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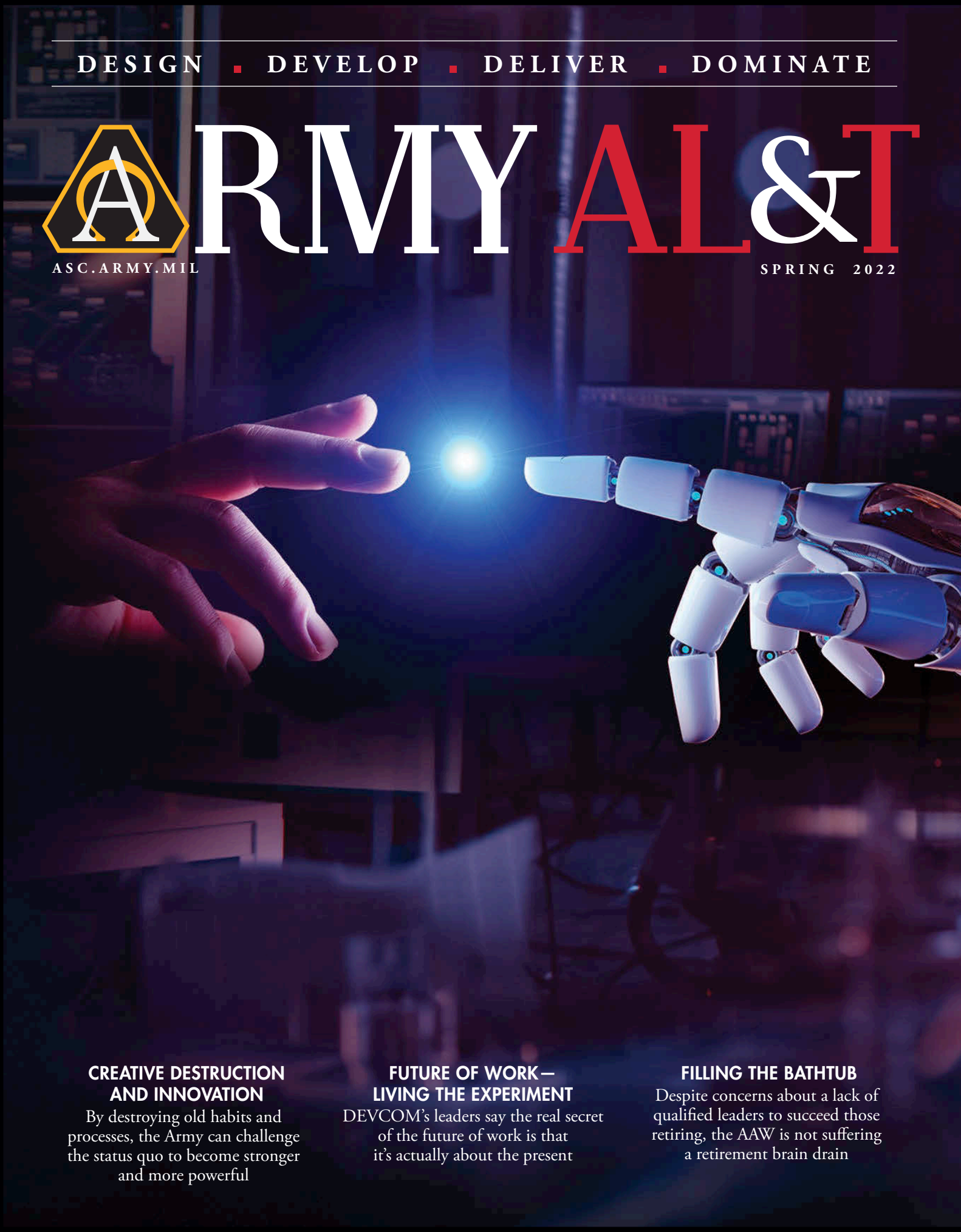

CREATIVE DESTRUCTION AND INNOVATION
By destroying old habits and processes, the Army can challenge the status quo to become stronger and more powerful

FUTURE OF WORK—LIVING THE EXPERIMENT
DEVCOM's leaders say the real secret of the future of work is that it's actually about the present

FILLING THE BATHTUB
Despite concerns about a lack of qualified leaders to succeed those retiring, the AAW is not suffering a retirement brain drain

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To contact the Editorial Office: Call 703-664-5636/5633

Email: **armyalt@army.mil**

Mailing Address:
DEPARTMENT
OF THE ARMY
ARMY AL&T
9900 BELVOIR ROAD
FORT BELVOIR, VA
22060-5567

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By Order of the Secretary of the Army:

JAMES C. McCONVILLE
General, United States Army
Chief of Staff

Official:

MARK F. AVERILL
Administrative Assistant
to the Secretary of the Army
2204106

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ARMY AL&T

SPRING 2022

FROM THE AAE

RESEARCH, DEVELOPMENT, TEST AND EVALUATION

ON THE COVER

In this issue, we examine trends and developments in research, development, test and evaluation across the Army acquisition enterprise—from Soldier touch points to small business accelerators and even "colorless" money for cyber defense.

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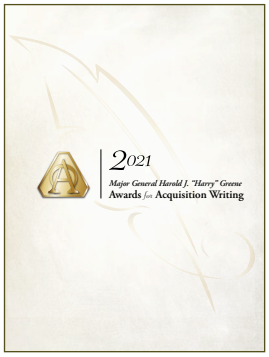
FEATURE ARTICLES

COMMENTARY

WORKFORCE



Also included with this issue: the 2021 Major General Harold J. 'Harry' Greene Awards for Acquisition Writing.

From the Editor-in-Chief

OK, so I'll be the first to admit that our theme for this issue—research, development, test and evaluation (RDT&E)—doesn't exactly roll off the tongue. It is a lot to unpack, but every element is critical to providing the very best equipment for our Soldiers to fight and win America's battles.

To ensure that happens, the complicated and even somewhat laborious process of RDT&E was born. It's not so much a process as it is the elements that guarantee success. Once our acquisition experts get the requirement, they have to research the best solution to the problem: Is there an existing platform, does it require new technology, and does it need to be tweaked to deliver the solution? Then, of course, the solution has to be engineered and made to work, and that takes time to develop. As the solution evolves, the path to success hits inevitable roadblocks, doesn't work, is overcome by events or is rendered obsolete as new technology comes along. Then, there is the testing and evaluation. This is where concept meets reality and sometimes becomes the valley of death for a program or product, because what works in the laboratory under controlled conditions may not work in real-world operational conditions.

How does the Army conduct research and development? What roadblocks (COVID-19, supply chain and computer chips, anyone?) have been encountered and how were they overcome? Are there funding constraints? What tests are underway and how are they conducted? There are lots of questions, but all that and more is what Army acquisition is working on, day in and day out. Many of the articles in this issue cross all the RDT&E boundaries, help get programs off the ground or keep them moving at speed.

Learn about the DOD pilot program to do away with the "colors" of money coming from Congress for specific uses, and create a new funding approach for software acquisition. The aim is to speed up the process and make it more relevant (and easier) to develop what's needed. In the Development realm, learn how the Joint Program Executive Office for Armaments & Ammunition leveraged prototyping capabilities, instead of relying on detailed requirements, to develop new cannon ammunition. For Research, see how the U.S. Army Combat Capabilities Development Command's Army Research Laboratory is bringing Soldiers in for "touch points" throughout the RDT&E process to provide helpful input on what they need and avoid creating costly delays or producing products that do not meet the requirement.

Email Nelson McCouch III
@ armyalt@army.mil

Army acquisition keeps up with current events as well, and just as for everyone else, the metaverse is quickly becoming our new reality. Read how our acquisition experts are exploring ways the metaverse can make today's command post more survivable by distributing operations among many points, reducing physical and electromagnetic signatures, while improving redundancy.

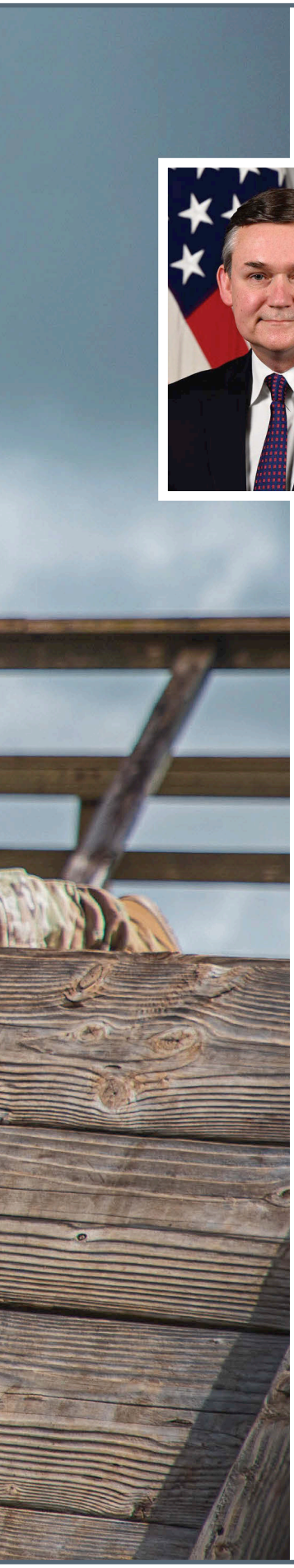
Finally, I would be remiss if I did not mention that this issue carries the winners and honorable mention papers recognized by the 2021 Maj. Gen. Harold J. "Harry" Greene Awards for Acquisition Writing competition. Now in its eighth year, the program is intended to continue shaping the public dialogue about Army acquisition through critical writing in the areas of Acquisition Reform, Future Operations, Innovation or Lessons Learned. Those who have been honored by the competition, either winning or being honorably mentioned, tell us that publication of their papers is the beginning of a conversation—often with a lot of people throughout the enterprise—instead of the end of the competition. I knew Harry Greene. He was a special man and a good friend. If you never met him, read "Life after the Army," on Page 118.

I hope you enjoy this issue, and if you have an intriguing idea, general comments or, better yet, a story about acquisition you would like to share, please contact us at **armyalt@army.mil**. We look forward to hearing from you.

Nelson McCouch III
Editor-in-Chief

HELPING HAND

Soldiers work together to overcome an obstacle at the Leader Reaction Course on Schofield Barracks, Hawaii in March 2021. Top among the Army acquisition executive's priorities are the people who research, develop and test the materiel that Soldiers need. (Photo by Sgt. Sarah D. Sangster, 25th Combat Aviation Brigade)



ROADMAP TO MODERNIZATION

> Priorities for "the most significant equipment modernization effort the U.S. Army has undertaken in the last four decades."

I appreciate having this opportunity to communicate regularly with the Army's acquisition, logistics and technology community. This award-winning publication is a valuable resource in providing information to help our workforce professionals do their jobs even better. With this issue, I would like to share with you my top priorities as I take on my leadership duties and responsibilities.

Let me state at the outset that I am deeply honored by the trust the President of the United States placed in me by nominating me to serve as the assistant secretary of the Army for acquisition, logistics and technology; by the confirmation of my nomination by the U.S. Senate; and by the confidence placed in me by the secretary of defense and the secretary of the Army. It is a privilege for me to lead the Army acquisition, logistics and technology team in the early years of what promises to be the most significant equipment modernization effort the U.S. Army has undertaken in the last four decades.

My first priority is taking care of people, our greatest asset. The acquisition workforce comprises more than 33,000 professionals who see that policies are implemented and cutting-edge capabilities get delivered to Soldiers. (Back-to-Basics streamlined the number of professionals whose jobs were classified as acquisition positions from roughly 43,000 to approximately 33,000.) They do amazing work. We must ensure the appropriate processes and tools are in place—particularly in the areas of recruitment, development and retention—for effective talent management.

TEST AND TEST AGAIN
A Ranger executes a live fire exercise with the Integrated Visual Augmentation System Capability Set 4 during tropical weather testing at Camp Santiago, Puerto Rico, in March 2021. Effective and realistic testing upfront enables the Army to find problems on the range where things can be easily fixed, rather than in theater when it could be a crisis. (Photo by Courtney Bacon, Program Executive Office (PEO) for Soldier)

My second priority is to intensely focus on acquisition program execution that ensures rapid delivery of equipment to Soldiers. For many years, Congress has directed acquisition reforms on improving acquisition velocity while not forgetting the other important parts of acquisition—cost and performance. All are important, but speed has been the emphasis. I will base my decisions toward taking actions that prioritize speed in a responsible manner.

My third priority is to improve the Army's policies and practices regarding the acquisition of software. With strong Congressional support, the Army now has more tools and authorities than ever to pursue software in a fundamentally different way, and many promising efforts are proceeding. I intend to accelerate and expand those efforts. (See related article, Page 27, "The Cyber Experiment.")

It is a privilege for me to lead the Army acquisition, logistics and technology team in the early years of what promises to be the most significant equipment modernization effort the U.S. Army has undertaken in the last four decades.

GET IT FAST

Bush's second priority is ensuring rapid fielding of equipment to warfighters. Soldiers assigned to the 82nd Airborne assemble the modular scalable vests they were issued during a fielding event at Fort Bragg, North Carolina conducted by the Program Executive Office for Soldier. (Photo by Jason Amadi, PEO Soldier)

STAY SECURE

Cyber security improvement is high on the new AAE's priority list. Jacob T. Jones, deputy cybersecurity program manager, U.S. Army Europe and Africa, speaks to attendees at the conclusion of the 2021 cybersecurity summit in Wiesbaden, Germany in August, 2021. (Photo by Thomas Mort, Training Support Activity Europe)

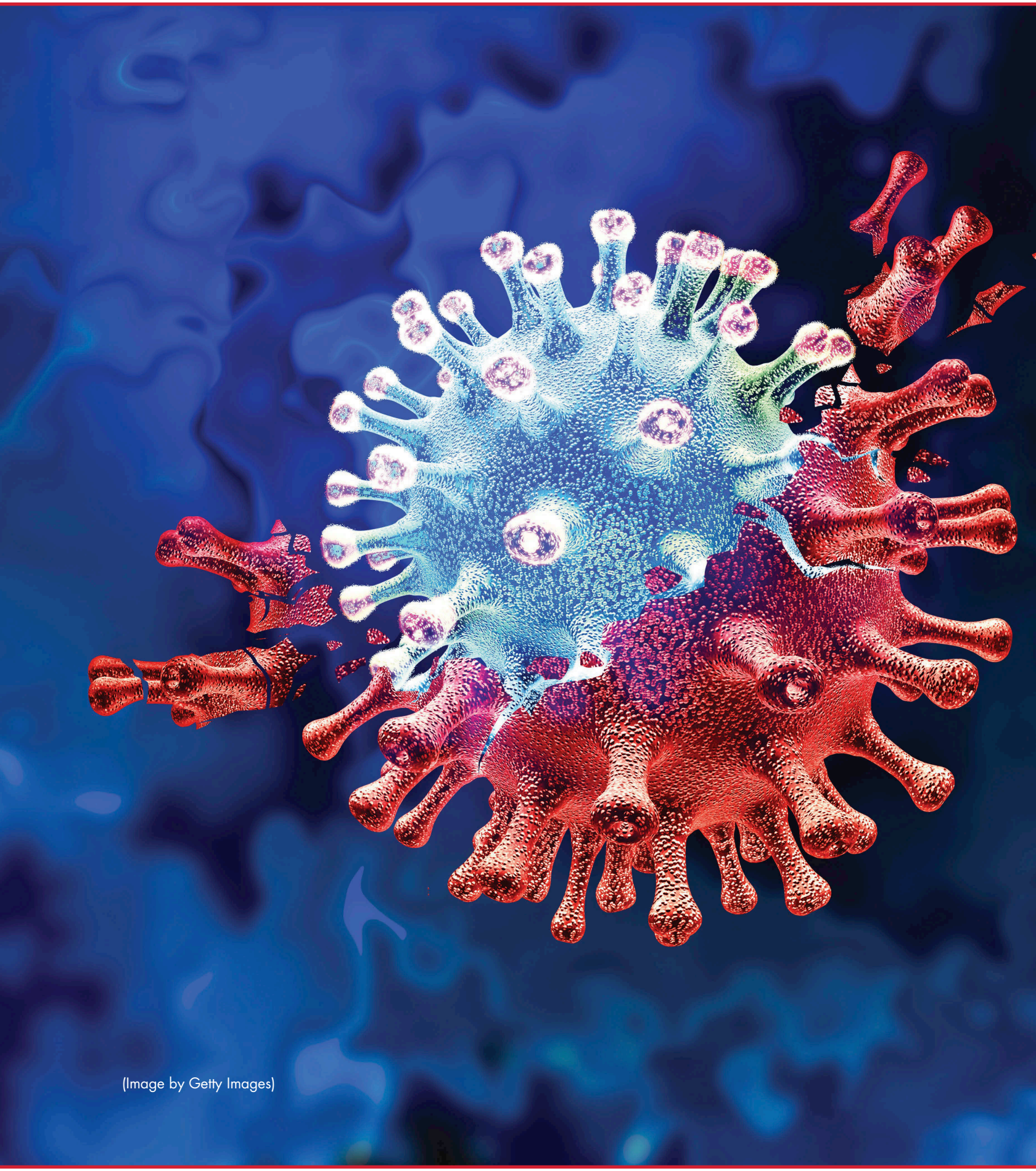
We must ensure the appropriate processes and tools are in place—particularly in the areas of recruitment, development and retention—for effective talent management.

My fourth priority is to return the Army to a focus on security in acquisition, with special attention toward cyber and supply-chain security. Both are necessary to deliver capabilities uncompromised by the aggressive efforts of China, Russia and other countries.

My fifth priority is to ensure realistic operational testing is integrated into Army programs, including rigorous cyber testing. While testing can be expensive at times, more time spent doing effective testing upfront can pay huge dividends later and, more importantly, allow us to find problems on test ranges rather than in combat.

My final priority is to ensure that the Army's modernization efforts are closely coordinated with Congress. Everything we do ultimately has to be supported by Congress doing its job to provide us with funding and oversight on behalf of the American people. The Army cannot achieve any of its modernization goals without the support of, and partnership with Congress.

In closing, let me state that it is a privilege to serve with you at this critically important time in the Army's history.



(Image by Getty Images)

DRIVING CREATIVE DESTRUCTION

By thoughtfully destroying old habits and processes, the Army can challenge the status quo to become stronger and more powerful.

by Bozena "Bonnie" Berdej, DM, Col. Anthony R. Gibbs and Peter J. Burke

The U.S. Army cannot ever be stationary. It must challenge the status quo to address new threats entering the sphere. Creative destruction is an effective way to do this, but situations emerge in which the perennial gale of creative destruction can be either controlled or rampant. Without emotionally intelligent leaders, it can be devastating. For example, let's look at COVID-19 as out-of-control creative destruction. Viruses mutate. However, it is hard to recall another virus spreading this fast, and with so many variants. Since March 2020, we have seen alpha, gamma, beta, delta and, now, omicron. Each new variant seems to destroy the one before it, but also builds on the last variant to become stronger and more destructive. Each successful new iteration of the virus that becomes predominant does so because it improves on the "mission" of keeping its genetic line alive. As with viruses, such is also the case with creative destruction in organizations. The organization destroys the old only to become stronger and more powerful, but with deliberate intent and planning.

Daniel Goleman, in his 1998 study titled "What makes a leader?," talked about effective leaders who have the desire to make their organizations better. It is that desire that drives innovation and controls creative destruction, and it stems from the emotional intelligence of a leader. The careless practice of destroying something solely in order to introduce something new should be stopped. Instead, emotionally intelligent leaders need to take control of unexpected change, reorganizing it and turning it into strategically sound innovations. In this way, creative destruction offers a modern, more logical way to innovate.

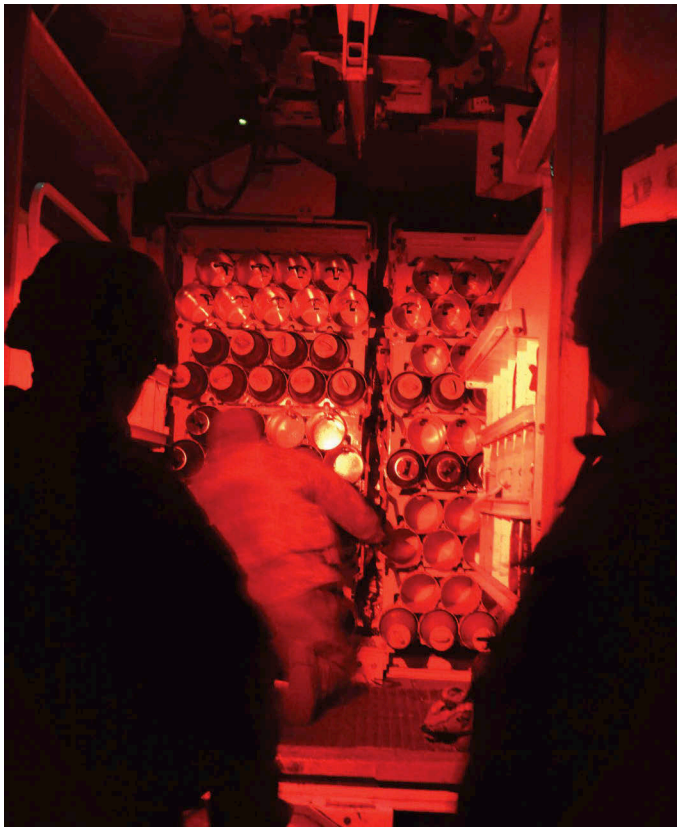
CREATIVE DESTRUCTION IN ACTION

The 155 mm Cannon-Delivered Area Effects Munition (C-DAEM) program provides a good example of applying creative destruction to stay ahead of the threat. (See "Fortune Favors the Bold" on Page 14.)

We know by now that the "gale of creative destruction"—as described in the originally proposed creative destruction methodology—takes place regardless of our understanding. It has a tendency to come unannounced, just as COVID-19 did. It mutates and continuously revolutionizes the organizational structure from within. It incessantly destroys the old variant and creates something new—good and bad—until it is stopped and effectively controlled. Our leaders have learned from the past that emulating the status quo frequently ends in disaster. Instead, they face the unexpected change and urgent requirements with thorough analysis, delivering next-level target-seeking and precision-guided technology. They reevaluate their assets by reviewing available resources, skills, designs and contract vehicles. Then, they capitalize on the knowledge and experience that have developed around these assets.

Teams of intellectually minded individuals supporting the Project Manager for Combat Ammunition Systems (PM CAS), including Pete DeMasi, Jim Sarruda and Rob Casale, were put in charge of recombining and counterbalancing creative destruction processes and existing structures, such as contract vehicles and agreements, processes and diffusing necessary knowledge to initiate innovative approaches, which resulted in C-DAEM. This program, initiated in 2016 to replace the Army's aging stockpile of cannon-fired cluster munitions, consists of two increments. Increment 1, or C-DAEM Armor, is focused on defeating at extended ranges, medium- or heavy-armor targets that are relocated or moving, whereas Increment 2, C-DAEM Dual-Purpose Improved Conventional Munition Replacement, is focused on defeating personnel and lightly armored targets. Focusing on the C-DAEM Armor program, PM CAS had two very different materiel solutions to choose from: a technically mature and well-understood existing solution known as a sensor-fuzed munition, and a new combination of existing technologies to create a hit-to-kill projectile solution. Specifically, the hit-to-kill solution involved integration of GPS and inertial guidance with a terminal seeker and shaped-charge warhead, a new and unproven combination for cannon artillery.

In large organizations like the Army, timely application of creative destruction requires a new way to work across traditional and organizational boundaries.



ON BALANCE

Soldiers transfer 155 mm rounds from an M992 Carrier Ammunition Track to an M109 Paladin self-propelled howitzer. Counterbalancing and recombining creative destruction processes and existing structures helped to create the C-DAEM. (Photo by Capt. Tobias Cukale, 3rd Brigade Combat Team, 4th Infantry Division)

In evaluating these very different materiel solutions, PM CAS worked with the user community, including the Long Range Precision Fires Cross-Functional Team and the Fires Center of Excellence Capabilities Development and Integration Directorate, to identify and prioritize the key metrics for selection. This team effort resulted in an objectives hierarchy, evaluating the schedule,

ONE STEP AHEAD

The C-DAEM program is a good example of applying creative destruction to stay ahead of the threat. (Photo by Markus Rauchenberger, Training Support Activity Europe)

performance, cost and long-term viability of available solutions. The performance objective was further broken down into a range-weighted lethality index encompassing many different use cases that covered a range of conditions and scenarios.

The objectives hierarchy and range-weighted lethality index provided a useful lens through which to evaluate the two very different solutions. Whereas the existing sensor-fuzed munition provided the lowest technical risk and best solution in terms of schedule and cost, the hit-to-kill provided a clear advantage in performance potential and long-term viability. The objectives hierarchy and range-weighted lethality index put into context the trade-offs between going with the known, low-risk solution and pursuing the high-risk, high-reward solution with the potential to revolutionize how cannon artillery is used.

PM CAS used creative recombination and counterbalancing to alleviate the cause of creative destruction, such as revolutionizing without evidence, constant strategic execution or development of new initiatives without a chance to take off. In the past, programs would be initiated as high priority and, several months into the effort, they were no longer high-priority programs. To avoid these types of creative destruction setbacks, PM CAS leaders combined the assets in a new and successful fashion, counterbalancing the good and the bad that come with it.

PM CAS worked with stakeholders and community leaders to carefully control and analyze the process. Teams of emotionally

BREAKING BOUNDARIES
Cross-functional teams are a good example of effectively applying creative destruction while breaking boundaries. (Photo by Pfc. Karleshia Gater, I Corps)

NEW AWARENESS
Leaders like Gen. Ed Daly, commanding general of the U.S. Army Materiel Command, are no longer ignorant of the destructive effects of creative destruction. Greg Edwards, center right, a supervisory supply management specialist, shows Daly and a group of Army leaders around a new receiving building at Crane Army Ammunition Activity, Indiana, on Sept. 2, 2021. (Photo by Lindsay Grant, Crane Army Ammunition Activity)

intelligent leaders took time to develop an effective "defense system" against uncontrolled creative destruction. They set up processes and processes within processes, such as breaking down an objectives hierarchy into target-specific requirements. As a result, they established a good model to follow in selecting more rewarding solution with potentials for the future. Teams focused on a specific goal, reviewing and discussing the potential risks. Ultimately, they eliminated rework and moved closer toward achieving the goal.

Cross-functional teams—effectively applying creative destruction while breaking traditional boundaries.

Cross-functional teams demonstrate both effective management of creative destruction and emotionally intelligent leadership. In large organizations like the Army, timely application of creative destruction requires a new way to work across traditional and organizational boundaries. For example, in order to quickly implement change in reaction to a new threat or to stay ahead of the competition, the sequential developmental model had to change. Therefore, Army leaders decided to use a new approach: Put the requirements managers, materiel developers, testers, trainers, logisticians and resourcing organizations together in a single cross-functional team to enable transparency, faster communication of ideas and effective decision-making. This new approach directly manages creative destruction and its negative impacts and has proven effective.

Members of cross-functional teams are typically at the colonel or senior civilian level and are empowered to speak for and direct their organizations toward a common goal. Issues in one area are quickly surfaced for all to understand, consider and, when needed, act upon.

Emotionally intelligent leaders need to take control of unexpected change, reorganizing it and turning it into strategically sound innovations.

Sequential development of ideas into a product turns into collaborative treatment by multiple stakeholders working in parallel, whereby plans can be adjusted much faster.

WHAT HAVE WE LEARNED?

The above examples demonstrate that leaders are no longer ignorant of the destructive effects of creative destruction. The concept has proven beneficial when, unlike COVID-19, the destruction is guided and controlled. It is important to understand that creative destruction requires emotionally intelligent leaders because only such leaders can manage the process, keeping people and organizations in mind. Emotionally intelligent leaders are aware of their moods and their thoughts as well as those of others. As a result, they can effectively reinvent processes that work while eliminating those that don't.

CONCLUSION

The world is ever-changing and there is no room to fall behind. The Army has to operate in a challenging, multidimensional environment. This requires that Army leaders effectively manage creative destruction to achieve overmatch, deter and defeat current adversaries, and win and protect our freedoms. The Army cannot afford the consequences of out-of-control creative destruction which equals poor reasoning or outsourcing critical thinking. The originally proposed creative destruction methodology and its destructive components must be controlled and ultimately eliminated.

Along with effectively managed creative destruction, organizations need emotionally intelligent leaders who act logically and with the desire to make their organizations better. Those qualities allow them to communicate and leverage all emotions, good and bad, and deliver the desired organizational outcomes while eliminating the negative side of creative destruction. As in the examples above, such leaders attract innovation and deliver unmatched results. They refuse to validate mistakes; instead they tirelessly race to be ahead of their competitors by taking careful approaches that innovate but also protect their organization. This continuous balancing act requires just the right level of self-examination and knowledge about ways to innovate—ways to understand when decisions are right, but also to acknowledge when decisions are wrong.

*For more information on creative destruction, contact Bonnie Berdej at **bozena.berdej.civ@army.mil**; for more information on C-DAEM, contact Col. Anthony Gibbs at **anthony.r.gibbs6.mil@army.mil**; for information on cross-functional teams, contact Peter Burke at **peter.j.burke.civ@army.mil**.*

BOZENA "BONNIE" BERDEJ, DM, serves as the business management specialist supporting the acquisition team of the Project Manager for Combat Ammunition Systems (PM CAS) within the Joint Program Executive Office for Armaments and Ammunition (JPEO A&A) at Picatinny Arsenal, New Jersey. She holds a doctoral degree in management from University of Maryland Global Campus. She is Level III certified in program management and holds a Black Belt Six Sigma certification.

COL. ANTHONY R. GIBBS is the PM for Combat Ammunition Systems within JPEO A&A. His 24-year career includes 12 years of acquisition experience in a range of contracting and program management positions. He is Level II certified in contracting and Level III in program management, and he holds an MBA from the Naval Postgraduate School and a B.S. in mechanical engineering from Missouri University of Science and Technology, and is a graduate of the Eisenhower School of National Defense University.

PETER J. BURKE is the deputy PM for Combat Ammunition Systems. He is Level III certified in program management. He holds an MBA from the New Jersey Institute of Technology and Florida Institute of Technology, and is a graduate of the General Management Program from Harvard Business School.

FORTUNE FAVORS THE BOLD

PRECISION DELIVERY
Cannon-Delivered Area Effects Munitions (C-DAEM) is designed to replace cannon-delivered cluster munitions. It will help Soldiers defeat high-priority targets with precision at extended ranges. (Photo by Yuma Proving Ground, Arizona)

"Unusual" approaches to materiel development can be the secret to innovative weapons.

by James A. Sarruda and Lt. Col. Brian Adkins

If the movie, "Avengers: Infinity Wars" has taught us anything, it's that—at least for comic book heroes—defeating an apparently superior army requires better technology. While the United States Army may not have the benefit of an impenetrable energy field that spans the horizon or a magical hammer of the god of thunder, it does have 155 mm cannon artillery weapons that rain down destruction like lightning from the sky. Cannon artillery, also known as the "king of battle," delivers lethal effects to shape the maneuver commander's fight and to change the enemy's behavior.

As the battlefield that the Army faces becomes revolutionized with easily accessible electronics applied in new ways, Army modernization must rapidly develop new technology for ammunition to enable the Army to expand its area of effects with increased lethality. The pace of commercial technology forces new ammunition to deliver specialized effects on target, such as armor-piercing or air-burst capabilities. As the Army leans forward to execute multi-domain operations as part of a joint force, acquisition personnel, engineers and software developers must collaborate to deliver better 155 mm ammunition. In the future, the Army's cannon artillery ammunition must defeat the enemy's strategic long-range systems and influence the battle from greater distances.

BIG BOOM
The battlefield has become revolutionized with accessible electronics applied in new ways, and the Army needs to develop new ammunition technology—fast. (Photo by Maj. Joseph Bush, 41st Field Artillery Brigade)

NEXT GENERATION AREA EFFECTS

Cannon-Delivered Area Effects Munitions (C-DAEM) is an Acquisition Category II development program designed to replace cannon-delivered cluster munitions with improved effectiveness to defeat current and future threats. C-DAEM will replace cluster munitions, which separate in the air into several bombs. It will enable the maneuver commander to defeat high-priority targets with a high degree of precision at extended ranges, a new capability for 155 mm artillery systems.

The warfighter needs to immediately change the behavior of high-priority targets by either defeating them or eliminating the threat. The most effective way to achieve success is to fire less ammunition and achieve more direct hits: ammunition that includes precision technology allows artillery weapons to quickly eliminate enemy threats from great distances. This crucial capability enables the maneuver commander to complete more beneficial missions. The Product Manager for Precision Attack Cannon Munition (PACM) under the Joint Program Executive Office for Armaments and Ammunition (JPEO A&A) used an original process to competitively select a game changer that will position PACM to rapidly deliver a long-range precision-kill solution to the warfighter.

The process began at an industry day, where the C-DAEM team clearly identified the program ambitions, emphasizing the desire to expedite the advancement of emerging technologies.

Industry partners recommended that the government speed up the design process by relying on iterative development, or the art of using established engineering best practices to build upon lessons learned in earlier designs. Iterative development leverages modeling and simulation in place of singular, grand, system-focused test events. This allows the more informative component-focused tests to drive design decisions.

In order to tie iterative development into the selection process, the government implemented a creative means of scoring the competition by organizing its program desires into a modeling and simulation tool called the "objectives hierarchy." There are lots of ways to collect and organize technical data for a comprehensive evaluation, but it took creativity to implement a tool that assigned value to the facts and figures based on operational utility.

As the name suggests, the objectives hierarchy is simply a list of program intentions, organized into groups to allow the team to assign ranking and importance. Many of the objectives were technical metrics derived from real-world applications of the desired

MORE BANG FOR THE BUCK
The Army must deliver better 155 mm ammunition in the future to be able to defeat an adversary's long-range systems. (Photo by Staff Sgt. Michael Gresso, U.S. Army Europe and Africa)

product. As the C-DAEM program progressed, engineers and analysts used the hierarchy to evaluate candidates across more than 100 operational scenarios by comparing both analytical and experimental data. At the end of the competition, the tool calculated a score, but it was the unique way the team connected the data to the mission that enabled the tool to choose the best solution that delivered lethal effects at the increased ranges needed to defeat strategic enemy systems.

INDUSTRY DAY ACTION

Army programs do not always choose to take technical risks early, because the acquisition process and program budget are not flexible. The C-DAEM team tackled these familiar challenges by tailoring its competitive process to communicate objectives instead of requirements, to use modeling of real scenarios in place of single occasion testing, and to accelerate technology maturation. For example, the objectives hierarchy tool communicated program intentions instead of requirements by allowing contractors to get credit for performance predictions and test reports that show understanding of their design.

This tool allowed the competitive process to evaluate more valuable information, such as performance of an electronic component, and then fast-track the knowledge gained from those smaller, more specific experiments.

The C-DAEM team held an industry day in the fall of 2018, during which government officials put forward an opportunity for defense firms to adapt to the Army's

The future artillery-ammunition solution will influence enemy movement and turn the tide of the future battlefield.

changing conditions by outlining general operational objectives and the blueprint of the competitive process. The two-day event, which included more than 100 people and 24 companies, featured representatives from the Army user community who presented operational context, such as how the enemy behaves, rather than detailed specifications.

The event clarified the Army objectives to remove tactical threats and achieve extended ranges in accordance with guidance from the U.S. Army chief of staff. On the second day of the event, individual sessions allowed each participating contractor 30 minutes to ask clarifying questions on the tactical circumstances that influence how, where and why a Soldier might use the weapon. Industry partners asked for further definition of potential threats and surroundings, and explained that additional clarification could help the detailed planning. The C-DAEM team compiled this information and created the objectives hierarchy, but would need a flexible contract vehicle to keep the program on schedule.

THE OBJECTIVES HIERARCHY

The C-DAEM team leveraged the flexibility enabled by the DOD Ordnance Technology Consortium other-transaction agreement to implement the objectives hierarchy scoring process. Generally speaking,

REVOLUTIONARY REIGN

Cannon artillery is known as the "king of battle" and delivers lethal effects to the enemy, but the Army must develop new technology for ammunition rapidly as the battlefield it faces becomes revolutionized. (Photo by Christoph Koppers, Training Support Activity Europe)

that consortium is a group that encourages government, industry and academia to work together and rapidly deliver promising technology to the warfighter using an other-transaction agreement. Its structure promotes collaboration and encourages large companies to form partnerships with the pioneering smaller companies that may develop cutting-edge technologies, but often struggle with the government's contracting processes. (See related article on consortia, "Not Far at All," in the Winter 2022 edition of Army AL&T: https://go.usa.gov/xtpT5.)

The C-DAEM team used the mechanism because the Army needed revolutionary technology. After all, the Avengers needed to turn the tide on the battlefield, not prolong their defeat. The consortium's program office delivers government program objectives to industry as part of its published annual plan, which its academic partners can read and then use to collaborate and quickly propose solutions. The C-DAEM team submitted the program objectives with the consortium's 2019 annual plan as tradeable desires, and invited the interested consortium members to provide feedback on the objectives hierarchy once again.

In the spring of 2019, the DOD Ordnance Technology Consortium, in partnership with its academic component, the National Armaments Consortium, held a general membership meeting that provided another formal opportunity for the C-DAEM team to receive feedback and confirm that industry understood the Army's challenges before proposing solutions.

AN OBJECTIVE PROCESS

At the meeting, the C-DAEM team explained the objectives hierarchy and how to maximize scoring by maintaining lethality at increased ranges. In the absence of hard requirements, the hierarchy compiled all design data, modeling, simulation and analysis into a single evaluation tool. By tying it to the competitive process, the C-DAEM team intended for the defense industry's finest

The C-DAEM team tackled these familiar challenges by tailoring its competitive process to communicate objectives instead of requirements.

engineers to use the same tool to inform design decisions before prototyping begins.

The objectives hierarchy assessed each contractor against four factors: schedule, performance, cost and long-term viability. The program office used the performance factor in the hierarchy, known as a range-weighted lethality index, to evaluate the number of rounds to achieve a specific amount of damage done against various enemy targets, across increasing increments of range. This allowed the program office to "weight" the performance based on range achieved, and relate it to the amount of damage done.

The range-weighted lethality index also evaluated the impacts of different weather conditions, terrains, target backgrounds, countermeasure combinations and target characteristics. After receiving feedback at the conference, the C-DAEM team announced the objectives hierarchy as the program office's primary method of data collection in order to ensure the best design solution moved forward in development, and made the hierarchy available upon request.

By the end of the competition, the competitors provided analytical and experimental data to complete the range-weighted lethality index. The winning solution, a 155 mm smart projectile offered by Raytheon, offered significant range and lethality benefits, while managing technical risk early to realize its full potential. The C-DAEM team evaluated each competitor using the objectives hierarchy to fully understand the risks associated with the technical development of each solution.

With the help of the Army's Data Analysis Center, the team completed statistical analysis of target engagement to characterize the performance of each solution's explosive and fully understand its destructive abilities. The C-DAEM team also worked with the Combat Capability Development Command Armaments Center to collect experimental flight data and flight-simulation modeling to estimate range in different weapon systems and in different conditions.

Ultimately, the Raytheon concept scored highest in its range-weighted lethality index because it addressed the Army's problems with a reasonable level of risk. It offered exceptional performance against countermeasures and significantly increased range opportunities. It also offered the Army a long-term area-effects solution by presenting opportunities to complete upgrades in the future.

CONCLUSION

The future artillery-ammunition solution will influence enemy movement and turn the tide of the future battlefield.

The C-DAEM team collaborated with industry partners through multiple conferences and created a selection tool using the feedback received, to incentivize iterative development to advance the right solution for the Army. The team succeeded because the government emphasized flexibility and the contractors took some risks.

The government leveraged the DOD Ordnance Technology Consortium other-transaction agreement for its efficient and effective selection process that encouraged industry partners to form relationships within the consortium and align prototyping to the objectives hierarchy. The hierarchy tool enabled the C-DAEM team to select an artillery weapon capable of defeating and changing enemy behavior at longer ranges. The C-DAEM program may not have had the budget of the Avengers, but now the Army is one step closer to mirroring its success on tomorrow's battlefield.

For more information, go to ***https://jpeoaa.army.mil/jpeoaa/****.*

JAMES A. SARRUDA works for PM PACM within JPEO A&A at Picatinny Arsenal, New Jersey, currently serving as the branch chief for the C-DAEM program. He holds a Master of Engineering degree in mechanical engineering from Stevens Institute of Technology, a B.S. in mechanical engineering from Lafayette College, and is a member of the Army Acquisition Corps.

LT. COL. BRIAN ADKINS is the product manager for PACM within JPEO A&A at Picatinny Arsenal. He holds an M.S. in systems engineering from George Mason University and a B.S. in mechanical engineering from Virginia Tech. He is Level III certified in program management and is a member of the Army Acquisition Corps.

THE ESSENTIAL ROLE OF SOLDIER TOUCH POINTS

Ensuring Army systems and tools meet the needs of future warfighters.

by Maureena Thompson

As the Army seeks to modernize everything from the way it operates to the equipment it fields, it is looking more and more to Soldiers on the ground to inform future requirements. Soldier touch points, as the Army calls them, are immersive testing and feedback mechanisms through which Soldiers can provide valuable insights on how certain tools or equipment undergoing development will be used practically in the field. The Army is using these touch points as it pursues a series of signature modernization systems to ensure any new solutions that are embraced are functional, durable and expertly tailored to the needs of Soldiers.

HARNESSING ITERATIVE INSIGHTS

Soldier touch points provide helpful input to industry representatives, testers, researchers and acquisition experts on the capabilities Soldiers will need to fight and win. The engagements can assist in pinpointing issues that may otherwise be overlooked, and in confirming or dispelling the need for development teams to address real or perceived technological challenges. Touch points have also proven essential in evaluating what might be a promising idea in a laboratory but a less feasible one in the field.

