batteries are moving at an extremely fast pace, leading to better range for electric vehicle technology, the significant challenge is the infrastructure that needs to be established for wider adoption of on-road vehicle electrification. Diesel powertrains will be around a long time due to issues with range and required uptime, especially for line-haul operations. The downtime to recharge a battery is a significant issue being worked with a combination of vehicle storage and infrastructure solutions. These infrastructure challenges are being invested in heavily by companies like Tesla. However, this type of infrastructure is not expected to be in place in the Army's operating area in the foreseeable future, making full vehicle electrification for long-range operations not a possibility for the Army's next generation of tactical vehicles. Short-range, short-duty cycle operations are good applications for the Army to consider for electric vehicles in the future.

Hydrogen fuel cells have a better fuel refill time than BEVs and begin to be advantageous above the 200-mile range or when transporting heavy loads. Size requirements for storing hydrogen on the vehicle are a challenge due to cost and volume requirements. Production and logistics of hydrogen to support a Brigade will be an infrastructure challenge as well, due to the need to add new equipment. Moving to a low-sulfur diesel fuel would simplify and reduce the cost of hydrogen production through fuel reformation, which is the most likely scenario for the military in the near term. Current reformers remove sulfur through cheap replaceable filters that will have extended operational time with lower sulfur fuel. Fuel reformation, hydrogen storage, and hydrogen dispensing can all be accomplished in mobile ISO container configurations. The technology is scalable and can be adapted to meet a projected vehicle roll-out strategy. Multiple companies believe this technology will be competitive with conventional powertrain technology between 2030 and 2040. The Army should be able to leverage commercial fuel cell systems without much modification due to the rigorous requirements for heavy-duty and automobile applications. Hydrogen can be produced using many different methods.

Many companies are also exploring non-traditional powertrains, including mild-diesel hybrid, battery electric, and fuel cell electric technology. These would switch between battery electric and series/parallel hybrid powertrain modes based on duty cycle. These solutions could mitigate range, infrastructure, volume, and recharge issues. One major regulation driver for such technologies will be any future zero-emission requirements for a given application/vehicle class.

Other Powertrain Subsystems

Industry is investing further in electrification with a strategy to develop electric axles (e-axles) within the next five years for specific applications. E-axles will aid in improving fuel economy during transient and forward-looking operation—where the operator can perceive terrain and adjust the powertrain control to reduce fuel consumption.

Technology advances in wider range transmissions can offer the same benefits as e-axles, but at a slower response

time, so they may not be optimal for specific operational mobility requirements. Automated Manual Transmissions (AMTs) automatically control the clutch and shifting. Road conditions, vehicle speed, acceleration, torque demand, vehicle weight and resistance is continuously monitored, resulting in a more efficient shifting pattern. AMTs provide fuel economy savings and are operable by more eligible drivers, a benefit for the Army, as many Soldier drivers do not have experience with manual transmissions. But, a requirement for a torque converter transmission would drive the Army away from these particular advances in transmission technology. The Army needs a clear understanding of vehicle system duty cycles and perform comprehensive mobility studies of its vehicles to make good power transmission decisions for vehicles.

Autonomy

Industry is investing heavily in autonomy, others are relying on R&D conducted by other companies or subsidiaries to pave the way for autonomous trucks—with Europe paving the way for commercial truck autonomy and the United States making strides in commercial vehicle autonomy.

Some industries have autonomous vehicles operating in confined and semi-confined road patterns (construction, mining, port operations). Many companies, like FedEx, have started field trials on platooning operations (front vehicle with driver, following vehicle with no driver). There are significant technical challenges associated with visibility sensing issues due to rain, dust, snow and cloud cover. Some autonomous vehicles will also require significant LiDAR power and will need a high-voltage power system on board to support.

The motivation for industry to pursue autonomy is different than the Army's. The Army is aggressively pursuing autonomy to remove operators from the vehicle. An example of this is the Army's investment in the Tactical Wheeled Vehicle Leader Follower (TWV-LF) capability. This is a suite of robotic applique sensors and vehicle by-wire and active safety upgrades to provide an unmanned capability to a TWV Fleet for convoy operations at the squad level with one manned leader and up to nine unmanned follower vehicles. While industry certainly recognizes the advantage of removing drivers from vehicles, Industry sees a fuel savings advantage to autonomy and has demonstrated this in platooning operations similar to the TWV-LF.

Industry expects to take advantage of "drop-in" autonomy kits. Army science and technology subject matter experts do not expect the availability of a "drop-in" autonomy COTS solution at any SAE level for broad Army utilization. Since most Army platforms are larger than commercial platforms, the sensor location is typically outside the recommend placement locations and calibration is needed. Some of the COTS sensors are capable of self-calibration, but require common infrastructure (e.g. road lines) which are not available in an off-road setting. Many of the commercial systems today are only allowed to operate on certain well-mapped areas (geofencing). This requires a good GPS signal, whereas the Army has a requirement for systems to operate GPS-denied environments. Additionally, most vendors are deploying over-the-air incremental autonomy software upgrades and software sustainment, which is not possible in a military environment from a cybersecurity perspective. Industry is able to self-certify their respective products' performance and safety—this creates a challenge unique to the Army for receiving a software safety confirmation in accordance with MIL-STD-882E. The Army safety community looks at these systems as "black-boxes" and immediately assigns them as "high risk," because they do not have access to the source code or the necessary information to conduct a supply chain risk assessment.

Industry faces its own challenges associated with product liability, as well as ethical and safety considerations, for full employment of autonomous vehicles in the commercial marketplace. Legislation changes would be required before significantly advanced autonomy configurations will be available in the open environment. Without legislation, full autonomy in the commercial market may be considered too high risk for many companies.

Requirements Best Practice

Army-unique requirements often cause COTS deviations and can drive the Army unknowingly away from potentially better-performing technology at a lower cost. In many cases, this is due to performance requirements dictating a material solution instead of specifying performance criteria. The Army must strive to operationalize requirements vs. dictating materiel solutions from in the requirements generation process. The Army must also keep abreast of industry technology to ensure that the cost/benefit trades of Army requirements continue to allow us to field the best-value solution for the Warfighter.

HONORABLE MENTION

Navigating the Readiness and Modernization Conundrum

By the following authors:

Lt. Col. Sarah Forster

Maj. Hassan Kamara

"We are at a similar inflection point to the one our leaders faced coming out of Vietnam, and like them we have to ask ourselves: Are we building the Army than can compete and win for the next 40 years?" [1]

—Gen. James C. McConville

40th Chief of Staff of the U.S. Army
Address at AUSA Breakfast Series
21 January 2020

Introduction (Military Transformation)

Military Organizations transform or change in two environments: war and peacetime, or in the U.S. Army's case, relative peacetime. During war, military organizations adapt in response to the actions and capabilities of an adversary relative to their strategic and operational objectives. Wartime military adaptation is more focused and much faster than the generally slower-paced change that occurs in relative peacetime.

Williamson Murray, a scholar in military affairs, similarly categorizes military transformation as wartime adaptation, and peacetime innovation. Murray writes that "while there are similarities between the processes of innovation and adaptation, the environments in which they occur are radically different."2 Murray explains that while peacetime innovation enjoys the luxury of time to gradually evolve toward transformational objectives, wartime adaptation sees less time for transformation due to "the terrible pressures of war as well as an interactive, adaptive opponent who is trying to kill us."[3]

The Challenge

Though military transformation under relative peacetime conditions sees more time to consider and pursue change objectives, it is still fraught with challenges. Principal among these challenges is the conundrum of military readiness and modernization. This raises the question: How can the United States Army best navigate the conundrum of readiness and modernization to prevail in future conflict? The Army can best navigate this conundrum by developing effective modeling tools to ascertain the long-term economic implications of readiness and modernization decisions. The ensuing analysis emphasizes the need for such models, and their potential utility.

The Concepts of Readiness and Modernization

What is Readiness? Readiness is the current ability of Army Units to fulfill the mission for which they exist. It entails furnishing organizations with adequate quantities of manpower, training, equipment, and competent leadership, to meet global force requirements in fulfillment of the National Military Strategy. This understanding of Readiness is consistent with the Army's outlook on the subject.

The Army defines Readiness at the tactical, operational, and strategic level. Readiness is a confluence of the Army's ability to: have units fulfill their assigned mission (tactical), provide forces to Geographic Combatant Commanders (operational), and ultimately provide forces to fulfill the demands of the National Military Strategy (strategic).[4]

If the Army allows major shortfalls in readiness, it will not be able to provide forces that are fully capable of fulfilling their assigned mission to the Combatant Commanders. This will put the attainment of National Military Strategic objectives at risk.

What is Modernization? Army Modernization in relative peacetime is the progressive transition of various aspects of the Army transformation framework known as the DOTMLPF (Doctrine, Organization, Training, Materiel, Leadership, Personnel and Facilities) from the present or norm to the future. Modernization is critical to maintaining the Army's superiority of arms relative to potential adversaries in future conflict.

If the Army fails to modernize relative to potential adversaries, it will likely incur the risk of technological surprise in future war. In this context, technological surprise is defined as when potential adversaries employ military capabilities that not only drastically exceed the expectations of the Army, but also create advantages for the adversary.

The Readiness and Modernization Conundrum

Readiness and Modernization both require considerable financial resourcing, which the Army is increasingly constrained to do. Thus, a conundrum emerges wherein Army Senior Leaders have to trade-off Readiness and Modernization requirements. This entails confronting questions about whether to invest in producing more of an existing capability to sustain readiness, or invest in developing a more modern, advanced capability to give the Army an advantage over future adversaries.

Considering the complexities inherent in building readiness and modernizing the force, coupled with the risks associated with failing in either venture, as well as political considerations (Congressional interest in military investments), the Readiness and Modernization conundrum isn't readily solved.

Interestingly, Readiness and Modernization are both mutually complementary and antagonistic in different ways. Readiness supports modernization by creating a constant requirement for force optimization to meet Combatant Command requirements. Modernization spurs readiness when the greater Army Acquisition System ('Big A') introduces materiel solutions that optimize the force's existing capabilities. Modernization also spurs readiness by ensuring the force's capabilities are relevant to contemporary threats.

On the other hand, Readiness and Modernization are also antagonistic. This is because the dollars invested in readiness (for example, training and sustainment), cannot be invested in modernization efforts such as technological research and development. The same is true vice versa.

The Conundrum in the Inter-War Era (1920s & 30s)

The Readiness and Modernization conundrum isn't unique to the contemporary period. In fact, the complexities of the conundrum plagued Army Senior Leaders during the Interwar years, specifically the 1920s and 30s. For example, faced with resource constraints as the Army Chief of Staff in 1934, Gen. Douglas MacArthur had to balance readiness and modernization concerns.

According to historian Allan Millet and his co-authors, MacArthur prioritized readiness in terms of manning, and thus "fought to hold trained Soldiers rather than buy new weapons."5 Millet and Co. explain that in line with his focus on building readiness, "MacArthur wanted the War Department's funds to go to an 'Initial Protective Force' of 400,000 Soldiers that could respond to a real crisis, especially a war with Japan."6 MacArthur biographer William Manchester also highlights his commitment to readiness in terms of Army manning. He writes that as Chief of Staff, MacArthur "spent what [Army funds] he was given on personnel rather than materiel, reasoning that equipment becomes obsolete but leadership does not. Thus, he abandoned Major Adna R. Chaffee Jr's tank arm in 1931 but warded off an attempt to cut the Officer Corps from twelve thousand to ten thousand the following spring."[7]

Despite his commitment to Army readiness in terms of manning, MacArthur attempted to modernize the Army. However, the General's efforts were hindered by fiscal and Army organizational constraints. Millet and co-authors write that from 1925 until 1940 Army Ground forces received "an annual average of $21 million for new procurement." Efforts to increase this amount were largely unsuccessful. Unfortunately, "saddled with World War I weapons and ammunition surpluses, the Army had difficulty winning modernization funds from Congress until it had exhausted its obsolescent stocks."[8]

According to Millet and co-authors, from 1934 to 1937 the above fiscal constraint caused the Army to settle for simply developing prototypes aligned to its modernization priorities, namely: "Tank and artillery mechanization, field force motorization, aircraft, communications equipment, and a new semi-automatic rifle." Model capabilities built included 60-mm and 81-mm mortars, the 105-mm howitzer, and the M1 Garand rifle.9 Motorization, however, was hindered by unfocused requirements. Millet and co-authors write that "when the Army began a major motorization program in 1926, it allowed too much innovation, which produced 360 different types of vehicles and maintenance problems."[10]

The preceding Interwar era anecdotes are shared to highlight the complexity of the Readiness and Modernization

conundrum. Despite this complexity, it is possible for Army Senior Leaders to navigate the conundrum toward favorable long-term outcomes for the institution. In other words, in the contemporary period, it is possible to develop tools to help the Army navigate this complex challenge.

Navigating The Conundrum—A Way Ahead

Navigating the Readiness and Modernization conundrum requires affording Army Senior Leaders the ability to identify and analyze readiness and modernization tradeoff opportunities, as well as the impact of resourcing decisions on the modernization and readiness of the Army. Subsequently, the Army will need to effectively war-game the impact on modernization from planned investments in long-term readiness. Additionally, factoring future capability requirements and threats, the institution will need to effectively assess the impact of planned modernization investments on readiness. These requirements demand a strong analytical tool to optimize data-driven decision-making by Army Senior Leaders.

An adaptive Army Force Modernization and Readiness modeling tool that could war-game the long-term effects of readiness and modernization decisions and tradeoffs will enhance Army Senior Leader decision-making with data. Specifically, by analyzing and portraying the potential outcomes of readiness and modernization trade-off decisions, such a model will help Army Leaders identify and analyze tradeoffs in order to decide concerns like when and how to fund new capabilities while sustaining readiness.

Data collection and analysis is central to building a modeling tool that will inform readiness and modernization trade-off decisions. While more data is available now than ever before, utilizing that raw data to make decisions is challenging. Recognizing the need for decision-makers to have access to timely and accurate information, the Army is making considerable strides to harness data in a way that is both secure and manageable. In November 2019, the Army published an Army-wide data plan and subsequent execution order as a first step toward shifting into a cloud environment and managing data as a strategic asset. An adaptive Army Force Modernization and Readiness modeling tool will build on this data framework to produce predictive analysis that will better inform tradeoffs and alleviate the risks inherent to the readiness and modernization conundrum.

Conclusion

The Army can best navigate the conundrum of readiness and modernization to prevail in future conflict by developing tools to help Senior Leaders make data-driven decisions. To this end, the Army should continue investing in data transformation, and leverage the latter to develop predictive models that will enable Senior Leaders to visualize the long term economic impact of readiness and modernization investment decisions. By effectively navigating the conundrum of readiness and modernization, we can build the Army to compete and win for the next 40 years.

Notes:

[1] Gen. James C. McConville, "Address at AUSA Breakfast Series," 21 January 2020 https://www.bing.com/videos/search?q=mcconville%2c+ausa%2c+breakfast&view=detail&mid=CBECD660923645A6C-786CBECD660923645A6C786&FORM=VIRE. 22:19 mins/secs.

[2] Williamson Murray, Military Adaptation in War: With Fear of Change, (New York: Cambridge University Press, 2011) 2.

[3] Murray, Military Adaptation in War, 2.

[4] Department of the Army, AR 525-30: Army Strategic and Operational Readiness , April 9, 2020, https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/ARN15118_AR525_30_FINAL.pdf, p2.

[5] Allan R. Millett, Peter Maslowski and William B. Feis, "For the Common Defense: A Military History of the United States of America" (New York : Free Press, 2012), 358.

[6] Ibid., 356.

[7] William Manchester, "American Caesar: Douglas MacArthur 1880-1964" (Boston: Little, Brown and Company, 1978), 148.

[8] Millett, Maslowski and Feis, "For the Common Defense," 358.

[9] Millett, Maslowski and Feis, "For the Common Defense," 358.

[10] Millett, Maslowski and Feis, "For the Common Defense," 359.

Category: Innovation

WINNER

How Relevant is Speed? The Global Dynamics of the Twenty-First Century

By the following author:
Dave Riel

As I traveled the smooth, newly constructed road to the small Ugandan village that our medical mission team was serving that week—and remembering the awful, bumpy ride to Bukeka only 18 months prior—I questioned my Ugandan host, Ronnie, "When did this happen?" His answer surprised me.

The Chinese had built it within the last year—one of many economic outreaches that Beijing has initiated under its Belt and Road Initiative. As highlighted by the 2018 Summary of the National Defense Strategy (NDS), China "is leveraging military modernization, influence operations, and predatory economics to coerce neighboring countries to reorder the Indo-Pacific region [and others] to their advantage."

Growing tensions between China and America, along with burgeoning Chinese assertiveness and military capabilities, propels us with an urgency to emerge from what the NDS describes as "a period of strategic atrophy" and "a security environment more complex and volatile than any we have experienced in recent memory."

As Michèle Flournoy, former Under Secretary of Defense (USD) for Policy, points out, "It will take a concerted effort to rebuild the credibility of U.S. deterrence in order to reduce the risk of a war that neither side seeks." It is this reprioritization from defeating terrorism to focusing on inter-state strategic competition that drives our acquisition priority from the early 2010s' "better buying power" to today's "speed of relevance."