While Soldier-centered design may seem like a natural step, it has not always been a prominent feature of Army acquisition and modernization processes. Lt. Gen. Thomas H. Todd III, deputy commanding general of acquisition and systems development, and chief innovation officer at Army Futures Command, describes the new approach as a full life-cycle commitment to evolving Soldier needs. " 'A persistent Army capability environment' [PACE] enables continuous modernization. Soldier touch points are the cornerstone of a PACE. By putting the Soldier at the center of modernization, we use feedback to inspire innovation, solidify our technologies through continuous iteration and validate our technologies in real time." (Read more about Soldier-centered design in "All About U," from the Spring 2021 issue of Army AL&T at: https://go.usa.gov/xtdNP.)

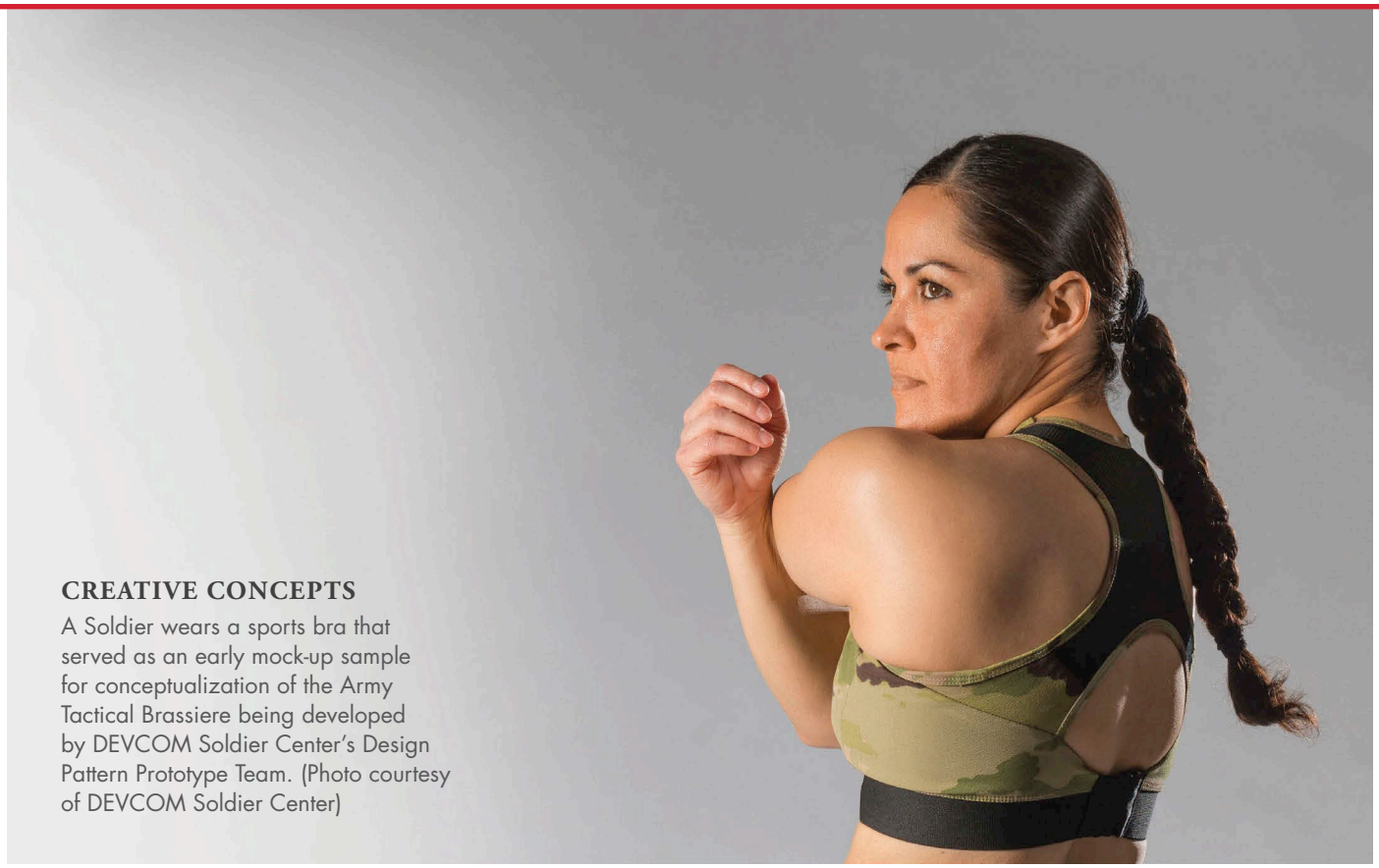
In embracing the PACE approach to modernization, Army Futures Command has refocused development objectives on users, who will naturally have the greatest understanding of which solutions will best meet their needs. In turn, the command's eight cross-functional teams, which serve to accelerate modernization progress across six priority areas, are employing Soldier touch points frequently and strategically to ensure optimal modernization outcomes.

"The Soldier is at the center of everything we do," Todd explained, underscoring that gaining Soldier insights early in the process and throughout iterative developments makes modernization efforts

SECURING SAFETY MEASURES

The U.S. Army Aeromedical Research Laboratory worked with active-duty and National Guard Soldiers in 2021 to test its new Load Stability System - Litter Attachment (LSS-LA). The LSS-LA stabilizes otherwise wobbly hoist lines to create a safer medevac environment. Aeromedical Research Laboratory researchers worked with pilots, Soldiers and product developers to simulate rescue missions in difficult conditions and terrains, using feedback collected to enhance the LSS-LA prototype.

A group of 82nd Airborne Soldiers also demonstrated use of the LSS-LA at Yuma Proving Ground, Arizona, during Project Convergence 2021, as captured in video at: https://go.usa.gov/xtN2H.



CREATIVE CONCEPTS
A Soldier wears a sports bra that served as an early mock-up sample for conceptualization of the Army Tactical Brassiere being developed by DEVCOM Soldier Center's Design Pattern Prototype Team. (Photo courtesy of DEVCOM Soldier Center)

more effective, sustainable and long-lasting. Soldier touch points are therefore not a highlight in the process, they are a foundational element of the process. "This is how we will modernize our Army," he said.

But what does a Soldier touch point actually look—and feel—like in practice?

Capt. John Sexton, a logistics officer with Joint Modernization Command, participated in a Soldier touch point at White Sands Missile Range, New Mexico, in late 2020 as part of the Army's annual Positioning, Navigation and Timing Assessment Exercise (PNTAX).

During touch points, "Soldiers are exposed to a variety of solutions for a common problem," Sexton said. "It provides the opportunity to get a good look at the systems in a low-stress environment and provide objective feedback."

"It takes the technology out of the lab to determine how it operates in an open environment," he added. The result is an experience that is both informative and highly engaging. "The vast majority of Soldiers would be thrilled to be part of this program," said Chief Warrant Officer 2 Matthew Pfannerstill, a member of the 41st Field Artillery Brigade who participated in a sensor-to-shooter live fire exercise and Soldier touch point at Grafenwoehr Training Area, Germany, in 2020. Sensor-to-shooter generally refers to the use of sensors or machines that detect threats and intelligently convey that information to the appropriate shooter. "This is a once-in-a-career opportunity to be part of something that has amazing implications for the future of the United States military."

Pfannerstill sees the willingness of Soldiers to participate actively in Soldier touch points as critical to the product development process. "We have to be willing and able to provide the earnest feedback up the chain of command to allow for informed decision making."

MEETING PERSISTENT NEEDS AND RECOGNIZING NEW ONES

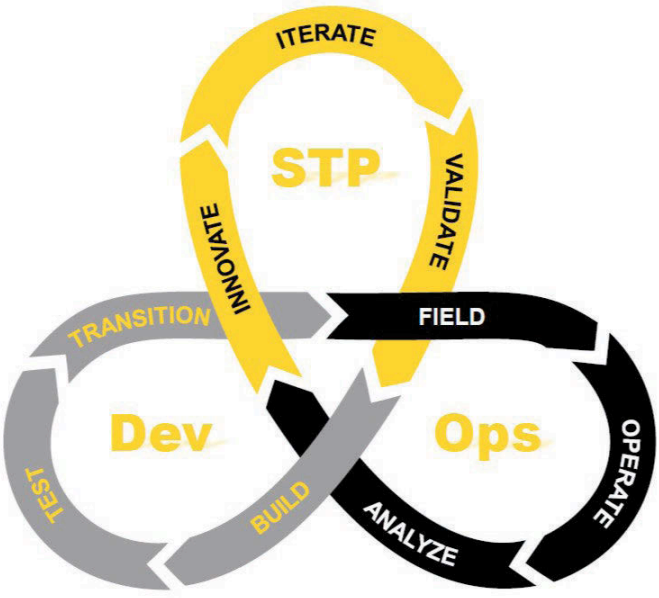
In fiscal year 2021, the Army conducted 113 Soldier touch points, in addition to dozens of operational assessments and limited user tests. Touch points tested everything from on-the-go nutrient packs for peak performance to the utility of new camouflage technologies, to Soldier interest in a long-lasting mosquito repellent.

The U.S. Army Combat Capabilities Development Command (DEVCOM) Soldier Center conducted multiple touch points in fiscal year 2021 through its Measuring and Advancing Soldier

Tactical Readiness and Effectiveness (MASTR-E) program, which uses various field simulations to collect human performance data and inform operational outcomes. The MASTR-E program works with Army partners, including members of the 82nd Airborne Division, to carry out a range of stress tests, evaluating Soldier decision-making capabilities and physical responses through wearable devices and other data collection means.

"I do not believe there is a more important program the Army is doing, when we're talking about people first, when we're talking about being able to build resiliency, because this transcends the tactical fight. There is no more important program that takes what a Soldier is doing and allows us to be able to maximize the equipment that they're getting," said Col. Phillip Kiniery, commander of the 2nd Brigade, 82nd Airborne Division.

Touch points are an integral part of the Army's modernization push and thus often focus on determining whether a state-of-the-art device works well in the hands of a small group of Soldiers, before the Army proceeds with rolling out the device to a larger group. However, some Soldier touch points also highlight needs that are not yet addressed, which the Army then has the opportunity to tackle creatively.



KEEPING THE PACE
Soldier touch points are key to enabling a persistent Army capability environment, as illustrated by the diagram, which also highlights development (Dev) and operations (Ops) elements. (Graphic courtesy of Army Futures Command)

For example, the DEVCOM Soldier Center began issuing prototype sports bras to female Soldiers in October and November as part of a touch point designed to assess whether new, high-impact sports brassiere concepts developed as part of the Army Tactical Brassiere (ATB) program would provide optimum support, durability and comfort for combat and training use.

ATB development began with seeking input from female Soldiers on what type of functionality and preferences should be considered during initial prototype design. Given that the ATB is a tactical rather than sportswear item, it will need to integrate well with equipment and body armor, providing enhanced protection and performance in addition to an ideal fit. This means that designers are evaluating options such as the inclusion of flame-retardant fabrics and expertly layered compression, structural and protective materials while also taking into account the importance of accurate sizing, reliable comfort, moisture management and breathability.

"The overall goal is to produce garments that not only protect the user, but reduce the cognitive burden on the female Soldier caused by discomfort and ill fit," said Ashley Cushon, clothing designer and project lead for the ATB at the DEVCOM Soldier Center. "Achieving this will improve the Soldier's overall readiness and performance levels, allowing them to focus on their mission," she explained.

Reaching this goal is a multiphase process that requires the involvement of designers, subject matter experts and Soldiers. "Developing well-fitting patterns is a skill that exists at the crossroads of technical art and science," Cushon said. "It requires understanding body shape, growth points and the relationship between 2D elements and 3D objects. Just as commercial sports brassiere items tend to cater to targeted consumer groups, designers worked closely with the anthropometrists and engineering psychologists to conduct pilot studies that helped to validate the size tariff within the female Soldier population and extract body scan dimensions to build out the first prototypes to fit the Army's median size. Understanding that sports brassieres incorporate various structural elements as they increase or decrease in sizing, final results from the studies will inform [the Program Executive Office for] Soldier and ultimately the Army Uniform Board, so that a determination can be made on the Army's path forward for best equipping female Soldiers for their missions."

NIGHT VISION

Soldiers from the 101st Airborne Division participate in a nighttime touch point at White Sands Missile Range, New Mexico, during a positioning, navigation and timing assessment exercise in 2021. (Photos by Austin Thomas, Army Futures Command)

DEVCOM plans to collect data on the experiences of the more than 200 female Soldiers wearing the ATBs, who are located at Fort Riley, Kansas; Fort Benning, Georgia and Joint Base Lewis-McChord, Washington, between December 2021 and March 2022. The process will inform performance and integration of the ATBs, as well as help designers and researchers assess which design attributes are most appropriate for military use. Feedback on improvements will be used to determine design direction for future iterations.

The effort serves as a complement to other, ongoing efforts to provide military uniform options that fit Soldiers of all body types, including those who are pregnant or nursing. For example, the Soldier Center's Soldier Protection Directorate recently worked with the Marine Corps and Air Force to develop versatile maternity uniforms that help ensure warfighters have access to military garments that fit well and are functional throughout pregnancy. Touch points conducted throughout the process informed multiple redesigns and improvements.

"Soldier touch points allow our engineers and scientists the chance to see firsthand how new technologies integrate with existing Soldier clothing and equipment, as well as how they fit into or enhance [tactics, techniques and procedures] and mission-specific tasks," said Al Adams, team leader of the Soldier Clothing, Footwear and Integration Team at the DEVCOM Soldier Center.

"An example of information we would not have otherwise had without frequent [Soldier touch points] is the impact of wind and weather on camouflage systems for snipers and how the user accounts for these factors," he said. "Until you have the system in the field with Soldiers, you don't know what critical considerations you may have missed."

"Combining controlled lab testing of technologies with real-world Soldier field evaluations gives us both the quantitative and qualitative data to make the best development decisions for our warfighters," Adams said.

CONCLUSION

As the Army seeks to modernize quickly, Soldier touch points are invaluable for ensuring smart, calibrated investments that offer maximum utility. While touch points may seem like a straightforward solution for tailoring novel equipment, their purposeful and regular incorporation into testing and development is helping to ensure a stronger, more agile Army—one more capable than ever of proactively anticipating and addressing Soldier needs.

For more information on Army Futures Command organizations conducting Soldier touch points, go to: ***https://www.armyfuturescommand.com/****.*

MAUREENA THOMPSON is a contracted writer and editor for Army Futures Command in Austin, Texas. She holds a Master of Public Policy degree with a concentration in national security policy studies from Duke University and a B.A. in English from the University of California, Los Angeles.

CHRISTINE M. BERG

COMMAND/ORGANIZATION: Joint Program Executive Office for Armaments and Ammunition (JPEO A&A), Project Manager Combat Ammunition Systems (PM CAS)

TITLE: Program analyst team lead

YEARS OF SERVICE IN WORKFORCE: 12

DAWIA CERTIFICATIONS: Level III in business, financial management

EDUCATION: MBA, Florida Institute of Technology; B.S. in business administration, American University

AWARDS: PM CAS Excellence Award (2020 and 2021); Department of the Army Commander's Award for Civilian Service (2017); Department of the Army Achievement Medal for Civilian Service (2013)

PAYING IT FORWARD

Choosing the right career and navigating the best path forward can be challenging, unless you have the right education, experience and most of all, a solid support system. Christine Berg has what it takes, but mainly attributes her career advancement to the support of her family, a network of mentors, business managers and coworkers who have empowered her along her journey and challenged her with opportunities for growth both personally and professionally. Now, she's paying it forward.

"I was very lucky to have people who invested time and energy in me and offered opportunities that I didn't even realize existed," she said. "So, as I enter a new phase of my career, where I'm responsible for other people, I'm sharing my knowledge and guiding new team members in navigating their acquisition careers—because I was really lucky to have had people do that for me."

Berg currently serves as a program analysis team leader within Project Manager Combat Ammunition Systems (PM CAS), where she is responsible for programming, budgeting and execution of financial resources currently totaling $1.1 billion across multiple research, development and acquisition appropriations, foreign military sales, special defense acquisition funding and other service budget authority.

In addition to budgeting and managing funding for her assigned programs, she leads a team of interns, journeymen and senior analysts, overseeing the financial management of various Acquisition Category II, III and IV programs, and serves as the senior financial advisor for several high-priority programs aligned to the Long-Range Precision Fires Cross-Functional Team in pursuit of Army modernization, in accordance with the National Defense Strategy.

Berg began her career with the Acquisitions Workforce as a summer intern at the Project Director Joint Services. "It was funny because I was supposed to work in the DEVCOM AC [Combat Capabilities Development Command Armaments Center] financial management directorate to see if I would be a good fit for the organization after college, but someone else picked up my résumé in Program Manager Demilitarization. So, I spent the summer working with that organization doing different types of analyses, and was fortunate that the team leader within the business division took time to mentor me," she said. "I've moved around a lot in the last 12 years, but I feel like I've benefitted from a lot of different experiences."

It was her dream to work in the financial services sector, but Berg said her early experiences in the acquisition workforce, and opportunities like formal training programs, postgraduate education and developmental assignments, as well as well-defined career paths allowing for advancement made the Army a more appealing choice right from the start. "It was evident that the Army invests in its people, and that was important to me when seeking my first job."

"I make a conscious effort to constantly learn and grow as an acquisition professional and an expert in my career field."

She said a big part of that investment was the guidance she received from those within the JPEO Armaments and Ammunition community who took the time to explain what her job would entail, and the opportunities that were available to her. "People invest a lot of time in you, and since outlining these opportunities as an acquisition professional was of great benefit, I welcome the opportunity to pay it forward with junior staff members."

Berg said the experience she's gained across the entire JPEO would not have been possible without the help of her mentors.

After five years with Joint Services, where she advanced from intern to a senior program analyst, Berg had reached a pivotal point in her career and decided it was time for a change. She said Cathy Heslin, who was then the business manager, became a mentor and friend—steering her toward her next position with JPEO A&A.

"She saw things in me that I didn't even see in myself," Berg said, recalling how Heslin moved mountains to help her get to the next level. "I found the job I was in challenging, but I felt like I needed exposure to different things. I shared that with her, and she was sad that I wanted to leave, but also put me ahead of her own organization, leveraged her relationship with the PEO, and said 'Hey I have this analyst, she's looking for a broadening experience. Would you be willing to take her on your team?' "

Berg said that Rich Stryker, then the JPEO G8 (finance) business director, was willing to give her a chance as a senior program analyst within his team. "I worked at the PEO level for two years, and that was probably the most valuable career experience I've had to this point. It allowed me to interact with all the subordinate organizations within the PEO, and I was able to learn more about all the different products that fall under their purview—everything from towed howitzers to grenades, to small and medium caliber ammo, to the conventional artillery and mortar ammunition, precision ammunition, mortar weapons and mortar fire control systems that I support today."

Berg said thanks to the efforts of Heslin and Stryker, the opportunity not only advanced her career as far as working in a high-level position relatively early on, but also made her realize the importance of being people focused. "They gave me a chance," she said. "And as a result, I was able to develop more relationships because of that position—relationships that I will take into the rest of my life."

Berg said she's always been "people focused," both in and out of the office, which was especially necessary at the height of the pandemic, when professional and personal life blended together. Berg said for 15 months, she and her husband, Nick, a cannon artillery engineer at DEVCOM AC, juggled their careers while caring for their now 2-year-old son, Nicholas. "The pandemic presented unique challenges, but taking care of him gives me something to look forward to every day," she said. "Spending time with him and seeing him develop and explore new things that we take for granted—it's really opened my eyes to a whole new world."

She said she encourages Nicholas, as well as junior personnel at work, to always keep exploring new things whenever possible. "I made a commitment early on to continue learning, reading and researching—that's something I apply inside and outside of work."

"In the early stages of your acquisition career, it's understandable to be eager to complete all the training or work toward a given level of certification and think that you're officially 'done,' " she said. But she believes it is important to continuously "hone one's skills and expand one's knowledge."

"I make a conscious effort to constantly learn and grow as an acquisition professional and an expert in my career field."

Berg said she's learned a lot in her career as an acquisition professional and that a combination of independent research, a great support system, and hands-on experience helps her continue to advance in her career.

"I find serving as a resource manager within this fast-paced organization incredibly rewarding," she said. "It is an honor to support the mission to develop, procure and field lethal armaments and ammunition to the joint warfighters and allied partners, and I am proud to do so while serving as a fiscal steward to our ultimate boss, the United States taxpayer."

—CHERYL MARINO

(Image by Getty Images)

THE CYBER EXPERIMENT

Defensive Cyber Operations pilots a new funding approach for software acquisition and development.

by Jennifer Sevier

For years, there has been a disconnect between modern software acquisition requirements and congressional funding sources. Software acquisition funding has traditionally been spread across three separate appropriations categories: Research, Development, Test and Evaluation (RDT&E); Other Procurement Army (OPA); and Operations and Maintenance Army (OMA). This diffused approach has posed acquisition challenges to organizations such as the Program Executive Office for Enterprise Information Systems' Defensive Cyber Operations (DCO), whose mission is to rapidly deliver innovative and dominant cyberspace capabilities to the nation's cyber defenders.

Until recently, the specific ways in which government programs like DCO were able to spend money hindered innovation. In fiscal year 2021, however, Congress initiated a new pilot project to bridge the gap between budgeting categories and software procurement. Through the pilot, DCO and other participants have been able to more efficiently progress through acquisition cycles and deliver critical capabilities to warfighters timely.

CYBER SOFTWARE PROCUREMENT CHALLENGES

Project management has two primary methodologies: waterfall and agile. Current policies and regulations treat software acquisition as a waterfall—a series of steps and sequential phases. This approach is at odds with modern software development, since software is treated as a depreciating asset. Assets need to be continually updated with new functionality, upgrades, license renewals and cloud hosting environments, but current policies restrict the ability to interchange appropriations as new requirements emerge.

Due to the speed at which cyber threats evolve, and the fast pace of industry innovation in countering them, it is nearly impossible for Army cyber defenders to identify the software tools they will need one to two years in advance. Program managers often have only months or weeks in which to identify specific cyber defense tools for procurement. This short acquisition lead time poses difficulties when program managers are forced to either procure a new software system with OPA funds or renew existing licenses with OMA funds. Doing this creates unfunded requirements in the year of execution, and hinders program offices from adequately planning or acquiring appropriate tools and resources for critical software requirements.

Additionally, at any given time, software tools rapidly progress through multiple acquisition phases: prototyping, production and sustainment. Because of the highly dynamic and evolving cyber threat environment, programmers and financial managers cannot accurately forecast how much of each type of funding will be needed until the required year of execution.

In short, a modern approach is needed to align acquisition pathways with budget processes.

DIGITAL DEFENSE
A Soldier participates in a defensive cyber software testing exercise in September 2020, during Cyber Quest, an annual event at Fort Gordon, Georgia. (Photo by Jennifer Sevier, DCO)

PILOTING A NEW APPROACH

As part of the fiscal year 2021 Presidential Budget Request, DOD announced a new multi-year pilot program to assist program managers in their responsiveness to warfighters' needs. The Budget Activity 8 (BA-08) Software and Digital Technology Pilot is a testing solution that realigns existing funds—spanning multiple appropriations—into a single appropriation budget activity. It is important to note that the BA-08 pilot is not a new funding appropriation; it is housed as an additional budget activity under RDT&E. This activity is supportive of agile software acquisition and development, and aims to remove budgetary constraints for program managers.

Nine existing and fully funded military efforts were proposed for the fiscal year 2021 pilot program, and in the summer of 2020, DCO officially became the first and only Army organization chosen to participate. By consolidating software programs from all phases of the acquisition life cycle into the BA-08 pilot, DCO set out to improve funding and execution decisions, build more cohesive acquisition strategies and optimize program management support in the delivery of critical capabilities to cyber defenders. To track the pilot's success, DCO and other pilot program participants are required to collect and report financial measures and performance metrics to the undersecretary of defense for acquisition and sustainment.

DCO is taking advantage of the BA-08 pilot in support of the DOD's January 2020 modification of the 5000 series of DOD instructions, including the implementation of the Adaptive Acquisition Framework. This framework centers on rapid and continuous delivery of software capabilities, supporting DCO in its objective of delivering timely, effective and affordable solutions to the cyber warfighter. Since the current budget process still operates independently and is not timely or flexible for short-notice or rapid software procurement, the BA-08 pilot provides a welcome solution.

DCO's project manager, Col. Mark Taylor, has been a champion of the pilot program. "Using the BA-08 will optimize budgeting efforts, mitigate delays in software acquisition and reduce overall costs in procuring critical capabilities," said Taylor. "It will also reshape our acquisition strategies to better support the timely delivery of our products and enable us to remain ahead on today's cyber battlefield."

SOFTWARE PROCUREMENT

There are several steps in procuring software—from identifying a need, to prototyping a solution, to testing the environment and determining the longevity of technologies and license agreements. Historically, the RDT&E appropriation focused on hardware systems that have longer lifespans than software. The BA-08 pilot is allowing DCO to be more responsive to the dexterous environment of software procurement and development.

DCO's capabilities cover an array of threats and associated solutions, with each piece of software simultaneously integrating with the next. DCO's software tools proactively identify cyberspace threats through simulation exercises and actively monitor current network activities—a full spectrum of solutions to assess, deter, deny, defend, defeat and evolve against insider threats.

DCO performs user testing before full deployment of all its systems, and has identified the need for continuous updates, licenses and integration. Soldiers use the systems in real-life scenarios and give feedback to test engineers. Recently, Soldier feedback and testing identified a system that was no longer effective in deterring cyberspace attacks. Based on operational needs, cyber defenders requested a new software tool that could be used to capture, index and correlate real-time network data.

ACQUIRING CAPABILITY—FASTER

DCO procures and prototypes comprehensive cyberspace weapons systems for the Army. Prioritizing capabilities for cyber mission forces is critical to remaining ahead of today's evolving cyber threats. It is incumbent upon DCO to ensure that data breaches and malicious activity do not happen on the DOD Information Network. By the end of fiscal year 2021, the DCO team found that the use of the BA-08 pilot led to faster acquisition lead times for many of its mission-critical capabilities, including cloud hosting for research, testing and software procurement.

TESTING TECH

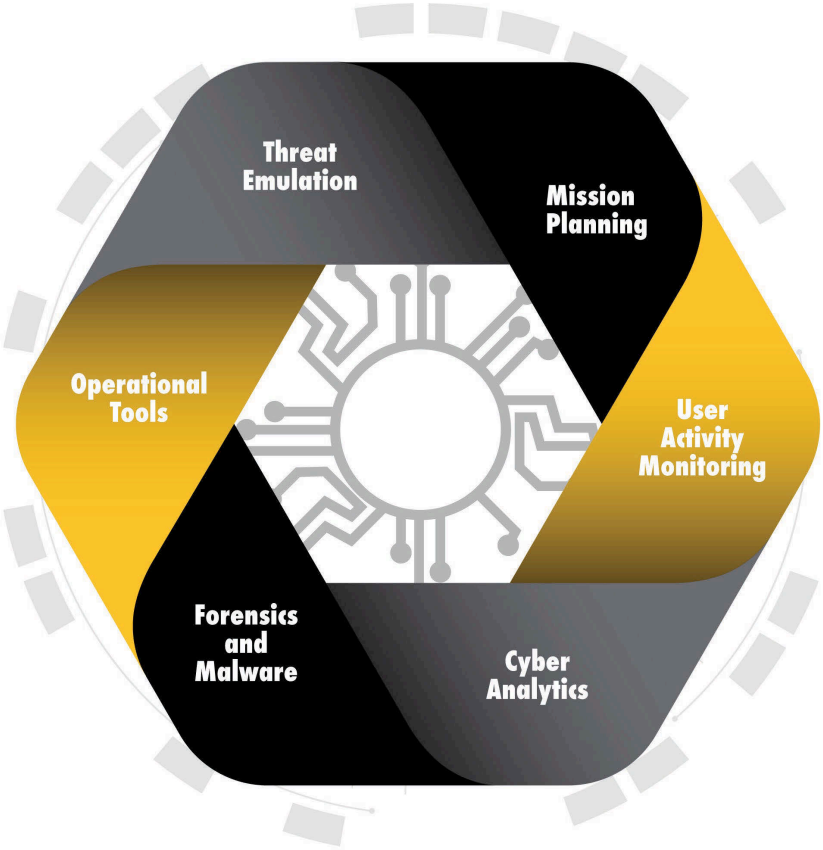
During the September 2020 Cyber Quest exercise, cyber warriors participated in experiments to help Soldiers fight and defend against cyber attacks, prevent cyber threats and identify gaps in software technology. (Photo by Jennifer Sevier, DCO)

Decommissioning the obsolete software would have required an above-threshold reprogramming action from OMA to OPA, necessitating congressional approval. By using the BA-08, DCO was able to procure and provide user testing to cyber warfighters with a cost avoidance of over $3 million. Soldiers have been able to prototype and test new software with optimal results timely.

CLOUD HOSTING

Gabriel Nimbus is the Army's big data platform. It provides analytics and visualization tools for large amounts of data collected by the DOD Information Network. These analytics facilitate counter-reconnaissance activities meant to discover the presence of cyber threats and vulnerabilities. The platform is also the Army's No. 1 defensive cyberspace operations weapon system, providing an integrated technology solution. These capabilities drive decisions, enhance situational understanding and promote automation, while enabling cyberspace warfighters to achieve their objectives.

In fiscal year 2021, the amount of data being aggregated and stored in the cloud exponentially increased due to escalating cyber threats. This unforeseen growth in data collection needed to be funded immediately. DCO tracks cloud hosting as an operational expense that is usually paid with OMA funds. Prior to the enactment of the fiscal year 2021 Defense Appropriations



DEFENSIVE SUITE

Defensive Cyber Operations' software tools are a full-spectrum solution developed to assess, deter, deny, defend, defeat and evolve against the insider threat. (Graphic by U.S. Army Acquisition Support Center and Jennifer Sevier, DCO)

Act, DCO did not have access to flexible BA-08 authorities. If DCO had been able to use a single appropriation at the time, the organization could have reprioritized funds to better equip Gabriel Nimbus and immediately increase its storage capacity.

In fiscal year 2022, the BA-08 was fully in place, and DCO was able to address the storage capacity in rapid time, discovering the presence of advanced cyber threats and vulnerabilities on non-classified and classified networks.

"With the agile nature of the BA-08, DCO is able to quickly execute procurement and acquire cutting-edge technology for the cyber battlefield," said Lt. Col. Dakota Steedsman, product manager for DCO's Cyber Analytics and Detection. "Having the BA-08 funding line allows us to move forward with modernization while keeping our systems operational. Cloud hosting and license renewal are critical to our continuous modernization."

CONCLUSION

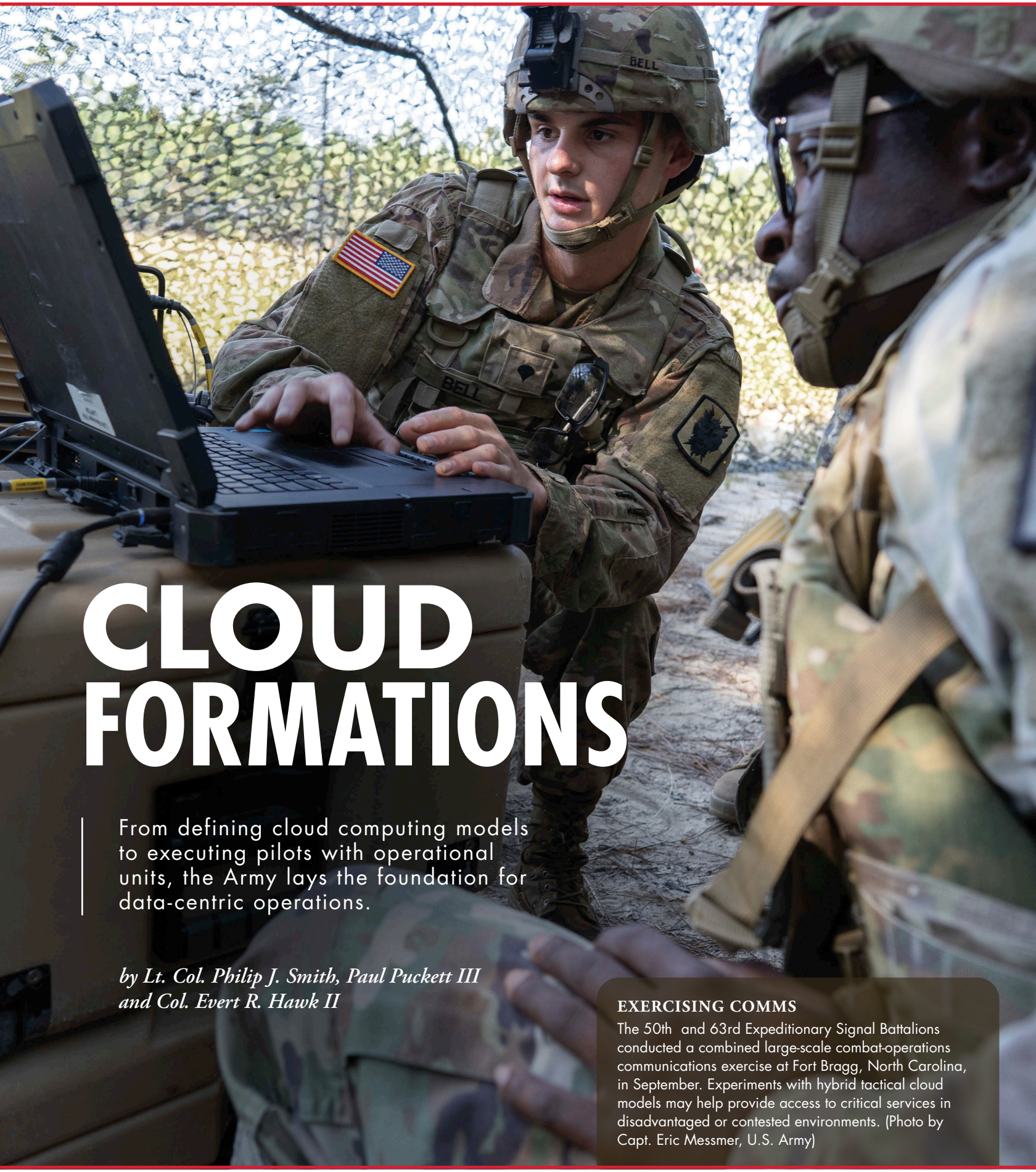
The use of multiple types of funding has caused many of DCO's portfolio acquisition challenges in procurement, agile software development, license renewals and technology modernization. The BA-08 pilot allows the project management office to rapidly integrate and revolutionize critical technologies for our cyber warfighters. DCO plans to use the BA-08 as a tool to responsively fund software procurement and development efforts in the rapidly evolving cyber domain.

Based on the fiscal year 2021 results of the pilot—which has been extended through fiscal year 2022—DCO is continuing to participate in the DOD's BA-08 pilot. By the conclusion of the pilot, the optimal outcome for the defense acquisition community would be for Congress to establish a new single appropriations category for software and digital technology. This monumental step would ensure that program managers could prioritize and control how funding is spent on emerging technologies, based on warfighter or other end-user needs, change mission profiles and other external drivers, and deliver innovative and cost-effective solutions.

"We are doing this work with the understanding that the next near-peer war will be won or lost in the cyber domain, well before the first Soldier touches down on the battlefield," said Taylor. "Having a single appropriation dedicated for software-intensive acquisition ensures Army readiness in the defense of our networks."

For more information, go to: ***https://www.eis.army.mil/programs/dco****.*

JENNIFER SEVIER provides strategic communication support to Defensive Cyber Operations at Fort Belvoir, Virginia, for Octo Consulting. She has 20 years of communication and marketing experience for public and private sector communities.



CLOUD FORMATIONS

From defining cloud computing models to executing pilots with operational units, the Army lays the foundation for data-centric operations.

by Lt. Col. Philip J. Smith, Paul Puckett III and Col. Evert R. Hawk II

EXERCISING COMMS

The 50th and 63rd Expeditionary Signal Battalions conducted a combined large-scale combat-operations communications exercise at Fort Bragg, North Carolina, in September. Experiments with hybrid tactical cloud models may help provide access to critical services in disadvantaged or contested environments. (Photo by Capt. Eric Messmer, U.S. Army)

Shoot, move and communicate. All three fundamentally involve movement. It can be moving a small chunk of lead to its intended target or moving raw materials to ammunition plants. It can be placing Soldiers in the right situation with the right mission to move to a specific objective. It can be moving information in the form of data from the location of observation to an analysis center, then back to field commanders for decision-making at the pace of war. But the real challenge is delivering payloads to their intended targets simultaneously in a constantly moving and therefore changing environment.

In each of the examples above, we find that access to real-time information is critical to ensure that we are shooting, moving and communicating the right way. As DOD pointed out in its 2020 DOD Data Strategy, and the U.S. Army has pointed out in the Army data plan and joint all domain command and control documents, data has become the new ammunition in a changing battlefield. Similar to moving ammunition, we must be able to move relevant data to the right users in time to make a difference. The U.S. Army Network Cross-Functional Team, part of Army Futures Command, is enabling the Army to leverage modern concepts and technologies to access and evaluate data from numerous sources, enabling faster and better informed decisions.

The foundational concept on which many other concepts and technologies will be built is the cloud: the ability to remotely access data and services via an internet connection. In the same way we build physical structures, this foundation—while not as visible to the unknowing eye—is critical to a stable end-state complete with a frame, walls, plumbing and electrical. In this multipart series, we aim to describe the Army's tactical cloud progress to date, as well as challenges to consider moving forward. We also explain key cloud terms where common understanding will be mandatory within the requirements, communications, acquisition, tactical and general leadership communities.

With the availability of dynamic computing and storage paradigms enabled by cloud computing comes a new set of challenges for how we use software.

PILOT TAKES FLIGHT

The Tactical Cloud Pilot with the Pennsylvania Army National Guard, conducted in August 2020 at Fort Indiantown Gap, validated that units could be trained on new mission command software without being fielded associated hardware. (Photo by Justin Eimers, U.S. Army)

WHAT THE CLOUD BRINGS TO DOD

Often "cloud" takes on two very different but complementary meanings. One approach focuses on the value of access to data in the cloud—think backing up the photos on your smartphone—while the other focuses on the infrastructure that enables that access. The second version, often referred to as cloud computing, means that computing and storage capabilities require hardware and therefore, must exist somewhere. That can be your pocket, in the form of a smartphone, or your laptop or Internet-of-Things-like device. It can be warehouses full of high-end servers and networking equipment. For larger workloads (such as artificial intelligence, data analysis, service hosting), it requires specialized hardware purposefully built to handle the kind of computing needed to create complex machine-driven neural networks. It can

also include the small collection of servers and networking kits Soldiers take to the field today, or any hardware combination thereof.

For DOD, acquiring and maintaining this hardware is a challenge because the uncertain nature and scale of conflict make it difficult to target investments, not only in acquisition but also in people. Cloud has become a way to offload expertise requirements and hardware investments while allowing for instant flexibility—if you need more computing and storage resources, you pay for them, click a button and they are instantly available. When they are no longer needed, you simply delete the resources you used and can reduce your cost rather than sinking an unused investment and obligation in equipment and people. However, for the tactical and operational Army, access to online cloud computing resources means bringing cloud computing resources into the field—or drastically increased reliance on the expeditionary network systems, often with bandwidth restrictions, that reach back to centralized cloud locations. Doing this in a way that meets today's mission needs and the unknown needs of the future is a major concern.

The vision most have of the cloud is that it's just someone else's computer or data center somewhere that cannot be touched or controlled. This is one of numerous models when it comes to cloud computing, called off-premise public cloud, which intends to serve numerous tenants with common cloud computing requirements. There are other models for cloud computing that start to combine both public and private cloud offerings that can be delivered in both off- and on-premises architectures. Designers and engineers can structure those different cloud environments to function as one hybrid cloud.

CLOUD IN MANY FORMS

Understanding how the Army and DOD are approaching cloud implementation starts with defining these different cloud models.

Hyperscale and Off-Premises

Modern off-premises hyperscale cloud involves multiple (usually large) data centers with the ability to replicate data and load-balance access at large and robust scales. When you become a tenant of one of these cloud providers, you are renting a set of components of that infrastructure for use, just like renting an apartment. Depending on the agreement and cost, where and how mission-critical data is replicated and load-balanced can vary. Most cloud providers replicate data between zones within a geographically similar region—enabling load balancing and resilience of service—but can be expanded to multiregion to guard against catastrophic failure such as an earthquake, flood or malicious attack that could compromise geographic power or network connectivity.

On-Premises Cloud

When it comes to on-premises cloud computing serving DOD needs specifically, the community has been practicing this in select IT spaces for some time now. On-premises means services are physically in the organization's owned facilities. This could be on organization-owned equipment or equipment provided by a second or third party, such as Amazon's Snowball line or Microsoft's Azure Stacks. The burden of power, space, cooling and external connectivity are the minimum responsibilities of the hosting organization. Other responsibilities vary based on what services and agreements are procured with a service provider. This model provides the most autonomy for an organization but comes at the cost of dynamic flexibility.

Hybrid

As the world becomes more connected, industry is reevaluating how to design its systems to take full advantage of the value of cloud computing. For sectors like the oil and gas industry, where companies often operate within remote and challenged environments, a hybrid cloud architecture serves both local and global cloud computing needs. This model attempts to take the best of both previous models so that when you have connectivity, you have access to the resources available in hyperscale (robust, on-demand and flexible), and when your connection is disadvantaged or contested, you have critical services locally hosted with you. In the tactical space, this is the design we must strive for. There are times on the battlefield where loss of certain services could lead to unacceptable loss of situational awareness, obstructing command while other less critical services can enhance decision-making on a broad tactical to strategic scale when network connection allows.

IMPLEMENTATION AND EXPERIMENTATION

The Network Cross-Functional Team is working with the Army's Enterprise Cloud Management Agency (ECMA), Project Manager Mission Command (PM MC) and others to make this tactical hybrid capability a reality. In the beginning, the team worked with PM Mission Command on a pilot to see if current software could be served from a cloud without operating outside of current contract constraints. PM MC, the Network Cross-Functional Team and the Pennsylvania National Guard proved it was possible in a Non-classified Internet Protocol (IP) Router Network (NIPRNet) environment. Others expanded on that capability once Secret IP Router Network (SIPRNet) capabilities were available from ECMA's cArmy service, which provides an authorized and accredited set of general-purpose multivendor cloud environments that host Army IT services for multiple classifications.