So, are we entering a new "Cold War?" Perhaps, but this is not yesteryear's Cold War. Our only interaction with Russia (still a challenging adversary) and its Warsaw Pact allies was government-to-government. We didn't share commerce. It was like two clenched fists bumping into each other, each racing within their respective military-industrial complexes for the next technological breakthrough. Times have changed. Since what has been known as the "Last Supper," when Secretary of Defense Les Aspin advised the CEOs of our major defense industry partners to consolidate, major defense companies have eroded from 107 at the end of the Cold War to just five by the late 1990s.

Yet, is multiplying the number of defense industry companies the answer to our goals? No, probably not. The world has changed and is more complex. Unlike two clenched fists, America and China have a much more complex relationship, tightly intertwined economically, while separated doctrinally. As Thomas Friedman illuminates in his book "The World is Flat," if Walmart was its own country it'd be China's eighth largest trading partner, surpassing Canada and Australia. Further complicating the scenario is that this global economic race now drives technology. No longer is it predominant for technological advances from the military-industrial complex to pollinate civilian and commercial enterprises, such as the internet and GPS; the commercial marketplace now dominates advancements in technology. If our Nation is to maintain the technological superiority needed by our Soldiers on the battlefield and the deterrence needed for diplomacy, we must capitalize on commercial advances.

Since the early 2018 release of NDS, the acquisition community has established as its primary objective producing war-winning capabilities at the speed of relevance. Each of the military branches' service acquisition executives have prioritized speed. Dr. Bruce Jette, the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT), has indicated that we must "maximize the use of law and policy in order to rapidly prototype, produce and field products."

The Adaptive Acquisition Framework, described by the Honorable Ellen Lord, USD for Acquisition and Sustainment (A&S), as "the most transformational acquisition policy change we've seen in decades," was introduced to "enable innovative acquisition approaches that deliver warfighting capability at the speed of relevance." The AAF establishes multiple pathways to achieve that speed, including the Congressionally-directed Middle Tier of Acquisition, with its five-year limit for rapid prototyping and rapid fielding, and the Software Acquisition

pathway, taking advantage of commercial software development processes to quickly develop and field solutions. Even the stodgy, traditional pathway, now referred to as Major Capability Acquisition with its five phases and multiple decision points, embraces as its first priority the "speed of delivery."

As the NDS states, "New commercial technology will change society and, ultimately, the character of war. The fact that many technological developments will come from the commercial sector means that state competitors and non-state actors will also have access to them, a fact that risks eroding the conventional overmatch to which our Nation has grown accustomed." Recognizing the importance of speed and the dominance of the commercial realm's technology progress, the question becomes how do we get it to our Soldiers quickly? How do we tap into, adapt, and adopt the innovation being developed by commercial entities at a rate faster than China and Russia can?

We have taken some good, necessary steps in allowing commercial companies to more easily engage in contracting with our bureaucratic acquisition and contracting policies, such as increased use of Other Transaction Authority (OTAs). However, China has a distinct advantage to tapping into its own advancing commercial technology.

A survey of the world's top defense contractors shows America with the top five defense revenue-producing companies in the world. However, our economic model, with the exception of Boeing, typically yields a distinct line between defense and commercial companies. The world's No. 1 defense revenue-producing company, Lockheed Martin, garners 95% of its revenue from defense, with the others top companies between 75% and 94%. China contradicts this model. With five companies in the world's top 15 for defense revenue, Chinese companies are also heavily involved in commercial enterprises, with only 20-38% of their revenue being generated by defense. This provides for an easier opportunity to transition advanced commercial technology into defense products than their American counterparts. We must stop simply providing ways that allow commercial companies to provide defense products. We must develop more innovative ways to actively attract and encourage these worldwide technology-leading companies into providing our Soldiers the war-winning products that will deter our competition.

Expand the use of OTAs. The use of OTAs has shown an impressive increase from $950 million in FY15 to $7.7 billion in 2019, with the U.S. Army leading the way ($4.5 billion in FY19). More can be done. One of the primary ways that these innovative companies connect to government projects is through consortia, aligned by focus areas, such as cyber, space, undersea, propulsion, etc. These consortia establish streamlined procedures to more quickly evaluate ideas and proposals than traditional Federal Acquisition Regulation (FAR) processes.

However, the method that the government has decided to fund these consortia places an unfortunate disincentive for companies to participate. To join a consortia, these non-traditional vendors, non-profits and academic organizations must pay an application fee and membership dues, initial and annual, as well as provide a percentage of their profit to the consortium manager. In this race to technology dominance, these barriers may just dissuade the right company with the right technology to make the war-winning/deterring difference from participating. To attract versus merely allow, why not conduct a competitive source selection for each focus area and pay the consortium manager for its services.

This would alleviate any negative financial considerations for innovative, non-traditional entities from submitting their ideas and proposals. For each contract awarded, the consortium manager would also receive a bonus payment, providing incentive to actively pursue and evaluate a maximum number of companies and organizations operating in their focus area.

Design for Commercialization. Initiated by Congress with the FY11 National Defense Authorization Act, the Design Exportability Features pilot program has evolved into a requirement in the recent Major Capability Acquisition regulation, DODI 5000.85. Starting with Milestone A, the proposed acquisition strategy is to include "design[ing] the system for exportability to foreign partners, except when the program has an MDA-approved waiver allowing for a U.S.-only design," while also requiring the Milestone Decision Authority to "notify the USD(A&S) and the requirements validation authority."

One benefit of designing systems with a modular open system approach (MOSA) is that they can be readily adapted for our allies' use to enhance international cooperation and improve our interoperability. Why not take

this logic one step further and design for commercialization? Obviously not all weapon systems and/or their components have commercial application. However, if many commercial technologies have defense application, the reverse is also likely true, e.g., the internet and GPS. Yes, they must be properly managed for security considerations; however, how can we more aggressively and properly incentivized these transitions? Dedicated, supplemental funding can be used to encourage our "heavily-reliant-on-defense-revenue" partners to devise ways during early cutting-edge technology design work to adapt defense technology for commercial application.

This could potentially enable them to increase their profit, reduce our production costs, and create more economic competitiveness for the U.S. in the global market—a win-win. A company like Lockheed Martin, with 95% of its revenue being derived from defense work, would obviously remain defense heavy. However, wouldn't it be a worthwhile goal to see Lockheed Martin rebalance its revenue-generating percentage to something closer to 75% through commercial adaptation of defense-generated technology?

Actively recruit leading technology companies. Congress and DOD leadership should not just be extending ways to allow our top technology companies to work with DOD, but should be actively courting them. The government should identify those commercial technologies that have the greatest potential for war-winning/deterring systems, and provide financial and intellectual property incentives for their development, similar to the government's Operation Warp Speed program to find a vaccine for COVID-19, but perhaps with less intensity due to resource limitations. The NDS hints at some of these needed technologies in identifying its key modernization priorities, e.g., advanced autonomous systems. Obviously, this would be a very selective process; however, it could help avoid what the NDS describes as "a Joint Force that has legacy systems irrelevant to the defense of our people."

So, how relevant is speed? It's critical! Our Soldiers need our acquisition professionals to provide them with the latest technology and systems to win the wars that we have to fight and fully deter our inter-state strategic competition from taking actions that may lead to war. We must be proactive in the pursuit of war-winning capability, rather than reactive. Therefore, we need to not just innovate ways that allow leading technology companies to contract with the DOD, we must pursue, attract, encourage and incentivize them to do business with us. We should also urge our defense industry partners to venture into world-leading technologies that have potential commercial application. These are just three ideas to jumpstart the process to "change business practices to achieve mission success (NDS)." We must make it our priority to find more ways if we hope to strengthen America's deterrence and meet the NDS' "most far-reaching objective," to "set the military relationship between our two countries [China and America] on a path of transparency and non-aggression." We need to produce war-winning capabilities at the speed of relevance!

HONORABLE MENTION

A New Benchmark for Transit Case Acquisition: Drop Testing

By the following author:
Mark DuBose

Introduction

The current drop test requirements from MIL-STD-810H (shown in Table 1, below) To summarize, Transit case < 100 lbs. Drop Test: Drop on each face (6), edge (12) and corner (8); total of 26 drops. Transit case 100 lbs. to 1000 lbs. Drop Test: Drop on each corner; total of 8 drops.

TRANSIT CASES
A Pelican 1660 Case used in the field. (Photo courtesy of Pelican Products Inc.)

Why are there two different drop tests? This paper reexamines drop testing and defines a single standardized drop test, using physics, math and test data to provide a new benchmark to streamline acquisition and control costs.

The Physics of Dropped Objects

Endevco, an MTS Company, designs and manufacturers Accelerometers or "G" meters for various instrumentation applications. Their technical staff derived a mathematical equation for the acceleration at impact of dropped objects see the blue box in Figure 1, on page 26. For those interested in the derivation, the web link to the Technical Paper 321 is included.