Initially, PM Mission Command, the Pennsylvania Army National Guard and the Network Cross-Functional Team collaborated on a pilot to explore the technical possibility of placing currently fielded Mission Command Information Systems, the core of the Command Post Computing Environment, in a NIPRNet cloud—because of accreditation timelines, the pilot could not expand into SIPRNet. The Tactical Cloud Pilot, Increment I validated the hypothesis that units could be trained on new software without being issued associated hardware. COVID-19 constraints forced an adaptation that also proved that, while not ideal, such training could be done remotely. Others took notice of the success and began work on their own adaptations. One U.S. Army Training and Doctrine Command use case is attempting to expand the number of users and locations, while units are striving to exercise these capabilities in tactical scenarios to inform the requirements community.

Today, we are leveraging the XVIII Airborne Corps' Project Ridgway to pilot hosting capabilities through cArmy, with Amazon Web Services in the 101st Airborne Division and Microsoft Azure in the 82nd Airborne Division. As part of Project Ridgway, which encompasses XVIII Corps data and software modernization efforts, these units are providing realistic use cases and putting them to the test with current and legacy software during various experiments and field exercises on a mix of hyperscale, commodity and vendor on-premises cloud solutions.

The Network Cross-Functional Team also just began working with I Corps on upcoming events for the spring of 2022. Upon successful I Corps implementation, the Army will have initially experimented or piloted with as-is software and configuration in at least one of the two cArmy cloud options from the battalion all the way up through the corps and brigade echelons, and division in the other.

What value does this bring to the Army? These pilots demonstrate possibility. While not the ideal or most fiscally efficient arrangement of software, with the episodic nature of exercises and operations, the Army can put cloud computing to use to enable a persistent, real-time mission command environment delivering those resources as a service to the total Army. When online, every unit asset could have secure access to the same common operating picture of resources and capabilities. In a contested environment, critical data and services for maneuvering capability will remain with the units geographically. However, much work still must be done to make this a feasible option for any program of record. In general, fielding to the cloud with as-is software is currently cost prohibitive.

CONCLUSION

There is still much work to be done, mainly with the key tool that creates, consumes and disseminates our data: software. With the availability of dynamic computing and storage paradigms enabled by cloud computing comes a new set of challenges for how we use software. The software that the tactical Army currently owns and operates was not built to be run in

Cloud has become a way to offload expertise requirements and hardware investments while allowing for instant flexibility—if you need more computing and storage resources, you pay for them, click a button and they are instantly available.

TRAINING AT A DISTANCE
The constraints of COVID-19 on the 2020 Tactical Cloud Pilot forced an adaptation that proved cloud software training could be done remotely. (Photo by Justin Eimers, U.S. Army)

the agile cloud environments in which we are placing it. The way we handle, manipulate, translate, store and visualize data in its various forms is still largely tied to specific warfighting functions, limiting the ability to inform decisions more broadly.

While the current pilots will deliver new value to the Army in the form of real-time data access, reduced technical overhead and informing operational uses of cloud resources, the Army's software was never designed to run in the cloud in optimized ways. Therefore, while the Army will see isolated value in using the cloud, software and system modernization remains fiscally unachievable at the scale the Army requires. The Army cannot change operational software across the force overnight, causing a legacy compatibility requirement as it adapts to future capabilities.

All these considerations lead to follow-on topics of the technical knowledge and strategic investment in software redesigning and replatforming to take full advantage of cloud computing. These new means of implementing IT services may cause us to reevaluate the ways in which we employ them. Concepts of operation for how identity services are implemented and compartmented are at the root of many if not all other IT services in a secure environment, and must be addressed and resolved. While each concept brings its own advantages, the revolutionary contribution to the fight can only be delivered in its integration with the others.

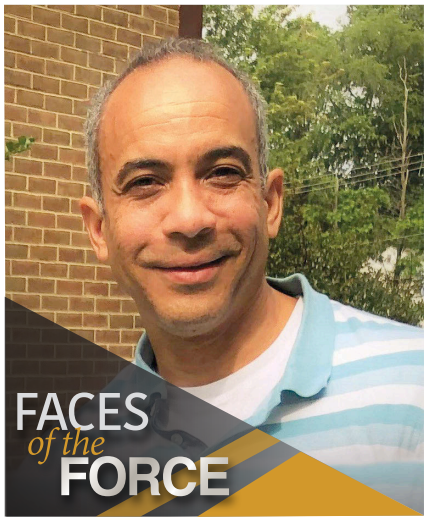
In the next article, the authors will discuss "as a service" models and talk about how the software and therefore the development process must change, enabling greater flexibility, mobility and hopefully faster delivery of change and adaptation.

For more information, contact Lt. Col. Philip Smith at ***philip.j.smith2.mil@army.mil****.*

LT. COL. PHILIP J. SMITH is the Network Cross-Functional Team's information system development officer. He holds an M.S. in telecommunications and network engineering from Syracuse University and a B.S. in communications with an emphasis on computer science from Truman State University. He has served as the division automation management officer for 10th Mountain Division, as well as chief network engineer at the Defense Intelligence Agency and Joint Staff Directorate for Intelligence.

PAUL PUCKETT III is the director of the U.S. Army's Enterprise Cloud Management Agency. He has served as the federal chief technology officer at an industry cloud native service provider and numerous civil servant roles at the National Geospatial-Intelligence Agency, including cloud integration lead. He holds an M.S. in systems engineering from George Washington University and a B.S. in computer management information systems from Liberty University.

COL. EVERT R. HAWK II is the line of effort 2/3/4 team lead at the Network Cross-Functional Team. He holds a Master of Strategic Studies from the United States Army War College, an MBA in finance from Saint Joseph's University and a B.S. in business administration and finance from Penn State University. He is a certified Project Management Professional and PMI–Agile Certified Practitioner from the Project Management Institute and a Lean Six Sigma Black Belt.



JOSE SANTOS

COMMAND/ORGANIZATION: Project Manager Expeditionary Energy and Sustainment Systems, Program Executive Office for Combat Systems and Combat Support Systems

TITLE: Mechanical engineer

YEARS OF SERVICE IN WORKFORCE: 20

DAWIA CERTIFICATIONS: Level III in engineering, Level II in life cycle logistics and program management

EDUCATION: M.S. in engineering management, George Washington University; B.S. in industrial engineering, Northeastern University.

HANDS ON IS JOB WON

Knowledge, understanding and expertise do not come solely from a textbook. For Jose Santos, it's a whole lot more than that—it's being out in the field and getting a firsthand look at how things are being run, it's talking with Soldiers and military personnel to assess what's required for field operations, and it's working with colleagues to deliver products to the warfighter for a successful mission.

"Working with others to support the Soldier in the field and identifying existing problems with power generation and power distribution in the armed services—Army, Navy, Air Force and Marines—has given me new perspective," he said. According to Santos, human interaction and working with others has made all the difference in his career and throughout his life. And hands-on experience in the field has been advantageous for his role as a mechanical engineer supporting DOD warfighter power-generation needs by developing solutions to address identified capability gaps. "What I'm doing is working toward getting that final product out, whether it's a generator set, power distribution box or a hybrid system that works on battery, out to the Soldier, and that's a group effort."

Santos, who earned a B.S. in industrial engineering from Northeastern University and an M.S. in engineering management from George Washington University, believes that formal education is important and necessary in preparing a person for their career of choice, but he shared that his most beneficial learning came from a combination of education, field experience, collaborating with subject matter experts like logisticians and technical writers, and working with the warfighter to assess their needs and implement measures to address those needs.

Long before he began his career as a mechanical engineer with Project Manager Expeditionary Energy and Sustainment Systems (PM E2S2), a position he's held for over a decade, Santos had been a scientific, technical problem solver. "It wasn't like I thought, 'I want to become an engineer and one day build a robot,' although I knew I could use the engineering capabilities to work with others to address capability gaps," he said.

"The greatest satisfaction I have from my work comes from seeing a power generation solution move from concept to implementation, then used to support real-world mission equipment deemed necessary for survival until a permanent, prime power solution is established," he said. "People are always surprised by how important power generation and distribution [are] for operating most equipment used by warfighters in the field environment, from coffee pots to C4I [command, control, communications, computers and intelligence] equipment." He added that all power solutions are essential in the field, not just the C4I equipment that provides critical mission management capability, but also apparatus like printers, copy machines, space heaters and air conditioners that stabilize the temperature in the field units (command posts and combat hospitals), and the generators that keep all energy sources running 24/7.

"We need to provide Soldiers with products that are safe to use. Part of my job is to make sure they don't have to worry about the power systems they rely on, once deployed. They

INSIDE OUT

Santos shows a Soldier how to connect and import power for mission equipment during routine field instruction in April 2014. Importing power reduces fuel consumption, noise and wear and tear on the engine. (Photo courtesy of Jose Santos)

have enough to worry about out there, dodging bullets, than to think about how to manage power generation and distribution in the field," he said. "It's vital to make sure power is readily available for your mission—whether it's running an expensive piece of C4ISR [command, control, communications, computers, intelligence, surveillance and reconnaissance] equipment or running a coffee pot or an air conditioner."

For Santos, problem-solving wasn't the only thing that motivated him throughout his career, he said. Overall, he truly enjoys helping people get what they need, both on and off the job. Much like collaborating with colleagues on helping warfighters set up power generation and distribution equipment in a field exercise, he works with his church in stepping up efforts to help those less fortunate get their basic needs met—food, clothing and shelter—which is also a team effort. Santos said sometimes he takes along his 5-year-old son, who is always eager to help his dad volunteer at a shelter, serving food to those who are homeless, lost their job or have fallen on hard times. "I get to spend time with my son and, at the same time, set a good example of how to help people who need it."

"It's that underlying view of helping others address clear needs—whether it's out in the field or more importantly, in the real world." He said. "There are so many people who are disadvantaged and might need food, clothes, a place to live or financial help. It's also about collaborating with others on how to help them."

While he was working toward his engineering degree, Santos took advantage of a college co-op program and became a U.S. Army Communications-Electronics Command intern, supporting power and change proposals before he had the opportunity to go out into the field and support Stryker brigades. Once he graduated, he became part of the Army Acquisition Workforce, assigned to support the standard family of generator sets at Project Manager Mobile Electric Power. "My first task was working on generator-set engineering-change proposals, technical manual updates and other engineering activities. It wasn't until a few years later, when I had the opportunity to work with Soldiers in the field and their equipment, that the true satisfaction of my position came shining through," he said.

The highlight of Santos' career is that there are multiple opportunities to collaborate with power producers, engineers, logisticians and fielders in his current position at PM E2S2. He also works with myriad power consumers in the development and implementation of the Central Power Solution—trailer-mounted generator sets that allow brigades and battalions to operate command post mission equipment in the field, in a safe uninterrupted method, while providing fuel savings with organically supportable generator sets and power distribution equipment solutions.

To sharpen his skill set, Santos has taken career development courses like the Inspiring and Developing Excellence in Acquisition Leaders program, which he said provided a great opportunity to team with people at similar points in their career and learn how to be effective leaders (not just bosses) and to avoid pitfalls. "I learned that many leadership goals and objectives can be achieved by simple steps like listening, effective communications, critical conversations and mentoring at the individual or group level," he said.

And he's applied these objectives—as well as field experience, education and hands-on experience—to every aspect of his life, and continues to do so by sharing what he's learned with junior acquisition personnel. "I talk with younger engineers who have questions and I provide them with information," he said. "I may not have all the answers by any means, but I can point them in the right direction. And I often learn from them too."

—CHERYL MARINO

HIGH-LEVEL VISIT
U.S. Sen. Mitch McConnell (R) of Kentucky visits the training center for the chemical weapons processing facility. (Photos courtesy of PEO ACWA)

UPGRADE TO DESTRUCTION

PEO ACWA updates rocket handling systems to improve performance while destroying its deadliest chemical weapons.

by Timothy K. Garrett and Katherine B. DeWeese

The Program Executive Office for Assembled Chemical Weapons Alternatives (PEO ACWA) is charged with destroying the United States' remaining chemical weapons stockpile, which is stored at U.S. Army installations in Colorado and Kentucky. A portion of the stockpile stored at the Blue Grass Army Depot in Kentucky consists of M55 rockets containing either VX or GB nerve agent, weapons that were slated to go through a designed, constructed and tested destruction process. But after recognizing numerous operational and maintenance challenges ahead, PEO ACWA pivoted to an other-transaction authority process to develop a new rocket processing system for the Blue Grass Chemical Agent-Destruction Pilot Plant.

The existing system included a number of moving components, sensors and waste streams, causing maintenance concerns to become top of mind. Maintenance workers must wear the most stringent of personal protective equipment, which includes respirators and tethered air hoses.

The reactors used in the destruction process are a three-story climb, and with a two-hour maximum period in the suit, the challenges of performing the anticipated frequent maintenance in a complex protective apparatus resulted in an upgrade of the original system to reduce those requirements.

GUIDED TOUR

U.S. Sen. Mitch McConnell (R), center, and Michael Abaie, right, program executive officer for PEO ACWA, tour the training center for the chemical weapons processing facility at the Blue Grass Army Depot in Richmond, Kentucky, in fall 2021.

"Our highest priority is the safety of the workforce," said Michael Abaie, program executive officer for PEO ACWA. "When we learned of the challenges of operating and maintaining the existing system, we applied all the resources at hand to develop a system more conducive to meeting the identified needs and keeping our workers protected, while staying focused on meeting our Chemical Weapons Convention treaty destruction commitment of Sept. 30, 2023."

THE PATH TO PROGRESS

PEO ACWA used the other-transaction authority process to design, fabricate and test a new automated system for the plant, allowing the program to use a more flexible acquisition approach while creating efficiencies and enhancing safety for those involved.

Defense contractor Amentum performed as the lead for the project. Amentum, one of the teaming partners of Bechtel Parsons Blue Grass, the systems contractor selected to design, construct, test, operate and ultimately close the pilot plant, brought in Swedish company DynaSafe, as well as Crown Packaging and CRG Automation, both of Louisville, Kentucky, to establish the new rocket processing system.

"CRG Automation developed a newly designed rocket warhead containerization system to dispose of rockets which measure six feet long and 4.4 inches in diameter," said James DeSmet, CRG Automation president and CEO.

"Once the warhead containing chemical agent is separated from the rocket motor assembly and punched and drained of its agent, the all-robotic system places the warhead into a steel container with a lid that is sealed in place using a crimp station," DeSmet said. "The drained chemical agent is then neutralized in a separate process."

The automated system places the containers into packaging skids that hold 25 containers each. These skids are then monitored in an airlock to detect any surface contamination of chemical agent. If no agent is detected, the skids are moved to temporary storage on the depot to await the next step in the destruction process, a static detonation chamber, in which intense heat greater than 1,000 degrees Fahrenheit will destroy the warhead and overpacked container. The pilot plant will use two of these chambers to augment the main plant.

CRG Automation engineers used eight industrial robots, as well as six autonomous mobile robots, in the customized system, which is designed to improve speed and efficiency and reduce downtime.

UNPLANNED DETOUR

With the revamped process complete, another problem arose. It became clear that a significant number of aging M55 rockets, which began production in the 1950s, had warped during storage, creating the possibility that their different dimensions would not fit properly in the system.

Ken Ankrom, a project manager for Amentum, estimated that up to 12,500 rockets may be warped, and each one that enters the line can conceivably stop the process, requiring workers to enter and resolve issues, potentially adding up to two days to the overall destruction timeline each time the line stops.

The former system required clamping the rocket assembly (a complete M55 rocket inside a fiberglass shipping and firing tube) in a horizontal orientation, rotating it, and creating a vertical cut to remove the warhead portion of the shipping and firing tube, and then separating the warhead from the motor. But vertical cuts meant

ROCKETS EN ROUTE

An operator pushes a tray of VX nerve-agent M55 rockets into the rocket non-destructive examination system in the Munitions Demilitarization Building at the Blue Grass Chemical Agent-Destruction Pilot Plant. This system allows operators to scan each rocket for potential leakage to avoid contamination of the processing equipment.

UP AND AWAY

A robot lifts a test rocket warhead from the Vertical Rocket Cutting Machine in the Munitions Demilitarization Building at the Blue Grass Chemical Agent-Destruction Pilot Plant. This equipment cuts the shipping and firing tube from around the rocket, then separates the warhead from the rocket motor.

DIRTY WORK
These robots in the Munitions Demilitarization Building at the Blue Grass Chemical Agent-Destruction Pilot Plant transfer a piece of a test M55 rocket shipping and firing tube to place it onto a conveyor for packaging as waste.

ROBOTS AT THE READY
Robots stand ready in the Munitions Demilitarization Building to load drained rocket warhead canisters into custom packaging skids for transport to temporary storage before their destruction in one of the static detonation chamber units at the Blue Grass Chemical Agent-Destruction Pilot Plant.

any warped rockets that may have leaked inside their shipping and firing tubes would spread their chemical agent with the first cut, instead of keeping it neatly confined. An alternative method was developed by holding the rocket assembly fixed vertically and making a rotating horizontal cut, ensuring that any leaking chemical agent would gather in a containment device. Making these horizontal cuts also added more precision and accuracy, with the robots able to make cuts as small as one thousandth of an inch consistently, Ankrom said.

Should a leaking rocket be encountered following the shipping and firing tube cut, a new tilting reject station is used to take the leaking rocket and place it into an overpack container. The new design creates yet another efficiency and safety improvement, as the old system required workers to manually perform the overpack operation. The new technology also identifies whether the cut location of the rockets has warped and adjusts the system's hydraulics to compensate and keeps the same pressure around the rocket while cutting.

Ankrom added that the new rocket-cutting robots also require far less maintenance than the earlier designs. "That keeps people out of the room, which is always safer."

With the vertical rocket cutting design complete, the team turned to developing a system to help identify leaking rockets long before the robots make their first cut.

STOP THE LEAKS

"If we can avoid the leakers before they ever go to the vertical rocket cutting machine, then we're never having downtime," said Ankrom, noting that less downtime is essential to the goal of completing disposal of more than 70,000 rockets by late 2023.

AUTONOMOUS GLOW-UP

Autonomous mobile robots line up in their charging stations in the Munitions Demilitarization Building at the Blue Grass Chemical Agent-Destruction Pilot Plant. These robots transfer empty and filled M55 rocket warhead canisters to and from different steps of the warhead destruction process.

Over the course of a few months, the team evaluated four technologies to improve the process, both in speed and accuracy. Among them was handheld leak-detection technology used in petrochemical plants, as well as iridium used in medical industries.

A process was devised to perform an X-ray scan of each rocket and focus on the areas where there is most likely to be leakage. CRG Automation's engineers also crafted the ability to tilt each rocket up to 10 degrees for better clarity of the image.

Solving the challenges by designing and developing the new containerization system, vertical rocket cutting system, and the X-ray scan took approximately 18 months. With multiple actions required to process the rockets and incorporating two identical process lines, the system spans about nine rooms of the Munitions Demilitarization Building at the pilot plant. Multiple tight deadlines proved challenging, particularly given the ongoing coronavirus pandemic and its complications.

"This process allowed us to move quickly to keep us on track for the treaty destruction commitment of September 2023," said Dr. Candace Coyle, site project manager for the pilot plant. "The team did a great job of bringing this all to fruition, pandemic notwithstanding."

CONCLUSION

In July 2021, the first M55 rocket containing VX nerve agent was destroyed using the new system. The team is using this chemical weapons destruction campaign to destroy just under 18,000 VX rockets as an optimization period before starting the final campaign. Then, the team will destroy more than 50,000 rockets containing GB nerve agent—the largest portion of the Blue Grass stockpile—expected to begin in spring 2022.

"There would normally be a longer testing period known as systemization, before we start an agent campaign, but due to the short timeline and success in factory and site acceptance testing, we are able to safely use the VX rocket destruction campaign to optimize the equipment for the upcoming GB agent campaign," Coyle said.

PEO ACWA and its contractor teams worked together to meet the challenges discovered in the rocket-destruction process, and the abilities of additional partnering companies using the other-transaction authority process allowed for quick design, fabrication and testing in a short period of time. Once the chemical weapons in Kentucky and Colorado are destroyed, destruction of the U.S. stockpile of chemical weapons will be complete.

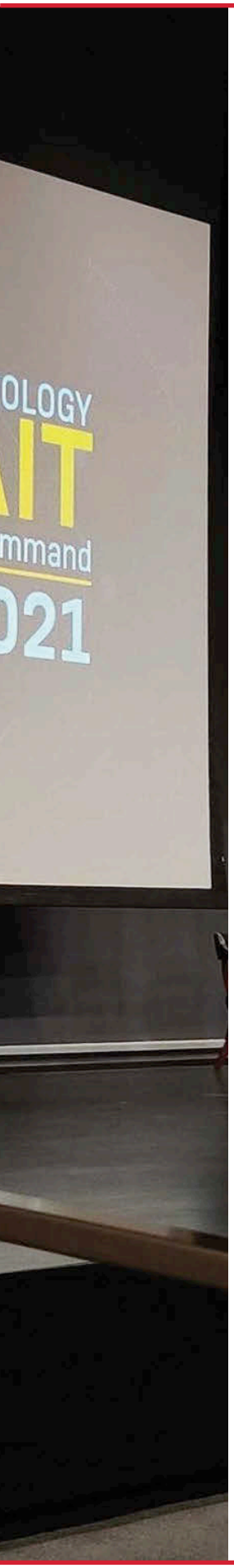
For more information, go to the PEO ACWA website: ***https://www.peoacwa.army.mil/****.*

TIMOTHY K. GARRETT is director of field operations for PEO ACWA. He is a licensed professional engineer and holds an M.S. in environmental engineering and a B.S. in chemical engineering, both from the University of Alabama. A member of the Army Acquisition Corps, he has 35 years of expertise in chemical and environmental engineering related to chemical demilitarization.

KATHERINE B. DEWEESE is the public affairs officer for PEO ACWA. She holds a B.S. in advertising from the University of Maryland and is a Distinguished Honor Graduate of the Defense Information School. She has more than 30 years of experience in Army public affairs, primarily with chemical defense programs and demilitarization.

LEADER ENGAGEMENT

Brig. Gen. Edmond "Miles" Brown, commanding general of DEVCOM, delivered opening remarks at the xTech Innovation Combine pitch competition on July 21, 2021. Six companies pitched their ideas to an open forum of attendees from government, industry and academia. (Photo by Army Futures Command)



PEDAL TO THE METAL

Sometimes, research and development is about finding cutting-edge suppliers and developers and accelerating their capabilities.

by Matt Willis, Ph.D.

Transitioning cutting-edge commercial technologies into the hands of Soldiers is a top priority for the U.S. Army, and accelerator programs are among the mechanisms the Army is leveraging. Accelerators can assist in bringing in dual-use technologies to solve current problems and provide Soldiers with the necessary tools in the field. The Army's Applied Small Business Innovation Research (SBIR) and xTech programs—led by the assistant secretary of the Army for acquisition, logistics and technology (ASA(ALT))—have successfully adopted the use of accelerators to assist in educating, mentoring and transitioning technologies from nondefense businesses into the Army's ecosystem while providing them with opportunities to earn cash prizes and potential follow-on contracts to support the continuous development and implementation of their solutions.

WHAT ARE ACCELERATORS?

Army accelerators are tailored programs designed to speed up a businesses' growth and development to address key market gaps and explore dual-use cases that can be used in military and commercial industries. Each accelerator's programming is uniquely crafted to provide businesses with specialized education, individualized mentorship, exposure opportunities, or other services based on the needs of the Army, DOD and the small businesses. For businesses identified by the Army as having relevant technologies, participation in an accelerator provides resources that can greatly enhance a business's probability of successfully transitioning technology to the DOD, all while bolstering their business model.

Army accelerators provide a space for government entities to have flexibility in how they work with innovative small businesses by using the resources available to non-government entities, such as third-party investors, industry contractors and other service providers. One example is the use of public-private partnerships to provide a connective landscape among the Army, small businesses, the venture community, the organic industrial base and DOD

RESEARCH ROUND-UP

From top left, the xTech 5 Accelerator virtual kickoff, the xTech Energy Accelerator final showcase, xTech 5 Accelerator program team, xTech 4 Accelerator Defense Prime Exposure Event, xTech 5 Accelerator Immersion Event with Assistant Secretary of the Army for Acquisition, Logistics and Technology Douglas R. Bush, xTech 3 Accelerator Defense Prime Exposure Event, xTech 3 Accelerator Investor Showcase, and the xTransition Accelerator Program kickoff. (Image courtesy of DEVCOM)

prime contractors in the context of the U.S. markets. All of these parties and efforts bolster the probability of transition success to the Army at scale.

These specialized programs benefit not only the businesses directly, but also the Army stakeholders looking to transition technology to the Soldier. A small business that is not yet a seasoned military partner is more likely to field its innovative technologies to Soldiers if it has the information and guidance provided by an accelerator. The Army Applied SBIR and xTech accelerators produce insight reports, quantitative and qualitative data, and recommendations for how the Army can continually evolve its programs to be better positioned to transition technologies rapidly from external partners.

THE BEGINNING

The xTech program manages the Army's prize competitions to award and accelerate innovative technology solutions to help solve critical mission challenges, and was the first Army program to adopt the accelerator construct. The program leverages judges from across the Army and DOD to assist in assessing and selecting innovative technologies from the commercial sector to support current Army needs.

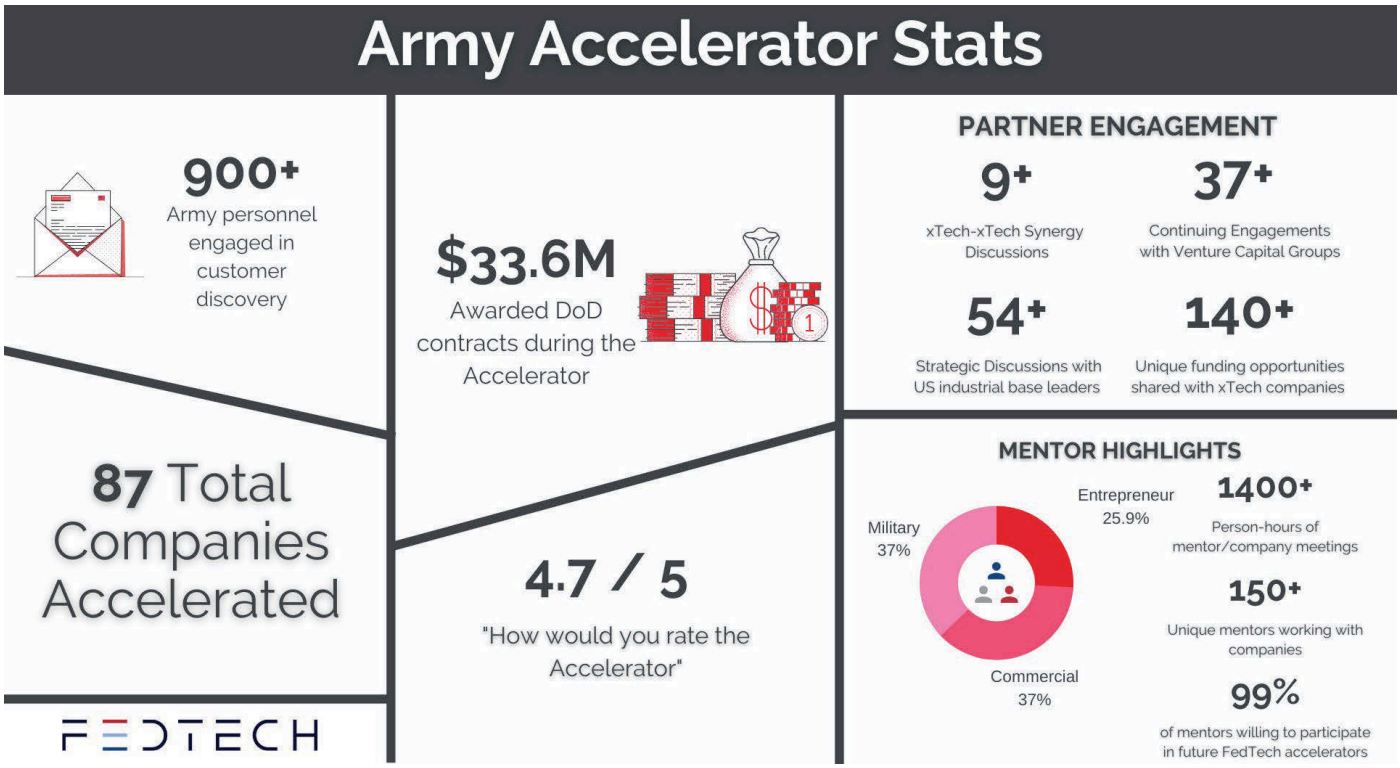
XTech was the first Army program to launch a pilot accelerator program to assist in breaking down barriers to entry for bringing small business solutions into the Army. XTech began as the Army's Expeditionary Technology Search Competition, which provided seed money as prizes to competitors in successive rounds. The first two iterations of the annual open-topic

competitions did not include accelerators. While the program successfully marketed the Army as a viable partner, the participating businesses were not fully able to understand where they fit within the Army's ecosystem. Early xTech competitions revealed a need for further direction on how these businesses could create lasting relationships with the right stakeholders and how to navigate the Army landscape to implement their solutions. Thus, the xTech Accelerator program was launched during xTechSearch 3 in 2019. Since then, more than 10 Army-sponsored accelerators have been developed and executed, spanning both the xTech and the Army Applied SBIR programs, to offer additional opportunities to participating small businesses. The Army has partnered with FedTech—a private venture-building firm at the intersection of deep tech and entrepreneurship—to support design, building and implementation of accelerators.

ADOPTING THE ACCELERATOR CONSTRUCT

The Army SBIR program, which aligns innovative small businesses with critical U.S. Army priorities to turn over game-changing solutions to Soldiers, recently adopted the accelerator construct because of the value it has brought to small businesses participating in xTech competitions. Lt. Col. Marcus White, the deputy director for Army Applied SBIR and Army prize competitions, said, "Within the offices of the U.S. Army SBIR program… we are trying to take some real, deliberate, measured steps to push technology acquisition as far as we can within the Army… for both small businesses and Army stakeholders."

The Army SBIR Program launched its first two accelerators in September and October 2021 with a goal of assisting small businesses in quickly and efficiently transitioning technologies into the hands of Soldiers. Through the accelerator, there was an average 54-percent



BY THE NUMBERS

The accelerators gather data on the utility of the programs and use it to improve the experience. Statistics include those collected from the xTech 3, 4, 5, Energy and Transition Accelerators, along with the Army SBIR Cohorts 1 and 2. Each metric aligns with a core pillar of the program, including opportunity curation, mentorship, strategic exposure and obtaining feedback from users. (Graphic courtesy of DEVCOM)

increase in small businesses' understanding of the Army's current priorities, based on survey responses, and more than 55 Army engagements which included things like conference attendance, one-on-one meetings with program managers and accelerator event participation.

BENEFITS OF ARMY ACCELERATORS

Since these programs have been adopted, a number of positive outcomes have resulted. Army accelerators have promoted greater awareness of the Army as a potential partner and customer among commercial technology businesses, and have developed new frameworks for traversing the chasm of technology transition, otherwise known as the valley of death. Accelerators allow the Army to have close contact with the founders of small businesses, creating an opportunity for the Army to have direct interactions and develop empathy for challenges unique to innovative small businesses, which, in turn, allows stakeholders and policymakers to adjust protocols for streamlined integration.

A unique benefit of accelerators is that they can be customized to the needs of participating companies and the content is at the discretion of the sponsoring organization. A prime example of this customization was in the xTech Global Artificial Intelligence (AI) Challenge, in which the accelerator team designed a customized accelerator for international AI businesses looking to partner with DOD.

"To truly have 'world class' technologies, the U.S. Army must reach out to worldwide technology development sectors to understand their unique solutions to the DOD's AI challenges," said Nathan Anderson, technical director for the Combat Capabilities Development Command (DEVCOM) Atlantic International Technology Center – UK.

ALL EYES ON OWL

Douglas R. Bush, assistant secretary of the Army for acquisition, logistics and technology, center, presents the grand prize award to members of Project OWL, winners of xTech 5, at the Pentagon in Washington, D.C., Sept. 2, 2021. Project OWL developed communications technology that can be used quickly and easily in operational environments or in areas impacted by natural disaster. (Photo by Laura Buchta, U.S. Army)

"Another goal of the [competition] is to provide mentorship and networking to industry finalists, many of whom may not have done business with the U.S. government previously. This mentorship will help break down entry barriers to future business and create more enduring partnerships with international technology developers."

The global competition enabled the U.S. to understand the solutions available on an international level that can meet the Army's needs. The accelerator helped the participants work with the Army effectively to meet those needs.

The Army Applied SBIR and xTech programs strive to continuously improve the processes and the benefits for participating businesses, making it easier to do business with the Army. For example, each accelerator program collects comprehensive entrance- and exit-interview data from its cohorts to augment the strategy and execution of future accelerator programs.

The data has aided the Army in identifying areas of improvement for future competitions to meet not only the needs of the Army, but also small businesses. Through continuous feedback from previous xTechSearch accelerators, the Army learned that small businesses wanted additional opportunities for follow-on contracts. As a result, the xTech program was able to confirm the information with data points and provide the top small business finalists an opportunity to submit for a Phase I SBIR award in conjunction with cash prizes. This pivot is in line with the Army SBIR program's broader strategy to have acquisition personnel and end users drive topics to maximize the likelihood of transition through established and funded Army acquisition programs.

ACCELERATED IMPACT

To date, the program has provided accelerator support to 87 companies from across the U.S. and internationally. These businesses have experienced success in winning more than $33 million in DOD contracts,

and engaged with more than 900 Army personnel through the facilitation of educational modules, interactions with strategic partners and customer discovery.

In addition, the businesses had an opportunity to converse with more than 30 U.S. industrial-base leaders, and more than 30 businesses briefed senior leaders in Army acquisition, with many being directly connected to program managers. When asked what the most valuable part of the experience was, Jennifer Perusini, Ph.D., the CEO of Neurovation Labs, Inc., one of the Army SBIR Accelerator participants, said, "Understanding what acquisitions are and what the process looks like are what I gained from the accelerator.... I feel significantly more comfortable than when I started."

These engagements and contract awards are driving growth within these businesses and creating opportunities for them, not only with the Army but also in the commercial marketplace. Among the participating businesses are dozens of success stories demonstrating technology transition to Soldiers and the small businesses becoming healthy dual-use ventures. For example, Vita Inclinata, a maker of helicopter and crane load stabilization and precision hardware, and the xTechSearch 4 winner, had unprecedented speed from initial federal research and development funding to purchasing of systems.

TRX Systems, xTechSearch 3 winner, similarly went from a SBIR Phase I project to being chosen by the Army at source selection for the dismounted operators' position, navigation and timing system.

Another prime example, xTechSearch 5 finalist and quantum technology company ColdQuanta, has been leveraging federal funding since its inception and has a strong research partnership with the DEVCOM Army Research Laboratory (ARL) and multiple key partnerships in the defense industry.

Since the first iteration of these accelerator programs, the team has worked with dozens of Army program offices to support their goals of successfully transitioning innovative technologies to Soldiers. Accelerators have proven to be a value-add for businesses experiencing roadblocks and hurdles that make it harder for them to develop actionable technology transition plans.

Army accelerators provide a space for government entities to have flexibility in how they work with innovative small businesses.

CONCLUSION

DOD initiatives prove more successful when they are developed with empathy for small businesses. Nontraditional business partners developing innovative technologies may lack the financial resources, knowledge and experience with government contracting efforts that larger businesses often have. The regulations associated with government work require specialized resources and expedited contracting, and award mechanisms are particularly helpful to businesses that may not have the ability to wait longer for revenue.

DOD should continue its efforts to mitigate limitations for small businesses to work with the government, especially in the area of deep-tech. Businesses are often unable to devote the needed resources to navigating the contracting process, government bureaucracy and military technological requirements, while simultaneously funding their own technology development. Though the tech transition process can be challenging, accelerators are a proven resource that can be made even more effective through DOD stakeholder support, whether through mentorship, attendance at an accelerator event, judging a prize competition, participating as a company or sponsoring a competition. Innovation is not a destination; it is an iterative and continuous process that accelerator programs understand and foster.

For more information, or to get involved in an accelerator program, contact the xTech Program at ***https://go.usa.gov/xtA6T*** *or the Army Applied SBIR Program at* ***https://go.usa.gov/xtA6V****.*

MATT WILLIS, Ph.D. leads the Army's portfolio of private sector engagements through prize competitions and the Army SBIR program, comprising more than $275 million in annual research and development investments. Previously, he served as the Army director for laboratory management; chief for acquisition at the Joint Chemical Biological Radiological Nuclear Program Analysis and Integration Office; and the deputy director for special projects in the Office of the Deputy Assistant Secretary of Defense for Research. Willis started his Army career as a research chemical engineer at the U.S. Army Edgewood Chemical Biological Center. He earned a Ph.D. and an M.S. in chemical engineering from the University of Illinois Urbana-Champaign and a B.S. in chemical engineering from Cornell University.

(Photo by Getty Images)

THE FUTURE OF WORK— LIVING THE EXPERIMENT

We're all living in an experiment about the "future of work," but DEVCOM's leaders say the real secret of the future of work is that it's really about the present.

by Ellen Summey

It's all a big experiment. Telework, remote work, hybrid work, day-to-day interactions with colleagues on Microsoft Teams—though the Army didn't plan to undertake this massive pandemic-related workforce experiment, the Combat Capabilities Development Command (DEVCOM) has taken advantage of the opportunity to study its effects and plan for what's next.

A major subordinate command of Army Futures Command, DEVCOM is the Army's largest technology developer, with a total workforce of about 25,000 people in a variety of research, development and engineering roles at more than 100 locations around the world. "A lot of what we do is lab experimentation—you try something new out in the lab and you see how it goes," explained John Willison, DEVCOM's deputy to the commanding general. "This, basically, was a lab experiment on ourselves, for over a year. Obviously it was a *forced* experiment, but we had the opportunity to run an experiment we probably would have had a little bit of a harder time selling before."

That experiment: Offering the flexibility to the entire workforce to work "where and when they are most productive."

If February 2020 was the last true *control*, they've been living the test ever since.

POSTURED FOR SUCCESS

Why is DEVCOM at the forefront of this hybrid work initiative? According to Willison, the command had already been focusing its efforts on talent management before the pandemic. "Four years ago, we started putting a greater emphasis on talent management," he said. Willison and

SPREADING THE NEWS

Willison, left, speaks to Dr. Robert Kania of the U.S. Army Ground Vehicle System Center, at the Association of the U.S. Army annual meeting and exposition in Oct. 2021. DEVCOM's future-of-work concept has been widely discussed among DOD organizations since its inception. (Photo by DEVCOM Public Affairs)

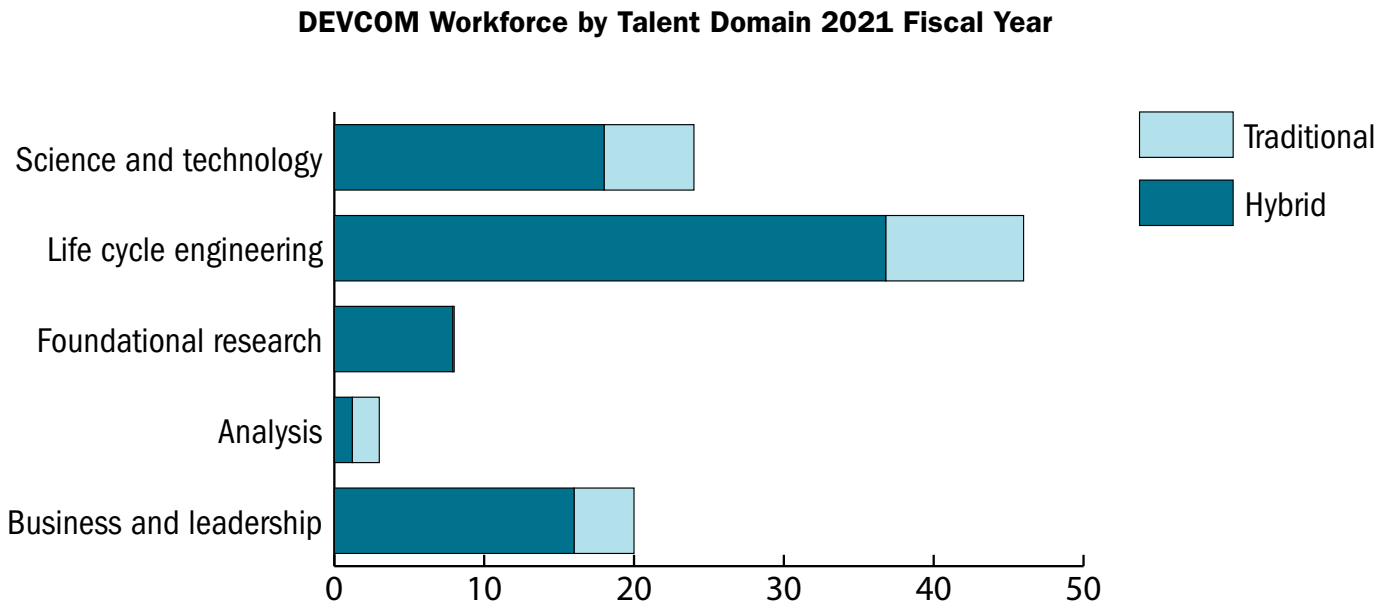
DEVCOM leaders had worked for about 18 months to publish a comprehensive talent management strategy. "We're an organization that does research, development and engineering, but in the end really, it's a people business. So, we went through a phase of defining six talent domains over 70 different competencies within those domains, and really getting to an understanding of the talent that we have, the talent that we think we need in the future, and everything having to do with talent, talent engagement, talent recruitment, etc."

Then, as the talent management initiative was being implemented, COVID-19 forced an unplanned change. "As the pandemic hit in March and April of 2020, our immediate reaction was to take care of the workforce," Willison recalled. "We pushed everyone remotely, with the primary focus being the health and wellness of the workforce." This is what he refers to as "phase one" of the future-of-work experiment—the period marked by the reactive steps the command took to adapt to the pandemic. But a reactive posture has a short shelf life, and DEVCOM leaders knew they needed to plan their next steps.

"By August of 2020, we were going into the fall and this seemed a little more enduring than probably anyone had expected," Willison said. "I went in to our [commanding general] at the time, Maj. Gen. [John A.] George, and said 'I'm seeing a lot of anxiousness in the workforce. They don't know what's coming, they don't know what to expect.' So we took a step in August to tell our workforce that we want everyone to continue to work remotely to the maximum extent possible, through December. We wanted to give them at least that certainty, or that assurance."

"Shortly after we put that out, the boss came in and said 'OK, now what?' And I said, 'That's a great question,' " he chuckled. This was when the idea started to take shape. "We had an eye on, by the end of December or early January, publishing a concept paper for our workforce—and we did that in January. It said basically, the 'why' of our mission and the 'what' of our mission are not going to change. Why we exist as an organization, what we do as far as our mission, isn't going to change. But the 'where' and the 'when' and the 'who' and the 'how' are likely going to change, so we looked at how we define that change, how we give people some idea of where we were and where are we going."

"You've got to be willing to trust your managers and leaders, and in turn, they've got to be willing to trust their workforce."



THE BREAKDOWN

This chart illustrates the DEVCOM workforce, broken out by work "domain," and the percentage of employees who were on hybrid versus traditional work in fiscal year 2021. (Source: DEVCOM Public Affairs Office, graphic by the author)

NEXT STEPS

"The Army is looking at Army Futures Command in general for innovation and for doing things differently, so that also applied to the future of work. Army Futures Command, in turn, turned and looked at us because we had this foundation of doing talent management work and we really were leaning forward, so we've had the luxury of their support throughout," Willison said.

"We adopted this construct of 'work where and when you're most productive.' It sounds pretty simple, it makes a lot of sense, but there's a lot of complexity in that, given the range of different things that we do and the requirements of what we do," he explained. "So we published the concept paper in January and allowed people to start interpreting or applying those concepts locally, where they were."

By August of 2021, DEVCOM leaders briefed Gen. John M. Murray, then-commanding general of Army Futures Command, on their strategy to pivot from their reactive posture to a hybrid-work pilot that was more future-focused. "It laid out those concepts of why, what, where, when, how, who, and gave people some broad guidance of the range of acceptable practices within all of that," he said.

"We talk about the range of acceptable practices—that's what Gen. Murray tasked us to do. I went back to him and said, 'OK sir, the range of acceptable practices—people can work remotely anywhere between zero and 100 percent.' I wasn't sure how that was going to be received, frankly," Willison laughed. But Murray approved the plan, and the team continued their work of communicating and implementing the pilot while tracking data regarding its effectiveness.

"We've got some people who have come in every day since the pandemic. We've had some people who *haven't* come in since the pandemic started, and won't ever come back in again. And we're good with that." The key, he said, is tailoring the approach for each specific location and team, and the requirements of the work itself.

"Our assertion is that we've been able to do all this while being at least as productive as we were before, if not more," Willison

MANAGEMENT AND MISSION COMMAND

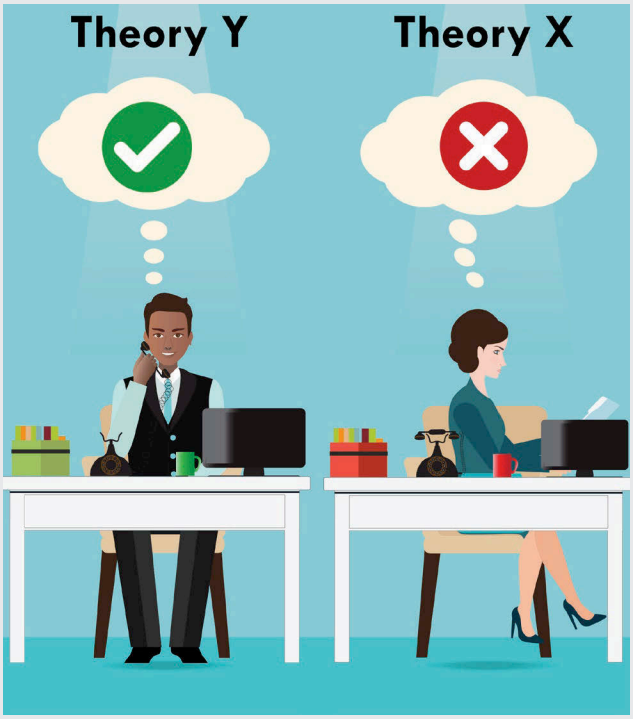
Douglas McGregor was a professor of management at MIT in the 1950s who developed the Theory X and Theory Y models of work motivation and management. Essentially, a person who subscribes to the Theory Y style of management would believe that employees are generally self-motivated to do their work, and can be trusted to complete their tasks without close supervision. Theory X, on the other hand, states that employees are inherently lazy and lack ambition, and that they must be punished or rewarded in order to maintain productivity.

DEVCOM's willingness to embrace telework, remote work and hybrid work seems to have a few things in common with McGregor's Theory Y, and Willison also sees a parallel between that model and the Army's mission command doctrine.

"I have not always been a Theory Y person. I was a strong Theory X person for a period of my career," Willison laughed. As he tells it, the change occurred around the time the Army was transitioning from a command-and-control doctrine to mission command. "The whole premise of command and control was very hierarchical. Orders come from the top, they're pushed down, they're implemented below, and you manage compliance. This was the Army's doctrine." As the Army began to grapple with unconventional adversaries in Afghanistan and Iraq, Willison said leaders began to realize "this wasn't working."

"We were fighting an enemy without a hierarchy, we were fighting an enemy that was very adaptive, things were moving and changing so fast on the ground, that if we really wanted to fight more effectively, we had to go to mission command. That is, commanders give broad intent and then they enable disciplined initiative based on trust, within that intent, and then we saw how things turned around."

On a personal level, Willison had the same realization. "For me, I was working in the mission command space, and it happened to be right at a period where I was starting to figure out that Theory X also was not a great leadership model and I was not seeing it be as effective," he laughed. "At one point, I had a little professional crisis and said 'Geez, I've gotta figure out a different way.' So, if this works for the Army, why wouldn't it work as a leadership model? As a leader, what I'm doing is providing broad intent and giving you trust to apply disciplined initiative within that intent. When you think of 'future of work,' it's really an extension of that."



TWO SCHOOLS OF THOUGHT
Some managers believe employees are inherently lazy and need to be punished or rewarded to maintain productivity. Others believe employees are generally self-motivated and don't need close supervision. (Graphic by the author)

"It's like, if you trusted me enough to hire me, then trust me enough to work on something without watching me, or thinking that watching me is going to make me more productive. Frankly, the people who work hard are going to work hard no matter where they are. The people who don't work hard, aren't going to work hard, no matter where they are," Willison said. "The notion that, if you're watching them, they're going to work hard, it just doesn't work and it's exhausting, as a leader. I got there through a series of hard lessons."

"We're a creative organization, so we want diversity of thought, and diversity of thought comes from a diverse workforce."

BEST IN A LABORATORY
Soldiers and scientists observe autonomous ground vehicle tests at the DEVCOM ARL Research Robotics Collaboration Campus in Graces Quarters, Maryland. Some jobs, like those at DEVCOM ARL, cannot be performed safely at home. DEVCOM is taking those conditions into account with its future-of-work concept. (Photo by Neil Adams, Army Research Laboratory)

explained. "So, we've got a real concerted effort now to collect metrics to make sure we're keeping our eye on that, because that will really then take us from this pilot phase to the ultimate phase, which is, adopting this as just the way we do things in phase three."

SOMETHING TO TALK ABOUT

Word has gotten out about this pilot—and people have questions. "One of the things we learned up front is you cannot over-communicate with your own workforce," Willison said. "In this time of uncertainly, you cannot keep them informed enough, you cannot over-communicate. So that communication, naturally, does not stay within our organization."

DEVCOM's Future of Work Concept has been covered widely in government news circles. There are podcasts, articles, videos and social media content across the internet featuring Willison's confident and positive explanations of the initiative.

One question he hears frequently—"How are you doing this?" Willison said the answer is both simple and unexpected. "My own boss has asked this, Gen. Murray has asked this, other people have asked this, and they're surprised with the answer when I tell them we've been able to do all of this within existing policy, within existing regulations," Willison said. "We're not breaking any rules. It's kind of remarkable if you think about that. That means a lot of these flexibilities existed for a while and just weren't really employed to the extent they are now."

Through his conversations with other government agencies, Willison said he has seen an array of different approaches. "You see a lot of organizations that want to put that range of acceptable practices—they want to define that [to be] a little bit more constrained and say 'you've got to be in the office at least two days a week,' which I've seen from some people. If that works for you, that works for you. We just couldn't figure out however to put those rules out and not be leaving out someone who could be even more productive in another way."

For Willison and DEVCOM, it all comes down to flexibility and a willingness to

trust the workforce. "You've got to be willing to trust your managers and leaders and, in turn, they've got to be willing to trust their workforce," he said. "That's palatable to some people and less palatable to some others, depending on your leadership style and your kind of belief and how you got to where you are."

But anytime he is challenged on DEVCOM's approach, he said his reply is the same. "We'll be talking about 'the great resignation' even more, if we start telling everyone come back to [the office]. 'Let's pretend like this never happened.' You'll see people who that just won't work for."

BENEFITS AND CHALLENGES

It wouldn't be a true experiment if we didn't talk about the results. According to Willison, the future-of-work pilot has been well received by the workforce so far and has shown promising outcomes already. Among the many anticipated benefits of this pilot, he said DEVCOM leaders are optimistic that it will help with workforce development, recruiting, retention, diversity and collaboration across areas of the command.

"We think that by adopting that 'where and when' construct, we'll be able to open up opportunities for a group of talent that we probably haven't even been able to track before, and be able to retain the talent that we've got." A broader and more diverse talent base will be a net positive for the organization, he said. "We're a creative organization, so we want diversity of thought, and diversity of thought comes from a diverse workforce," he said. "It's always been in our minds and part of our talent management strategy to look at our diversity, equity and inclusion posture, so this was another opportunity to think about how to attract talent that we may not have been able to attract before."

CONTRASTING THE PAST AND CURRENT AND THE FUTURE

	Past/Current	Objective
WHY	Remains constant.	
WHAT	Remains constant.	
WHERE	Work primarily at official duty location.	Work where you are most productive.
HOW	• Local, discrete terms operating within constraints of organizational boundaries. • Linear, requirements-driven process. • Local management of networks and device data.	• Agile, cross-competency and cross-organization teams rapidly formed to deliver integrated solutions. • Iterative, Soldier-centered design. • Enterprise solution enabling broad collaboration.
WHO	• The best talent to "come" to us. • Reactively filling organizational vacancies. • Permanent positions, "career" development. • Limited, local view of deversity, equity and inclusiton (DE&I).	• The best talent, anywhere. • Proactively building competency-based talent. • Movement built into the system. • Fully inclusive—opportunities with few boundaries.
WHEN	• Locally defined "core hours." • Largely synchronous operations.	• Work when you are most produtive. • Asynchronous operations emphasizing output.

CHOOSE YOUR OWN ADVENTURE

The DEVCOM future-of-work concept advocates for a hybrid workforce, with the employees choosing their most productive work environment. (Graphic by DEVCOM)

With greater flexibility, Willison is also looking forward to creating new professional opportunities for the workforce. "The part I'm most excited about for the enduring future is providing people opportunities that aren't constrained to their geography," he said. "We've got over 100 locations worldwide. If I'm sitting somewhere and I see an opportunity in another location that I could potentially be involved in, that opportunity space now got really broadened for me."

And so far, he said, the pilot is paying off. The command has seen new innovation, new collaboration and new thought as a result of these changes. "So, it's not just that we're doing this because it makes us feel good," Willison continued. "I absolutely believe it's going to allow us to

ELECTRIFYING RESEARCH

The Hon. Kathleen H. Hicks, Ph.D., center left, the deputy secretary of defense, talked to staff at the Ground Vehicle Systems Center (GVSC) at Detroit Arsenal about how electrification research-and-development efforts can improve vehicles' mission duration and advanced warfighting capabilities. (Photo by GVSC)

move forward as an organization from the mission output point of view as well."

But there are challenges, too. Simply put, there are some jobs that just can't be done from home, and managers will need some new skills to effectively lead remote and hybrid teams. "We've had some people who have continued to come in every day since the pandemic," Willison said. "There are some things that can only safely and effectively be done in a very controlled, secure lab. So, you can't tell the person working on anthrax defense to do that at home in their kitchen."

Some research has indicated that workers who spend more time in the office may receive more promotions, pay increases and favorable reviews than their peers who work from home more frequently. In addition, women and people of color may be more likely to prefer telework and remote work, which begs the question—how can managers ensure those workers are not negatively impacted by so-called proximity bias? "Management of hybrid work is definitely a challenge," Willison said. "Part of what we've emphasized is … the expectation is that you're managing output. You're not managing physical presence. You're not managing time put in. This should have been true even before COVID, right?" Though he concedes that that can be difficult in certain fields. "For us, doing research, doing engineering, we have ways to do that that are not always as tangible as we'd like them to be. It still is a level of effort, but it's put even a greater emphasis on the notion of managing output."

"This construct of 'work where and when you're most productive' sounds pretty simple, it makes a lot of sense, but there's a lot of complexity."

Willison said that DEVCOM leaders have taken a hard look at the roles and expectations of managers and leaders in particular, and how to ensure that favoritism and bias don't creep in to the evaluation process. (Read more about how leaders can adapt to managing hybrid teams in "Future of Work—Present Tense," from the Winter 2022 issue at https://go.usa.gov/xtF7P.)

Despite the difficulties, Willison said this is something that simply must be done if DEVCOM is to effectively recruit and retain the right workers for its mission. "One of the motivators for us to provide this kind of flexibility to the workforce is because we are constantly in a war for talent. If we don't provide those flexibilities, we know someone else is going to."

CONCLUSION

Though the experiment is ongoing, Willison is already making predictions about the final outcomes. "Even though we're calling it a pilot, there's no way you can put this back in the box," he said. "You

WORK CONTINUES
Garlin Gilchrist, center right, Michigan's lieutenant governor, was at Detroit Arsenal in late 2021 for briefings on GVSC modernization. He toured some of GVSC's integration laboratories, where many work staff continued working in the office throughout the pandemic. (Photo by GVSC)

know, we call it the 'future of work,' but it's really the *now* of work. There's no way to go back." A hybrid workforce will be an enduring result of the pandemic for DEVCOM, he said. "It will look different and people will continue to evolve it and change it, but I'm really optimistic and really encouraged by seeing how it's been embraced."

"There are certainly challenges, including performance, measures, managing a hybrid workforce and biases, and those aren't to be minimized or trivialized—those are all significant and we'll have to get at them, but I'm really enthused by what I've seen so far and really optimistic about the future."

"You cannot over-communicate with your own workforce."

For more information, go to the DEVCOM Future of Work Concept page: ***https://go.usa.gov/xtmUp***.

ELLEN SUMMEY provides contract support to the U. S. Army Acquisition Support Center at Fort Belvoir, Virginia, as a writer and editor for SAIC. She holds an M.A. in human relations from the University of Oklahoma and a B.A. in mass communication from Louisiana State University. She is certified as a Project Management Professional, Change Management Professional and User Experience Manager, and has more than 15 years of communication experience in both the government and commercial sectors.

Telework Questions?

Telework, remote work, hybrid work—what is the difference?

How is my locality pay impacted if I live in a different area?

Where can I find the most current guidance?

For answers to all of these questions and more, check out the

Office of Personnel Management's Guide to Telework in the Federal Government

WILLIAM "CODY" SWINFORD

COMMAND/ORGANIZATION:
Acquisition Support Command, Program Executive Office for Missiles and Space

TITLE: Program manager

YEARS OF SERVICE IN WORKFORCE: 20

YEARS OF MILITARY SERVICE: 4

DAWIA CERTIFICATIONS:
Level III in business, cost estimating and financial management and Level II in program management

EDUCATION:
M.S. in management and acquisition and contract management, Florida Institute of Technology; B.S. in secondary education, Athens State University

AWARDS: Army Achievement Medal for Civilian Service (2018)

HAVE COMMUNICATION WILL TRAVEL

William "Cody" Swinford was awakened out of deep sleep at midnight in Fayetteville, Tennessee, by a call from an Army civilian recruiter 600 miles away in Dallas, Texas. The recruiter had reviewed his resume and said "You do not qualify to become an acquisition [contracts] analyst, but how would you like to be a budget analyst?" Swinford said "Sure," and the recruiter said someone would be in touch in about three weeks.

The rest, he said, is history.

Swinford joined the Army Acquisition Workforce in 2004, after completing his internship as a budget analyst for the Department of the Army. He may not have—according to the recruiter—qualified as an acquisition analyst at the time, but three years later that intern position as a budget analyst was identified as part of the Army Acquisition Workforce. To make it official, he completed the Defense Acquisition Workforce Improvement Act (DAWIA) training in business cost estimating and financial management, and received his Level III certification in 2007.

"Things do not always go your way," he said. It's the old motto, "if at first you do not succeed, try and try again," which is the most important lesson he's learned, on the job or off, during the course of his career. Though Swinford didn't get the position he sought right away, he ultimately ended up where he wanted to be.

Swinford currently serves as program manager in the Leadership Excellence and Acquisition Development (LEAD) program for high performing professionals in GS-12/13 or NH-03 pay bands, working in the Program Executive Office for Missiles and Space (PEO MS) for the assistant PEO for international operations.

"International and security cooperation is relatively new for me, so learning new and challenging things brings me satisfaction." Plus, he said, whenever he mentions the Army or a missile or aviation system he supports, it tends to pique people's interest. "I believe they think I am more important than I really am, which is kind of cool."

And his job is both important and cool. Swinford is responsible for creating trip books—reference tools that contain vital information about countries that PEO MS senior leaders engage with when they travel to trade shows, program management reviews or other high-level events. "I support the team by helping to develop some of the information for our dashboard," he said. "I research the artillery systems other countries obtain, and generate a report with compiled information about the U.S. relationship, missile systems and equipment they are procuring or are preparing to buy through the foreign military sales process."

Swinford said his next assignment will be at the Office of the Deputy Assistant Secretary of the Army for Defense Exports and Cooperation (DASA DE&C) in Washington, D.C., where he will learn the many facets of security cooperation at the Army senior level. "Specifically, I am looking to gain experience as a region or country desk officer who works to support requirements from a specific region or country," he said. "The overall

goal of the program is to achieve the next level of responsibility as an NH-04," he said. "For me, that could be a branch or division chief or a project lead for one of the many program offices for one of the program executive officers or other commands," he said. "The Army as a whole is very good at developing leaders."

According to Swinford, leadership starts at the ground level. In addition to knowledge and expertise, it's also about interpersonal relationships, laughing and having some fun. Before joining the acquisition workforce, Swinford served in the Army for four years, and said his experiences as a Soldier prepared him in many ways for the civilian roles that followed.

Swinford said he will never forget the time his drill sergeant in basic training told him that he "reminded him of someone who shot at him once." Or the time he arranged a conference room prom at lunchtime for a colleague who never got to attend one in high school. Or the time he was the new Department of the Army System Coordinator with the responsibility of escorting a visiting colonel to a meeting and, somehow, he got both of them lost at the Pentagon.

These experiences may seem unrelated, but not when you look at them in terms of communication and positive outcomes. Swinford said the Army is, after all, in the people business. "Each of these experiences has made me the individual and leader I am working to become," he said.

Communication and dealing with all personality types are just two of the reasons Swinford enlisted in the Army. Another was to take advantage of the unique opportunity for personal and professional growth and development.

"I was born and raised in a small town called Fayetteville [Tennessee]. Like many small towns, there were not a lot of job opportunities and between my mom passing away when I was seven, and my dad who was disabled, there was not much money for college. Therefore, I decided to take advantage of what military service could provide and, put simply, it was a way out. I tell people that I joined the Army to see the world and got stationed 30 minutes from home at Redstone Arsenal [Alabama]. I had no clue what I was getting myself into. Looking back, it was the best decision career-wise that I would make," he said.

When Swinford was up for reenlistment, he found himself at a crossroads professionally, but the advice from his command sergeant major, Jack Hoffman, helped put things into perspective. "He sat me down and said, 'Cody, you can take your military

REMARKABLE ACHIEVEMENTS

Lt. Gen. Robert Marion, principal military deputy for the Army Acquisition Executive, previously the deputy for acquisition and systems management (DASM), left, and Col. Willie Coleman (Ret.), right, DASM, presented Swinford with the Army Achievement Award for Civilian Service in 2018. (Photo courtesy of Swinford)

experience of four years and get out and complete your education, or if you decide to sign up for an additional four years, you would have eight years in and at that point, you might as well complete the 20 years and retire and then have a second career,' he said. "I chose the first option."

"At that time, I was working toward a degree in education. I thought I wanted to teach." Swinford said he pursued his degree while working several jobs, including the seafood department of Winn Dixie Supermarket, as a teller at Redstone Federal Credit Union, and a camp counselor at the U.S. Space and Rocket Center, until he received his bachelor's degree in secondary education from Athens State University in 1998.

"I had no leads or offers for a teaching position, so I took a job with the State of Tennessee in the Department of Human Services until I was selected for the …intern program as a budget analyst," he said. Seeing how his role directly supported the Soldiers in the field gave him a purpose and mission.

"Being in the acquisition workforce, it's my job to ensure our Soldiers have the system or equipment within budget, on time, and in perfect working condition so that they can do their jobs and be ready to defend our freedom at any point and anywhere in the world," he said. "If my actions play a role in making them successful, then I have done my job."

—CHERYL MARINO

MY TURN
Col. Joseph Parker, right, Corpus Christi Army Depot commander, takes the aircraft key from a senior test pilot for the first UH-60V produced at Corpus Christi Army Depot (CCAD). The new UH-60Vs have better pilot interfaces that reduce the burden on the crew. (Photos by Ervey Martinez, CCAD Public Affairs Office)

NEW LIFE

The Black Hawk UH-60V upgrade is a key component for the Army's future vertical lift transformation.

by Cheryl Marino

Whether it's troop transport, medevac, air assault or special ops, the Sikorsky Black Hawk UH-60L "Lima" was made for the mission. Its speed, durable lift capability and overall versatility make it the perfect candidate for an avionics upgrade to produce the Black Hawk UH-60V "Victor"—a digitally reconfigured aircraft with a glass cockpit that matches, and in some cases, outpaces, its predecessor the Black Hawk UH-60M "Mike," and segues the Army to its Future Vertical Lift program.

"We're taking all the good stuff of the Lima—the range, the speed, the sling load capacity, the internal cargo weight, and then putting in a new entire wiring system from tip to tail and a fully digital cockpit that takes out all the old gauges that are all analog," said Col. Joseph Parker, commander of the Corpus Christi Army Depot (CCAD) in Texas. "Everything now is like flying with four iPads and it's pretty neat," which is high praise, coming from an AH-64 pilot.

Parker said that, with the digital interface, pilots can do their mission planning outside the aircraft using a computer that works with the same programming as the aircraft, then load it into the aircraft and set up different views and moving maps to monitor everything, from the condition of the aircraft to routes, waypoints, landing zones, pickup zones and return flights at the same time, or however the pilot wants to engage it. "If there's an issue, you can get a maintenance report from it. You're not having to judge things by sight, sound and feel. You're able to get that digital information into the aircraft," he said. "A better pilot interface reduces crew burden and allows pilots to maintain situational awareness outside the aircraft to execute the mission safer, faster and more effectively."

DRIVING FORCES

Parker, who is working with Col. Calvin Lane, utility helicopters project manager (PM), and his team at the PM Utility Helicopter Program Office within the Program Executive Office for Aviation at Redstone Arsenal, Alabama, to produce the UH-60V, said four major benefits have driven the Black Hawk upgrade initiative. Those benefits are: Pilot interface enhancements, flexibility to the combat aviation brigade commander, significant

FRESH COAT
The UH-60V is coated with primers and paints that are completely free of hazardous heavy metals previously used in aircraft production. (Learn more about the removal of heavy metals in "Heavy Metal—Banned" from the Fall 2021 issue.)

cost savings since the Army owns the software, and the opportunity to breathe new life into an older aircraft.

"The digital technology enhances the pilot interface and reduces the burden of the pilot so that he or she can execute the mission with as little input as required because the helicopter is augmenting the workload," he said. With the older, more antiquated analog technology, all of the information was brought to the pilot via round gauges with numbers and needles, and the pilot then had to synthesize the position of those needles into an understanding of where the aircraft is in time and space, in order to make decisions about manipulating controls that fly the aircraft. Those older aircraft have no automatic features for holding parameters like position, altitude or heading—so the pilot is flying the aircraft manually throughout its mission while ensuring mission success at the same time.

SOFTWARE OWNERSHIP MEANS COST SAVINGS

In terms of flexibility, Parker said the new technology would enable the brigade commander to choose the exact right aircraft for the mission. The digital cockpit of the Victor model is nearly identical to the Mike model and uses the exact same planning software, so the training for both models is also nearly the same, making training easier for everyone.

Parker said that, by the Army owning the software that's programmed into the helicopter, the near- and long-term cost savings are in the millions. "When the software changes or needs to be upgraded, the Army doesn't have to pay someone hundreds or thousands or millions of dollars to change it like we do now with the Apache and Chinook [helicopters]. We can make these changes ourselves internally. That's the first step into modular

open system architecture [MOSA], so that's a huge advantage. And best of all, we're making an old aircraft new again, to give this [UH-60L] airframe another 10, 20, 30 years of use in the Army."

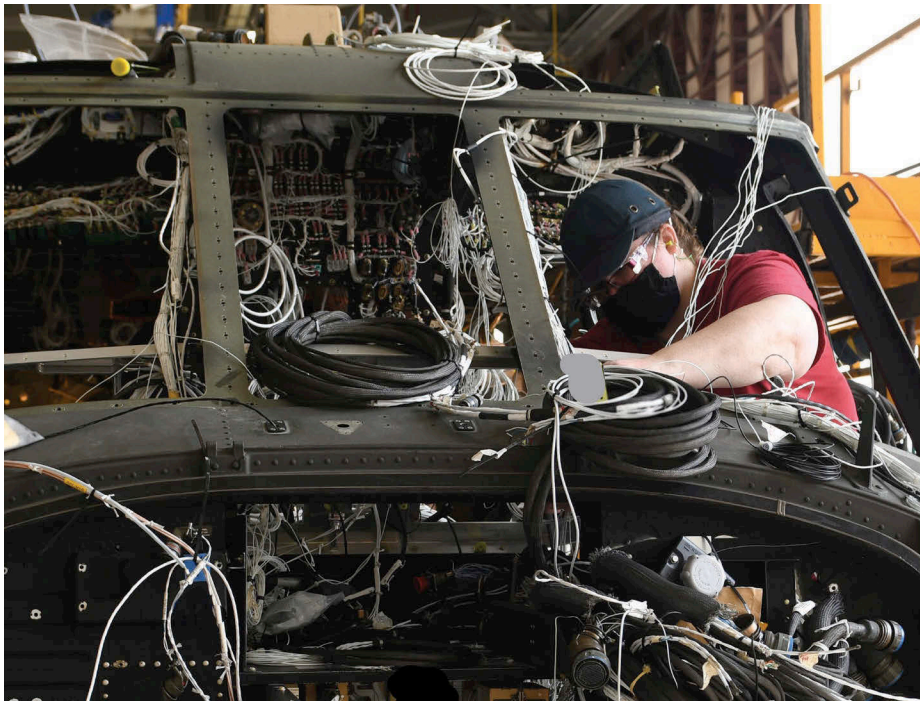
"So taking a Black Hawk and making it a UH-60V is millions of dollars cheaper than buying a brand new UH-60M model helicopter, and that savings can be used for funding the Army's 31+4 programs which, in our case, is the Future Vertical Lift [FVL] program," he said.

In another cost-saving initiative, all of the upgrades are being done at the Corpus Christi Army Depot rather than turning to industry for modernization work. According to Lt. Col. Kenneth Ferguson, managing director for aircraft operations at the depot, modernizing the Black Hawk is only a part of what they do at the Corpus Christi facility.

He said that the depot, which is mainly a helicopter component and repair manufacturing facility, is broken down into three prime directorates—business, components and aircraft operations. On the aircraft operations side, which Ferguson oversees, there is the aircraft production team that builds the UH-60V; the flight test section, where all aircraft repaired or built at the depot is tested; and the on-condition maintenance—inspection of an item to see if it is fit or unfit—team that repairs all of the crashed or battle damaged aircraft that come in from the field that need to be fixed and sent back out again. The Black Hawk upgrade program is "the bridge we need at the time we need it," he said.

THE FRAMEWORK FOR FUTURE VERTICAL LIFT

According to Ferguson, the Black Hawk is the most numerous aircraft in the force, and since the Army wasn't able to acquire the UH-60Ms fast enough to completely fill the modernization gap before future vertical lift coming on, this created an aircraft modernization capabilities gap primarily in the Army National Guard and the Army Reserves.



A LONG WAY TO GO

An electrician installs more than 20 miles of new wiring and digital components into a newly remanufactured UH-60V airframe.

"Replacing Limas with Victors will help modernize our force prior to the fielding of the first vertical lift aircraft, which will be a fully modern, fully digital open architecture aircraft," he said. "The software on the Victor is slightly better than what we have in the Mike. The Victor's technology will help bridge the gap between the current fleet and Future Vertical Lift. With the addition of Future Vertical Lift [FVL], it will be fully coupled so that it can be flown by a pilot or flown simply by the computer without pilot interaction. And so it'll be a step further. This is a great middle step that enables us to go full digital. So if we get into a heavy conflict, we've got commonality across the force in how we can employ these aircraft. The 60V program does it quick, and it does it cheap."

With the cost of a UH-60V being significantly less than a UH-60M, he said "The Army has already paid for the Limas, so that's part of the cost savings, but it also extends the life of that Lima that would have to be phased out due to aging out the airframes."

SETTING CONDITIONS FOR THE FUTURE

Parker said there are many other cost-saving initiatives conducted at the Corpus Christi Army Depot that set up conditions for the future, including the use of composites. "I believe the future for the vertical lift aircraft will require CCAD to be fully composite capable. So we're

GET THAT UPGRADE

Before: The analog cockpit of a UH-60L.

After: The digital cockpit of a UH-60V.

setting the conditions now, knowing that in 10-12 years we're going to start to get the first components from the FVL programs and then in another 20-30 years, depending on the life of the FVL programs, we're going to start to do re-capitalization work on the Future Vertical Lift program assets—future attack reconnaissance aircraft, future long-range assault aircraft, future unmanned aerial systems and future tactical unmanned aerial systems."

Using an open system architecture approach means the software design is not dependent on proprietary systems, making it easier to add or swap components and facilitate faster future upgrades. "It's the proof of principle for the [modular open system architecture] that we're using. So that's the data and the chips and the software in the aircraft. That's the first step in helping to lead to the modernization of the entire fleet. So it's going to be the first use of Army-owned software, Army-developed software, and it's going to be the first step to ensure that MOSA is able to come online."

FRESH OFF THE ASSEMBLY LINE

Parker said the upgrade project began in 2016, but really got going in 2018 when they inducted the first UH-60L to be converted to a UH-60V at Corpus Christi. The first six UH-60Vs were completed in the spring of 2021, and the next 32 should be out the door by this fiscal year. He said that, from start to finish, the process to completely strip a UH-60L helicopter down, upgrade it to a UH-60V, then paint, complete and deliver the aircraft today takes about 400 to 430 days.

"We're starting to move more quickly with production now. The goal is to convert a total of 760 UH-60Ls to UH-60Vs in the next few years—30 per year at first, then that will increase to 48 per year until all 760 become part of the UH-60 fleet. "It's like an assembly line process, without a track," he said of the upgrade process. "We tear it down to its skin, ribs and bones, inspect it all and make any fixes that are needed so it's essentially a brand new airframe from the bones to the skin. Then we put it back together with 20 miles of brand new wires, new computers and new displays and we get it going."

Parker said a major perk is that the next generation of aircraft won't be tied solely to one company. The Army can compete the part and find where a vendor can get it the cheapest. He said a good way to describe it is it's like taking your phone and putting whatever apps you want on it, instead of buying all of those apps from Sikorsky. "Similar to the app store, the Army is going to require 'the app' be interfaced that way so the people making the part have to make sure it communicates that way. It's very plug and play."

"The crews that have flown it so far are huge fans of it. It's like getting a new car. It has the new helicopter smell and it works very, very well. They love it." Parker said. "They like what it can do and want more of them, and they want it faster. Which is why we had to decrease our production time from 600 days last year, to as quick as 330, but in the range of 330 to 400 in the next few years. We've got to go faster to support the warfighter."

CONCLUSION

Ferguson said that digital is the future and gone are the days when a panel of analog dials gauged airspeed, altitude and position, while a handheld slide rule was used to calculate things like time, windage and fuel, and pre-mission planning and navigation were penciled into a paper map book, glued, folded together and pages were flipped while in flight—all occurring simultaneously in the cockpit, while the crew managed the flight mission.

"I think that this is a timely extension of a true and trusted aircraft, modernizing it digitally in order to fill a critical capability gap at the right time and for the right price," Ferguson said. "This is a good thing for Corpus Christi Army Depot, for sure. We've got something that we're working on that will immediately enhance national defense and enhance the safety and wellbeing of our aviators and the infantry men and other Soldiers that ride in these aircraft," he said. "There's a sense of real excitement and purpose here at the depot, and we understand that this is a critical contribution to the force and the depot is extremely privileged to be a part of this program."

For more information, go to ***https://www.ccad.army.mil/****.*

CHERYL MARINO provides contract support to the U.S. Army Acquisition Support Center at Fort Belvoir, Virginia, as a writer and editor for Network Runners, Inc. and Army AL&T magazine. She holds a B.A. in communications from Seton Hall University, and has more than 20 years of writing and editing experience in both the government and commercial sectors. In addition to corporate communications, she is a feature writer and photojournalist for a biannual New Jersey travel magazine.

TEST FLIGHT

The new UH-60V is a digitally reconfigured aircraft that segues the Army to its Future Vertical Lift program.

TOTAL COVERAGE
U.S. Army Spc. Justin Earnhart pulls security while wearing a joint service general purpose mask during an exercise in the Army Futures Command Best Warrior Competition on Fort Sam Houston, Texas, June 9, 2021. So-called gas masks are dependent on military-grade carbon for their effectiveness. (Photo by Pfc. Joshua Taeckens)

CARBON COPY

How DEVCOM is qualifying additional sources to supply military-grade carbon for use in gas masks and large-scale protective filters.

by Brian B. Feeney, Ph.D.

The protective air filter on a gas mask, or a protective filter on a vehicle or building, can be all that stands between the warfighter and a deadly chemical agent that an enemy force might use in battle. That means that the filter's carbon—the active mechanism in capturing the chemical agent—must meet the DOD's exacting specifications and be available in the quantities that the force needs.

For 30 years, the DOD relied on just one supplier, Calgon Carbon Corporation, in Pittsburg, Pennsylvania, with just one carbon production line for this critical life-protecting material. That represented a serious supply chain vulnerability. Now, the DOD is on its way to having double the supply *and* a second supplier, Molecular Products, Inc., headquartered in Louisville, Colorado. That second supplier was achieved through innovative acquisition and teamwork.

The Combat Capabilities Development Command Chemical Biological Center (DEVCOM CBC) joined forces with the Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense (JPEO-CBRND) and several other defense agencies to create a new and better standard for military-grade carbon.

A LONG ROAD

In 1992, DOD replaced the chromium-containing carbon it had used for 50 years with a safer but harder-to-obtain carbon for protective masks and filters. It was very effective for removing cyanide but was found to be a carcinogen. That effectiveness could be retained with a safer but harder-to-obtain carbon, known as ASZM-TEDA, which is an initialism for the ingredients embedded in it as part of the supplier's manufacturing process.

These metals are less toxic and safer for the user than chromium. Center scientists worked with Calgon to develop the new formulation. The problem was that only Calgon had the ability to mine the material and to treat it with this mix of metals.

But first, to fully understand the challenge of obtaining a second supplier of military-grade carbon, an explanation of raw carbon, and the processing it must undergo to get to military-grade, is needed.

RAW TO READY

Carbon is such a complex subject that it has its own branch of study: organic chemistry. While only 0.025 percent of the Earth's crust contains carbon, it is integral to all plant and animal life on the planet, and in its

crystalline form it is a girl's best friend—a diamond. Because it is mined from the ground, it is readily available to manufacturers of gas masks and filters. Once mined, raw carbon goes through several processing steps to be turned into a granular porous substance capable of adsorbing and neutralizing toxic chemicals with remarkable efficiency.

Carbon mined from the ground is the raw ingredient for gas masks and collective protection filters because it is primarily an amorphous carbon, meaning that it does not have a crystalline structure, as with diamonds and graphite. Instead, it contains a mixture of volatile components—materials that readily change to vapor—that are removed by heating it up in a reduced oxygen environment.

The resulting product, referred to as activated carbon, contains an extensive network of pores with dimensions ranging from 0.2 to 100 nanometers. A human hair is approximately 90,000 nanometers wide. Because of how minute these pores are, one gram of activated carbon has a surface area of greater than 1,000 square meters.

This maze of micropores creates a topology that is ideal for rapid mass transport and adsorption of low vapor-pressure toxic chemicals. But additional removal capability is needed. To add that, scientists impregnate the carbon with the metals copper, silver, sodium and molybdenum, represented by the initials ASZM, plus triethylenediamine, commonly referred to as TEDA. While the pores trap the toxic chemicals, the four metals plus TEDA bind and decompose toxic gases by breaking up their chemical bonds. Center scientists found that TEDA, most commonly used as a catalyst for manufacturing polyurethane foam and curing epoxy resin, is effective at neutralizing certain cyanide chemicals and even the nuclear byproduct radioactive methyl iodine.

A key feature of the new standard is that it is based on detailed measurements of the length of time it takes for agents to break through the carbon.

The actual carbon impregnation occurs by mixing the metal salts with water and ammonia hydroxide. The solution is then added to the carbon, which is heated gradually to about 375 degrees Fahrenheit. When the dried ASZM carbon product cools down, granular TEDA is added, which sublimes—switches from the solid state to a gas, and then condenses again as a solid without passing through the liquid state—and is adsorbed in the pores of the activated carbon.

This is the military-grade carbon that Calgon and Molecular Products put into a drum and ship out to the protective mask and filter manufacturers who supply our military forces. There, the carbon is poured from the drums into individual filter containers in a granular form. Samples are selected at random from these deliveries and sent to DEVCOM CBC where scientists perform breakthrough testing using live chemical agent to ensure that they meet the military specifications.

TUBE TIMING
Aaron Salgado, a DEVCOM CBC chemist, places a tube containing a layer of carbon into a testing system that will analyze the time it would take a chemical agent to break through it. (Photo by Brian Feeney, DEVCOM CBC)

GIMME SHELTER: COLLECTIVE PROTECTION FROM CHEMICAL-BIOLOGICAL THREATS

Military protective masks, or "gas masks," appear in everything from news stories to Hollywood movies. Less well known is "collective protection." This kind of chemical-biological threat protection is designed to protect a group of people inside a tent, building, armored vehicle, aircraft and even a naval vessel.

Instead of one carbon filter housed inside a protective mask, collective protection systems consist of a series of filters arrayed inside a much larger container that attaches to a vehicle or structure. Any air entering the protected space must pass through it, and any toxic gases are captured by the bank of carbon filters.

The U.S. Army first started developing collective protective systems in the mid-1960s, and their use has steadily increased within the U.S. military since then. Now, virtually every combat vehicle being designed for future use includes some form of collective protection.

In 2015, the U.S. Army introduced the Joint Expeditionary Collective Protection tent. It is 43 feet long, 13 feet wide and 7 feet high erected, and can house 12 to 15 people. It can house command and control, aid stations or other critical functions. It is one of a family of chemical-biological protection shelters currently under development.

Protective masks will always play a crucial role in protecting individual warfighters in the battle space, but collective protection systems are likely to keep growing in capacity and find ever-new applications.

CRITICAL COVER

The U.S. Army's Joint Expeditionary Collective Protection tent is 43 feet long and protects up to 15 occupants from a chemical-biological agent. (Photo by U.S. Army)

TEAM SEARCH

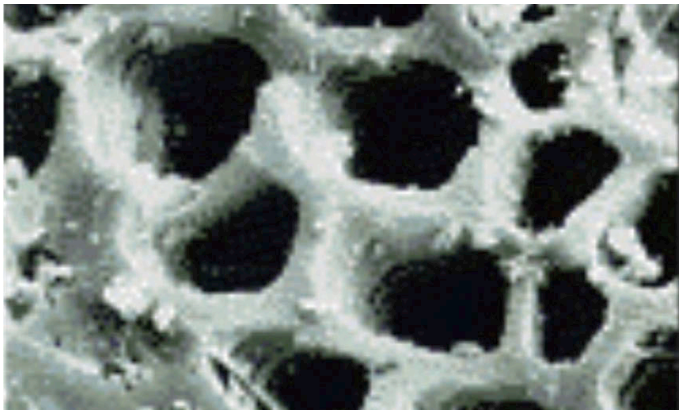
DOD first assembled a team in 2012 to solve the problem. It launched a project it called Activated Carbon Capability Expansion, or ACCE, under the Defense Production Act Title III Office. The project's mission was to qualify additional sources to supply military-grade carbon for use in gas masks and large-scale protective filters. The project's first task was to set up a team consisting of carbon filter experts largely drawn from scientists and engineers at JPEO-CBRND who specialize in this area. Once stood up, the team went straight to the DEVCOM CBC for its expertise in protective carbon testing. The center had established the original qualifying standard for ASZM-TEDA in the late 1980s.