The main conclusion from the equation is highlighted in the red box which is: The greatest accelerations or G's experienced by a packaged item in a transit case occurs when the transit case is dropped onto its largest surface area of contact (face drops), and when a transit case is dropped onto its smallest surface area of contact (corner drops) the packaged item will experience the least

TABLE 1 Logistic Transit Drop Test

Table 516.8-IX. Logistic Transit Drop Test[1].

Weight of Test Item & Case kg (lbs)	Largest Dimension cm (in.)	Notes	Height of Drop, h cm (in.)	Number of Drops
Under 45.4 (100) Man-packed or man-portable	Under 91 (36)		122 (48)	Drop on each face, edge and corner; total of 26 drops[5]
	91 (36) & over		76 (30)	
45.4 - 90.8 (100 – 200) inclusive	Under 91		76 (30)	Drop on each corner; total of eight drops
	91 (36) & over		61 (24)	
90.8-454 (200 – 1000) inclusive	Under 91		61 (24)	
	91 – 152 (36 – 60)	2	61 (24)	
	Over 152 (over 60)	2	61 (24)	
Over 454 (1000)	No limit	3 4	46 (18)	Drop on each bottom edge. Drop on bottom face or skids; total of five drops

amount of G's (Surface Area variable "A" is in the numerator of the equation). Reviewing the two current drop tests in Section 1.0, referencing the equation (See Figure 1, below) the 26 drops for transit cases < 100 lbs. is over testing, as only the 6 face drops test the packaged item and cushioning system to the maximum G levels. The 8 corner drops for transit cases that are 100 lbs. to 1000 lbs. is under testing, as the packaged item and cushioning system never experience the maximum G levels during the drop test. Mathematical models/equations are good representations of reality, but need to be validated to provide confidence for their use in real world applications, so research was undertaken by the author for two weeks after work in the University of Central Florida (UCF) Library.

The research provided a published drop test and results from the Handbook of Shock and Vibration, one of the "Bibles" of the industry. The published drop test is representative of a typical transit case drop test, as it took a packaged item and instrumented it with G meters (accelerometers) and then placed it in a transit case and encapsulated the packaged item with 2 inches of foam all around. Drop tests were then performed to see how many G's were experienced by the packaged item. The drop test was duplicated with a larger transit case using 3 inches of foam all around the packaged item. The drop test results (shown in Figure 2, left) Solid line curve is the 2 inch thick foam, the dotted line curve is the 3 inch thick foam.

The results confirm/validate the equation and the primary conclusion that face drops are the only way to test the worst case shocks (G's) imparted on a packaged item and cushioning system in a transit case. Edge drops are 5-10 G's less and corner drops are 10-15 G's less, depending on the thickness of the foam. The new standard drop test should concentrate on face drops. For further confidence, a review of the best commercial practice (shown in Figure 3, left) which summarizes the FedEx drop testing standard.

Note that the FedEx drop test is the same 10 drops no matter what size the package is or what the drop height is, and it concentrates on the 6 face drops. This drop test provides maximum shock (G load) exposure to the packaged item, which is what FedEx is liable for. Similarly, the Government's primary concern is for the protection of the packaged item, so our standard drop test should also concentrate on face drops, to impart the worst case shock loads on the packaged item and cushioning system. Also, United Parcel Service (UPS) and Amazon

FIGURE 1 Equation for Acceleration at Impact of a Dropped Object

$$a = \sqrt{\frac{E\,A\,g\,d_1}{h\,m}}$$

Where:
a = Acceleration of the dropped object
E = Modulus of Elasticity
A = Area of contact at impact
g = Gravitational constant
d_1 = Drop height
h = Height of the object being dropped
m = Mass of the object being dropped

From this basic equation, a number of conclusions can be deduced.

1) Greater acceleration levels will be achieved when the surface area, A, is increased. Specifically, if an object is dropped onto its most flat surface (flat-on-flat impacts) the acceleration is the greatest. Conversely, if dropped onto a sharp corner, the acceleration will be minimized.

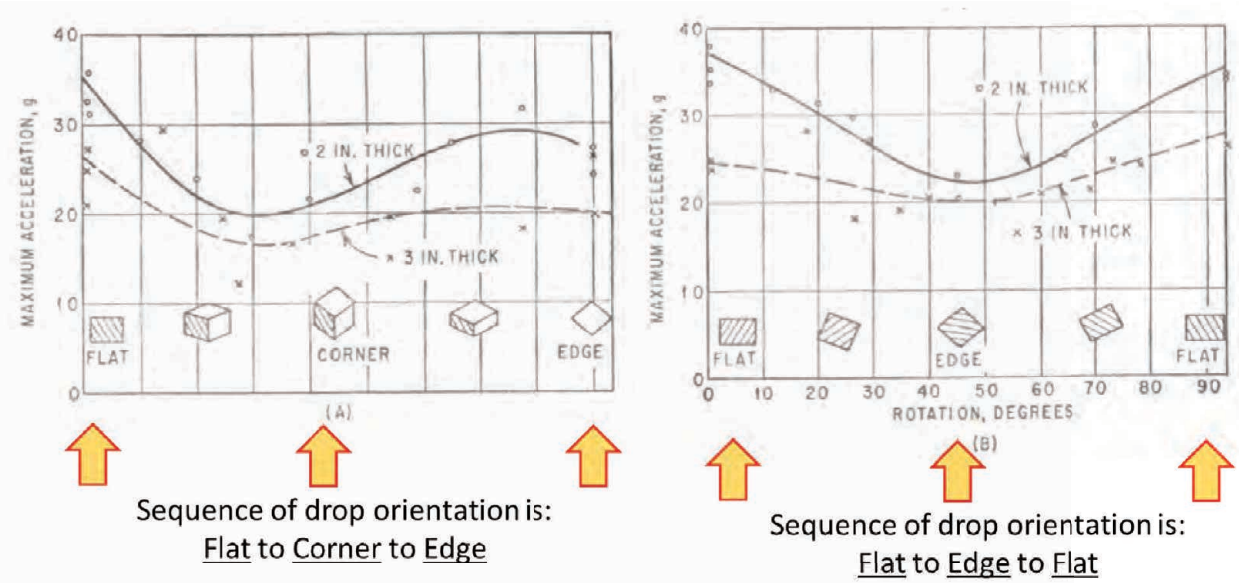
2) Greater acceleration levels will be achieved with a higher drop (this should be obvious).

3) Greater acceleration levels will be achieved with a lower mass object.

4) Greater acceleration levels will be achieved with a stiffer object (higher modulus).

Source: Endevco Technical Paper 321, Acceleration Levels Of Dropped Objects
https://endevco.com/endevco-resources/literature/

FIGURE 2 Container drop orientation upon maximum G's experienced during drop testss

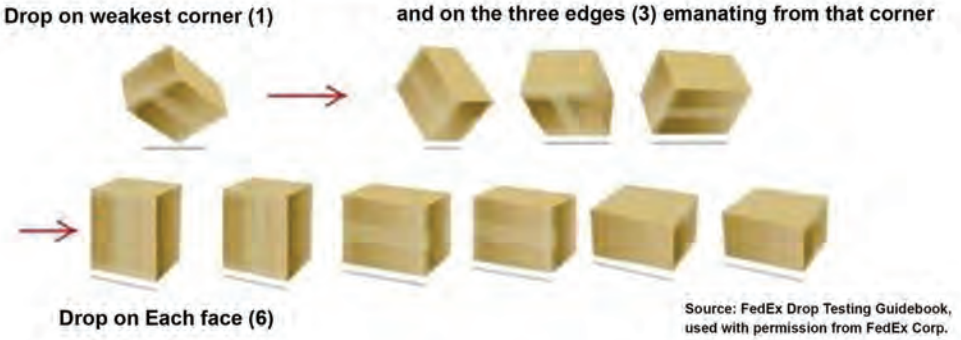


Source: Shock and Vibration Handbook, Harris & Crede, pg. 41-10

FIGURE 3 FedEx Drop Testing, Total of 10 Drops

From FedEx:

Package Weight	Drop Height	Drops per Sequence
Equal to or less than 75 lbs.	30"	10
Greater than 75 lbs. but equal to or less than 100 lbs.	24"	10
Greater than 100 lbs. but equal to or less than 150 lbs.	18"	10



Source: FedEx Drop Testing Guidebook, used with permission from FedEx Corp.

TABLE 2 Logistic Transit Drop Test Tailored

Table 516.8-IX. Logistic Transit Drop Test[1]. (Tailored)

Weight of Test Item & Case kg (lbs)	Largest Dimension cm (in.)	Notes	Height of Drop, h cm (in.)	Number of Drops
Under 45.4 (100) Man-packed or man-portable	Under 91 (36)		122 (48)	Drop on the weakest corner (1) and on the three edges emanating from that corner (3); Drop on each face (6); Total of 10 drops
	91 (36) & over		76 (30)	
45.4 - 90.8 (100 – 200) inclusive	Under 91		76 (30)	Drop on the weakest corner (1) and on the three edges emanating from that corner (3); Drop on each face (6); Total of 10 drops
	91 (36) & over		61 (24)	
90.8-454 (200 – 1000) inclusive	Under 91		61 (24)	
	91 – 152 (36 – 60)	2	61 (24)	
	Over 152 (over 60)	2	61 (24)	
Over 454 (1000)	No limit	3 4	46 (18)	Drop on each bottom edge. Drop on bottom face or skids; total of five drops

performs the same drop tests on their packages, as both companies and FedEx adopt their drop tests from the International Safe Transit Association (ISTA) International testing standard.

The Standard Drop Test for Transit Cases

Based on section 1.0 and 2.0, the tailoring of MIL-STD-810H (shown in Table 2, above) provides for one standard drop test for transit cases and once adopted will: Streamline this portion of acquisition, by controlling proposal estimates, and standardizing Government cost reviews, eliminate unnecessary drops during testing and by making this the industry standard drop test, it will control actual testing cost.

An Option for Eliminating the Transit Case Drop Test

In the sections 1.0 through 3.0, it has been shown, using math, research, test data and best commercial practice, how and why the Government should perform transit case drop testing by tailoring MIL-STD-810H. This section will provide a strong case for program management to option out of drop testing if a situation warrants it. The author is an engineer and will always advocate testing, but innovation and cost avoidance must be considered as well.

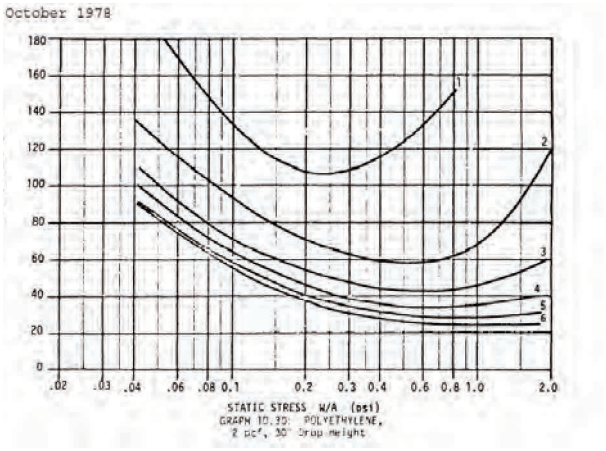
First of all, from section 1.0 and 2.0, for transit cases 100 to 1000 lbs., only 8 corner drops are performed for current and past drop testing. Corner drops provide the least amount of shock loads to the packaged item, providing a false positive (flawed test), so for these transit cases, the Government is already accepting the risk of opting out of drop testing.

The transit cases are specified to comply with ATA SPEC 300 category 1 container. Appendix A shows the testing requirements that a category 1 container is subjected to. It includes drop testing a loaded case, and dropping it 280 times (160 face drops, 80 edged drops, 40 corner drops). Testing is conducted during qualification of the design and again to validate production lots (with a random sample). So is it necessary to drop test the transit case when it has already passed drop testing per the ATA 300 SPEC?

The foam cushioning system inside the transit case is designed using load compression curves, from MIL-HDBK-304B (See Graph 1, page 29).

The curves are generated by performing thousands of drop tests onto different types of foam, different foam densities, different drop heights and different thicknesses. Graph 1 is for polyethylene foam with a density of 2 lbs./cu.ft. (PCF) and a drop height of 30 inches. So the engineer is designing/selecting the type of foam, its density and thickness to protect the packaged item with drop test data. So is it necessary to drop test the transit case to test the cushioning system when the cushioning system was designed using drop test data from the

GRAPH 1 Load compression curves, from MIL-HDBK-304B



same height as the drop test that the transit case is being tested from? Simple reasoning dictates the answers to the above questions: No drop testing is required. These are compelling arguments for program management to use to option out of drop testing if the situation warrants it. The following are risks and mitigations associated with this option.

- *Risk:* Reliance on the transit case manufacturer's ATA SPEC 300 category 1 certification of the transit case. Mitigation: The manufacturer marks the case with "ATA spec 300" and "Reusable Container" and "Category 1" to certify compliance (Risk is LOW).
- *Risk:* Reliance on the Standard Test Method for Dynamic Shock Cushioning Characteristics of Packaging Materials (ASTM D1596) to generate the foam compression curves, which is performed in laboratory testing conditions and does not consider extreme temperature environments. Mitigation: For high temperatures, the upper right portion of the compression curves shall be avoided when designing the cushioning system inside the transit case. For extreme cold temperatures, divide the packaged items fragility rating by 2. These mitigations have been used successfully in practice (Risk is LOW).
- *Risk:* Reliance on contractors to design the foam cushioning system within the transit case per MIL-HDBK-304. Mitigation: Employ the "Du-Bose Design Rule" to ensure compliance with MIL-HDBK-304 (See my companion paper "A New Benchmark for Transit Case Acquisition: The Design Process" also submitted for the 2020 writing competition) (Risk is LOW).
- *Risk:* Testing the transit case in its final configuration would be eliminated. The actual component/real world impact loads may be different than the test loads used in the testing machine that generated the compression curves or the loads used to drop test the ATA SPEC 300 cases. Mitigation: Surface area of contact of the actual packaged item is used for determining the type of foam cushion, its density and thickness (Risk is MEDIUM).

Cost Avoidance Estimate for Eliminating the Transit Case Drop Test

In Table 3 (page 30) a hypothetical cost proposal is referenced for a Cost Avoidance Estimate (CAE) analysis. The hours proposed are for the drop test procedure, preparation and execution.

Table 3: Cost Avoidance Estimate (CAE) per Drop Test
Also included is the NTS testing company's proposed ROM estimate for the new standardized drop test provided in section 3.0 (10 drops).

The orange highlighted column shows the time (Engineering and Management) that is eliminated and the green highlighted box is the NTS testing facilities ODC cost eliminated, by opting out of drop testing. The time and ODC cost savings results in a CAE of $12,730.88 per transit case design.

In Table 4 (page 30) the drop testing labor time and ODC have been inputted into an Independent Government Cost Estimate (IGCE) spreadsheet and the resulting sensitivity analysis is shown in the blue highlighted charts.

The CAE is per transit case design, so this generates questions:

- How many different transit case designs will be acquired by the U.S. Government, over the next 10 to 20 years?
- What's the average number of transit case designs per program? E.g. the Range Communications System (RCS) program had nine different transit

TABLE 3 Cost Avoidance Estimate (CAE) per Drop Test

GOVERNMENT COST AVOIDANCE ESTIMATE Labor - (Hypothetical Cost Proposal)					
Labor Classification	**Transit Case Drop Test Task Description**	**Typical Hours Proposed**	**Hours eliminated by eliminating Drop Testing**	**Hypothetical Burdened Hourly Rate**	**Drop Test Cost Avoidance Sub-Total ($)**
Engineer-Test 4	Transit case drop test Test Procedure	20	20	$ 156.25	$ 3,124.99
Engineer-Test 4	Drop Test prep (Load transit case,….,etc.)	8	8	$ 156.25	$ 1,250.00
Program Manager 3	Drop Test prep (Load transit case,….,etc.)	4	4	$ 174.14	$ 696.56
Engineer-Test 4	Drop Test execution	8	8	$ 156.25	$ 1,250.00
Program Manager 3	Drop Test execution	4	4	$ 174.14	$ 696.56
Engineer-Test 4	Test Report inputs and generation	8	8	$ 156.25	$ 1,250.00
Program Manager 3	Test Report inputs and generation	20	20	$ 174.14	$ 3,482.79
	Total for Drop Testing of Transit Case:	**72**	**72**	**Sub-Total:**	**$ 11,750.88**
Total Drop Testing Cost Avoidance per Transit Case Design ⇨					**$ 11,750.88**

Material Item	Description	Quantity	Estimated Cost	Sub-Total ($)
NTS Facility	Transit Case Drop Test	1	$ 580.00	$ 580.00
NTS Facility	Drop Test Report	1	$ 400.00	$ 400.00
				$ -
			Sub-Total	**$ 980.00**

ROM Quote from NTS for the cost of a drop test and report

TABLE 4 Scaling the Cost Avoidance Estimate of Drop Testing per Transit Case Design

No. of Transit Case Designs ????	Drop Test Cost Avoidance ($K)
5,000	$ 65,139
10,000	$ 130,278
15,000	$ 195,417
20,000	$ 260,556
25,000	$ 325,694
30,000	$ 390,833
35,000	$ 455,972
40,000	$ 521,111
45,000	$ 586,250
50,000	$ 651,389

IGCE Transit Case Drop Test Cost Avoidance	
Cost Categories	**Estimated Cost**
Labor	$ 11,751
Material	$ -
Travel	$ -
ODC	$ 980
Other	$ 297
Total	**$ 13,028**

IGCE Sensitivity Analysis (Total Contractual Cost)	
CAE (+20%)	$ 15,633
CAE (+15%)	$ 14,982
CAE (+10%)	$ 14,331
CAE (+5%)	$ 13,679
CAE (Baseline)	**$ 13,028**
CAE (-5%)	$ 12,376
CAE(-10%)	$ 11,725
CAE (-15%)	$ 11,074
CAE (-20%)	$ 10,422

case designs, this equates to $117,252.00 (9 x $13,028) cost that could have been avoided by eliminating drop testing.