That standard is known as MIL-DTL-32101, and it was relied upon to test the sole supplier's carbon from 1992 on. The team of carbon filter experts had originally hoped to go on using it, without change, as the standard for qualifying any new suppliers. However, when they found a second supplier and awarded a contract to it in 2016, the experts at the center advised against it because the standard does not accommodate a second supplier.

WE'RE GOING TO NEED A BIGGER STANDARD

"We had to tell them that, no, 32101 alone is not enough to qualify a second supplier," said Lowry Brooks, acting deputy director of engineering at DEVCOM CBC. "That standard had been in use since 1992 because all the carbon came from the same supplier, mining the same material from the same mine, impregnating the carbon with the same metals in the same way."

Brooks and his team persuaded the Title III Office carbon-filter team that with an additional carbon source, none of those steps would be performed exactly the



EARTH ESSENTIALS
Only 0.025 percent of the earth's crust contains carbon, yet it is integral to all plant and animal life on the planet. (Photo courtesy of Molecular Products, Inc.)

same way. A more comprehensive qualification standard would be needed to make sure all DOD specifications were met. The center formed a multi-disciplinary team of its in-house experts that worked overtime to meet a strict DOD deadline to develop a better standard. The result was the classified MIL-DTL-32101B.

While this was a significant accomplishment, it was clear that further improvements to the specification were required to confidently qualify new carbon suppliers. The updated specification was more comprehensive, but it still relied heavily on limited historical data points. The team needed to get up-to-date data through current live agent tests. But that would take more funding.

The center persuaded the Title III Office carbon-filter team that, because protective carbon is a life-supporting material, it was vital to base the standard on current testing. The standard also had to be expanded to include chemical threats that have emerged since 1992. In addition, the center needed to calculate the shelf life of protective carbon material under tropical, desert and arctic conditions using the latest testing equipment, which the center has.

The alternative—relying on old, less comprehensive data—would not have qualified the new supplier with enough confidence that the carbon could adequately protect warfighters on the modern battlefield without up-to-date real-world testing. Adding to the necessity of this was the fact that Calgon decided to create a second production line, which, as with any additional production line in any industry, is not entirely identical to the earlier version.

The more expensive path turned out to be the only path, and the center collaborated with ACCE, JPEO-CBRND and U.S. Army Tank-Automotive and Armaments Command (TACOM) to secure funding for the center to perform a year-long study.

TEAM OF EXPERTS

The center's interdisciplinary team performed the necessary testing and established a current data set over the course of 2018. In 2019, they started updating the specifications for MIL-DTL-32101B using this new trove of data. The architect for all this was Ryan Bearekman, the center's program manager for the effort. "The work spanned a lot of areas and disciplines," said Bearekman. "We needed chemists who could design and perform tests to challenge the carbon using a wide range of live chemical agents. And we needed people trained in how to stress the carbon in our unique environmental chambers that simulate arctic, desert and tropical conditions."

Bearekman also needed engineers who understood the supply chain and experts in quality control and quality assurance of materials. He got both from the center's Rock Island, Illinois, research campus. "The Sustainment Engineering Protection Branch provided the experts who were the real authors and architects of MIL-DTL-32101B. They have been working on military specifications for decades and knew exactly how to codify them so that they would be understandable to all." Bearekman said.

CARBON COMPOSITION
The pore structure inside activated carbon is so complex that one gram has a surface area of greater than 1,000 square meters. (Photo courtesy of Molecular Products, Inc.)

HIGHER STANDARDS
DEVCOM CBC, working with several of its defense agency partners, developed a new standard that quadrupled the nation's production capacity for military-grade carbon to go into protective masks and filters, ending 30 years of reliance on a sole supplier. (Photo by T. Anthony Bell, U.S. Army Garrison Fort Lee Public Affairs)

A key feature of the new standard is that it is based on detailed measurements of the length of time it takes for agents to break through the carbon. Different chemical agents take different lengths of time to break through a carbon layer and render it no longer protective. Other variables that need to be measured are the breakthrough times of each agent at different carbon-bed thicknesses and airflow velocity.

CONCLUSION

DOD accepted the updated standard, now known as MIL-DTL-32101Bw/AMD2 as the official standard in 2020. It uses the new data to pass or fail batches of carbon material with a high degree of confidence so that users of protective masks and filters know they will be safe.

The new standard was used to qualify Molecular Products, Inc. It now has two production lines in operation at its Louisville, Colorado facility and is finalizing the qualification of its second line after getting the first line approved in March 2021.

The new standard will also be used to qualify a second facility for the long-time sole supplier, Calgon Carbon, Inc., which it plans to open in Louisiana. Their original facility near Pittsburg will continue production, too. The diversity of operating locations provides DOD with security against losing capacity due to natural disasters.

Having two suppliers and four manufacturing lines means that the nation will have four times the production capacity for military-grade carbon for masks and filters. Having a more certain supply of a material that is vital for keeping warfighters safe is a comforting feeling, according to Keith Scheffler, the Title III Office's executive agent for the effort and a project manager at the Air Force Research Laboratory. "This is an acquisition success story. We now have supply chain redundancy, which is how you ensure the stability of the industrial base and better assist the warfighter."

This expanded capacity is truly a national security benefit, according to Brooks. "For 30 years we were only one factory fire away from a complete supply disruption. For something as vital as respiratory protection for our warfighters, that had to change. And, by working together as a team with JPEO-CBRND, TACOM and the Title III Office, it did."

For more information, go to ***https://www.cbc.devcom.army.mil/****.*

BRIAN B. FEENEY, Ph.D., is a public affairs specialist at the U.S. Army Combat Capabilities Development Command Chemical Biological Center where he writes news and feature stories on the science and engineering achievements of the center's researchers. He has written for the center since 2014, and wrote stories, fact sheets and strategic communications plans for the U.S. Army Chemical Materials Activity, and the U.S. Army Environmental Command, since 2000. He holds a Ph.D. in risk communication from Temple University, an M.A. in communications from Cornell University, and a B.A. in history from Colorado College.

JEFFREY M. SHTOGRIN

COMMAND/ORGANIZATION: Program Executive Office for Combat Support and Combat Service Support, Joint Program Office for Joint Light Tactical Vehicle, Product Lead for Ground Mobility Vehicles

TITLE: Engineering branch chief

YEARS OF SERVICE IN WORKFORCE: 11

DAWIA CERTIFICATIONS: Level III in engineering and technical management, Level I in test and evaluation, Level I in production, quality and manufacturing

EDUCATION: MBA, Lawrence Technological University; M.S. in mechanical engineering, Oakland University; B.S. in mechanical engineering, Lawrence Technological University

AWARDS: Army Civilian Service Commendation Medal, 2018 and 2020; Army Civilian Service Achievement Medal, 2014

LIFE IN BALANCE

For Jeffrey Shtogrin, life is all about balance. Early in his career as a young engineer, he worked a demanding job in the automotive industry, where he felt he had to work 60 hours a week in order to contribute and grow in his profession. On top of that, he also felt that his work wasn't particularly important. "At one point, when I was at Hyundai, I was working on cup holders," he said. "It just lacked meaning." A colleague suggested that he consider working as an Army civilian, both for a better work-life balance and for a more significant mission. "I felt like the opportunity to work for the government, to work for the Army and for Soldiers, would provide more meaning." And he had heard great things about the Army's more flexible work schedule and supportive team environment.

He applied and was hired as a system integration engineer in Warren, Michigan, at what was then the Program Executive Office for Integration (now referred to as the System of Systems Engineering and Integration Directorate). The transition was challenging. Throughout his first six months as an Army civilian, he wasn't sure he would stay. "It was a difficult time because I didn't really know anybody," he said. "The unit was going through a major transition, so there were a lot of people coming and going. I learned a lot about the Army organization, and about working with Soldiers." He can laugh about it now, but it took him some time to learn the "language" of Army acquisition. "Starting out, I didn't know what a bumper number was, what a motor pool was, or what a property book owner was," he chuckled.

But throughout the last five years, he has finally found his groove. When he was able to use his experience in the automotive industry and his understanding of acquisition, everything started to make sense. "I felt like I was learning to be a competent acquisition professional, and I understood how to contribute," he said. "I'm learning, I'm growing, I'm developing, in addition to giving back to the office and supporting Soldiers. It's the whole idea of balance—I'm giving to the office the most that I can, but I'm also getting something out of it in terms of learning and experience."

When it comes to work-life balance, Shtogrin said some people just don't get it. "People could say, 'Well, you just don't want to work hard,' but that's not the case. Life is all about balance, and maintaining that balance is very difficult to do. It sounds like a very easy thing, but it's easy to say and not so easy to do. And balance doesn't mean you're always right on the center. There will be times when you have to dedicate more to work, and times when you have to dedicate more to family, but on average, trying to stay centered is key—at least for me."

Today, Shtogrin is the engineering branch chief for Ground Mobility Vehicles at the Program Executive Office for Combat Support and Combat Service Support, where he leads and supervises a team of platform-system engineers who work with

industry to design, develop, test, field and sustain systems for Soldiers. He said his biggest challenge and his greatest source of satisfaction is streamlining the acquisition process while also maintaining the appropriate level of engineering rigor to deliver quality systems to the field.

As the Army focuses more on Soldier-centered design, which integrates Soldier feedback into the product design and fielding processes, Shtogrin said he has really enjoyed the change. "I've been involved, more than I ever actually imagined, with Soldiers. Just over the last five years at Product Lead Ground Mobility Vehicles, I've done three different touch points where we've actually worked with the Soldiers, we've brought the systems out there and run them through their paces, collected data through surveys, and then incorporated that feedback into the product itself," he said.

"You work in an office all year round—or in this case, from our homes—and you think that what you're working on is going to meet expectations. But when you're at one of those events and you see their initial reactions to the system, you see them operating the vehicles, you see how they're going to be using them, or how they could be using them differently, and then giving their feedback when they come back in, that is really gratifying. It kind of confirms what you've been doing, in some cases for the last several years. It reenergizes you and makes you remember why you're doing what you're doing."

When he offers advice to junior acquisition personnel, he often focuses on that point—the importance of understanding how and why your work contributes to the larger mission. "Regardless of what you are working on, always make sure you understand the intent behind the work you are doing. If you truly understand the intent, your work will have more meaning to you and you will more than likely exceed your leaders' expectations," he said. He also encourages his teammates to have the courage to try new things. "There are no jobs or assignments that you will not learn and grow from, or that will limit you, early in your career," he said. "Always take the time to invest in yourself. Take advantage of opportunities, whether a new position or some training that could lead to an advanced degree or certification. You never know what your future will hold, so continue to build value within yourself."

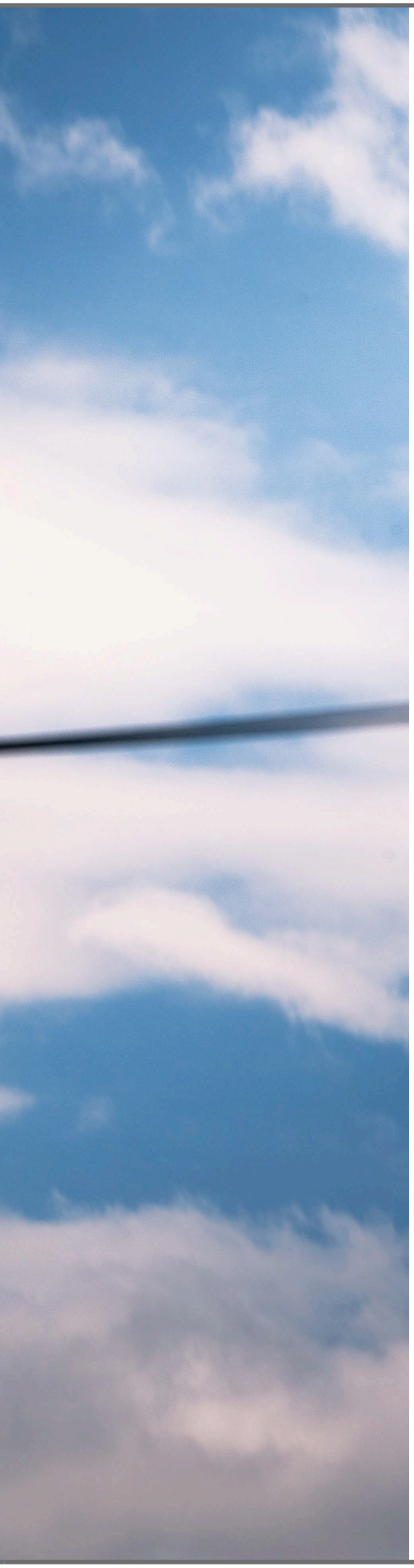
Shtogrin takes a sensible approach to his life and his career, always seeking to maximize his contribution to the mission while also focusing on his own personal growth and time with his family. Sometimes it takes an engineer to build a life in balance.

—ELLEN SUMMEY

A NEW PERSPECTIVE

Shtogrin thought his industry vehicle manufacturing job lacked meaning, but once he was hired as an Army civilian, he found purpose in his work. (Photo by Program Executive Office for Combat Support and Combat Service Support)

TAKING FLIGHT
An AH-64 Apache takes off at Katterbach Army Airfield, Germany, on June 24, 2021. (Photo by Maj. Robert Fellingham, U.S. Army)



THE MAINTENANCE FORECAST

Prognostic and predictive maintenance give aircraft maintainers insight into what might go wrong, and when.

by Danny Parker, Ph.D., and Lt. Col. Andy Bellocchio, Ph.D.

Prognostic and Predictive Maintenance (PPMx) is the U.S. Army Aviation's initiative to advance from a reactive maintenance posture to a proactive, decision-based approach. PPMx's goal is to arm the maintenance manager with the information to make efficient decisions that avoid mission disruption and eliminate premature removal of components. The desired effect is increased availability, reduced cost of ownership and increased safety.

Traditional aircraft maintenance has been the combination of correcting unexpected faults and following a preventive schedule that is reactive and overly prescriptive. This reactive approach is akin to Gen. George Washington and the American Army responding to brutally cold weather at Valley Forge, as it happened, with almost no advance notice of changing conditions. Fast forward 200-plus years and weather predictions are part of our everyday life. They help us decide what to wear each day, understand whether it is safe to fly, and anticipate any impacts on a mission. Weather forecasting is so prevalent that we often do not think about how it is informed by a network of stations and radars that feed advanced models capable of predicting weather with a varying degree of accuracy over several days.

The maturation of PPMx is similar to the advance of weather forecasting. Diagnostics and failure characteristics provide maintainers with a more complete

understanding of an aircraft's health, much like radar and weather stations define conditions in the sky. Prognostic systems forecast the future health of an aircraft, just like weather forecast models predict daily conditions. Such information about current and future health will inform our decisions on aircraft readiness, what maintenance needs to be done today, and which in the future, to best meet upcoming operational demands. Planning maintenance for the future based on the current health of the aircraft and its forecast state is known as predictive maintenance. The advantage of PPMx is that maintainers gain new, quantifiable knowledge of impending failures. They can decide when to conduct a repair by weighing the risk to the aircraft against operational demands. The efficient control of maintenance will increase operational availability, decrease lifecycle costs and reduce mission disruption.

QUANTIFYING RISK

Predictive maintenance is built on a series of decisions following a framework that scientifically evaluates the likelihood of component failure and its effect on the system. The approach is not much different than the Army's composite risk management. Risk is defined as the product of probability (likelihood of component failure) and severity.

Risk = Probability × Severity

Severity is measured by the criticality of a fault and is denoted by the threat of injury to crew and damage to systems, repair time, repair cost and mission disruption. The weighting and combination of these factors, from criticality to mission disruption, are defined in reliability engineering as the "loss function." Risk is formally calculated using a Bayesian framework with loss functions. The Bayesian framework is a mathematical means to update the probability of failure given measured evidence (data). The likelihood of failure is updated by diagnostics that provide the data (measured evidence) to evaluate system health. The likelihood is fused with the criticality to give an estimate of the risk to the platform. The risk for each component is then synthesized into an overall risk to the aircraft.

Predictive maintenance allows logistical ordering to lead the maintenance, thereby reducing logistical downtime and increasing availability.

A deep dive into this topic, along with the data requirements and calculations, is best reserved for a technical article; however, it is important to know that minimization of the composite risk drives the decision about whether to conduct maintenance now or defer to the next window, ensuring there is no unscheduled maintenance in between. The framework accurately assesses and properly bounds predictions and conveys that information to commanders, maintainers and logisticians.

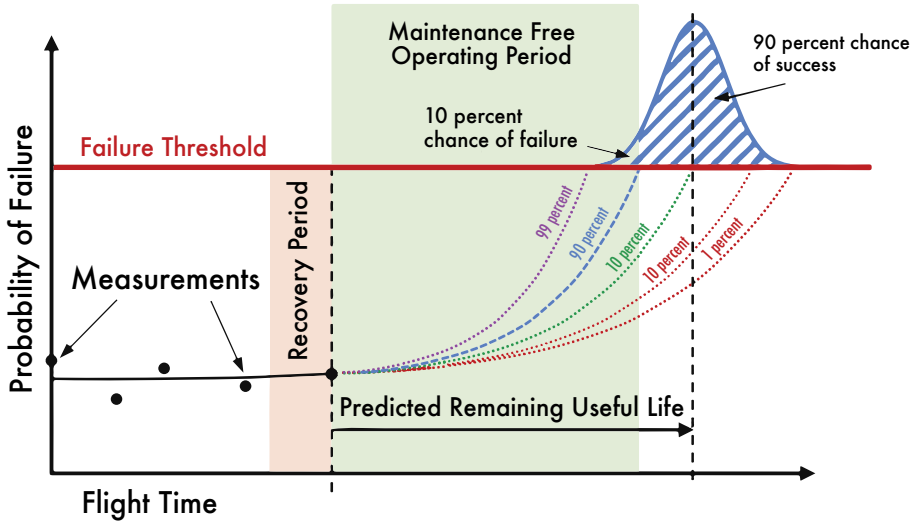
USING RISK TO MODERNIZE

Making predictions about the future is inherently a probabilistic task. Uncertainty grows the further into the future a prediction is made. We have experienced this. Weather predictions become less reliable the further in the future they forecast. The same is true for components that experience wear and fatigue in the rotor, flight controls, airframe, engine, drive and weapon systems. Figure 1 (see Page 79) illustrates the probability of failure increasing with accumulation of wear during flight hours. In practice, an onboard diagnostic system collects usage and environment data to make an estimate of the current health state. Next, expected usage and prognostic models forecast failure times where the spread of possible outcomes increases the further in the future the prediction is made.

Figure 1 illustrates PPMx supporting a maintenance-free operating period. The operating period, shaded green, provides an extended period without disruption by maintenance. The recovery period, shaded orange, consolidates maintenance tasks between the operating period and provides discrete windows for maintenance. The key question when entering a recovery period is: "What is the likelihood each component survives to the next recovery period?" To answer this question, a measurement is performed that assesses the health state while in the maintenance window. This can be done through a combination of embedded solutions and nondestructive inspections. The estimated health state is then combined with expected usage to predict the remaining useful life.

Because of the uncertainty in predicting the future, a range of possibilities is computed. This is shown as a blue normal distribution. The dotted lines that lead from the current health estimate to the future represent the probability that the component survives *at least* that many hours. The most likely time of failure (highest point in the distribution) is called the *expected* remaining useful life, but the component may fail at any of the times under the distribution of possible outcomes.

FIGURE 1



SURVIVABILITY ASSESSMENT

Figure 1: Illustrates the probability of failure increasing with accumulation of wear during flight hours. (Graphic courtesy of the authors)

As indicated by the blue hash area, the component has a 90 percent chance to remain functional by the end of the operating period and, consequently, a 10 percent chance the component will fail. The future risk is the product of this 10 percent probability and the criticality of the component. With this estimate of the future, a maintainer has the information necessary to make appropriate maintenance decisions today. If the risk is unacceptable, then the framework can be queried for which components are driving the risk over the acceptable threshold.

UNCERTAINTY IS COSTLY

Under PPMx, the uncertainty about the remaining useful life adds complexity to the maintenance decision. Using the weather example, if the forecast gives a 40 percent chance of rain in five days, a traveler may pack an umbrella for a trip. Thus, the uncertainty about the prediction influences actions today as we hedge against future risk. With less variation in the predicted remaining useful life, a component will remain in service longer and the Army will see more benefits from PPMx.

Risk mitigation is a core goal under PPMx. To maintain safety, most of the time the failure will never occur. For aircraft using PPMx in a maintenance-free operating period strategy, some near-but-not-yet-failed parts will be removed. In doing this, the maintainer is trading economically useful life for uninterrupted flight operations. These parts would still be operating in the prescribed limits, but will be removed because they are expected to fail before the next maintenance window.

Our inability to know the exact moment of component failure is quantified by the uncertainty. The uncertainty about the health statement drives maintenance actions which then raise sustainment costs and keep availability low. Better diagnostic systems and prognostic models with reduced uncertainty maximize the use of the remaining useful life to save money and minimize mission disruption.

MODERNIZED THINKING

PPMx is a concept that hinges on probabilities, yet thinking in probabilistic terms does not come naturally to humans. The engineering community needs to strive to give accurate assessments of the risks, broken out into usable information. For example, the risks could be reported as

PPMx's goal is to arm the maintenance manager with the information to make efficient decisions that avoid mission disruption and eliminate premature removal of components.

CHANCE OF RAIN
Just as weather forecasts allow travelers to prepare for rain, predictive maintenance will allow aircraft maintainers to anticipate needed repairs before component failure. (Photo by Getty Images)

several different categories like safety critical, mission affecting, or reduced mission capabilities.

In addition, commanders, pilots and maintainers will need dedicated training to use the risk information effectively. Commanders need to know how to evaluate their local risk tolerance and match it to the equipment on hand. Pilots can use the information to familiarize themselves with emergency procedures relating to high-risk component failures. Maintainers will need guidance on the cost-benefit analysis of replacing components before they fail, how to handle near-but-not-yet-failed parts, and what opportunistic maintenance should be performed in the recovery period. This is a vastly different mindset than current maintenance.

Support organizations will have to modernize for PPMx. Spares can be purchased by looking at the probability distributions and calculating the expected number of failures over the fiscal quarter. Predictive maintenance allows logistical ordering to lead the maintenance, thereby reducing logistical downtime and increasing availability. However, depots will need to develop additional testing capabilities because the parts will be removed before failure and the onboard systems will rarely collect data that show what a failure looks like. Depots should run these parts to failure and feed the data back into prognostic systems to improve the quality of the predictions.

CONCLUSION

The changes to the current sustainment system required to implement PPMx are numerous and go beyond adding sensors to the aircraft. Formalizing the decision framework first is of utmost importance

Prognostic systems forecast the future health of an aircraft, just like weather forecast models predict daily conditions.

since all requirements—data, accuracy, organizational and training—flow from that implementation. Policies need to be created and changed as necessary to allow for probabilistic assessments of the future health state. Hardware requirements and standardization should be developed. Training should be done to guide humans on how to use risk-based assessments of the future and the limitations of the information provided.

Predictive and Prognostic Maintenance touches nearly every area of the sustainment chain.

While the work necessary to implement it is substantial, it is essential to enabling the Army Aviation Enterprise Sustainment Strategy, and its benefits to the Army include reduced logistical footprint, improved operational availability and decreased life-cycle cost.

For more information on the Army Aviation Enterprise Sustainment Strategy and PPMx, please refer to the January issue of Army Aviation magazine or contact the authors at ***Andrew.Bellocchio@westpoint.edu*** *or* ***Danny.L.Parker20.ctr@army.mil****.*

A GROUP EFFORT

UH-60 Black Hawk helicopter mechanics with Bravo Company, 640th Aviation Support Battalion, prepare to loosen a helicopter blade before pre-maintenance for a Black Hawk at Camp Buehring, Kuwait, June 25, 2021. (Photo by Sgt. 1st Class Ryan Sheldon, 40th Combat Aviation Brigade)

DANNY PARKER, Ph.D., has more than 15 years of control theory, optimization, machine learning and signal processing experience in the defense industry. He has been the principal investigator in various government research projects totaling over $20 million. One of his major contributions is in the application of dynamical systems principles to the development of formal design methodologies for structural health monitoring systems. In this field, he has adapted and implemented modern control theory techniques in removing environmental effects and estimation of amounts of damage. He has also done extensive work in target estimation, tracking and classification using acoustics. He received his Ph.D. in electrical engineering, a master's degree in control theory and a bachelor's in electrical engineering from Mississippi State University.

LT. COL. ANDY BELLOCCHIO, Ph.D., is the director of the U.S. Military Academy at West Point Center for Innovation and Engineering, where he also teaches mechanical engineering. He previously taught aeronautics, thermodynamics, fluid mechanics, ballistics and design. Additionally, he has course-directed cadet capstone research in mechanical engineering and led interdisciplinary projects for the Academy at West Point. His active research is in aircraft reliability and structural health monitoring. He earned an M.S. and a Ph.D. in aerospace engineering from the Georgia Institute of Technology, and he holds a B.S. in mechanical engineering from West Point.

OUT WITH THE BATHWATER
Retirement brain drain is the loss of critical skills and experience required to maintain the workforce when seasoned employees retire en masse. (Image by Getty Images)

FILLING THE BATHTUB

Despite concerns of brain drain and a dearth of mid-level experience, the Army Acquisition Workforce is not currently suffering the predicted widespread exit of skilled workers.

by Daniel E. Stimpson, Ph.D.

For more than two decades, many human resources experts, university professors, consultants and think tanks have issued warnings and feared the worst about the current period. Namely, what will happen when the baby boomers retire?

The primary concern is related to the loss of the critical skills and experience required to maintain and improve the workforce as a high volume of seasoned employees exit the federal ranks in retirement. This situation, also known as "retirement brain drain," has the potential to leave organizations with a talent vacuum.

Figure 1, Page 84, shows the distribution of the civilian Army Acquisition Workforce (AAW) in 2013, where 49 percent of the workforce was either retirement eligible or within 10 years of eligibility. In 2016, the DOD Acquisition Workforce Strategic Plan put this number at 57 percent for the entire DOD acquisition workforce. Clearly, the situation appeared daunting.

THE BATHTUB EFFECT AND AN IMPENDING CALAMITY

The term "bathtub" is used to describe the shape of the workforce distribution that was simultaneously overrepresented with senior acquisition professionals and underrepresented by mid-level employees. This situation became especially concerning because of the significant threat of experience-loss coupled with a shortage of qualified mid-level leaders to succeed those retiring.

The origin of the bathtub and the related concerns can be traced back to hiring freezes in the 1990s. In 2000, the undersecretaries of defense for acquisition, technology and logistics and for personnel and readiness said that "after 11 consecutive years of downsizing, we face serious imbalances in the skills and experience of our highly talented and specialized civilian workforce. Further, 50 percent will be eligible to retire by 2005. In some occupations, half of the current employees will be gone by 2006."

The Acquisition Advisory Panel reported to the U.S. Congress in 2007: "During the 1990s, the federal acquisition workforce was significantly reduced and hiring virtually ceased, creating what has been

termed the 'bathtub effect,' a severe shortage of procurement professionals with between five and 15 years of experience. The impact of this shortage is likely to be felt more acutely soon, as half of the current workforce is eligible to retire in the next four years."

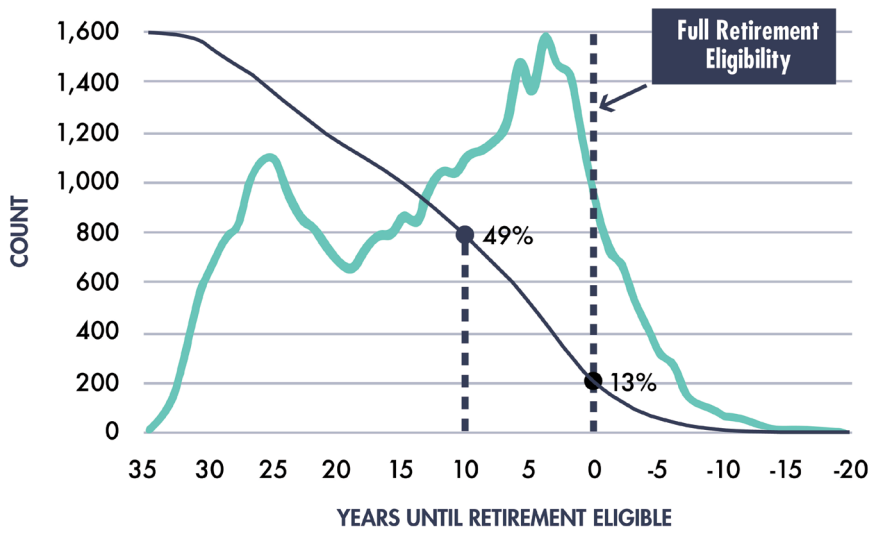
In fact, this situation progressed to the point that, in 2005, the Defense Acquisition University (DAU) reported that 76 percent of the acquisition, logistics and technology workforce were baby boomers or older. Even as recently as last year, researchers at the Naval Postgraduate School were still indicating that a "sharp (natural and unavoidable) shrinkage of the workforce" could be expected as senior professionals reach retirement age and "it is self-evident that such large changes in the number and composition of the workforce must be highly disruptive."

WHAT ACTUALLY HAPPENED IN THE AAW?

These forecasts motivated senior defense acquisition leaders to take action and maintain focus on filling the bathtub. This was accomplished by persistently framing strategy and policy decisions over the course of decades. To date, these many remedies appear to have been effective in the AAW, as nothing that can be characterized as "sharp" has occurred. Rather, as Figure 2, right, shows, the distribution of civilian AAW employees has been smoothly transitioning over the last nine years, the period for which high resolution data are available.

Figure 2 has several features worth noting from a human-resources perspective. First, the prominent leading peak of the distribution (i.e., those approaching retirement eligibility), has decreased, dissipating much of the impending retirement wave—but the trailing peak and bathtub bottom have increased. Thus, the early

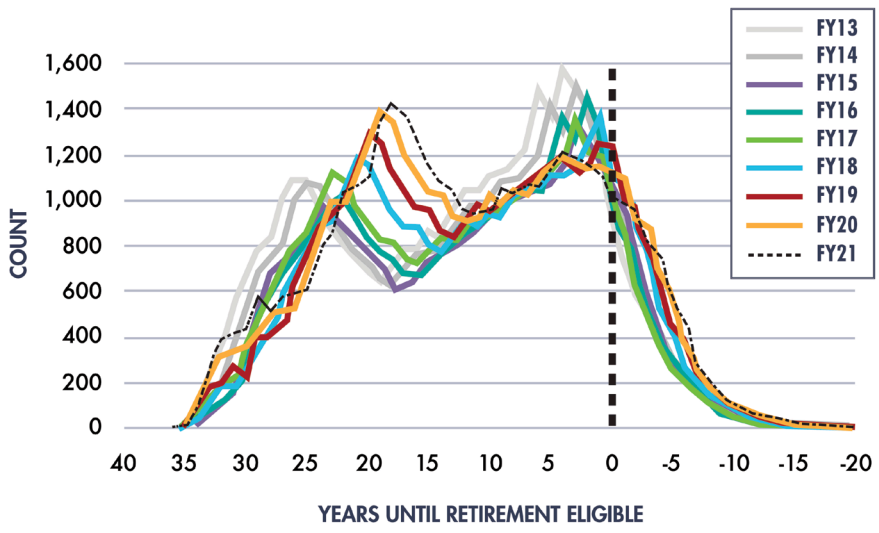
FIGURE 1



ALMOST THERE

This graphic illustrates the AAW 2013 Civilian Employee Retirement Eligibility Distribution. (Source: The Career Acquisition Personnel and Position Management Information System [CAPPMIS]. Graphics by USAASC)

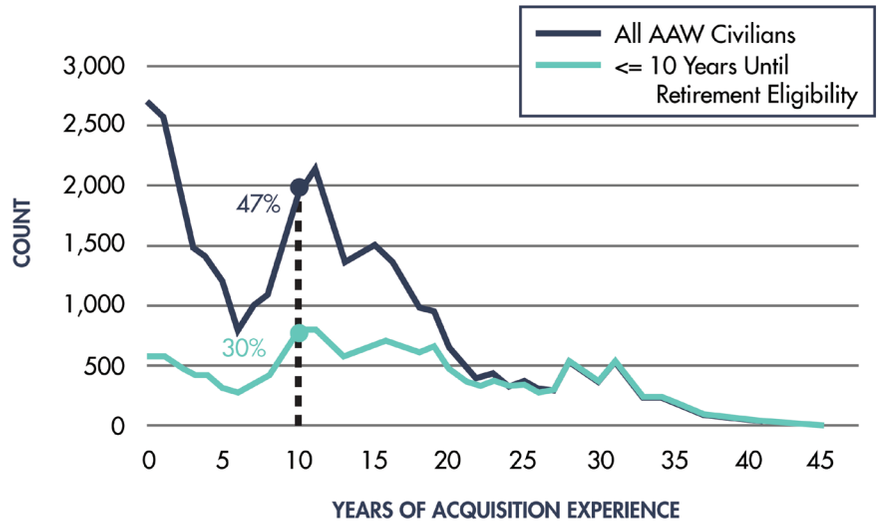
FIGURE 2



THE OVERVIEW

AAW Civilian Employee Retirement Eligibility Distribution, fiscal years 2013-2021.

FIGURE 3



NEAR ELIGIBILITY
This graphic illustrates AAW acquisition experience distribution and the breakout of those within 10 years of retirement eligibility.

Management of the current generational transition between these cohorts has been the subject of years of proactive planning, focused policy implementation and dedicated effort.

and mid-career population has grown, filling much of the perceived mid-career shortage.

There are two other, less obvious, features of Figure 2 worth mentioning. These are the expansion of the distribution's right- and left-hand tails. These show recently increased early career hiring (left tail), and employees working longer after retirement eligibility (right tail). The latter is an important factor in understanding the generational transition. Simply put, many people do not immediately retire upon reaching eligibility. Consequently, we should not view retirement eligibility as a cliff employees reach and then fall off.

NO SUBSTITUTE FOR EXPERIENCE

Viewing baby boomer retirement by the sheer number of pending retirees is misleading in several important ways. First, it carries with it a hidden assumption. Namely, it assumes all else is equal with regard to those exiting the workforce. But this is simply not true. From an institutional perspective, it is very important to take the time to understand the composition of those going out the door.

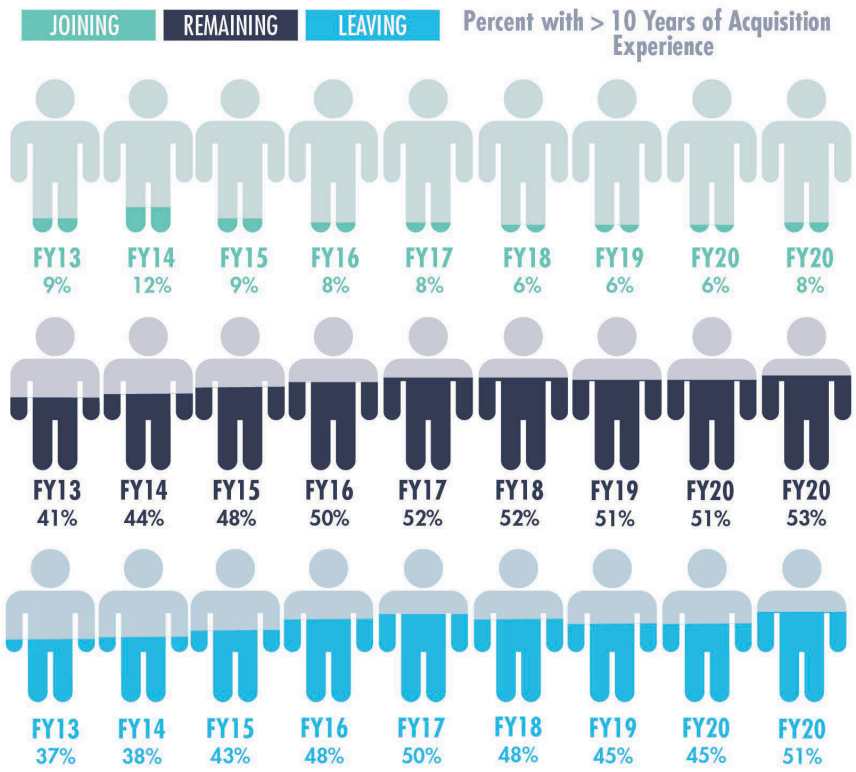
Expertise, or skill, is difficult to measure, but if we use experience (or time in the saddle) as a proxy, we can draw some broad conclusions. Figure 3, above, shows this distribution. The first thing to notice is that the near-retirement-eligible population (aqua line) is nearly uniform from about zero to 30 years of experience. So, we see the retirement-eligible population represents every experience level in the AAW about equally (including acquisition novices). As shown, 30 percent have fewer than 10 years of acquisition experience compared to the entire AAW, where about half (47 percent, dark blue line) have fewer than 10 years of acquisition experience.

TEN THOUSAND HOURS TO MASTERY

Here we should consider research conducted by K.A. Ericsson, R.T. Krampe and C. Tesch-Romer, in a 1993 Psychological Review article, "The role of deliberate practice in the acquisition of expert performance," studied how people improve. This research was popularized by Malcolm Gladwell in his 2008 book "Outliers." You may recall that Gladwell articulated his well-known principle of "10,000 hours to mastery."

In their investigation, Ericsson, Krampe and Tesch-Romer "argue that the differences between expert performers and normal adults reflect a life-long period of deliberate effort to improve performance in a specific domain." Further, they state that "many characteristics once believed to reflect innate talent are actually the result of intense practice extended for a minimum of 10 years."

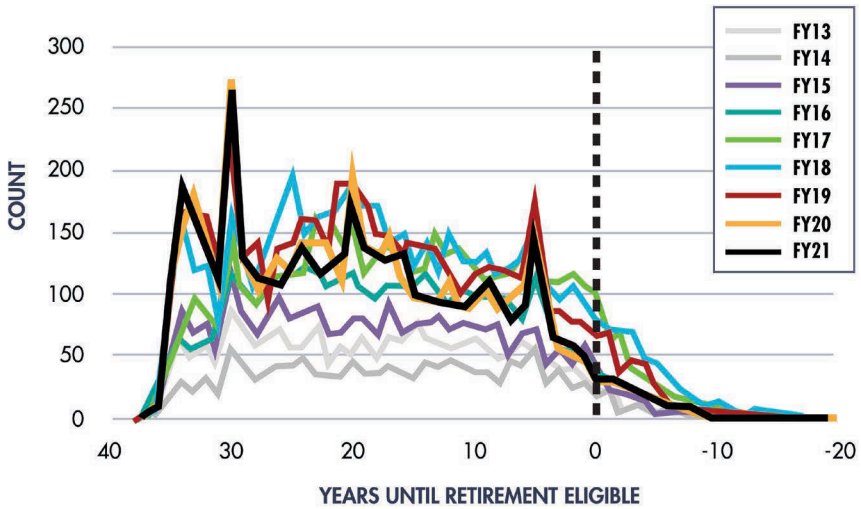
FIGURE 4



THE EXPERTS

Here is the percentage of employees with 10 more years of acquisition experience joining, staying or leaving the AAW.

FIGURE 5



ALL ABOARD

This is the distribution of employees joining AAW since 2013.

We gain further support for accepting 10 years of experience as the mark of an "expert" from a 2017 Management of Information on Teaching Resources and Employment Corporation Mitre Corp. survey of federal acquisition workforce members, in which 64 percent said it takes at least 10 years to become fully proficient.

Since 20 hours a week over 10 years is about 10,000 hours, it seems reasonable to define an acquisition expert as someone with 10 or more years of "deliberate" (professional) experience. An historical count of such experts in the AAW is shown in Figure 4, left. It shows that, after increasing from 2013 to 2016, the percentage of AAW experts has been steady since 2016.

This provides us positive, qualitative evidence that the AAW is not currently suffering a widespread brain drain of experience, even though a considerable number of experts are leaving the workforce every year. Additionally, this finding is consistent with a 2018 Professionals Services Council survey of federal officials from across the federal government who reported federal acquisition skills were generally increasing overall.

In addition to these measures, a couple of additional facts are important to keep in view when thinking about the AAW retirement wave. Firstly, on the loss side, most AAW attrition is not among those who are retirement eligible. Rather, about 60 percent of AAW attrition is among those who have not reached retirement eligibility. Then, on the gain side, the distribution of those joining the AAW since 2013 has moved increasingly toward the younger and less experienced (those with more than two decades until they are retirement eligible). These distributions are shown in Figure 5, left. Finally, and most importantly, we have seen that

attrition among these younger workers has been much lower than expected.

WHAT DOES IT ALL MEAN?

Today, millennials are between 25 and 40 years of age, occupying the heart of the high-priority hiring population. Meanwhile, nearly 100 percent of federal baby boomer employees are retirement eligible. Management of the current generational transition between these cohorts has been the subject of years of proactive planning, focused policy implementation and dedicated effort across the AAW enterprise. Together, these actions are proving effective, so that nothing resembling a brain drain has occurred. But, surprises can always lie ahead.

In the near term, these will likely be related to the current pandemic which has already produced several unpredictable workforce changes. For example, the U.S. saw record employee separation rates in 2020 in both the private and government sectors. But as concerning as this has been to many, and as much high-profile media attention as the issue received, in 2021 these rates appear to have reversed and returned to their historic trend (see Figure 6, right).