- How many U.S. Government programs are there (DOD, FAA, DOE, FBI, etc.)?

The orange highlighted chart in Table 4 quantifies and scales the total cost avoidance based on the number of different transit case designs. The range of the number of transit case designs, over the next 10 to 20 years, is targeted to be 5,000 to 50,000 and if drop testing is optioned out of, the cost avoidance range is from $65 million to over a half billion dollars.

Conclusion

Implementing a standardized drop test that concentrates on face drops to impart worst-case shock loads on the cushioning system and packaged item will provide validation that protection of the packaged item is being provided by the transit case design, streamline transit case acquisition and control cost. If the risks in section 4.0 are mitigated as prescribed, the confidence level increases (80-90%) that the drop test can be optional, to avoid program cost and relax a program's schedule.

_____

Appendix A: *Air Transport Association (ATA) Spec 300 Category 1 Testing (source: ATA Spec 300)*

Appendix B:

B. 1-1: Reusable Shipping Containers

Tests for reuasble shipping containers shall be conducted in accordance with the following sections: Category I- Conducted on prototype container of each design prior to production and on at least one other container of that design selected at random from the first production lot. Where any element of the deign or material used is altered, this process will be repeated.

B. 2-2 :Flame Penetration and Thermal Resistance

Outer packaging used to transport as air cargo cylinders containing compressed oxygen, other compressed oxidizing gasses, or oxygen generatiors must comply with applicable regulations including flame penetration and thermal resistance tests and documentation of the tests.

B. 2-3 :Water Resistance

Category I containers shall be resistant to normal precipitation.

B. 2-4: Vibration Test for Category I Containers

Vibration tests shall be conducted on Category I containers in accordance with ASTM Designation D-999 [ASTM D-999], Procedural Method B, within the range of 5 to 50 cycles per second for a period of not less than two hours.

B.2-5 :Penetration Test for Category I Containers

All Category I containers must be capable of passing the impact resistance test which consists of a bar of 3.2 centimeters in diameter with a hemispherical end, weighing 6 kilograms being dropped with its longitudinal axis vertical, onto the weakest point of any exterior surface of the container. The drop shall be 0.5 meters from the bottom of the bar to the top of the container surface. Failure occurs if the bar either penetrates the outer wall or permanently damages it in a manner which will degrade the structural strength of the container or container wall.

B. 2-6: Cause for Rejection

At the conclusion of the testing, the contents of the container, its interior shock-absorbing materials and devices shall not show any changes that affect their utility. The interior or exterior of the container shall not reveal any failure of the container or shifting of the part.

Pass/Fail Criteria: At the conclusion of the drop test, the critical design elements of the container must remain funcational. The exterior of the container should not have any failures that affect the utility of the container or that would prevent the container from being offered for transportation. The interior of the container should not have any failures that affect the containers ability to adequately protect the contents from damage.

B. 3: Tests for Preservation Packaging

The efficiency of sealed barriers or containers which provide preservation shall be determmined in accordance with generally accepted quick-leak or vaccum retention tests.

B. 4: Records and Certification

The container manufacturer shall maintain records of tests and provide copies of these records to the supplier's customers upon request. Containers of either category from a particular production run which have successdully demonstrated compliance with requirements of this specification shall be marked "ATA Spec 300" and "Reusable Container" and "Category I" or "Category II" as applicable. These records and marks shall be container manufacturer's certification to the customer of compliance with ATA Spec 300.

Bibliography:

"Pelican™ 1660 Case", Case Club at https://www.caseclub.com/product/pelican-1660-case/, Photo #3: "Transit Cases", used with written permission from, Pelican Products, Inc., Web. Case Club 1990-2020.

MIL-STD-810H, "Department of Defense Test Method Standard Environmental Engineering Considerations and Laboratory Tests", Method 516.8 Shock, US Army Test and Evaluation Command, Aberdeen Proving Ground, MD, 31 January 2019. Print.

Endevco Corp., "Technical Paper 321 Acceleration levels of dropped objects", Page 5, Graphic: "Acceleration formula of a Dropped Object" used with permission from, PCB Piezotronics, Inc., parent company of Endevco Corp., Print.

Harris, Cyril M., and Crede, Charles E., "Shock and Vibration Handbook", 2nd Edition: Page 41-10. New York, NY: McGraw-Hill, 1976. Print.

FedEx Corp., "FedEx Drop Testing Guidebook", Page 3 and 4, Graphic: "FedEx Drop Testing" used with written permission from, FedEx Corp., FedEx Corp., 2016. Print.

MIL-HDBK-304B, "Military Standardization Handbook Package Cushioning Design", Section 2.2 Fragility of an item, Air Force Packaging Evaluation Agency (AFALD/PTPT), Wright-Patterson APB, OH, 1 October 1978. Print.

American Society for Testing and Materials, "Method of Test for Dynamic Properties of Package Cushioning Materials", ASTM Method D 1596-71, 1971.

Air Transport Association (ATA), "ATA Spec 300 Specification for Packaging of Airline Supplies", Revision 2014.1: Air Transport Association of America, Inc., 2014. Print.

Category: Lessons Learned

WINNER

FWS-S (Family of Weapons – Sniper) and the OTA (Other Transaction Authority) Process

By the following author:
Elliott J. Bird

Executive Summary

The Family of Weapons – Sniper (FWS-S) program successfully implemented a complete Other Transaction Authority (OTA) Process and awarded agreements to two vendors. In this article, the Assistant Program Manager for FWS-S explains the decisions and processes performed to award the agreements. Throughout the OTA Process, there were many decisions the FWS-S team made and also procedures that we implemented to make the program a success. This article explains a framework for successful execution of an OTA award process. The procedures discussed here can be modified to meet any organization's needs in conducting an OTA.

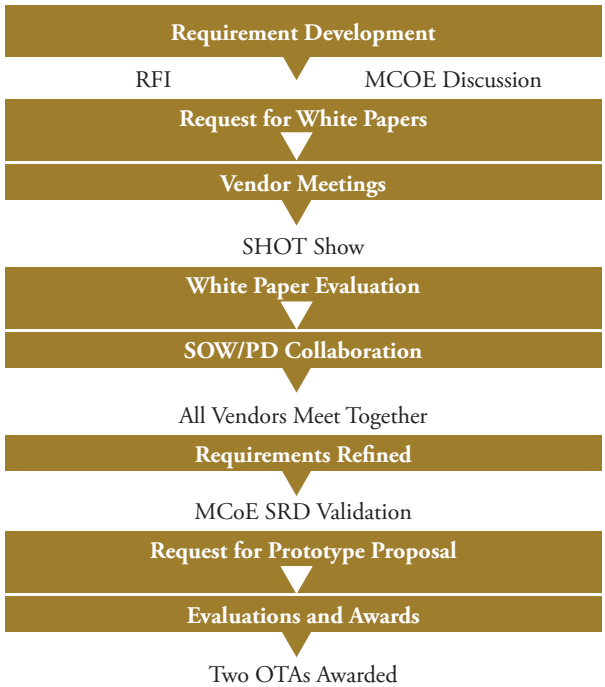
Introduction

In July 2018, Product Manager Soldier Maneuver Sensor (PdM SMS) terminated the previous FWS-S contract due to the vendor's various failures. PdM SMS decided to pursue an OTA Agreement to try and expand the industrial base and open up the competition for the program. PdM SMS leadership wanted to bring in non-traditional vendors while pursuing specialized technical requirements. After researching options through a variety of sources we selected a Prototyping OTA as the best option and used the OTA Guide as our guide. We budgeted for two awards to allow for competition. The required technology is mature, so we determined a Firm Fixed Price OTA as the ideal choice.

Each decision brought its own set of pros and cons that we weighed while determining the best course of action for our program. We used a consortium to assist the program in targeting the proposal to vendors that possessed the specialized experience to perform the work. The table below lays out many of the decisions we made and their relation to our lessons learned from the terminated contract.

LESSONS LEARNED	OTA DECISION
Lack of Competition (1 Vendor)	At least two prototyping OTAs
Cost Overruns	Firm Fixed Price
ACAT IV Program	Use established consortium
Changing Requirements	Open Collaboration
Maintenance Support insufficient	Provide a GFE TMDE Solution
Little Soldier participation	Involve MCoE in every phase of the OTA process

PdM SMS successfully completed an OTA award for the Enhanced Night Vision Goggle – Binocular (ENVG-B) program of record (POR). The FWS-S Team followed the ENVG-B POR model closely to use their lessons learned to assist in our OTA Process development. This allowed us to have a good framework to start our OTA Process. One of the advantages to the OTA Process is that it affords some flexibility in the award process and also welcomes collaboration with potential vendors. The pathway below can be tailored to the unique needs of your program.



Requirement Development

The team held an FWS-S reboot meeting at Fort Belvoir, Virginia, in November 2018. This meeting brought in many of the stakeholders on the program. The stake-

holders included the Maneuver Center of Excellence (MCoE) Soldier Requirements Directorate (SRD), an Army Contracting Command (ACC) Agreements Officer, ACC Legal Office, representatives from the System of Systems (SOSSEC) Consortium, Night Vision Electronic and Sensors Directorate (NVESD) experts and FWS-S team members. The reboot meeting allowed each stakeholder to review the Statement of Work (SOW) and Product Description (PD) and determine which requirements needed updating to match with the Capability Production Document (CPD) currently in staffing. The meeting resulted in updates made on many of the technical and logistics requirements. The FWS-S Team worked to revise these documents and get approval from all stakeholders.

One of most significant updates was the addition of the Intra-Soldier Wireless (ISW) requirement. ISW would allow the FWS-S to receive range information from the Small Tactical Optical Rifle-Mounted Micro Laser Rangefinder (STORM) and also transmit imagery to the ENVG-B or Integrated Visual Augmentation System (IVAS). In order to transmit data, the system would need to incorporate a specific encrypted chip. There were a number of other added requirements including the implementation of the Modular Test, Measurement and Diagnostic Equipment (TMDE) developed by NVESD as well as increased distance and weight. The FWS-S team conducted meetings with SRD to ensure that the user requirements were properly annotated in our requirements documents.

Once we felt we had an understanding of the desired system attributes we sent out a Request for Information (RFI) through the SOSSEC Consortium and also beta.sam.gov. We included our desired Statement of Objectives (SOO) and requested feedback from interested vendors. We received comments from seven potential vendors. They provided valuable input that allowed us to modify the SOOs to better match desired attributes with vendors' capabilities. Once we refined the SOOs, we were ready for the next phase.

Request for White Paper (RFWP)

The FWS-S Team and ACC Agreements Officer prepared an RFWP that incorporated these changes. We sent out the RFWP less than a month after receiving the comments to our SOO/RFI. The RFWP was published to SOSSEC and beta.sam.gov prior to the Shooting, Hunting, Outdoor Trade (SHOT) Show in January 2019. This allowed PdM SMS to have the RFWP available to vendors during discussions at the SHOT Show in Las Vegas.

Vendor Meetings

The FWS-S APM and the PdM SMS attended the SHOT Show in Las Vegas in January 2019. During the SHOT Show, we invited all seven vendors who had responded to the RFI/SOO to meet with us. Each vendor already possessed a copy of the RFWP and could direct their questions/comments to the RFWP requirements. After the SHOT Show there were a number of additional RFIs from the potential vendors. The team met with MCoE SRD and users from the US Army Sniper School to ensure that we responded to the RFIs presented by potential vendors without degrading the desired capabilities.

White Paper Evaluation

The FWS-S Team received four white paper responses to our RFWP. We evaluated the proposals using the following criteria:

EVALUATION FACTOR	DEFINITION
Contribution to the Requirement (#1)	Degree to which the technical approach is relevant to the Army requirements in the SOO.
Technical Approach/ Qualifications (#2)	Degree to which the technical approach is innovative, feasible, achievable, and complete.
Schedule (#3)	Achievable within 24 months from award.
Cost (#4)	Realism of proposed cost.

The FWS-S Team evaluated each of the White Papers and ranked them according to the factors listed. We presented our recommendation to the MCoE SRD and Snipers at the US Army Sniper School. Based upon our evaluations and Soldier feedback all four vendors were invited to compete for the final OTA award.

SOW/PD Collaboration

The FWS-S Team hosted a collaboration session with all four vendors. The Team and vendors met at the Program Executive Office Soldier Ideation Center at Fort Belvoir. We provided each vendor a copy of the draft Statement of Work (SOW) and draft Product Description (PD). The FWS-S engineer led the collaboration and facilitated

feedback from each vendor in the open forum. The team received critical feedback on current capability to achieve the desired technical requirements.

In addition to the four vendors, we had stakeholders and experts from PdM SMS, Project Manager Solder Maneuver Precision Targeting (PM SMPT), NVESD, CECOM, ACC (Agreements officer and legal), SOSSEC and MCoE SRD. We provided each stakeholder the opportunity to provide feedback to the proposed SOW and PD.

After the open collaboration meetings, we held private one-on-one meetings with each vendor. They all departed the collaboration meetings with a copy of the draft SOW and PD as well as with an understanding that the Request for Prototype Proposal would be coming out within the next few months. This would enable them to start working on their proposals immediately.

Requirements Refined

After the collaboration meetings, the FWS-S Team refined the SOW/PD and ensured that each requirement from the CPD was properly crosswalked in the SOW/PD. One common concern from the vendors was the testing requirements. The team worked with our quality assurance (QA) team to refine the testing requirements and provide better fidelity. The QA team balanced testing requirements to better meet the prototyping effort while at the same time ensuring a production-capable system. The team worked closely with all stakeholders as we refined these requirements. This collaboration ensured that stakeholders were ready to accept the final developed prototypes. After making the changes, we validated the requirements with MCoE and the CPD to ensure compliance.

Request for Prototype Proposal

On July, 8, 2019, we sent out our RFPP to all four vendors through SOSSEC. We provided a summary sheet of significant changes since the collaboration and gave the vendors three weeks to respond to submit their proposals.

Evaluation and Award

The proposals were each evaluated using the following criteria:

EVALUATION FACTOR	DEFINITION
Soldier Acceptance (#1)	Impact on the Warfighter based on Soldier review.
Overall Quality and Technical Merit (#2)	Overall quality and/or technical merits of the proposal. Demonstrated understanding of the critical technical challenges.
Impact of Project Schedule (#3)	Ability to achieve a developed Technology Readiness Level 7 prototype.
Capability and Related Experience (#4)	Demonstrated capability to perform the SOW requirements during a site visit performed by Government personnel.
Price (#5)	Price Reasonableness.

The FWS-S Team visited each vendor's facility to evaluate criteria #2. The site visits allowed the team to evaluate each vendor's capabilities and also to determine their ability to transition to production for a possible future production OTA award.

The team evaluated the proposals and determined one vendor did not meet the requirements of criteria #2 and one failed to meet the requirements of criteria #4. We eliminated those vendors and evaluated the cost proposals of the other two vendors. We maintained competition by awarding agreements to both vendors.

The team made the recommendation to award two OTAs to the remaining vendors (one to a non-traditional Department of Defense vendor). We briefed our leadership on our decision and presented our recommendation to the Agreements Officer. After program leadership, the ACC agreements officer, and legal reviewed our recommendation, we successfully awarded two OTAs on September 30, 2019.

Conclusion

Our application of the OTA Process to the FWS-S program was successful. We applied the principles laid out in the Other Transaction Guide to successfully award two agreements. Through the OTA process, the FWS-S program brought in non-traditional vendors and created a competitive environment. By practicing open collaboration, we created the conditions to ensure that our SOW and PD were refined to meet the requirements with current industry capabilities. Through the seamless integration of the user community into all phases of the

OTA process, we will ensure the final solution is readily accepted by snipers. It is clear that fully integrating stakeholders early and throughout the process is key to successful OTA execution. In fact, all four vendors stated that the open and deliberate process employed for the FWS-S OTA program was beneficial to them in preparing their proposals. Any program that is looking to conduct an OTA should review the process we pursued and tailor it to their program.

HONORABLE MENTION

Streams Theory: A Policy Enactment Tool for Army Materiel Development

By the following author:
Maj. Steven R. Cusack

In academic environments, acquisition professionals learn that materiel solutions start with a military capability gap. Once a gap is identified, the acquisition team members write requirements and participate in risk reduction, prototyping, testing, and production events to ensure a feasible solution is fielded to warfighters. This linear model is a simple way to teach a process but, unfortunately, does not adequately reflect the procedures, personalities, and other complexities involved in communicating problems to senior leaders for action. Furthermore, the simplified academic process fails to acknowledge the entrepreneurship or flexibility in the industrial base on which the acquisition community relies for material solutions.