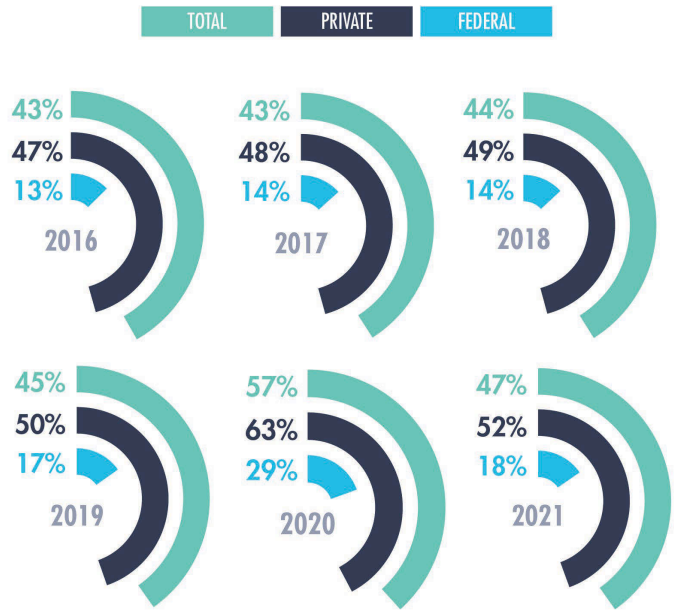
It is important to note that, to date, this separation effect has not been significant in the AAW but, rather, there is evidence that the opposite may be occurring. Thus, to the extent that AAW retention is being buoyed by pandemic influences, like preferences for stable jobs with liberal telework, we should expect the opposite effect if such accommodations are removed.

At the bottom line, individual employee choices are inherently personal and hard to predict. We should continue to monitor the situation and avoid extrapolating trends that, in many cases, have already reversed. Continuous attention and fine-tuning in AAW recruiting, retention and training has enabled enterprise success so far, and it is our best path to remaining successful in the future.

For more information, go to ***https://federalnewsnetwork.com/mike-causey-federal-report/2019/03/retirement-tsunami-or-aging-in-place/.***

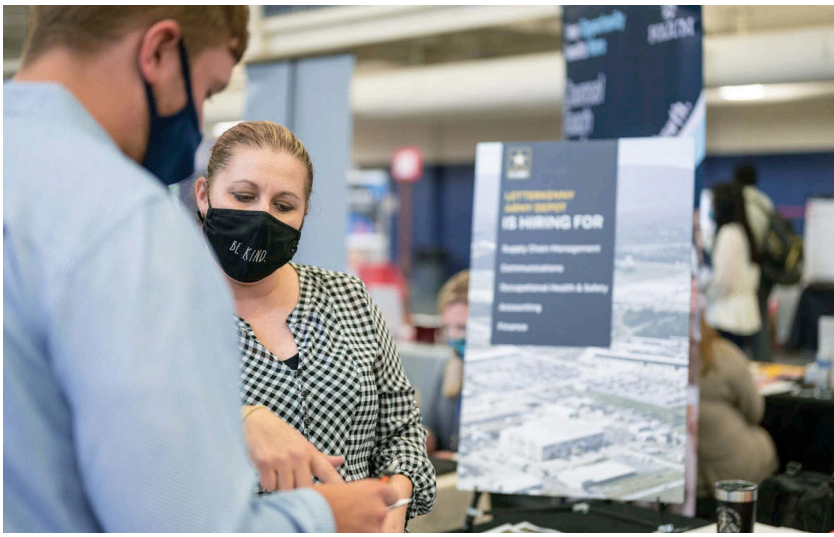
DANIEL E. STIMPSON, Ph.D. is an operations research systems analyst and Level III-certified program manager at the U.S. Army Director of Acquisition Career Management Office. He holds a doctorate in systems engineering and operations research from George Mason University, an M.S. in operations research from the Naval Postgraduate School and a B.S. in oceanography from the U.S. Naval Academy.

FIGURE 6



SEPARATION PAINS

Here are the annual total separations rates by industry and region—not seasonally adjusted. (Source: U.S. Bureau of Labor Statistics. Graphic by USAASC)



NOW HIRING

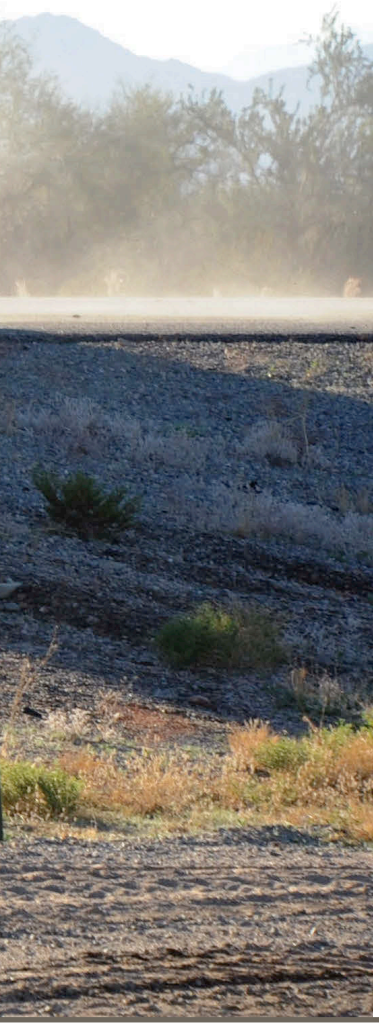
DOD has long feared an exodus of knowledge when older employees retire—but those fears appear unfounded. (Photo by Joshua Shinn, Letterkenny Army Depot)

STAND-IN

In January 2020, the U.S. Army tested Advanced Running Gear on existing Bradley vehicles for potential use on the future Optionally Manned Fighting Vehicle at Yuma Proving Ground, Arizona. (Photo by Mark Schauer, Yuma Proving Ground)

BEEN THERE,
DONE THAT

BEHAVIORAL ACQUISITION



Behavioral biases have played a significant role in acquisition program decision-making, specifically hampering the Army's efforts to modernize and upgrade infantry combat vehicles.

by Robert F. Mortlock, Ph.D., Col., USA (Ret.)

This is the second in a series of articles focused on behavioral acquisition—a topic first introduced in the Fall 2021 Army AL&T magazine.

Behavioral acquisition explores defense acquisition from a behavioral standpoint, including the impact of psychology, organizational behavior and organizational politics on decision-making in acquisition programs that ultimately affect the delivery of capability to the warfighter. Behavioral acquisition studies how acquisition professionals think, manage and lead acquisition programs—and addresses organizations, hierarchies and the intersection of individual behavior, leadership, culture and decision-making.

One aspect in particular, behavioral biases, is the focus of this article. These biases have a common root in people's limited ability to process large amounts of information, resulting in poor decision-making. That, in turn, contributes to acquisition program failures. A case study is the Army's efforts to modernize its infantry combat fighting vehicles. The decadeslong effort has shown evidence of multiple decision-making biases: *planning fallacy bias*, *overoptimism bias*, *recency bias* and *trade-off bias*.

FIGURE 1

EVOLUTION OF THE BRADLEY
After an 11-year development effort, the Bradley Fighting Vehicle has been in production for 50 years. (Graphic by USAASC adapted from "Then and now: Next generation on track," Army AL&T magazine, Spring 2019.)

A HISTORY OF DECISIONS

The Bradley Fighting Vehicle remains the backbone of Army mechanized infantry warfighter formations. Developed in the 1960s, the Bradley (see Figure 1, above) was initially fielded in the early 1970s and has been upgraded several times to offer Soldiers enhanced capabilities. Since the early 2000s, the Army has been trying to replace the Bradley because size, weight and power constraints severely restrict potential upgrade options. After an 11-year development effort, the Bradley has been in production for 50 years.

One attempt at a Bradley replacement was the Infantry Carrier Vehicle (ICV), part of a family of manned ground vehicles within the planned Future Combat Systems program. (See Figure 2, Page 92.) Future Combat Systems entered the acquisition framework as an official program of record at milestone B to begin engineering and manufacturing development (EMD) efforts in 2003 with a planned milestone C (low-rate initial production) in 2009, later shifted to 2013. The 10-year time frame for technology development, design, prototyping and engineering and manufacturing development was similar to the Bradley program and other efforts of similar complexity and risk. However, the Infantry Carrier Vehicle effort (along with the entire Future Combat Systems program) was canceled in 2009.

Defense acquisition experts have referenced Future Combat Systems as an example of everything wrong with defense acquisition—a canceled program that wasted billions of dollars and delivered no capability to warfighters. A 374-page 2012 RAND Corp. report, "Lessons From the Army's Future Combat Systems Program," highlighted hundreds of lessons from different aspects of the program, including requirements management, program management, contracting and technology management.

The Future Combat Systems program attempted to integrate critical technologies using a system-of-systems management approach. The program started as a Defense Advanced Research Projects Agency effort contracted through other-transaction authority (OTA) with Boeing and its industry partners. The OTA incentivized Boeing to get the Army to an approved milestone B and establish a baseline for the formal program of record as quickly as possible.

Boeing and the Army achieved a successful milestone B in 2003. The OTA also enabled Boeing to become the lead system

integrator for the Future Combat Systems program. Despite warnings from the Government Accountability Office (GAO) in a 2004 report titled "Defense Acquisitions: The Army's Future Combat Systems' Features, Risks, and Alternatives," which warned of immature technologies and lack of adequate funding, the Army marched forward. The Future Combat Systems program was canceled in 2009 primarily for being unaffordable, overly ambitious from a technology maturity standpoint (integration of too many critical technologies with low maturity), overly complex from a program management standpoint (the system-of-systems approach), and for failing to reflect current emerging threat requirements from conflicts in Iraq and Afghanistan.

Future Combat Systems can be studied with a behavioral acquisition lens. The Army did not appreciate the effects of the planning fallacy bias, and the result was a gap between plans and outcomes. The Army built an unrealistic "insider view" of a program, with detailed plans for implementation, to gain program-of-record approval. These detailed plans enhanced the Army's perception of control over the program and confidence in its success that were unwarranted when the full context of the program was considered.

The effects of the planning fallacy are not unique to the Infantry Carrier Vehicle effort within Future Combat Systems or to Army acquisition programs in general. A 2015 GAO report titled "Defense Acquisitions: Joint Action Needed by DOD and Congress to Improve Outcomes," highlighted that program managers (PMs) are incentivized to develop acquisition strategies focused on program approval at the milestone review but not acquisition strategies that could later be executed and deliver capabilities.

It is ironic that the planning fallacy has roots in what are perceived to be good management practices. Program planning efforts tend to reinforce idealized perceptions of control, resulting in PMs typically thinking they have more control over outcomes than they have in reality. The planning fallacy creates biased expectations that will impact the cost, schedule and performance baseline over the course of most programs.

Future Combat Systems was also hampered by overoptimism bias—the tendency to see the world through "rose-colored glasses" or expect positive outcomes even when not justified. The Army's "can do" mentality, combined with the general observation that the program management field generally rewards optimistic individuals, led to a Future Combat Systems Infantry Carrier Vehicle program plan that was overly optimistic. In this case, the Army underestimated the technical maturity level of the critical technologies, the complexity of the development effort and the difficulty

ROLLING ALONG
A U.S. Army Stryker infantry carrier vehicle rolls off a C-17 cargo plane in India Feb. 1, 2021. (Photo by Staff Sgt. Joseph Tolliver, 1-2 Stryker Brigade Combat Team)

in transforming the way the mechanized infantry fights (concept of operations as well as tactics, techniques and procedures).

Recency bias is the widely recognized bias wherein recent data are given disproportionate emphasis in making judgments. Recency bias occurs when individuals process large amounts of information and rely on intuition. This helps them sort through the information but also introduces biases and leads to suboptimal decisions.

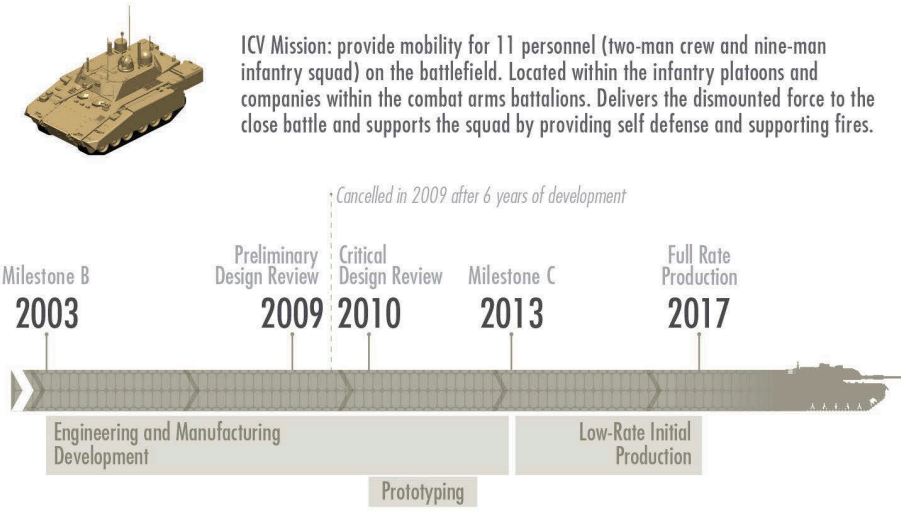
Future Combat Systems was plagued with recency bias from its inception—specifically from the tendency to incorporate as many of the latest acquisition reform initiatives as possible.

The program was initiated by leveraging a Defense Advanced Projects Research Agency effort. Future Combat Systems chose the innovative, non-Federal Acquisition Regulation (FAR)-based contracting approach with the use of an OTA. Finally, the program incorporated the use of a contractor to act as the lead system integrator as well as a system-of-systems approach (rather than separate programs).

The use of any one of these recent acquisition reform initiatives would have been a significant shift in acquisition management, but the Army felt obligated to incorporate multiple initiatives, despite the availability of more appropriate, less risky acquisition management approaches like a longer incremental development.

Finally, Future Combat Systems was saddled with a difficulty in making trade-offs. The trade-off bias is central to program management, particularly trade-offs among program cost, schedule and performance that form the acquisition program baseline.

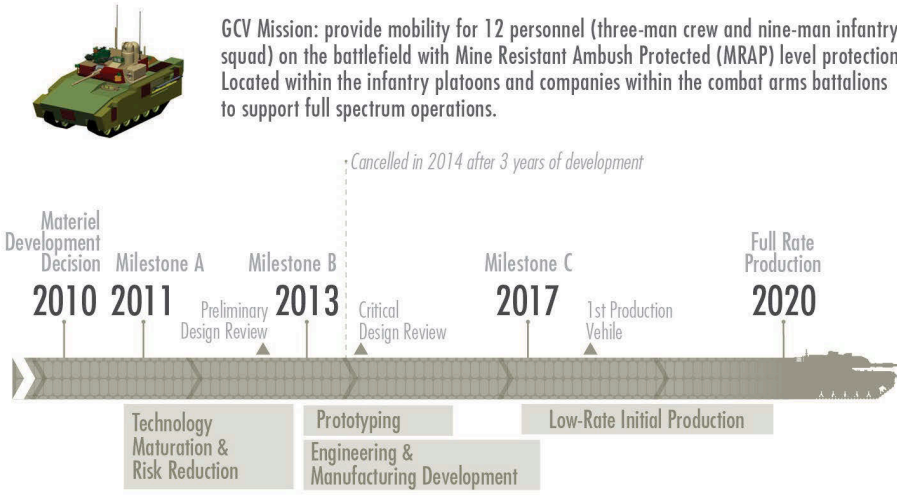
FIGURE 2



INFANTRY CARRIER VEHICLE

One attempt at a Bradley replacement was the Infantry Carrier Vehicle (ICV). It was part of the ill-fated Future Combat Systems program and canceled in 2009. (Graphic by USAASC)

FIGURE 3



GROUND COMBAT VEHICLE

Ground Combat Vehicle (GCV) also attempted to replace the Bradley. In 2014, the Army canceled the program because the vehicle was going to be too big and heavy and had too many requirements. (Graphic by USAASC)

Decision theory has proposed rational methodologies for making trade-offs by confronting them systematically, typically through some version of cost-benefit analysis. But the models based on rationality bump up against the realities of the complex defense acquisition environment.

Typically, rational, reason-based models make conflicting choices easier to evaluate. By constructing reasons, individuals turn difficult-to-reconcile characteristics of options into a problem that is more comprehensible.

Furthermore, it is likely that reason-based choice may be even more difficult when groups are making decisions, reflecting the fact that programs involve numerous stakeholders and significant resources, and that decisions have to be justified and approved by oversight groups.

Therefore, while individuals typically choose using rational models, groups may prefer reasons based on social, organizational or political dynamics.

The Future Combat Systems operational requirements document approved by the Army Requirements Oversight Council and the Joint Requirements Oversight Council was 475 pages long and contained hundreds of key performance parameters, key system attributes, and additional performance attributes, leading to thousands of design specifications for the Infantry Carrier Vehicle. The vehicle simply had too many requirements placed on it, making the trade-offs of performance, cost and schedule beyond the cognitive capability of individual PMs and Army leaders and too difficult for the Army from an organizational perspective. Basically, all the requirements were treated as important—too difficult to trade off.

After cancellation of Future Combat Systems in 2009, the Army embarked on the Ground Combat Vehicle (GCV) program (see Figure 3, page 92) to replace the Bradley. All resources that had been supporting the oversight and management of the development of a family of FCS-manned ground vehicles (including the Infantry Carrier Vehicle) were now applied to the development of the Ground Combat Vehicle. This program achieved a materiel-development decision in 2010 and milestone A in 2011 to award technical maturation and risk reduction contracts to industry.

The same two industry partners that were teamed together in the Future Combat Systems Infantry Carrier Vehicle program now competed against each other in a technical maturation and risk reduction phase for the Ground Combat Vehicle. The program

MOVING OUT

Idaho Army National Guard Staff Sgt. Daniel Bistriceanu checks his communications equipment before moving out to fuel up a Bradley Fighting Vehicle. The Army has been trying to replace the Bradley since the early 2000s because of its size, weight and power constraints. (Photo by Thomas Alvarez, Idaho Army National Guard)

had an aggressive schedule to get to milestone C within six years of milestone A—influenced by planning fallacy and overoptimism bias like the Infantry Carrier Vehicle program. The Army began the Ground Combat Vehicle program and awarded firm fixed price-type research and development contracts to BAE Systems and General Dynamics for designs and prototypes. The new vehicle's requirements called for a heavy reliance on mature commercial technologies. In an example of recency bias, Better Buying Power initiatives strongly encouraged the use of firm fixed-price research and development contracts despite the lack of appropriateness based on the level of system integration complexity and risk.

The Ground Combat Vehicle requirements included a mixture from the Bradley, the Future Combat Systems Infantry Carrier Vehicle, the recently fielded Mine Resistant Ambush Protected vehicles, and the M1A2 Abrams tank. Based on the GCV requirements, the program office, industry competitors and the research, development and engineering center at the U.S. Army Tank-automotive and Armaments Command (TACOM) determined that the GCV would weigh between 50 and 70 tons—nearing the weight of the 72-ton M1A2 Abrams tank and almost twice as heavy as the Bradley or the planned 30-ton Infantry Carrier Vehicle. The GCV had force protection, survivability and

lethality requirements for a mechanized infantry vehicle that more resembled an armored tank.

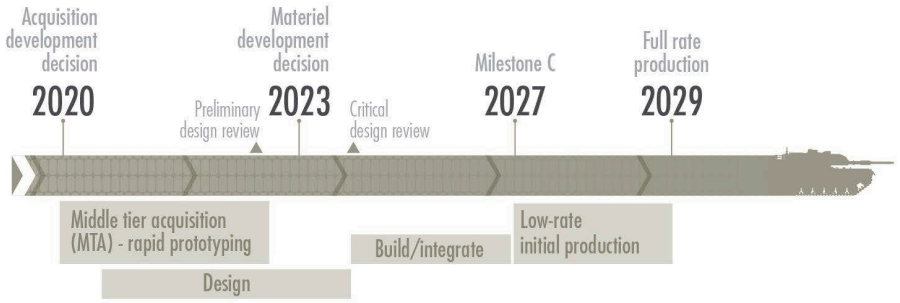
In subsequent reviews with Army senior leaders, the potential weight of the Ground Combat Vehicle and excessive requirements were highlighted. However, the Army pushed ahead and approved the requirements—heavily affected by a difficulty in making trade-offs. The technical maturation and risk reduction contracts seemed to be based primarily on a need to protect the planned and programmed resources from the old Future Combat Systems Manned Ground Vehicles program (schedule-driven). In 2014, three years into the development effort, the Army canceled the Ground Combat Vehicle program because the vehicle was going to be too big and heavy and had an excessive number of requirements.

In recent years, after several failed attempts of initiating the Next Generation Combat Vehicle because of aggressive requirements and a lack of interest by industry, the Army is trying again—this time calling the Bradley replacement the Optionally Manned Fighting Vehicle.

The Optionally Manned Fighting Vehicle program plan is presented in Figure 4. The program is leveraging the newly established middle tier of acquisition pathway and begins not with a milestone A or B, but with an acquisition decision memorandum from the milestone decision authority. After the prototyping phase, a materiel-development decision will continue the design effort and start build and integration efforts. The program plan specifically avoids using the technical maturation and risk reduction and engineering and manufacturing development phases of a major-capability acquisition. Again, as with the Ground Combat Vehicle program schedule, the Army plans to achieve the milestone C within seven years of program initiation. Interestingly, the program uses the terms "characteristics of need" to describe the requirements to competing contractors rather than more traditional terms like key performance parameters.

FIGURE 4

The Optionally Manned Fighting Vehicle (OMFV) will serve as the Army's infantry fighting vehicle (IFV) tasked to maneuver through the enemy's disruption zone as part of a joint combined-arms team for the purpose of creating an advantageous position, relative to the enemy, to deliver a decisive strike while manned or remote operated. In the close fight, the OMFV enables the ability of squads to maneuver by detecting and destroying targets at a range beyond the enemy's capability. The OMFV will replace the Bradley Fighting Vehicle, providing the Army decisive vehicle capability now while possessing sufficient growth and modularity to take advantage of transformational technologies.



OPTIONALLY MANNED FIGHTING VEHICLE

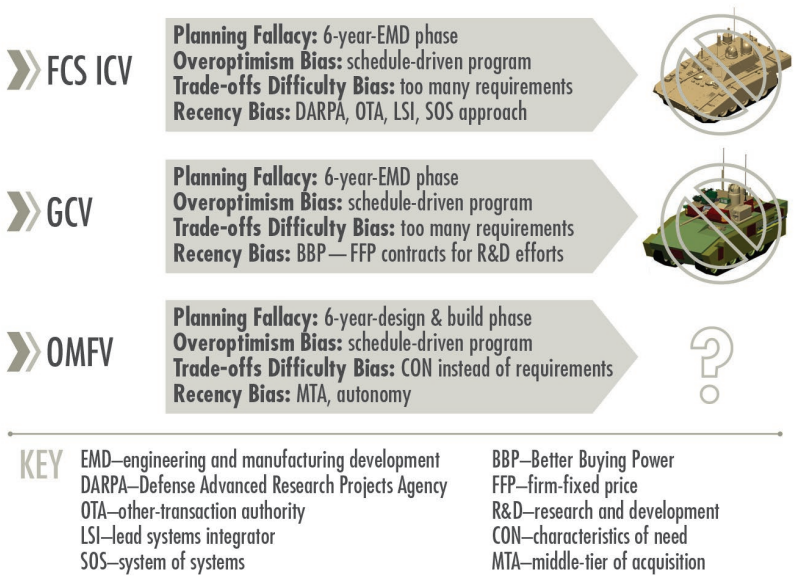
The Optionally Manned Fighting Vehicle program leverages the newly established middle tier of acquisition but is susceptible to the same behavior acquisition biases that contributed to the failures of the predecessor Bradley replacement vehicles. (Graphic by USAASC)

The Optionally Manned Fighting Vehicle program is susceptible to the same behavior acquisition biases (planning fallacy, overoptimism bias, recency bias, and difficulty in making trade-offs) as contributed to the failures of the predecessor Bradley-replacement acquisition efforts. How can the design and development of a mechanized infantry vehicle be optimized for troop transport and protection, lethality and remote autonomous operations simultaneously? Unfortunately, the answer is that it can't—this will require difficult requirement trade-offs to avoid the planning fallacy and overoptimism bias. A vehicle that is optimized to protect the crew and dismounted troops being transported would be an inefficient combat vehicle for lethal autonomous operations (too big and heavy).

It appears that recency bias has also played a significant role in the Optionally Manned Fighting Vehicle program planning. Is the Army more interested in riding the autonomous vehicle hype wave? Or does the Army have other priorities like proving that major-capability acquisition can be done differently or innovatively in the newly established Army Futures Command?

The Optionally Manned Fighting Vehicle acquisition strategy leverages the middle-tier of acquisition pathway to avoid forming a program of record to enter the engineering and manufacturing development phase after a successful milestone B. The Optionally Manned Fighting Vehicle program will use middle-tier authorities to rapidly prototype vehicles for experimentation and demonstration and then

FIGURE 5



BEHAVIORAL BIASES

Programs can fail for many reasons—ill-defined requirements, immature technologies, integration challenges, poor cost and schedule estimating, and the acceptance of too much risk. (Graphic by USAASC)

establish a formal acquisition program of record at milestone C to enter low-rate initial production. For requirements, the Army initiated the Optionally Manned Fighting Vehicle program with a general characteristics of need document to avoid the approval of an initial capability document.

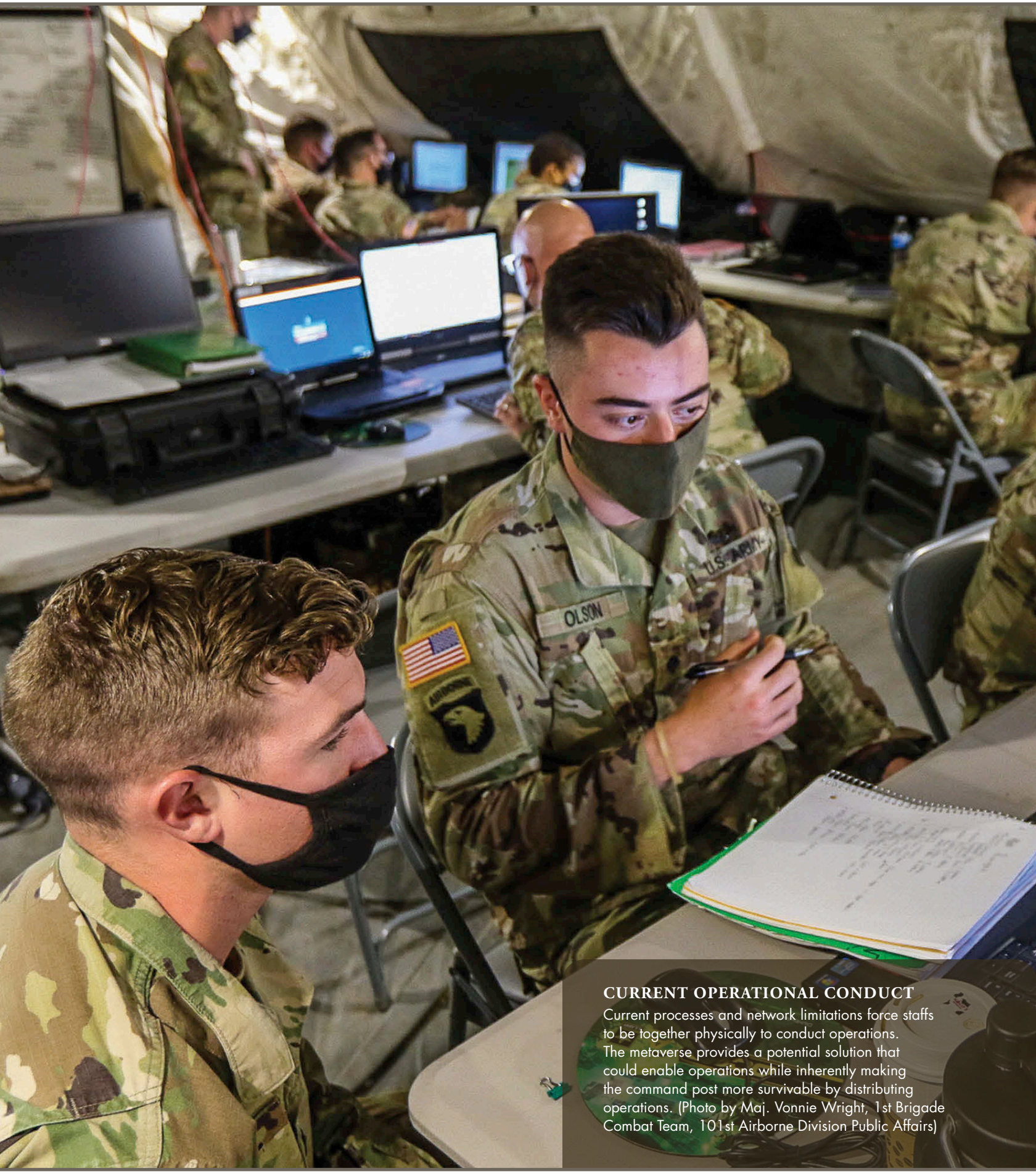
The exact opposite strategy has been recommended by the GAO for more than three decades for major defense acquisition programs—knowledge-based acquisition strategies with incremental development. Defense acquisition programs have routinely rushed to production decisions without well-defined requirements, complete detailed design drawings, fully mature technologies and mature manufacturing processes, and without demonstrating production-representative systems in an operationally relevant environment. The Optionally Manned Fighting Vehicle program is attempting to do in a middle tier of acquisition rapid prototyping effort what a major defense acquisition program achieves in a formal engineering and manufacturing development effort—a classic "schedule-driven" rush to failure with suboptimal decision-making that appears to be dominated by biases similar to those biases that plagued previous attempts to replace and modernize the infantry combat vehicles.

CONCLUSION

The behavioral biases of planning fallacy, overoptimism, recency and trade-offs difficulty have contributed to repeated failures in the Army infantry combat vehicle acquisition programs. Figure 5 summarizes the behavioral biases observed in the Future Combat Systems Infantry Carrying Vehicle, the Ground Combat Vehicle and the Optionally Manned Fighting Vehicle programs. Acquisition management has been highlighted on the GAO's high-risk list for excessive waste and mismanagement for the past three decades. Notable programs have failed to deliver capability and have failed to meet performance, cost and schedule management targets. The reasons for program failure vary from ill-defined requirements, immature technologies, integration challenges, poor cost and schedule estimating, and the acceptance of too much development risk.

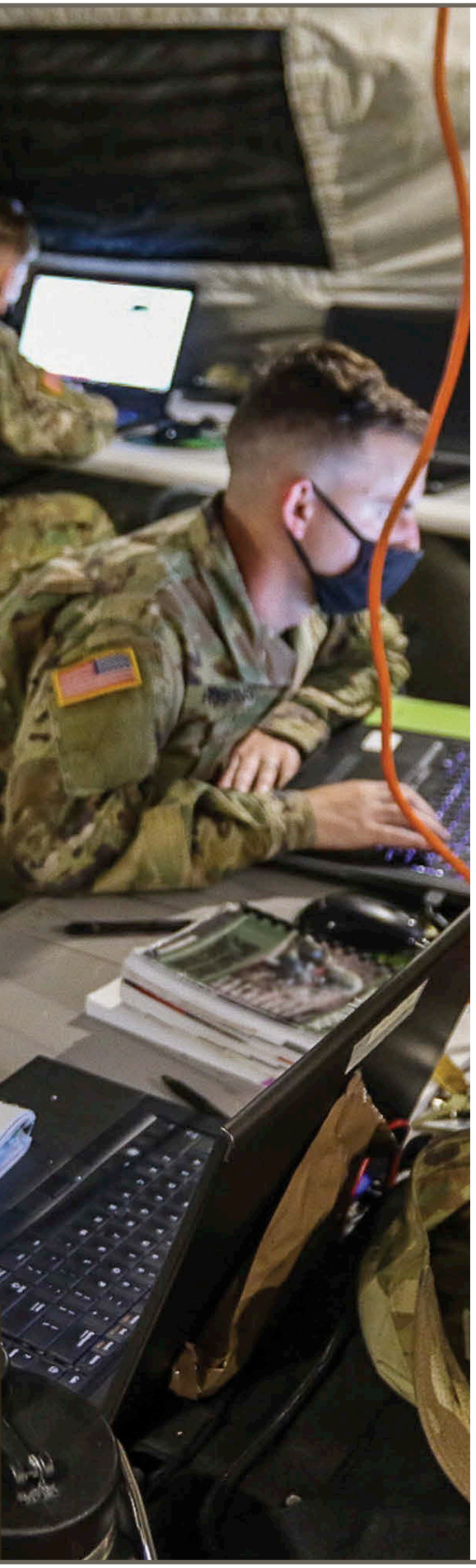
But the effect that the behavioral biases have in poor decision-making may be an even bigger contributor to acquisition program failures—the true root causes. The better acquisition professionals understand the effect of these systemic behavioral biases, the better DOD can mitigate the risks of program failures. The key is a better understanding of the people within big "A" defense acquisition.

ROBERT F. MORTLOCK, Ph.D., Col., USA (Ret.) managed defense systems development and acquisition efforts for the last 15 of his 27 years in the U.S. Army. He is now a professor of the practice and principal investigator of the Acquisition Research Program, teaching defense acquisition sciences and program management at the Naval Postgraduate School. He holds a Ph.D. in chemical engineering from the University of California, Berkeley, an MBA from Webster University, an M.S. in national resource strategy from the Industrial College of the Armed Forces, and a B.S. in chemical engineering from Lehigh University. He holds Level III certifications in program management, test and evaluation, and engineering, as well as the Professional Engineering, Project Management Professional and Program Management Professional credentials. His most recent column for Army AL&T appeared in the Summer 2021 issue.



CURRENT OPERATIONAL CONDUCT

Current processes and network limitations force staffs to be together physically to conduct operations. The metaverse provides a potential solution that could enable operations while inherently making the command post more survivable by distributing operations. (Photo by Maj. Vonnie Wright, 1st Brigade Combat Team, 101st Airborne Division Public Affairs)



REDEFINING REALITY

Creating a metaverse model for mission planning.

by Thom Hawkins, Lt. Col. Matt Maness, Mark Dennison and Pete Khooshabeh

Maj. Gen. Narrowpass impatiently watched the timer on his augmented-reality visor countdown—still two more minutes. Turning toward his autonomous security bot, ASB-3, he grumbled, "I hate waiting around to talk to my commanders just because some soulless artificial intelligence has calculated the optimal windows to conduct long-haul transmissions." ASB-3 knew it was not appropriate to respond to the comment; Narrowpass understood the consequences of transmitting outside of the communications survivability window and would not appreciate a reminder.

The mission was too complex and there were too many variables; voice and video transmissions were not going to cut it at the moment. At his request, the distributed division staff and all subordinate command-post constellations had aligned their communications windows to allow for a full rehearsal within the division's cross-reality command post.

Narrowpass initiated his connection to the tactical metaverse and was immediately greeted by his chief of staff's avatar as well as the primary staff and all subordinate commanders. The ominous timer above the all-domain common operational picture showed fewer than 15 minutes before everyone in this virtual environment would need to drop off for a survivability move or a temporary transmission halt. "Chief, roll the terrain fly-through and cue up the friction points on the 3D model. … I need to understand where we're going to need to intervene in the fight." Although the military metaverse is just a concept today, Army researchers are exploring its potential for the future.

THE COMMON OPERATIONAL PICTURE

"I need to understand" is perhaps the primary driver behind technology for mission command. The fundamental concept of developing and maintaining a common operational picture is to enhance situational awareness, enable situational understanding and promote shared understanding across all echelons. Executed through complex application programming interfaces that link digital systems to display information on 2D and 3D maps or by manually tracking friendly and enemy information on paper maps, the process hasn't evolved much in the last three decades. The effort requires large, cumbersome command posts resourced with centralized people and technology that conduct the operations process and ultimately generate a common operational picture that commanders and staffs can use to make the most timely and accurate decisions possible.

Unfortunately, as operations have grown more complex and data more prolific, units have struggled to effectively conduct information and knowledge management. Command posts have expanded in size and scope to meet the need. Increases in the number of personnel and dependence on the network have left today's command post vulnerable to enemy attack without sufficient mobility and survivability. The metaverse provides a potential solution that could enable the operations process while inherently making the command post more survivable by distributing operations, as well as reducing the physical and electromagnetic footprints.

NETWORKING

Bandwidth is a scarce resource on today's battlefields and will require a technological breakthrough to fully enable the metaverse. However, many tactical scenarios could benefit from information that is not particularly dense, and therefore requires less bandwidth to transmit, such as geospatial position, summary of unit status, current objective, etc. Furthermore, information that is more dense, such as a high-resolution 3D terrain model of the operational area or video of an unknown enemy vehicle to train aided target-recognition algorithms, does not need to be sent in real time over the network. This will require the Army to utilize cloud services that are not only efficient in moving and processing information but are controlled by intelligence that understands the value of information for the clients that are requesting, or are likely to request, data and services.

A critical problem that could mean the difference between life and death is the delay or latency of this information. The assumed change—or lack thereof—in position of friendly units can cause a waterfall of decisions across the metaverse and change the

WHAT'S A METAVERSE?

Coined by Neal Stephenson in his 1992 novel "Snow Crash" to describe an online world where users interact in a virtual space, the metaverse already has become familiar through massive multiplayer online games and virtual worlds like Second Life, Roblox or Minecraft. Just as mobile devices changed how the internet was consumed over the last 10 years, a new generation of technology—in this case, virtual and augmented reality headsets—are enabling a new perspective on how we consume content. No longer limited by the confines of flat screens, these headsets allow users to perceive and interact with 3D objects and media rendered on top of or in place of the physical world. The concept has gained even more popularity with the pandemic-driven acceleration of remote work. Facebook has even pinned its future on this shift, leveraging its acquisition of virtual reality headset maker Oculus and development of its own metaverse platform, Horizon Worlds, it changed the name of its parent company to Meta in October 2021.

One of the most thorough explor ations of the metaverse was written as a nine-part blog series by Matthew Ball, a venture fund partner and respected business writer. Ball's primer focuses on seven aspects of the metaverse:

- Networking.
- Virtual platforms.
- Hardware.
- Computing power.
- Interchange tools and standards.
- Payment services.
- Content, services and assets.

He discusses the progress in each area, as well as the way to fully enable and adopt the metaverse as a successor to the mobile internet.

Despite the push toward the future, we must also acknowledge the limitations we still face with current technology.

perspective of the state of the mission. To enable better decision-making, the Army must create a hyper-efficient network where only the right, relevant information is transmitted. This notion of real-time information updates is a critical component of the immersive hardware that will be utilized in the metaverse, since the representation and actions of a Soldier's "digital twin" must be synchronized across all other devices connected to their shared space. Unlike the commercial world, the battlefields of the metaverse will involve combatants trying to bring down the networks of their opponents, or to alter them so that the information flow degrades their decision-making, e.g., by using deep fake imagery.

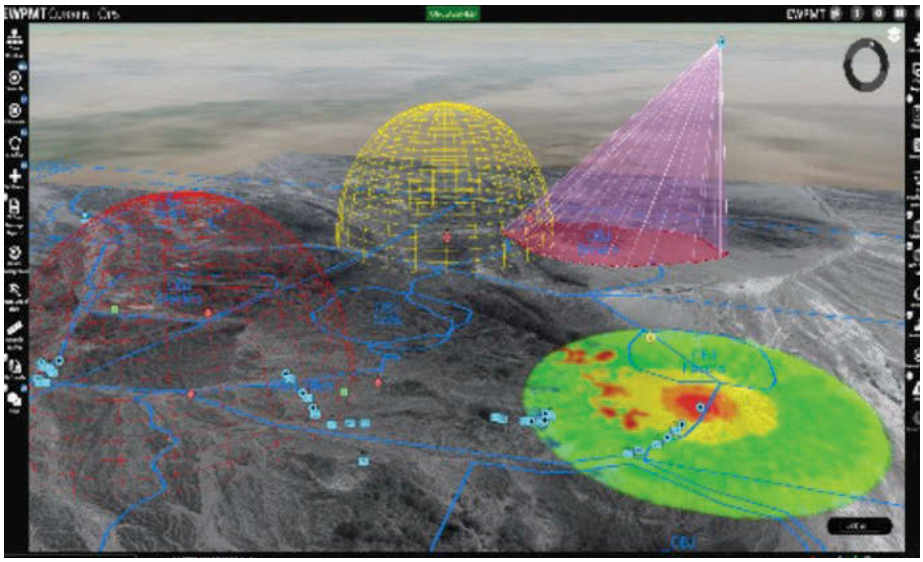
VIRTUAL PLATFORMS

The stovepiped platforms that incorporate the Army's digital training, fighting and enterprise systems will not suffice to realize the metaverse. The metaverse will require that a Soldier's digital presence transcend different training platforms and seamlessly integrate into other warfighting tools. These tools must also enable the user to interact with battlefield data from different perspectives, be it on a traditional 2D display but also from an immersive shared virtual space. This will require architectures that enable data from the real world or a simulation to seamlessly render across a variety of display media, regardless of how they are deployed. The commercial gaming world has been adapting to this challenge, enabling cross-play of the same game between different types of hardware such as PCs and gaming consoles.

While the appearance of avatars may not be as much of a priority for our Soldiers, digital assets can be used in other ways that could be useful—for example, including in one's identity system preferences or custom-language models that can aid with human-machine teaming even when

MEET ME IN THE METAVERSE

In the future, Soldiers could be able to "drop in" to a virtual environment to conduct mission planning prior to execution. Although a "military metaverse" is still only a concept, researchers and scientists across the Army are exploring the potential applications. (Photo by Mission Command Battle Laboratory)

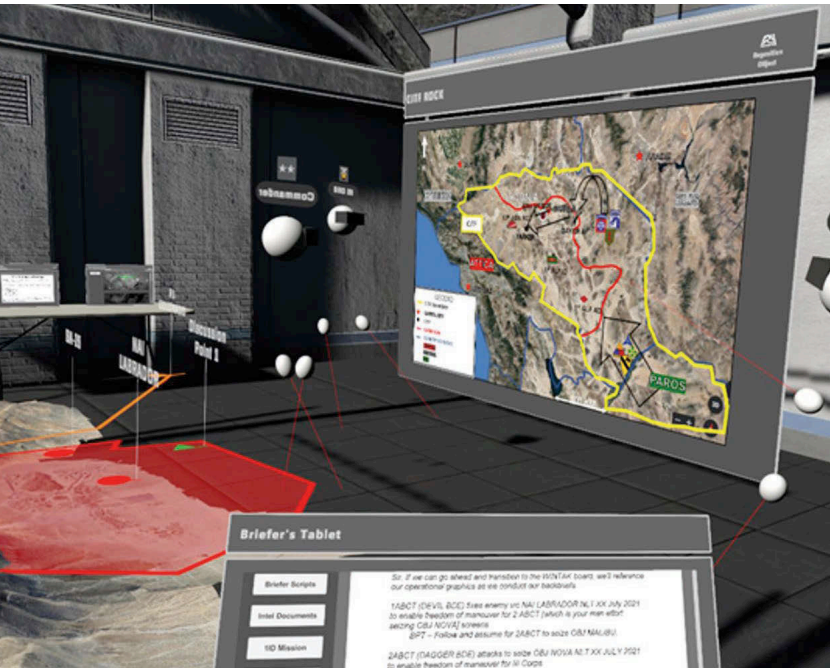


FROM VIRTUAL TO REALITY

As large command posts disaggregate their physical footprints and rely on digital environments, concepts such as the metaverse may help staffs conduct planning for real-world operations. (Image courtesy of Program Executive Office for Intelligence, Electronic Warfare and Sensors)

MICROSOFT FLIGHT SIMULATOR

The popular Microsoft Flight Simulator video game series includes a "digital twin" of the planet, combining maps and satellite imagery to render buildings and even trees with real-time weather and air traffic. This is a huge model that is impractical for the constrained bandwidth at the tactical edge, but this model and others like it can allow for hyper-realistic modeling and simulation of vehicles and weapons effects at higher, cloud-connected echelons, or on home station resources. Rendering new objects is facilitated by world-building packages such as NVIDIA's Omniverse, which include materials, textures and movement as building blocks for construction and simulations. Even lower-resolution versions of these world-based models can be used for rehearsal-of-concept drills or mission walkthroughs, regardless of whether a unit is co-located.



PICTURE THIS

The immersive hardware in use today almost completely obscures the user's view of the real world; ultimately, displays will need to dynamically adjust between rendering content on top of reality or replacing everything with synthetic content. (Image by Mission Command Battle Laboratory)

a user logs into a new system. Moreover, some games are enabling a subset of users to play wearing virtual reality devices from a godlike top-down perspective, whereas other players embody avatars and view the world in first person from the ground. Gaming concepts like this seem to fit neatly into the employment of this capability at various echelons, where different types of data and interaction are necessary.

From the tactical perspective, the Army must build systems that have a common look and feel, regardless of how the system is worn or interacted with. A Soldier should be able to utilize their head-mounted display, their handheld system and their desktop system with the same profile and easily switch between them utilizing the same persona.

HARDWARE

Systems like the Android Tactical Assault Kit (ATAK), a handheld tablet or phone housed in a rugged case, offer warfighters a digital perspective of their operating environment. ATAK can visualize maps, both 2D and 3D, as well as a host of graphic control measures to represent the position of friendly and enemy forces. While not as ubiquitous as the consumer smartphones in the civilian world, these devices represent one of the first attempts at converging the physical and digital domains into a piece of handheld kit.

However, the current hardware in augmented reality systems limits the quality of field of view of holographic content. Virtual-reality head-mounted displays provide high-quality visuals, but at the cost of occluding almost entirely the user's view of the natural world. While the Army is beginning to assess virtual reality for use in less lethal environments such as command posts, ultimately the future of immersive hardware will fuse into a single head-mounted display that can dynamically adjust between rendering content on top of reality or replacing everything with synthetic content. This will be necessary to fully realize the metaverse across the battlefield environments of the future.

CONCLUSION

Despite the push toward the future, we must also acknowledge the limitations we still face with current technology—for example, access issues, latency and hot mics. These problems won't be solved simply by upgrading to the metaverse and must be solved along with its development. Moving to a metaverse model for planning, preparing, executing and assessing operations would allow dispersed staffs to synchronize warfighting functions more effectively within a virtual node capable of collaboration that would rival existing physical command posts. Ad hoc meetings

The metaverse will require that a Soldier's digital presence transcend different training platforms and seamlessly integrate into other warfighting tools.

could transcend simple phone calls and video conferences by allowing users to occupy a virtual planning space that contains all the relevant data to make a decision: an interactive 3D common operational picture displaying friendly and enemy positions, intelligence products, relative combat power, sustainment estimates and more.

Like artificial intelligence, metaverse technologies bring a new suite of tools to bear on the problems of the battlefield, both current and anticipated. Also like AI, without the standards and infrastructure to enable these tools, the results will be piecemeal and underwhelming. It's important for the Army to lean forward and recognize the potential of the new technologies, not only for what they bring in terms of materiel, but also for their implications on how we will fight in the future.

*For more information, contact Thom Hawkins at **jeffrey.t.hawkins10.civ@army.mil**. For more information about the U.S. Army Combat Capabilities Development Command Army Research Laboratory's cross-reality common operating picture effort, contact Mark Dennison at **mark.s.dennison.civ@army.mil**.*

THOM HAWKINS is a project officer for artificial intelligence and data strategy with Project Manager Mission Command, assigned to the Program Executive Office for Command, Control and Communications – Tactical, at Aberdeen Proving Ground, Maryland. He holds an M.S. in library and information science from Drexel University and a B.A. in English from Washington College. He is Level III certified in program management and Level II certified in financial management, and is a member of the Army Acquisition Corps.

LT. COL. MATT MANESS is the Science and Technology branch chief at the Mission Command Battle Laboratory at Fort Leavenworth, Kansas. He holds an M.S. and a B.S in systems engineering from George Washington University and the United States Military Academy at West Point, respectively. Commissioned as an armor officer in 2006, he now serves as an information systems engineer supporting the Army's modernization enterprise with a focus on command and control information systems.

MARK DENNISON is a cross-reality researcher with U.S. Army Combat Capabilities Development Command Army Research Laboratory West (DEVCOM ARL West) at Playa Vista, California. He leads an applied research project on providing a cross-reality common operating picture under the common operating environment line of effort in the Network Cross-Functional Team. He earned a Ph.D. in psychology, an M.S. in cognitive neuroscience and a B.S. in psychology from the University of California, Irvine.

PETE KHOOSHABEH is a cognitive scientist and the regional lead of DEVCOM ARL West. He leads a group of interdisciplinary scientists and engineers who collaborate to operationalize science with trusted academic and industry partners. He earned a Ph.D. and an M.S. in psychological and brain sciences from the University of California, Santa Barbara, and a B.A. in cognitive science from the University of California, Berkeley.

MORE ON THE METAVERSE

These resources provide additional context on the metaverse.

"Framework for the Metaverse," at: ***https://tinyurl.com/4bsua8wn***.

"What is the metaverse? A deep dive into the 'future of the internet'" at: ***https://tinyurl.com/yz5p74t6***.

"Everyone wants to own the metaverse including Facebook and Microsoft. But what exactly is it?" at: ***https://tinyurl.com/2p8hpn4v***.

"The U.S. Army is building a giant VR battlefield to train soldiers virtually," at: ***https://tinyurl.com/2p8mbz6e***.

IMPLEMENTING INNOVATION

How the National Guard can be DOD's secret weapon for capturing cutting-edge technology.

by Lt. Col. Benjamin Posil

"The value of an idea lies in the using of it."—Thomas Edison

After the fall of the Iron Curtain, DOD put the National Guard at the forefront of a program tasked with building relationships between the United States and newly independent former Soviet republics. National Guard "weekend warriors" may have been an unlikely choice to lead the diplomatic charge into the Eastern Bloc, but the resulting State Partnership Program (SPP) has proven to be a resounding success. By applying this low-key, low-cost model inward toward domestic industry partners, DOD can leverage the same construct for a different kind of programmatic "diplomacy"—building partnerships with small and innovative companies. This Innovation Program would use the proven State Partnership Program model to harness cutting-edge innovation, creating a "win-win-win" that benefits DOD, state economies and local innovators.

The State Partnership Program initiative pairs U.S. states with partner nations, with the original goal to "create constructive relationships between state National Guards and the newly independent countries of the former Soviet Union," according to a Breaking Defense article from August 2020. The success of this program in Eastern Europe led to a global expansion that now includes bilateral partnerships with 90 countries. The SPP coordinates nearly 1,000 bilateral events every year and has become a strategic "game changer" according to Adm. Craig Faller, a former U.S. Southern Command commander. The fact the program develops mutually beneficial bilateral partnerships that focus on far more than just warfighting capability has generated access to partners who otherwise would have been unable or unwilling to support conventional military-to-military engagements with the United States.

With no more than two dedicated billets per partnership, and a minimal operational budget (approximately $200,000 per state), the State Partnership Program is purposely lean. The program leverages bilateral affairs officers who are embedded with partner nations to facilitate direct coordination between the state and the partner nation. In addition, SPP directors are a part of general staffs at the state level, providing direct access to senior decision-makers and enabling a close relationship between the state and the partner nation. The streamlined oversight and prioritized access result in strategically impactful exercises, training events and exchanges. It also provides a model that the DOD should replicate to promote innovation.

THE NATIONAL GUARD OPTION

Local National Guards are state-level resources that answer to governors or functional equivalents when not activated in a federal status. The vast majority of the "citizen Soldiers" who make up the National Guard ranks live and work in the same communities where they serve. They know the areas, use the schools, patronize the businesses and serve in the governments. Unlike active-duty service members who frequently change localities, National Guard personnel can and often do spend their entire military career within a single state. The connection that National Guard personnel have to their communities is unique for military organizations. Both their knowledge of the local communities as well as their vested interest in seeing those communities succeed

HIGH LEVEL CONTACT

Kristjan Prikk, right, Estonian ambassador to the United States, meets with U.S. Army Maj. Gen. Timothy Gowen, the adjutant general for the Maryland National Guard, in Baltimore, Maryland, in May 2021. (Photo by Tech Sgt. Enjoli Saunders, Maryland National Guard)

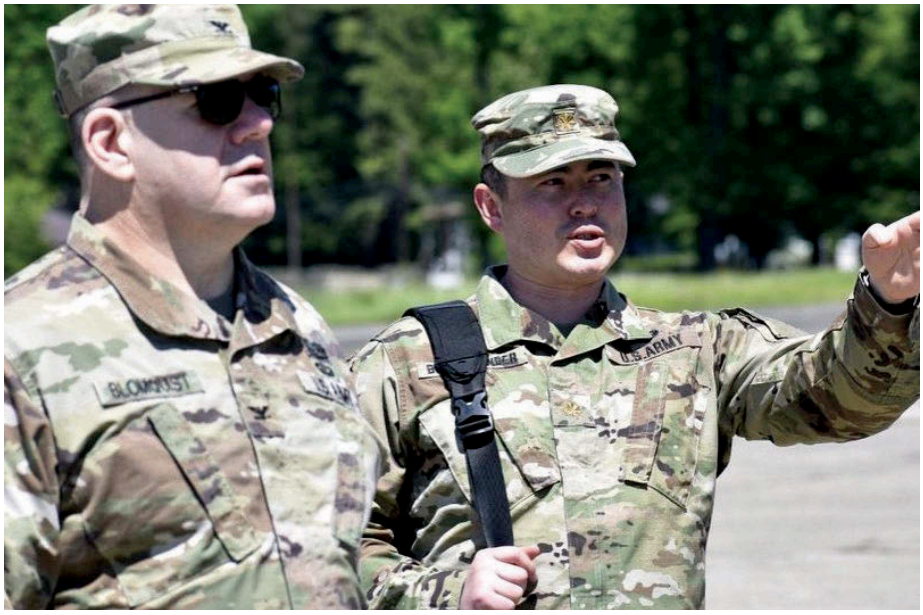
would be uniquely advantageous for a Guard-run Innovation Program.

The duality of the National Guard's mission results in a federal military force working at the direction of local state authority. For small-scale innovators, state Guards can provide access to the DOD system that would otherwise be out of reach. National Guard units use the same equipment as their active-duty counterparts, go to the same schools for training, operate bases that have the same requirements and function in a manner that is practically identical to active units. What this means for small-scale innovators with solutions to DOD-wide problems is that state National Guards become a much more accessible outlet for partnering than the federal military. The innovation officer could become the conduit through which local business can interact with the military at the state level, saving the hassle of navigating the larger DOD system (i.e., federal), at least initially. The military needs a mechanism to facilitate this link and the Innovation Program would be an impactful solution.

MODEL INNOVATION PROGRAM

The following model illustrates what a proposed National Guard Innovation Program would look like. Each state would have an innovation officer who functions in a capacity similar to the current State Partnership Program directors. Instead of facilitating relationships with an external, foreign partner, the innovation officer focuses on building relationships with local industry partners. They manage the program and work directly with senior Guard leadership at the state level for guidance and advocacy while the National Guard Bureau would provide policy and guidance for the program as they do for the State Partnership Program.

The innovation officer would be a new, full-time billet operating under Title 32 (i.e., federally funded, controlled by state) authority just like other National Guard "full timers" at the state level. Their primary duties would include liaising with local industry, educating business on the new innovation-focused opportunities, and facilitating access to the National Guard's Innovation Program initiative. They also would be responsible for overseeing



WALK THIS WAY

Maj. Harrison Bittenbender, right, State Partnership Program director, guides Maryland leaders around an airfield being used by Armed Forces of Bosnia and Herzegovina and U.S. Army National Guard Units, in exercise Immediate Response, part of the Defender 21 series in Tuzla, Bosnia-Herzegovina, "Old Eagle Base." (Photo by Maryland National Guard)

PARTNER OPPORTUNITY

From left, Maj. Harrison Bittenbender, State Partnership Program director; Brig Gen. Adam Flasch, director of the joint staff for the Maryland National Guard; 1st Lt. Lucija Šimovi of the Armed Forces of Bosnia and Herzegovina; Col. Zoran Batarilo, defense attaché of the Armed Forces of Bosnia and Herzegovina; and Capt. Nick Boeh, State Partnership Program coordinator. (Photo by Maryland National Guard)

the application process for DOD-funded grants, which would be the foundational "carrot" made available to incentivize local innovator involvement. Applications for the grants would be received, reviewed by local National Guard leadership and competitively awarded based on programmatic criteria and TAG (the adjutant general, i.e., head of individual state National Guard forces) priorities. The final step in the innovation officer's duties would be to oversee the portfolio of small innovation grants after they are awarded to local innovators.

A two-tiered grant system would provide the recommended primary structure for the program. Tier I grants would be valued at $50,000 to $100,000 and allocated proportionally by total personnel in a given state's formation. Along with the grant, the recipient firm also would receive dedicated support, coordination and advocacy from that state's National Guard, generating the "foot in the door" that small businesses often struggle to achieve with DOD. Allocating one grant to local companies per every 1,000 National Guard personnel is a reasonable ratio to use as a reference, though the actual apportioning of grants can be scaled based on budgetary or programmatic considerations. The intent would be to draw from viable candidates across a given state, ensuring the focus remains on capturing potential utility for DOD.

To be clear, Innovation Program grants would not equate to purchase orders, nor the program itself an alternate outlet for acquisitions. Instead, the combination of grant money and dedicated, sustained coordination between the military and the innovators would create DOD's own geographically dispersed innovation incubator. Much like the government offering an internship to a matriculating student, there would be no commitment for the

National Guard to "hire" that company after the initial investment of time and resources. With that said, the program would be structured to cultivate small companies with promising, DOD-relevant innovations, in a mutually beneficial way that maximizes the likelihood that DOD will be able to harvest innovative products that provide needed capabilities.

Twelve to 18 months after initial implementation, companies that received Tier I grants would be able to compete for a smaller number of Tier II grants. Tier II grants include a slightly larger funding amount (approximately $200,000) and allow for the continuation and maturation of innovations that proved promising during the Tier I trial period. Since this program would ultimately only look to capture commercial-off-the-shelf solutions, "maturation" in this case would be limited to minor refinements and realization of cost-related efficiencies. Total costs of the Innovation Program can be quantified using the Maryland National Guard as a reference.

INTERNATIONAL COOPERATION

Laura Cooper, deputy assistant secretary of defense for Russian, Ukrainian, and Eurasian Affairs, and Bosnia-Herzegovina defense attaché Col. Zoran Batarilo speaking to Maryland senior leaders, February 1, 2020 at the Dundalk Readiness Center. (Photo by Maryland National Guard)

STATE FOCUS

The Maryland National Guard has roughly 5,000 total service members across the state, including both those in the Army and Air National Guards. Using the reference ratio of service members to grants, this equates to five Tier I grants (one per 1,000 service members), and one additional billet for an innovation officer. Assuming an approximately 2-to-1 ratio for Tier I to Tier II grants, the Maryland National Guard also would qualify for two additional Tier II grants ($200,000 per grant). The total cost of those five Tier I grants, two Tier II grants, one full-time additional innovation officer billet, and associated expenses adds up to less than $1 million annually. From a return-on-investment standpoint, the actual investment is relatively minimal.

The real value of the Innovation Program is in the realization of return on DOD's investment. Using the Maryland National Guard example, the state's proximity to numerous DOD facilities along with a number of other factors (access to top-tier universities, significant defense industry presence, etc.) mean that the state has thousands of small businesses already operating in specialties that have relevant applications for DOD. The Maryland Guard could work with these companies and, using the tiered grants as a catalyst, generate utility from their innovations that benefits both the Maryland National Guard and the larger DOD. The value realized from any one of those grants resulting in a "hit" for DOD could easily exceed the cost of the state's entire program.

One of the benefits of this model is that it allows DOD to surge funding to states that have a competitive advantage in areas of particular need. Texas, California, Pennsylvania, Ohio and New York have the largest National Guards in the United States. Each of these states has industries, geography and business cultures that uniquely position them to support initiatives that align with various DOD priorities. Capturing innovative IT developments in California or Texas, industrial developments in Ohio or Pennsylvania, or finance-related technology in New York would afford DOD access to the most advanced developments in each these areas, some of which inevitably have defense-related applications. Additionally, smaller National Guards from states with highly specialized units, like those in Vermont, West Virginia

LISTEN UP

Command Sgt. Maj. Perlisa D. Wilson, Maryland National Guard senior enlisted leader, right, with Command Sgt. Maj. Mario Bagaric, the senior enlisted leader of the Armed Forces of Bosnia and Herzegovina, speaking to a class of noncommissioned officers in Sarajevo, Bosnia-Herzegovina, during a key leader visit to the country. (Photo by Staff Sgt. Sarah McClanahan, Maryland National Guard)

and Oregon, can be leveraged to focus on innovation opportunities in specific niche areas. The service-members-to-grants ratio can be adjusted to capture more representation from localities that are likely to have pioneering technologies in areas of specific need, such as space, cyber, natural disaster response or aviation.

Working directly with the military at the state level provides a number of advantages for both DOD as well as the local innovators. The state National Guards have similar needs as the larger active forces but are better positioned to identify targeted solutions. They are often more capable of quickly leveraging a standing pool of resources required for testing and evaluation. They also benefit from a compressed approval process. Achieving proof of concept can be reached in an expedited timeline via the National Guard compared with active-duty forces.

Another benefit is that National Guards are more capable of connecting with local industry. Guard members have a unique understanding of their local state's competitive advantages and organic resources. They also have a much more direct line of communication with local stakeholders than DOD, resulting in greater responsiveness and expedited outcomes. The fact that National Guard personnel often spend much of their lives in the same areas they are stationed allows for a level of awareness and accessibility that is especially relevant for capturing quickly evolving technologies.

The Innovation Program model also helps to bridge the incentive gap that exists between innovators whose livelihood depends on the success of their business today and DOD, whose innovation adoption timeline is often measured in years. From the DOD perspective, the fact that the Innovation Program would be managed at the state level allows for a straightforward method of comparing results from different states. The respective programs can be evaluated and the states that demonstrate the most successful record of delivering innovation rewarded with expanded programs and national recognition.

Incentive for successful innovation is also realized at the state level. As the local lead, the innovation officer has significant personal interest in achieving meaningful innovation progress. The state National Guards "own" the program and can leverage a successful program to garner additional resources and visibility. Because they are the champions for a specific innovation, the state is able to take the lead for implementation across the entire DOD. A successful program not only enhances the standing of a state's National Guard but also generates economic growth for that area, incentivizing political prioritization of the program. Ultimately, a successful innovation program benefits stakeholders at the local, state and DOD levels.

WEAK LINKS?

Despite the significant potential reward to DOD, this initiative still carries elements of risk. The reality that the innovation officer is the singular entry point for the program at the state level is the most prominent concern. An unqualified, unmotivated or underperforming officer serving in that role not only impedes innovation in the near term but erodes overall credibility for that state's program moving forward. But there are ways of minimizing this concern.

One mitigating factor already built into the system is that the higher-profile nature of the position becomes a de facto filter. Demonstrated achievers within a state's Guard are more likely to gravitate to the

position, as they currently do with the State Partnership Program. Additionally, the innovation officer's role as the sole manager of the program means that their performance will be conspicuously on display. Poor performance can be quickly identified, and personnel changes made to optimize benefit. A requirement for program management training would be essential, along with at least a basic introduction to fiscal law and the federal government's acquisition process. This combination would help ensure that those managing the program have a fundamental understanding of key management principles.

Given the projected costs, it is certain that there will be significant risk associated with securing funding for the program. By extrapolating the formula applied in the Maryland National Guard example across all state Guards, it can be deduced that the cost of a fully inclusive Innovation Program is roughly $88 million (based on approximately 440,000 National Guard members nationwide). Realistically, however, a smaller-scale program that places programs in select states or regions would allow for meaningful return on investment while still allowing for the program to be scaled nationally, mirroring the evolution of the State Partnership Program.

Funding from both research and development (R&D) and operations and support "pots" could be reprogrammed to support the innovation program in a minimally impactful way. The Innovation Program is inherently R&D in nature, but exclusively focused on small-scale projects. By taking ownership of the smallest programs in development, the Innovation Program would allow larger program offices to shift their focus to higher-profile efforts. The reallocation of funding to the Innovation Program would be offset by increased efficiencies for the established, conventional program offices. Integrating this program with the Small Business Innovation Research or Small Business Technology Transfer would provide access to existing funding sources and authorities, greatly simplifying the implementation of this program.

A reduction in operational requirements may also lead to available funding for the Innovation Program. As an example, the Army is moving toward reducing the pace of combat training center (CTC) rotations for their operational units. One training center alone can cost up to $25 million, so the cost savings garnered from just one canceled rotation would be enough to fund a pilot for the Innovation Program. This is not to advocate for a cancellation of combat training center rotations; they serve a critical role in maintaining operational readiness. If the decision to scale back CTCs is made, however, even a small portion of the funding would be enough to initiate this program. Once the program achieves proof of concept, follow-on support can be included in the program objective memorandum (likely through the National Guard Bureau) and the program formalized as part of the National Defense Authorization Act.

Regardless of where funding comes from, program champions at the flag level will need to focus on the investment aspect of this initiative. Despite the requisite investment, this program would lead to a net cost savings for the federal government, secondary economic benefit for states and a more capable military. Only when Congress understands this, however, will the potential value be compelling enough to gain support.

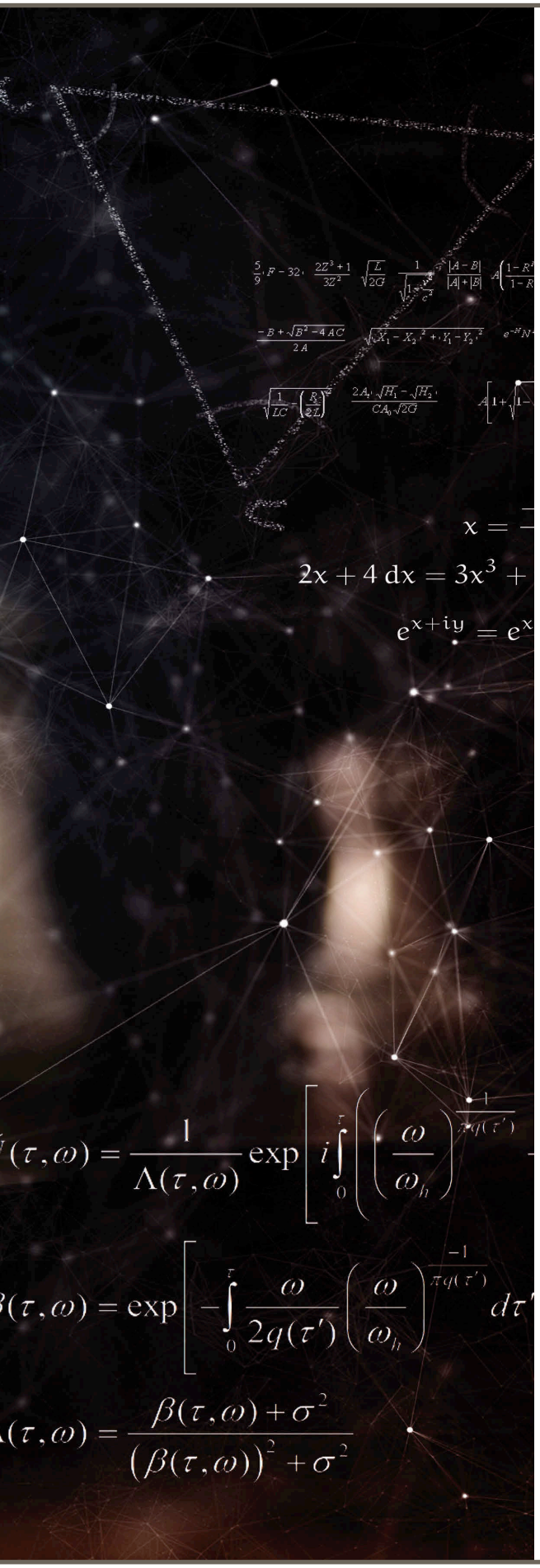
CONCLUSION

By establishing the Innovation Program, DOD can leverage the National Guard in a manner that mirrors the State Partnership Program. The disproportionate "bang for the buck" that the State Partnership Program has realized through bilateral partnerships can similarly be garnered by DOD via investment in local industry. This initiative relies on a small footprint of National Guard resources to find cutting-edge innovation in local communities and harness it for the purpose of enhancing DOD capabilities. The National Guard can use the Innovation Program to capture groundbreaking technology at the state level in a way that benefits federal, state and military stakeholders.

For more information on the State Partnership Program, go to ***https://go.usa.gov/xzcfk****.*

LT. COL. BENJAMIN POSIL is a security cooperation professional with more than 15 years' experience in the field. He is a lieutenant colonel in the Maryland Army National Guard, currently serving at J-4, logistics. He has earned MBA degrees from the University of South Carolina and Wirtschaftuniversität Wien in Vienna, Austria, along with an M.S. in international relations from Troy State University. He also has a B.A. in international relations and Latin American studies from the University of Delaware. He is an Acquisition Corps member, a Level III-certified program manager with the U.S. Department of Homeland Security, and is currently enrolled at the Eisenhower School as an M.S. in national security resource strategy candidate. His work has appeared in Army AL&T many times, and his article, "Radio ANASOC," received the ALTies Editor's Choice Award in 2019.

SYSTEMATIC STRATEGY
Military leaders, like grandmasters, must seek to understand the board, the position of the pieces and their own limitations and tendencies.(Images by Getty Images)



DECISION DOMINANCE

The science of decisions is a new science for future military leaders.

by Richard A. Nabors, Ph.D., Nathan Burkholder and Jacqueline A. Randall

We all know that chess is a thinking game, but did you know there is a science to winning? In 2004, cognitive scientists Michelle Cowley and Ruth Byrne published a major scholarly article titled "Chess Masters' Hypothesis Testing." The report resulted from an empirical study in which six positions were created halfway through a chess game for 20 players, including both amateurs and grandmasters.

The authors concluded that what differentiated the grandmasters from the novice players was using a scientific approach to making decisions. The approach, called falsification, ultimately led to more accurate and winning moves.

THE SCIENCE OF WINNING

The process of making hypotheses and trying to disprove them by testing their limitations, before committing resources to that hypothesis, is called falsification. Austrian-English philosopher Karl Popper (1902-1994) coined the term "falsification" in his 1937 book, The Logic of Scientific Discovery. Popper's view is that scientific theories can never be proven true, but they also cannot be disproven; instead, they are either supported or refuted based on their ability to withstand attempts at falsification. The more you try to disprove the theory and it withstands your attempts to falsify it, the more you can consider that theory to be well-supported.

For chess players to win, they must predict their opponents' next possible moves through what is called "look-ahead." In essence, the difference between a winning player and a losing one is the ability to gather information from a wider field of possibilities and identify the more likely outcomes. Once these possible scenarios have been identified, players can quickly and

FACING OFF
Knights on a chess board, like Soldiers on the battlefield, must prepare accordingly for battle.

confidently move their chess piece to the next best position, prepared for whatever move the opponent might make.

Military leaders find themselves facing the same set of challenges in today's complex, multi-varied threat environment. They must understand their position, look ahead across multiple scenarios and make time-sensitive decisions based on real-time changes, all with the knowledge that each decision may have lasting consequences far into the future. Many science and technology (S&T) labs and centers within the Army, including the U.S. Army Combat Capabilities Development Command (DEVCOM) C5ISR Center and Army Research Laboratory, are working on programs of significant impact in bringing needed sensing and network capabilities to our Soldiers. Army S&T is dedicated to investing in technologies that support our Soldiers' constant situational understanding of the battlespace and provide future military leaders with information needed for significant decision-making advantage over the opposition.

CHESS AND DECISION DOMINANCE

Chess is a game of decision dominance, where one player's decisions are ultimately proven better than the other. This decision dominance often leads weaker players to recognize their position and resign before the game is over. It's the same in the military: the goal of decision dominance is not to destroy your enemy, but to force the enemy to surrender or not go into war against you in the first place. It's the desire to outthink rather than obliterate your opponent, moving away from the "war of attrition" to a "war of decision."

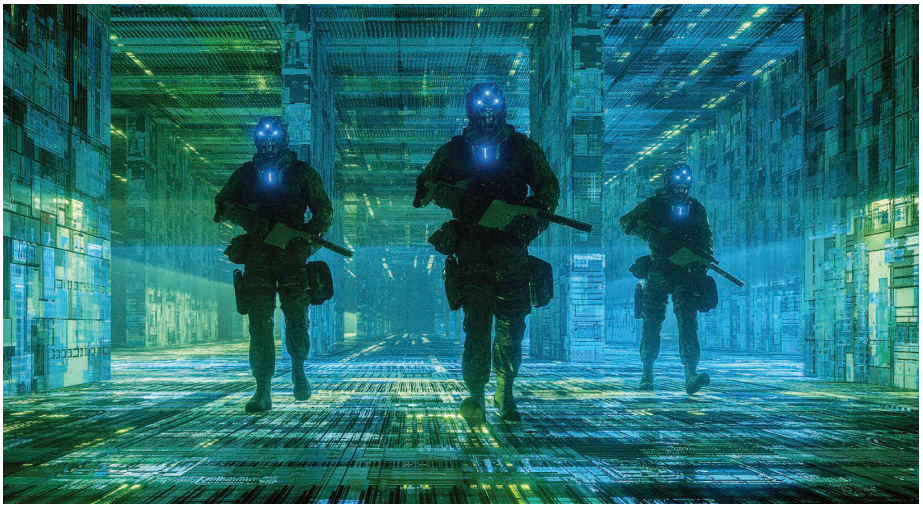
"Decision dominance is now possible by exploiting technology and innovation to achieve long-term success through economical effects-based planning," wrote U.S. Air Force Lt. Col. Merrick E. Krause in a 2003-article for Defense Horizons, a National Defense University publication. "This concept is a departure from the traditional Napoleonic war-fighting philosophies of attrition or annihilation," Krause said.

"Science is about gaining useful knowledge in a systematic way to solve problems," writes Devin Camenares, the author of the chess blog "the Science on the Squares." "Chess players engage in a similar activity all the time if even subconsciously, studying games and reading literature to build a model of the game in their mind that can be applied to making decisions at the board. Likewise, scientific knowledge about the natural world has informed incredible advances in technology for a wide range of industries."

Like chess players, military leaders must be empowered with the resources needed to apply the same study and scientific approach to solving military challenges. Camenares has identified three areas where science and a scientific approach can benefit chess players in decision making and, by extension, can have broader application to military decision-making: Informatic analytics, position analytics and psychological analysis.

UNDERSTANDING THE BOARD

Informatic analytics is about trying to know as much as possible about your opponent, the board and the game in advance. It's about creating scientific metrics around human decision-making processes and understanding how that shapes the environment in which you are engaged. In chess, informatics could be applied to make predictions about the winning chances offered by a certain opening move. Other questions that could be answered include which squares are most



HARNESSING TECHNOLOGY

Science and scientific methodologies can help military leaders better leverage their resources and decision processes to greater advantage.

often used. Knowing that information could do a lot to shape a player's strategy, before ever moving the first piece.

Camenares goes on to suggest the need in chess to quantify time (speed) and material imbalances (chess pieces, or in military parlance, "platforms") and to develop models around these constraints. These same challenges of understanding predictable behavior, common patterns, time and material imbalances are exactly the same objectives facing military leaders. It's the ability to look ahead or calculate what could happen in any given situation and how it might affect your current position. This involves looking at all possible scenarios from every angle so that you can take advantage of whatever opportunities arise along the way—both favorable ones and unfavorable ones.

Christian Brose published a best-selling book in 2020 called "The Kill Chain: Defending America in the Future of High-Tech Warfare." In it, he explains how the Chinese military is taking a decision-centric approach to fighting wars against the United States, capitalizing on their strengths while giving the Americans little chance to respond with a counter-punch using our superior military platforms, like an elaborate chess game.

"Over the past decade, in U.S. war games against China, the United States has a nearly perfect record: We have lost almost every single time," writes Brose in his book, arguing that while China's attack weapons are not as advanced, they have smartly used technology to render many United States forces "deaf, dumb and blind."

Future military leaders need the information derived from war games and simulations to shape their understanding of needed capabilities which will, in turn, influence investments in technology and science. It takes many decades to change the major pieces (military platforms) available on the board, but significant optimization is currently possible through the integration and networking of sensor and communication technologies within these legacy systems. Military leaders need to be able to conduct many, fast, low-cost, strategic exercises, and aggregate analysis across all of these activities to find the patterns and insights that will allow them to best understand the "board" and how technology investments in specific areas can give their pieces the maximum advantage.

UNDERSTANDING YOUR OPTIONS

Position analytics is the ability to evaluate the position you're in and determine whether it's a good or bad spot. It also includes understanding how your opponents might have assessed that same position, which can sometimes lead them to make assumptions about what they think is happening when their hypotheses are wrong (i.e., thinking you don't see an attack). Chess players use computer engines, such as lichess.org, to study positions and narrow down the possibilities in advance, so they don't have to spend time thinking about every possible move.

While in the real world of warfare, computers may never replace human intelligence, but they can help improve decision-making by providing objective analysis and rapid feedback. In military terminology, this is where sensor data, decision processing, communication and execution capabilities merge into a real-time tactical or strategic advantage. For future military leaders to make timely decisions in combat, they need accurate data on everything going on around them—from the locations of friendly forces and enemy units, to weather reports, geography information and more. Not only do they need this sensory information but they also need to be able to process it and communicate it in near real-time.

THE RIGHT MOVE
As the best chess players in the world look ahead at all possible scenarios to determine outcomes, future military leaders need information derived from war games and simulations to form an understanding of needed capabilities.

The appointment of Heidi Shyu, an American engineer, to be the undersecretary of defense for research and engineering—also referred to as DOD's chief technology officer—underpins the recognition by DOD leaders that technology is critical in helping to inform decision-making in wartime. In 2021, Shyu stated during a Senate hearing that the United States must invest more in technologies to counter what she called "the pacing threat" from China.

"DOD should avoid replicating private-sector research and should focus its investments on the innovative technologies that DOD uniquely needs but that the commercial sector is not developing on its own," she said, adding that the United States must invest more in new technologies rather than the so-called "legacy systems."

UNDERSTANDING YOUR BLIND SPOTS

Psychological analysis is about understanding how our opponents think and make decisions. It's also about knowing how they evaluate their own positions and what the best move is for them to make, based on that evaluation. Here is where the Einstellung effect comes in. The Einstellung effect is a state of mind triggered by years of experience in chess playing and has been documented to affect all decision-making.

Einstellung is the German word for "setting" or "attitude." In psychology, it's one concept from Gestalt theory about how preconceptions often distort our thinking. When we are exposed to one stimulus and then another, we tend to respond only to the second stimulus. This is called "sensory adaptation." For instance, if you are looking for a green sweater in your closet but all you see are red ones, you will not find it because your brain has grown accustomed to seeing other colors rather than green. This also applies to decision-making in chess and in the military, as it affects how people make decisions about what is happening around them—their minds have already been made up by previous thoughts, before making a move.

In other words, expertise and knowledge may lead to overconfidence in one's methods and an unwillingness to consider

Like chess players, military leaders must be empowered with the resources needed to apply the same study and scientific approach to solving military challenges.

alternative solutions to a problem. Military leaders may become fixated on the right move to make, not because it's necessarily the best one but because they are confident in their abilities. In psychology, this phenomenon is also called "tunnel vision."

This has been shown to happen more often among military leaders who have many years of experience and training with making decisions on the battlefield. It's a natural result of being trained to make decisions in specific ways for so long, but it can lead to errors and mistakes that cause more harm than good if you're not careful about what your options are or how much time is left on the clock when making an important decision.

Look at what the Chinese have developed to counter our advanced fighter jets: anti-access and area denial capabilities. Anti-access and area denial (A2/AD) are terms broadly used to refer to a Chinese (or Russian) military strategy in which air and naval power are used to control the combat region, making it difficult for an opponent's armed forces to come within a striking range of territory.

"If the DOD cannot move beyond A2/AD, it risks wasting billions of taxpayer dollars building a future force based on a flawed premise," wrote Chris Dougherty, a senior fellow in the Defense Program at the Center for a New American Security, in December of 2021. "More worryingly, it puts the United States at greater risk of losing a future war against China or Russia."

Future military leaders face the same challenge of avoiding the tunnel vision that comes from the decades of military excellence and global domination that the United States has enjoyed. The scientific community has a unique opportunity and obligation to help support military leaders in questioning their assumptions, and in some cases traditions, that may create an artificial blind spot that could be exploited through innovative thinking on the part of an adversary. Military leaders need to help identify and formalize opportunities for the science and technology community to influence the war games, scenarios and strategies with orthogonal thinking, based on emerging science rather than traditional approaches.

THE NEW SCIENCE

"Chess helps you to concentrate, improve your logic. It teaches you to play by the rules and take responsibility for your actions, how to problem solve in an uncertain environment."
–Garry Kasparov

Military leaders, like grandmasters, must seek to understand the board, the position of the pieces and their own limitations and tendencies. Science and scientific methodologies can help military leaders better leverage their resources and decision processes to greater advantage, just as the Chinese are doing with anti-access and area denial. To achieve decision dominance, future leaders need to move away from focusing on a small number of large platform-centric investments, to more innovative approaches that result in less predictable and better survivable systems and capabilities. Platforms must be seen as containers for new technologies, such as software, sensors and the C5ISR architecture. With more of these options available to them, future military leaders, like chess grandmasters, will be able to anticipate how their opponents will react to the moves they make and give themselves a variety of different options that can counter any potential threat.

For more information on the C5ISR Center and its mission, visit ***https://c5isr.ccdc.army.mil/****.*

RICHARD A. NABORS, Ph.D., is the principal deputy director of the DEVCOM C5ISR Center Research and Technology Integration (RTI) Directorate. He holds a doctorate in management from the University of Phoenix, an M.S. in management from the Florida Institute of Technology and a B.A. in history from Old Dominion University. He is Level I certified in program management.

NATHAN BURKHOLDER is a strategic analyst for KITEWIRE Inc. who supports the C5ISR RTI Directorate. He holds a B.S. in engineering from Messiah University (formerly Messiah College).

JACQUELINE A. RANDALL is a DOD contractor with AnaVation, LLC, supporting the C5ISR RTI Directorate. She holds a B.A in psychology from Siena College. She is a certified associate in project management.

BLAZING OUR TRAIL

RDT&E is critical to everything we do in Army acquisition.

The 2019 Army Modernization Strategy challenged the Army to achieve 10X overmatch over the next decade. We can only become more lethal and globally dominant if we develop and enhance our capabilities, continue to test and refine operating concepts, draw on emerging technologies, and anticipate changes in the operating environment. Research, development, test and evaluation (RDT&E) is at the cornerstone of these efforts.

I was at Program Executive Office Soldier for the development of both the Integrated Visual Augmentation System (IVAS) and the Next Generation Squad Weapons (NGSW). Both programs leveraged significant RDT&E efforts to integrate and bring the technologies to fruition. We worked extensively with both industry and our Army laboratories for thermal and low-light capabilities, fire-control capabilities and ammunition, leveraging all relevant corporate, internal and government research and development capabilities and funding to identify the right technology and pull those capabilities into the program.

Then we tested.

We leveraged multiple Soldier touch points to ensure the capability was evolving to meet user needs, refining both the requirements and the capabilities as we went—constantly pushing the envelope of technology.

Both programs completed undeniably successful rapid prototyping efforts. This achievement is the result of a huge integration effort made up of tireless Army Acquisition Workforce (AAW) professionals and teams, across the entire Army acquisition enterprise, working in sync to refine requirements, insert technology and deliver cutting-edge capabilities to the force.

RESEARCH REALIZED

Next Generation Squad Weapons—like this one being tested at Fort Dix, New Jersey—used significant RDT&E efforts to bring the technology to fruition. (Photo by Kevin C. Mcdevitt, U.S. Army Support Activity)

MULTI-USE RESULTS

The thermal capabilities on the IVAS, which are the product of thorough RDT&E and Soldier feedback, can be used to detect fevers in ill personnel and have been used to fight COVID-19. (Photo by Courtney Bacon, Program Executive Office for Soldier)

LEARN FROM THE USER

Soldier touch points were crucial in the development of the IVAS, and will remain an important factor in future RDT&E efforts. (Photo by Bridgett Siter)

The role the AAW plays in the development and execution of programs like IVAS and NGSW is one that requires an eyes-wide-open approach—having an understanding of where the program and the Army is going and how to best get there. It also means knowing when and where to accept risk, and understanding the associated implications in order to allow Army leaders to make informed decisions.