This article presents Policy Streams Theory, a complementary framework that will assist acquisition professionals as they move through acquisition processes to field materiel solutions that address military problems. Policy Streams Theory, a political science model that illustrates public policy enactment challenges, can also apply to acquisition challenges. Acquisition professionals can apply Streams Theory to anticipate and solve technical, interpersonal, and timing obstacles to solve military problems. Additionally, Streams Theory demonstrates that industry goals and materiel developer goals can be aligned for the mutual benefit of each organization's stakeholders.

The simplified linear process taught to acquisition students suggests that the Army generates requirements based on gap analysis, works with industry partners to develop an affordable, feasible solution, then verifies the solution, produces in mass, then fields the solution to operational units for use. The shortcoming with this linear model is that it assumes the military will be the first to identify the problem and act as the catalyst throughout the process to fill a gap.

In his book Agendas, Alternatives, and Public Policies, John W. Kingdon offers a policy enactment perspective that, with minimal adaptation, is a tool that acquisition professionals can use in daily interactions and to move a program through its formal and informal milestones. Kingdon's Policy Streams Theory suggests that policy enactment comes about as a result of three independent streams: Problems; Policy; and Politics converging at a specific Window of Opportunity. Acquisition professionals can use Streams Theory to anticipate and prepare for staffing challenges, budget requests, and take advantage of unanticipated opportunities when managing any acquisition project.

The Problem Stream [problems/gaps/messaging]

Suggesting that the acquisition process requires a capability gap is an over-simplified view of problem identification. While a problem in itself could satisfy the Problem Stream, reality suggests that any organization could have a long, perhaps infinite, list of problems to address; many problems will not receive attention beyond making it on the list (Kingdon 90). These lists, comprehensive as they may seem, cannot include all problems, and must be acknowledged as imperfect or at least incomplete lists of problems. Furthermore, industry may create a solution before a center of excellence or combatant commander recognizes the extent of the problem. If readers cannot imagine this, one of many examples exists later in this article.

Problems, however, are not created equally. To get attention, a well-developed problem will have messaging, scenarios, symbols, personal accounts, or other attributes that transform the theoretical problem into a more tangible military problem. Messaging for Problems may include threat analyses, exercise after action reviews, academic research, or country studies. Unfortunately, the death of a Soldier may be the most powerful form of Problem messaging that can generate action from the other two streams of Policy and Politics. Messaging gives Problems the boost they need to receive support (Kingdon 94).

The September 11, 2001 attacks presented a powerful problem with ample messaging. Today's Senior Army leaders are charged with preparing the Army for future anticipated enemies to prevent warfare. Anticipated problems are impossible to pinpoint and find agreement; future military problems and their solutions will not be apparent.

The Policy Stream [materiel solutions/garbage cans/soup]

The Policy Stream in policy generation is analogous to the various phases of materiel solution analysis that can result in a prototype and eventual full rate production item; this is the stream that produces an actual solution. Similar to Problems, not all materiel solutions are created the same, and acquisition professionals know that some solutions require additional maturity to meet minimum technology, manufacturing, and interoperability requirements, to name a few hurdles. But what happens to those ideas that are neither rejected nor accepted?

Recall that Policy Streams Theory is a model to represent challenges in developing public policy and not military materiel solutions. Kingdon suggests that policies (in acquisition, materiel solutions) that are not quite ready to advance in the acquisition process go into a garbage can where they are held. In this garbage can, policies float around with other policies in a metaphorical soup while collecting good qualities from other policies and shedding poor or inefficient attributes (Kingdon 84-6). Similarly, acquisition professionals know that down-select processes can result in a final accepted materiel solution that has the best qualities which may include parts of rejected solutions. Plenty of ideas are not poor concepts, but rather victims of poor timing or need additional maturity. The garbage can is a maturing area for ideas as they become ready for additional action; acquisition professionals can visualize this waiting period concept similar to technology, manufacturing, and interoperability readiness levels development. Ideas that never achieve acceptance remain in the garbage can indefinitely.

The Politics Stream [decision makers/compromises/authority]

The Politics Stream is perhaps the most complex stream, where the acquisition professional must consider the staffing process, its personalities, and the biases of the individuals involved. The Politics Stream represents the art of negotiation and persuasion in articulating needs and developing solutions. An unfortunate end result is that a materiel solution may be forced into any number of compromises as it seeks sponsorship from those in the chain of approval through decision authority. These compromises will most likely come in the form of cost or performance, but may use schedule as additional trade space. In anticipation of staffing troubles, acquisition professionals may alter requirements to satisfy the staffing process instead of focusing on the cost, schedule,

and performance characteristics that will produce quality equipment for its operators.

The importance of the three streams is understanding that any one of the Problem, Policy, or Politics streams can lead the other two or they can all move in parallel. Successful navigation and materiel solution decisions come only through attention to all three streams, their initial independence, and eventual interdependence as the streams move through time (Kingdon 18). Although these three streams can be a cumbersome management project, the streams process is far from over; the three streams must converge on an open Window of Opportunity.

Windows of Opportunity

Windows of Opportunity are critical in the acquisition process. Fortunately acquisition professionals become uniquely aware of federal budgeting and appropriation cycles, position in the fiscal year, and lifecycles of funds. Awareness of these fiscal events and limitations is a start, but acquisition professionals must manage the three streams to be at their prime during critical decision events. Procurement objective memorandum reviews and strategic portfolio analyses are examples of key events which inform congressional budgeting decisions to fund programs.

A validated requirement requires a clear problem, a solid path toward a solution, and sponsorship from key leaders who can positively influence the decisions of those with decision authority. Successful process management results in budget approval with little fanfare, but failure to arrive at a window of opportunity can result in long delays, stale messaging, and loss of momentum and interest from key sponsors (Kingdon 166-8, 186-90).

Mine Resistant, Ambush Protected Vehicle (MRAP) procurement illustrates the Streams Theory at work when the Window of Opportunity is ripe. Many remember the devastation of improvised explosive devices on US Service members, contractors, and non-combatants, and how the MRAP provided safe transport to military objectives and enabled tactical military action.

MRAP procurement came about by an urgent universal needs statement (UUNS) initiated by the US Marine Corps. However, the UUNS called for a solution of the MRAP, which was an already available solution from wheeled vehicle manufacturers, indicating that industry anticipated the government's realization of the problem and had already created a solution (DODIG Appendix C). Another anomaly in the MRAP procurement was that it had high-level sponsorship that ensured success. Secretary of Defense Robert Gates took personal interest and action to eliminate procedural delays and field the equipment to warfighters (Gates 119-126). In other words, industry led with a solution before the US Military declared that there was a problem. Understanding the gravity of the problem, the Secretary of Defense used his authority to expedite procurement and practically created a window of opportunity for the three streams to pass through.

The MRAP is certainly not typical, but it does contrast with perceptions that military acquisition processes are protracted engagements. MRAP fielded a solution quickly that improved protection from IEDs. The key differentiator in the process was a materiel solution that was production-ready, had widespread public support, and sponsorship from the Secretary of Defense who was also able to create a window of opportunity for approval. The final stream required was acknowledging the problem.

Streams Theory Lessons to Apply to the Acquisition Process:

1. Achieving consensus on a number of acquisition activities requires the convergence of the three streams in an opportunity window. To pass through, all streams must be sufficiently developed.
2. Personalities matter in determining military needs and solutions. Like all people, senior leaders have decision biases when identifying problems and developing solutions to complex military problems.
3. Acquisition professionals will better advocate for their communities by viewing stale progress through Kingdon's Streams model and apply resources to the lagging stream.

Managing acquisition projects requires determination, communication, persuasion and leadership. Acquisition professionals will continue to meet healthy resistance and scrutiny throughout acquisition processes. Streams Theory is a tool that will help acquisition professionals identify and overcome adversity, align stakeholder efforts, and recognize opportunities in the processes that make up the Defense Acquisition System.

Works Cited:

Department of Defense Inspector General (DODIG). Marine Corps Implementation of the Urgent Universal Needs Process for Mine Resistant Ambush Protected Vehicles (Report No. D-2009-030). Department of Defense Inspector General, 8 Dec. 2008, www.dodig.mil/audit/reports/fy09/09-030.pdf. Accessed 20 Sep. 2020.

Gates, Robert. Duty: Memoirs of a Secretary at War. Alfred A. Knopf, 2014.

Kingdon, John. Agendas, Alternatives, and Public Policies. 2nd ed., HarperCollins College Publishers, 1995.