This extends even more so to our teammates in RDT&E. These professionals must know their craft and have the capability to do assessments and survey the environment. They need to know when to partner with others, adapt or modify an off-the-shelf product.

RDT&E is critical to everything we do in Army acquisition. We all come to the table with varying degrees of education and experience, but we can always learn new things. We've incorporated Soldier touch points into the process to ensure we are providing the user with what they want, we test as we go and we make course corrections along the way.

It's important that the rest of us support our teammates in RDT&E. We need an agile and adaptive workforce to proactively push the envelope with regard to technology, and refine where necessary. We need to equip the entire community with the tools and talent to bring these key projects to fruition.

The programs that our community is responsible for have huge implications on our ability to meet our modernization priorities. It is my responsibility as the Army director of acquisition career management to best prepare our workforce for this challenge.

Our Student Loan Repayment Program helps us to recruit and retain top talent with skills in science, technology, engineering and math, and in business acumen. Our Training with Industry program exposes military officers to the latest commercial business practices and technology development processes. Defense Acquisition University's Senior Service College Fellowship program that my office sponsors prepares our senior-level civilians for leadership roles in program management and contracting.

These leader development programs enhance our workforce's capability, especially during times when our Army is facing declining budgets. We can't afford to not take a holistic look at how we manage and intertwine the acquisition process. We must show and develop what's possible. If you want overmatch, you can't buy off the shelf—you can only do that with RDT&E.

Greene Award Winners

In her role performing the duties of Army Acquisition Executive, the Program Executive Officer for Simulation, Training and Instrumentation Karen D. H. Saunders recognized the winners of the eighth annual Maj. Gen. Harold J. "Harry" Greene Awards in Acquisition Writing in a COVID-protocol Pentagon ceremony in December. Saunders was accompanied by Greene's widow, Susan Myers, Ph.D., herself a retired Army colonel. The ceremony also recognized honorable mentions.

The winners, by category, follow:

ACQUISITION REFORM

"The Authority to Compete," by Maj. David J. Delassus *(Photo 1, below)* from the joint staff won the award. Honorable mention went to Robert E. Finley of the Air Force Materiel Command for his "Acquiring Innovation in the 21st Century: Accelerating Procurement as a Weapon of War."

FUTURE OPERATIONS

"Change the Contingency Contracting Support Model to a Centralized, CONUS-Based Contingency Contracting Support Center," by Maj. Joseph D. Levin *(Photo 2)* of the U.S. Army Legal Services Agency won. Honorable mention went to "Protecting the Future Force in Multi-Domain Operations," by Lt. Col. Curtis Brooker and Christina Bates, Ph.D., from the Program Executive Office for Intelligence, Electronic Warfare and Sensors.

INNOVATION

In a tie, this category honored two winners, alphabetically. "Creative Acquisition and the Cyber Battlefield: Using Rapid Prototyping to Address Pressing Cyberspace Challenges," by Fianna Litvok of the Program Executive Office for Enterprise Information Systems, and "Scaling Innovation at the Department of Defense: An Actionable Framework and Practical Steps for the Joint Force," by Marina Theodotou, Ed.D. *(Photo 3)*, of Defense Acquisition University. Honorable mention went to "Animated Data: How Healthcare Data Lives Alongside Patients," by Holly S. Joers of the Program Executive Office for Defense Healthcare Management Systems.

LESSONS LEARNED

"Building Trust: A Cyber Story," by Lt. Col. Rachael M. Hoagland *(Photo 4)* of the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology took the award. "Onboarding New Employees as Remote Working is Here to Stay," by Jared J. Ryan of the Program Executive Office for Combat Support and Combat Service Support, received honorable mention for his work.

WINNING ANNOUNCEMENT
Karen D.H. Saunders recognizes the winners of the Maj. Gen. Harold J. "Harry" Greene Awards during a ceremony in December. (Photos by Sgt. Kevin M. Roy)

In congratulating the winners, Lt. Gen. Robert L. Marion, the military deputy to the assistant secretary of the Army for acquisition, logistics and technology, wrote in an email extending his "heartfelt thanks and deep appreciation to the authors, their families and colleagues who supported them in their work."

WINNERS' CIRCLE
Karen D.H. Saunders and Susan Myers, Ph.D. (Col. Ret.) presented the winners of the eighth annual writing competition with their plaques.

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SMILE BIG

Chelsea Haynes, left, with Haynes and Sue Myers, Ph.D. (Col. Ret.)—spouse of Maj. Gen. Greene. Haynes said that Myers has become like a member of the family since Greene's death. (Photos courtesy of Jeremy Haynes)

LIFE AFTER THE ARMY

Good mentors can help improve a career, but exceptional mentors can profoundly change your life.

by Steve Stark

Editor's note: *Most of the events that are portrayed in "Life After the Army" took place several years ago and are not news. So, why now? The answer is that the winners of the Maj. Gen. Harold J. "Harry" Greene Awards for Acquisition Writing were announced in December and are published as a supplement with this issue.*

At the time of his death in 2014, Greene was as close to a rock star within the Army acquisition community as it's possible to be. People who didn't know him knew who he was. Now, nearly eight years later, that may not be so true.

Jeremy Haynes's story of Greene's mentorship is not the one that's often told when Haynes has been interviewed or profiled. Haynes had a noteworthy mentor-mentee relationship with Greene, and Greene's ethos in that relationship reflects the ethos of the writing contest. Writing the paper is the first part of a conversation about acquisition.

Those who write put themselves on the line to help others, to pass along knowledge and expertise. The winning essays and honorable mentions all represent real accomplishment in the profession of acquisition, and a willingness to be part of the larger, ongoing conversation within and around Army acquisition.

Few things can be more valuable to a career than having a good mentor, a person who can take you under their wing and provide a been-there and done-that view of the ins and outs of a profession. That may be especially true for military careers, when the mentee has little practical sense of how to manage the career ahead, balance the demands of family and work, and undertake more and more challenging work.

For Maj. Jeremy Haynes (USA Ret.), Maj. Gen. Harold J. "Harry" Greene was an exceptional mentor. At the time the two men met, Greene was deputy commander of the Combined Security Transition Command - Afghanistan (CSTC-A). Haynes became Greene's aide-de-camp in May 2014 and served as aide until August 5, 2014, when both were shot—Greene killed, Haynes gravely wounded—during a routine trip to the Marshal Fahim National Defense University in Afghanistan.

Haynes said that Greene was a natural mentor, someone who gave to everyone around him. "He was all about growth, whether professional or personal," Haynes said. "He was a leader who never missed an opportunity to mentor, guide or pass along life lessons."

A NEW KIND OF BOSS

Being Greene's aide was more than a full-time job, Haynes said in an interview with Army AL&T magazine in January. Greene's chief of staff routinely told Haynes, "You got one job: Take care of the boss." That meant that Haynes was with Greene nearly every minute of every day. "First of all, when I had breakfast, lunch and dinner, I'm with Gen. Greene," he said.

TAKE CARE OF THE BOSS
Haynes, left, accompanies Greene in this undated photo. According to Haynes, Greene was an exceptional leader and mentor who encouraged Haynes to involve his family in his career planning process.

Haynes was a young military logistician, and his new job meant being close to someone unlike any other leader he'd experienced.

"From the first time I met him," Haynes said, "I was serious in everything I did." Greene once joked with him that, if he didn't loosen up, Greene was going to make him pack his bags. And "pack your bags" meant that "I was going to be fired," Haynes said. "Pack your bags" was one of many regularly occurring Greene jests. "There was never a dull moment with the boss. Regardless of how tense a situation might be, he had a gift for making everyone in the room calm. Often by telling a joke."

Part of taking care of the boss meant that Haynes accompanied Greene on missions and key leader engagements, he said. While traveling to and from missions, Haynes said, "The boss never missed a moment to provide mentorship or guidance." Such conversations ranged beyond serving in the military and included family, life, lessons learned as a father and husband, and his passion for Boston professional sports. Especially the Red Sox.

Coming up in the military, serving at Fort Campbell, Kentucky, and Fort Bragg, North Carolina, Haynes said that he'd never experienced the kind of leadership embodied by Greene.

Haynes said that, as an officer, he'd been exposed to different types of leaders—some who yelled or belittled troops to get a task done. Others whose "egos were larger than the mission or [their] care for Soldiers." Greene was different. He always led and spoke with his heart, Haynes said. His way of leading and caring was contagious and spread throughout the command.

Haynes was already in Afghanistan when, in January 2014, Greene was named deputy commander of the Combined Security Transition Command – Afghanistan (CSTC-A). At the time, Haynes was working as a foreign military sales officer whose responsibilities ranged from managing assets to acquiring rolling stock for the Afghan Defense Force. Greene's chief of staff at the time recommended Haynes for the aide-de-camp role.

THE SMARTEST GUY

Haynes grew up in southwest Georgia. He decided to join the military his senior year of high school after witnessing the events of 9/11. He went to Georgia Military College and was commissioned after two years—then his military career started in earnest, including a deployment to Iraq with the 101st Airborne Division. When he came back to the U.S., he went back to school, commanded a parachute rigger company and was accepted into a Training With Industry assignment with the American Red Cross National Headquarters in Washington, D.C.

Despite this experience, he said, until he met Greene, he didn't really have a sense of what a military acquisition career was. When Greene asked Haynes what he thought the Army Acquisition Corps does, Haynes said, "A military version of Amazon. You order stuff and it's delivered through the supply chain." Greene was taken aback, he said. "He took his glasses off, and slowly looked at me…. He said, 'What did you just say about my Acquisition Corps? How dare you compare us to Amazon. We will run laps around that company.' "

The general had a way of taking off his glasses and giving you probing looks, Haynes said. Greene would grab his glasses by the bridge and lift them off, then stare at you in complete silence. "Normally, this was an indication that something you either said or did was wrong." Depending on how bad you'd screwed up, Haynes continued, "the boss would either follow up with a question to allow you to re-evaluate and correct what was said or done, tell a joke to ease a tense situation, or use the opportunity as a teaching moment. I never observed him raising his voice in anger."

Greene was effective, Haynes said, in putting things into context, so people could see the larger picture. "Gen. Greene explained to me how the Acquisition Corps impacts our Army and entire military force," Haynes said. "He cross-walked how acquisition not only ties into logistics, but to other branches and services." He explained in depth the relationship between acquisition as a function and the warfighter.

MUTUAL SUPPORT
Sue Myers, Ph.D., visits Haynes at Walter Reed Medical Center shortly after his injury in the 2014 attack that took the life of Maj. Gen. Greene.

Haynes said that it was often clear that Greene was the smartest guy in the room, and others knew it. But Greene, who had a doctorate in materials science and three master's degrees—two in engineering and one in strategic studies—wasn't the kind of man who needed recognition for how smart he was. The example he set was about doing his job well, and passing rigor and excellence along to others.

Above all, it was clear that Greene valued mentoring. "He once asked, 'Jeremy, anybody talk career development with you?' " Haynes said that no one had. He'd just been told to perform well and the Army would tell him where to go next. Greene was flabbergasted, and said "Who told you that? There's a lot more to that equation." Haynes told Greene that his dream job was to command a sustainment brigade.

In response, the general, Haynes said "began to cross-walk duty positions I wanted that correlated to my experiences." During that discussion, Haynes said Greene also gave him an assignment. " 'Show this to your wife, get her input—and discuss her life goals also.' We both laughed after he warned me that I may have to negotiate and concede because our plan is not always our spouse's plan."

ADVOCATE GENERAL

By that time, Haynes had seen Greene help other junior officers and enlisted personnel with their careers more than once. He was passionate, engaged and not afraid to fight for others.

"He wasn't afraid to put his rank on the line to fight for what was right or for opportunities for someone else," Haynes said. "I recall an individual being denied a chance to re-deploy and go to a school that he was selected to attend. The boss found out. …I recall the boss saying, 'Just because there's a war in Afghanistan doesn't mean we should stop his professional growth.' A week or so later, the individual was granted the opportunity to re-deploy and prepare for his course," Haynes said. "I've been in commands where the mindset is, 'The mission is far too important to lose anyone.' Gen. Greene always instilled in me the importance of people-development as it related to the Army's big picture. He once said, 'A positive return on investing in you is that you'll one day invest in others.' "

LASTING INFLUENCE

There are no metrics to measure the effect that a mentor can have on a mentee. Nor is there a limit to the dimensions of life and work that a great role model can influence for the better in a mentee. During the period that Haynes worked for Greene,

EXTENDED FAMILY
Sue Myers, Ph.D., smiles with three of the Haynes children, Jeremy Jr., Jeremiah and Jordon, at an athletic event.

he was going through some issues in his marriage, he said. Days before "the incident," as Haynes calls the shooting, he'd had a fight with his wife—an Army Reserve Soldier—that Greene overheard.

"A few days prior to the incident, I was arguing with my wife on the phone. The boss walked in, and I abruptly hung up the phone. He stopped before my desk, removed his glasses, and gave me his signature stare before telling me to fix it."

The men had a follow-up trip scheduled to NATO Headquarters in Brussels after briefings in Washington. Greene proposed that, after they got back from Washington and were in Brussels, he was going to fly his wife, Dr. Susan Myers, a retired Army colonel, to Brussels. He suggested that Haynes do the same with his wife, Chelsea. Greene told Haynes, " 'I've been married for a long time and can relate to the frustration you both are dealing with.' Greene offered to share life experiences and things they did to overcome obstacles and time apart."

Haynes accepted Greene's invitation and made travel reservations for Chelsea, but things at home were still difficult. "On the day of the incident, I was again arguing with my wife." Greene overheard some of it. "Gen. Greene called me into the office, and said, 'Jeremy? Fix it.' " At first, Haynes said, he thought Greene was talking about the upcoming mission at Marshal Fahim National Defense University. Haynes said that he was surprised that Greene was talking about that, questioning their readiness. Greene said, " 'You need to fix it, young man. Do I need to spell it out for you?' "

Haynes said that he was embarrassed to have brought his personal issues to work with him. "But looking back on the situation, the boss understood that serving is a shared sacrifice" that often includes unsung but courageous and selfless spouses.

Greene told Haynes, " 'This is a shared journey. Not just for you, but for everyone who's attached to you. …You're here hurting; they're back there hurting. You're worried about this mission. …But the folks at home are worried about you.' And he went on to tell me to value my relationships because, 'There's life after the Army. You'll be just fine,' " Haynes said.

"I walked out of the boss's office and called my wife. While I was dialing her number, Gen. Greene stood in front of my desk as if he wanted to make sure I followed through…. I apologized but did not tell her that I loved her."

That, Haynes said, could have been his last moment talking with his wife and he hadn't told her that he loved her.

A DIFFERENT "LIFE AFTER THE ARMY"

Greene was right that there was life after the Army, except that Greene never got to taste it. Haynes almost didn't. He was among the 15 other people the gunman hit when Greene was killed. Haynes said that, immediately after the shooting, he lost consciousness. Then, Haynes said, "When I opened my eyes, I thought everyone left. From where I lay, I could see no one. I remember a peer, Maj. Chris Foreman, lifting me up. Although he was shot in the leg, Chris disregarded his own wound and rushed to get me to an aid station." Haynes said he remembered asking, " 'Where's the boss, where's Gen. Greene?' " And then someone said, " 'Gen. Greene is fine, let's just focus on you.' "

"There was never a dull moment with the boss. Regardless of how tense a situation might be, he had a gift for making everyone in the room calm. Often by telling a joke."

While under care at Walter Reed National Medical Center, Haynes said, "I discovered that Greene had passed. I remember [Greene's widow] Dr. Myers holding my hand. I was so weak. I faintly squeezed her hand and told her, "You lost a husband, but you inherited another son.' "

During that recovery period, Haynes said that his wife told him how she first met Myers outside his intensive care unit room at Walter Reed. Myers looked at her and said, "This damn sure enough isn't Brussels," and both began to laugh. Haynes said that that showed him how much

REMEMBERING A NAMESAKE
The two youngest Haynes children, Joseph and Jordon Harold, both named for Greene, play near Greene's tombstone at Arlington Cemetery.

Myers and Greene were alike. There she was, having just lost the love of her life, "her kids are in pain, she's in pain, but she selflessly devoted time to spend with me and give me encouraging words in my fight to survive," and, for Haynes, that was exactly something that the boss would have done.

Haynes and his wife were expecting a child in January 2015. To honor his mentor, Haynes asked Myers for her blessing to name the child for Greene. She gave it, and son Jordon's middle name is Harold. Haynes also asked her to be his son's godmother. Later, the Hayneses welcomed their fourth child. Joseph was also named in honor of Greene, whose middle name was Joseph. Today, the Haynes family are in frequent contact with Myers, whom they call Mama Sue. The kids also call the adult Greene children aunt and uncle.

"He was a leader who never missed an opportunity to mentor, guide or pass along life lessons."

A NEW FAMILY

These days, Haynes said, there isn't a week that goes by that Mama Sue isn't visiting or texting. Haynes said he finds it ironic that Jordon has Greene's loud voice and love for baseball while Joseph has his sense of humor and gregariousness.

The influence of his mentor, boss and friend still reverberates through Haynes's life in positive ways. Greene may have died far too young, but his legacy lives on, not just in his family, but also in Haynes's family, in Greene's extended Army family, and in the writing contest that was renamed to honor him by his friend Lt. Gen. Michael Williamson (USA Ret.).

"A positive return on investing in you is that you'll one day invest in others," Greene told Haynes, and probably others. That investment is a leap of faith that says, "I see you. I care."

Haynes didn't have the career that Greene helped him map out. But what he got from the man and continues to get is inestimable. It is perhaps also a debt to pay forward. That's a debt that Haynes will happily pay again and again, on behalf of "a phenomenal man who people liked, many loved and most admired. … His legacy will live on."

For more information on the Maj. Gen. Harold J. "Harry" Greene Awards for Acquisition Writing, go to ***https://go.usa.gov/xtMJA****. To read the 2021 call for submissions, go to* ***https://go.usa.gov/xtMJ6****.*

STEVE STARK is senior editor of Army AL&T magazine. He holds an M.A. in creative writing from Hollins University and a B.A. in English from George Mason University. In addition to more than two decades of editing and writing about the military, science and technology, he is, as Stephen Stark, the best-selling ghostwriter of several consumer health-oriented books and an award-winning novelist.

THROW ME A LINE

If you feel like you are adrift in a sea of policies and requirements, don't worry—the acquisition stakeholder network is here to help. (Images by Getty Images)

CAREER NAVIGATOR

A PORT IN THE STORM

The acquisition workforce stakeholder network can help workforce members untangle career requirements.

by Jacqueline M. Hames

There's no getting around it—having a career is *work*. It's not just performing assigned duties, or assigned duties plus any extras that may pop up. It is the managing of your own career. Keeping up with job-required training, career development opportunities, continuous learning points and any number of other "administrative" things can be a job unto itself. If you have ever found yourself adrift in a sea of policy and requirements, trying to figure out the next step in your career, don't worry—the acquisition stakeholder network is here to help.

The acquisition workforce stakeholder network is a group of selected professionals who advocate for and assist Army Acquisition Workforce (AAW) members in planning and developing their careers. These professionals have direct contact with AAW members at the tactical level—they are supervisors, organizational acquisition points of contact (OAPs) and acquisition career managers. They help workforce members with general acquisition career management guidance and an array of acquisition career-related matters. At the strategic level, the network consists of senior leaders who serve as acquisition career management advocates, Army acquisition functional advisors and Army acquisition functional leaders. These senior leaders are instrumental in advocating for the AAW in all career development matters, as well as providing strategic vision and advice related to training program management and policy development.

SHINE SOME LIGHT

Workforce members who have questions about a career move should start with their supervisor. Supervisors will be able to help with things like identifying required training or potential development opportunities.

But what workforce members really need to know is where to go first for answers and advice: the tactical level.

BEGIN AT THE BEGINNING

Have questions about a career move? Start with your supervisor. Supervisors will be able to help with the basics, like identifying what required training is next for your position or telling you about potential development opportunities. "The supervisor is the first level of defense for the workforce member," said Kim Gibbons, an acquisition career manager with the Director of Acquisition Career Management (DACM) Office. Supervisors provide one-on-one counseling and ensure AAW members understand their position requirements, she said.

"Once they have a conversation with that supervisor, if that supervisor is unable to provide the adequate assistance or [is] unable to answer [an acquisition question], then [the supervisor] can elevate it up to the acquisition organization point of contact. An OAP is appointed through the organization," Gibbons said.

If the OAP can't help, then the question is pushed to an acquisition career manager at the DACM Office—each OAP has a career manager liaison that supports them and the command they work for, she said.

According to the DACM Office, an OAP's role is to provide general acquisition career management guidance, respond to Career Acquisition Personnel and Position Management System (CAPPMIS) data calls, and ensure timely announcement of Army acquisition education and training programs in support of a designated organization. In other words, OAPs ensure that supervisors and AAW members have all the training requirements for certification, said Jennifer Marshall, the lead OAP for the U.S. Army Combat Capabilities Development Command (DEVCOM) C5ISR Center.

"We're here to help the acquisition workforce. That's our job," Marshall said. "If ever they're in doubt or there's a grey area, they should be able to reach out to us because that's what we do. We provide customer service to answer any and all questions."

Workforce members should be aware that OAPs are not in that role exclusively. "We are typically dual-hatted," said Bridget Patrick-Dollberg, a management analyst and lead OAP at the DEVCOM Armaments Center. She is also the telework coordinator and the Sexual Harassment/Assault Response and Prevention (SHARP) program point of contact and victim advocate for her organization. Like many other OAPs, interacting with the workforce is just one of her many duties. She is grateful to workforce members for their patience while waiting on answers to their questions, especially now with the implementation of the Back-to-Basics certification framework in full swing.

"We don't always have the depth or breadth of knowledge that a DACM [acquisition career manager] might have, or a DACM program [point of contact] might have," Patrick-Dollberg said. "But we're here for them to help with" training, applications to programs, or anything else workforce members might need. And it's important that workforce members know who their OAPs are, she added. Members can find a list of OAPs on the CAC-enabled site, MilSuite, at https://www.milsuite.mil/book/docs/DOC-640236.

The acquisition workforce stakeholder network is a group of selected professionals who advocate for and assist Army Acquisition Workforce (AAW) members in planning and developing their careers.

EXTENDED HELP

Acquisition career managers work hand-in-hand with OAPs to give workforce members the answers they need to succeed, Gibbons said. The career managers work within the United States Army Acquisition Support Center's DACM Office, assisting AAW members with their Defense Acquisition Workforce Improvement Act (DAWIA) certifications, acquisition career record briefs, individual development plans, questions regarding training and education program applications—anything that is acquisition career affiliated, she explained.

For example, "when a workforce member is trying to apply for their DAWIA certification within the [Certification Management System] module in the CAPPMIS database, they may have some sort of complications or challenges where they don't receive a green check for all of the criteria that [are] needed for certification," Gibbons said. If that is the case, the workforce member could submit an inquiry through the help desk, and the acquisition career manager would walk the employee through the process to correct it.

For questions about DACM Office leader development programs, the acquisition career manager coordinates with that program manager and relays the information to the OAP or employee, Gibbons explained.

Of course, with Back-to-Basics in play, things are going to work a little differently. While the acquisition career managers' roles will remain mostly the same, the OAPs will have to do some adjusting.

"It's an exciting time for the acquisition community because it's revamping itself with Back-to-Basics," Marshall said. The OAPs' roles are changing because some of the requirements they would help workforce members with are going away. Now, "it's about educating our workforce" on what the Back-to-Basics certification framework is and what it looks like across the infrastructure of the acquisition community, she said.

She believes the OAPs are the unsung heroes of the transition into this new framework. "Everybody is being impacted by this, and so it's adjusting the culture and trying to educate the workforce, supervisors included, on what it means," she said. "That's a round-the-clock effort."

CONCLUSION

Supervisors, OAPs, acquisition career managers and the rest of the stakeholder network can answer a boatload of questions and help workforce members navigate the treacherous waters of career planning and development. But it is critical for employees to remember that each individual is in charge of their own career.

"Hold yourself accountable," Gibbons said. "Take responsibility. You are your best acquisition career manager. You're in the driver's seat. No one can navigate your career better than you—you can ask for guidance from mentors and senior leaders, but ultimately, you are in control of your career."

For more information on the acquisition workforce stakeholder network, go to ***https://go.usa.gov/xteW4****.*

JACQUELINE M. HAMES is an editor with Army AL&T magazine. She holds a B.A. in creative writing from Christopher Newport University. She has more than 10 years of experience writing and editing news and feature articles for publication.

ROUGH SEAS

The stakeholder network can answer a boatload of questions and help workforce members as they navigate the sometimes treacherous waters of career planning and development.

THEN & NOW
1962 - 2022

WOMEN MAKING A DIFFERENCE

The roles of women in the Army have evolved considerably, and past contributions have paved the way for the future.

by Cheryl Marino

Once upon a time, women wanting to join the Army, serve their country or simply make a difference were faced with a barrage of challenges. Restricted from combat and not considered for many high-ranking roles, women found themselves weighing their options and pursuing alternate professions that might eventually lead to their desired career. Today, they face far fewer limitations and a lot more opportunities. But the transformation didn't happen overnight.

During the Civil War, women were limited in what they were allowed to contribute to the cause. While some women aided Soldiers by cooking or sewing uniforms, others wanted to play a more active role, to break through stereotypical confines and get closer to the front lines. Dr. Mary Edwards Walker, an accredited teacher and doctor—highly unusual for the time—served as an unpaid surgical volunteer until her request to serve as a surgeon was finally accepted years later. She became the first and only woman to ever receive the Medal of Honor.

By the mid-1900s, women gained more momentum in the workforce. Those who once fought to be recognized as Army surgeons were now applying their knowledge and field experience toward innovation and research and development. Dr. Janice A. Mendelson, who was known for her scientific research and a technical paper on experimental wound treatment, was featured in the Dec. 1962–Jan. 1963 issue of Army Research and Development, the predecessor publication of this magazine. She was the "only woman assigned as a U.S. Army surgeon," and the article noted her promotion to lieutenant colonel.

AN INFLUENTIAL CHAT

Valerie DiVito, Ph.D. speaks with Sen. Richard Durbin (D-IL) during an event held at USAMRDC in 2015. DiVito believes that women have come a long way in the Army, from not being allowed to serve as doctors at all, to now holding positions of influence and power. (Photo courtesy of DEVCOM)

Mendelson believed that "the military surgeon has a real opportunity to combine practical knowledge with research," which she did through her experience in the field and study of wound treatments to protect burns from infection. She was the first female Army surgeon to work in the field during the Vietnam War, earned a bronze star for service to her country, and was presented with the Outstanding Achievement Award at the 1962 Army Science Conference "for a commendable contribution to science and the furtherance of the U.S. Army Research and Development program."

Walker, Mendelson and others have paved the way of progress in the last century, expanding the roles that women play in the Army, and reducing their exclusion from traditional military culture. They would become the trailblazers of many firsts for women of all professions in the Army workforce.

LEVELING THE PLAYING FIELD

"I think we have a tremendous amount of opportunities now," said Charneta Samms, U.S. Army Combat Capabilities Development Command's (DEVCOM) first permanent chief technology officer (see related article, "Breaking Barriers", Page 132). "The playing field is now leveling. It's not level, there's still challenges associated with gender differences, of course, but I think it's more open. There are more opportunities and it's just a matter of taking advantage of them."

Samms began her 26-year career with the Army as an engineer working on systems and human performance modeling at DEVCOM's Army Research Laboratory (ARL) before she joined the program management side of the organization. Samms also led ARL's science, technology, engineering and math (STEM) outreach program and educational activities. Her technology background and experience working with budgets, research program development and management enabled her to gain a well-rounded understanding of the Army's strategic vision. And her years of experience as chief of plans and programs at ARL prepared her for the opportunity to help move that effort to the next level of the command.

"Being a woman in a male-dominated environment, it's hard to always make sure your voice is heard, but my personality kind of helps me overcome that," she said. "I tend to be more assertive, but that's something I've learned over the years. Because it's easy to be quiet, it's easier to sit back and not be the bigger boom in the room in order to have your voice heard. So it's important to really think about the importance of what you have to provide, and it's up to you to make sure that you're giving a voice to the situation."

Though women have made a lot of progress over the years, Samms said, the global pandemic has presented some challenges that have set them back a bit since women tend to have to balance family and work more than their male counterparts.

She said she believes that some women prefer having time with their families over pursuing leadership opportunities—a choice, she said, that influences women more than men. But whether it's a conscious choice or a reflection of societal norms and earning potential, she said "That's a challenge we'll have to face. But for women that want to keep moving

LET YOUR VOICE BE HEARD
Charneta Samms, the first permanent chief technology officer for DEVCOM, encourages women to speak up when they have something important to say—be assertive. (Photo courtesy of DEVCOM)

forward and want to take on more leadership opportunities, it's there."

The work that Samms does ensures that Soldiers get a better product—from the kits they wear to the vehicles they ride in to the networks and radios they use for communication—faster, and with enhanced modernization.

"Even as a kid I was always taking stuff apart and putting it back together. I drove my mom crazy, but I just always had an interest in systems," Samms said. When she was in high school preparing for college she found out about industrial engineering and human-factors engineering. "I've always been interested in people and how they work and how they think. So human factors engineering kind of brings human physiology and the way people think into systems design, and that helps to build better systems, so that was a real passion for me."

"I love the idea of being able to do what I love to do, but for the Soldier. The work we're doing impacts our Soldiers and helps with the defense of our nation, and to me that's super important. That's a mission that's worthwhile."

INCLUSIVE FUTURE

Valerie DiVito, Ph.D., civilian deputy director of the military operational medicine research program at U.S. Army Medical Research and Development Command (MRDC), said she believes times have changed significantly since the days when women were limited in their careers and didn't have as many opportunities as they have today.

"I personally feel like we've come a long way. It used to be that we couldn't be doctors or surgeons, we were relegated to less influential positions. History speaks for itself. But today, at least within our community, everyone is very inclusive."

DiVito said that, although at one time there were far fewer women in male-dominated military roles, since she's been in research and development, her office has been heavily on the female side and she doesn't see that as a tipping point where she's in the minority. "I think I owe that to every woman that's come before us and the R&D community," she said.

MRDC's all-inclusive STEM program encourages young women to get involved with this area of study and laboratory research to "build the bench" for the next generation of scientists for limitless possibilities, regardless of gender or race.

"If you show your passion in your work, it doesn't matter your gender—male, female or in between." She said a passion for what inspires you is the best guide for determining the right fit career-wise.

DiVito said that it was a lifelong fascination with logic and problem-solving that inspired her Army career—from senior scientist and physiological health program area manager for the U.S. Army Medical Research and Materiel Command, to director of the environmental health program at the U.S. Army Center for Environmental Research, to her current role as deputy director at MRDC.

"Math and science have always come naturally to me, and you gravitate toward the things you're good at and things that you like. I think if you find a combination of both of those that's a win for anybody," she said. "I always loved problem-solving and logic puzzles, and when tied together with research and solving problems in the laboratory—it's all about discovery, and I've always been drawn to this."

DiVito's role at MRDC is all about discovery and making a difference for the Soldier. She said Soldiers enter operational environments that are filled with mental and physical stressors as they prepare for battle and training. She and her team work along with advanced development partners to assess the needs of Soldiers and to gather and build upon basic applied research to better prepare them for combat.

"It's about that 'aha!' moment when you can see how a body of research translates into something that can be implemented into the Soldiers' lifestyle," she said. "You don't have that every day, but being able to see those times when it does happen, really drives me forward."

CONCLUSION

DiVito and Samms don't discount that gender disparities in the Army workforce

A PLACE IN THE LAB

Jeanean Ghering and Chris Jensen demonstrate a "sham" aerosol of SARS-CoV-2 in a Biosafety Level 3 laboratory at the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID). The women of the Army's past fought hard for the women of the future to be in surgical theaters and laboratories. (Photo by Ondraya Frick, USAMRIID)

RISING INFLUENCE

Women's roles have become more influential over the past decade, DiVito said. Here, investigator Dr. Keersten Ricks programs software to scan a lateral flow test to determine whether a sample is positive or negative for COVID-19 antibodies at the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID). (Photo by John W. Braun Jr., USAMRIID)

"The playing field is now leveling. It's not level, there's still challenges associated with gender differences."

still exist today, but both agree that it's less prevalent than it was years ago and the strides that women have made in the last century have been significant.

"I feel really fortunate to have never experienced discrimination or exclusion based on my gender identity," DiVito said. "It's obvious that women have had to overcome many obstacles for me to be able to say that and for our daughters to understand that. Within the DOD R&D community, women's roles have become more influential in the past decade and we're all reaping the benefits of being a more inclusive team, committed to the mission regardless of gender."

For more information, go to ***https://www.army.mil/devcom*** *and* ***https://mrdc.amedd.army.mil/****.*

CHERYL MARINO provides contract support to the U.S. Army Acquisition Support Center at Fort Belvoir, Virginia, as a writer and editor for Network Runners, Inc. and Army AL&T magazine. She holds a B.A. in communications from Seton Hall University, and has more than 20 years of writing and editing experience in both the government and commercial sectors. In addition to corporate communications, she is a feature writer and photojournalist for a biannual New Jersey travel magazine.

BREAKING BARRIERS

Creating a more diverse workforce, one person at a time.

by Argie Sarantinos

Being the first person to occupy a newly created position may intimidate some people, but not Charneta Samms. Samms recently became the first permanent chief technology officer (CTO) at the U.S. Army Combat Capabilities Development Command (DEVCOM), which is the Army's largest technology developer. As CTO, Samms is responsible for strengthening the integration of DEVCOM's multibillion dollar research and technology mission.

"It's an exciting mission, and I encourage women to not shy away from the fact that it is a male-dominated environment because the only way it will change is if more women join us. We're breaking down barriers and bringing a perspective that is unique," Samms said. "If you think about diversity of thought and women working on modernization from their perspective and experience, you're going to get a whole new generation of amazing ideas and technologies that we can develop."

Samms began her government career in engineering at DEVCOM's Army Research Laboratory (ARL) 26 years ago. ARL is one of DEVCOM's eight reporting units. During her tenure there, Samms designed and evaluated military equipment and systems.

Her most recent role at ARL, which was chief of plans and programs, included planning, programming, reprogramming, budgeting, execution and documentation of ARL's research program. Samms also led ARL's science, technology, engineering and math (STEM) outreach program and educational activities.

Samms shares her love of science and technology with students, particularly women, by encouraging them to study and pursue careers in STEM. Science and math were Samms's favorite subjects in school, and engineering was at the top of her list as a college major. She chose industrial engineering when she learned that it involves people and systems and how they work together.

"I like the idea of having to understand the technical side of systems and also understand people. To me, understanding people and understanding systems and marrying those two together seemed like a perfect fit, which is why I chose industrial engineering, specifically human factors engineering in college," Samms said.

Samms, and those like her who love math and science, represent the STEM talent the U.S. Army needs to acquire if it is to meet its modernization priorities. Hiring top STEM talent, as well as building a more diverse workforce, is a key part of DEVCOM's Future of Work Concept, which the command is spearheading for Army Futures Command (AFC). DEVCOM is a major subordinate command of AFC.

DEVCOM recently moved into phase two of its Future of Work model. The model includes hiring people from different

PURSUIT OF STEM
Charneta Samms encourages female students to study STEM sciences. (Photo courtesy of DEVCOM)

geographic locations, backgrounds and educational experiences to create a more diverse culture. The Future of Work Concept also serves as part of the natural progression of DEVCOM's competency-based talent management strategy, which includes a shift from reactively filling vacancies, to proactively building the talent needed to execute the mission now and in the future. It also enables the command to be more competitive in the global race for top STEM talent.

Samms is a strong advocate for mentoring and sponsoring peers, a key component to proactively building the workforce. She notes that there is a distinct difference between a mentor and a sponsor—a mentor knows strengths and weaknesses, whereas a sponsor only knows strengths.

"A mentor will discuss your challenges and problems, and they will know the kinks in your armor, whereas a sponsor will know what you are capable of and be your advocate," Samms said. "I love to share this, especially with women early in their careers, to make sure they understand the difference. We need people to advocate for us, so we need to build that network."

Samms believes the key to success is finding a career that you are passionate about, then developing a plan to achieve your goals, while still maintaining authenticity.

She discovered the concept of authenticity when she attended the Aberdeen Proving Ground (APG), Maryland, Senior Leadership Cohort. Established in 2009, the cohort is for GS-14 to GS-15 or equivalent employees to develop higher levels of leadership skills and knowledge. The cohort program begins each year in April and ends in February of the following year, and includes 26 sessions that are three-to-four days long with one-on-one executive coaching for each participant and team coaching for a community-based project.

"I learned about being your authentic self when I attended the APG leadership cohort. Whenever I am struggling, I stop and ask myself, 'Am I being my authentic self in this moment?' If I'm not, then that is probably why I am struggling," Samms said. "If I am being the best version of myself, then there isn't anything I can't accomplish."

Samms was recently installed as a Fellow Emeritus in the ARL Fellows, an honorary organization that consists of a select group of ARL's most prominent current and former leaders who serve as senior advisors and leaders for the organization.

She is also a lifetime member of the National Society of Black Engineers, where she has served in various leadership roles. Samms has won numerous awards and was featured in the US Black Engineer & Information Technology magazine winter 2011 feature, 'Spotlight on Historically Black Colleges and Universities' Distinguished Alumni.

When Samms is not working, she may be perfecting her shooting skills at a firing range. She is a certified firearms instructor who teaches the principles of safe firearm ownership and marksmanship, and she competes in multigun competitions, in which competitors use varieties of two or three weapons.

"I've always had an interest in firearms, especially with my role at ARL working with Soldiers and understanding the systems they use. Many times I am the only woman at the range or in a training class. It is such a fun, empowering activity that could potentially save your life. Why aren't there more women engaged?" Samms said.

To change that landscape, Samms plans to continue teaching women how to use firearms safely and effectively as a means to gain more self-confidence. At the same time, she is changing the landscape at DEVCOM in her new role as CTO.

"I am hoping we can shape and grow a more diverse command leadership. There won't be a ton of us to start, but there will never be a ton of us if we don't work together to move forward," Samms said.

ARGIE SARANTINOS is a public affairs specialist for Patricio Enterprises providing contract support to DEVCOM. She holds an M.S. in professional writing and a B.A. in mass communications from Towson University. She has 17 years of public affairs experience supporting DOD. A frequent contributor to Army AL&T, her most recent article "Quick Pivot" appeared in the Winter 2021 issue.

ON THE MOVE

ASSISTANT SECRETARY OF THE ARMY FOR ACQUISITION, LOGISTICS AND TECHNOLOGY

1: BUSH CONFIRMED AS ASA(ALT)

The **Hon. Douglas R. Bush** was sworn in on Feb. 11 as the assistant secretary of the Army for acquisition, logistics and technology (ASA(ALT)) following his confirmation by the U.S. Senate.

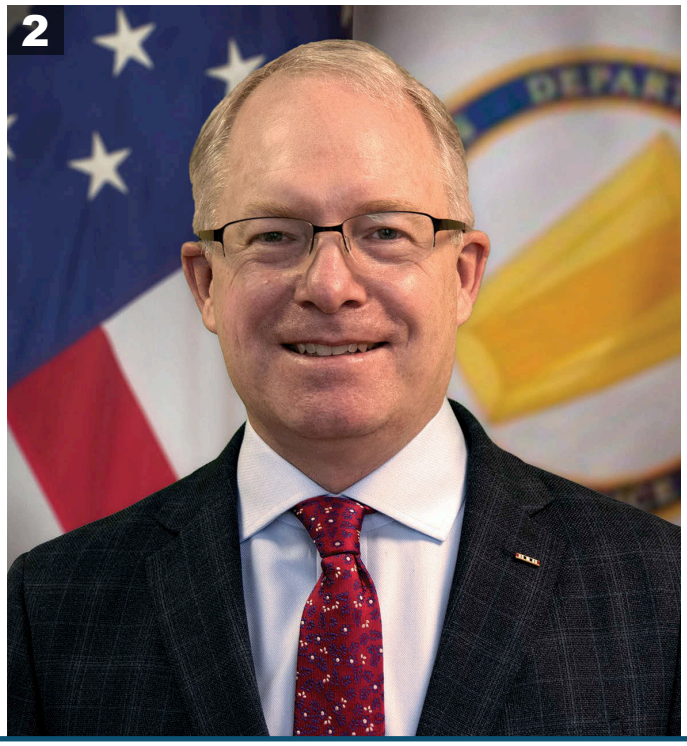
As ASA(ALT), Bush will lead the Army acquisition enterprise and will advise the secretary of the Army on all matters related to acquisition programs and policies. He also serves as the Army acquisition executive, the senior procurement executive, the science advisor to the secretary of the Army, and the Army's senior research and development official. Additionally, he appoints, manages and evaluates program executive officers and direct-reporting program managers, and is responsible for managing more than 30,000 professionals within the Army Acquisition Corps and the Army Acquisition Workforce.

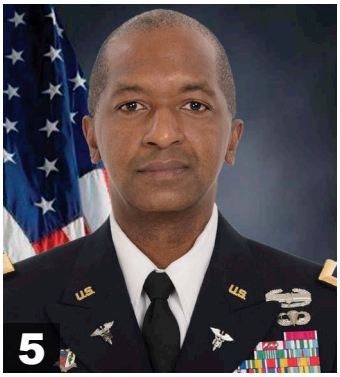
In March, Bush was appointed as the principal deputy ASA(ALT) and, in that capacity, was designated as the acting ASA(ALT) until his nomination in September 2021.

U.S. ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND

2: NEW DEPUTY TO CG AT USAMRDC

The U.S. Army Medical Research and Development Command (USAMRDC) at Fort Detrick, Maryland, welcomes **Joseph Holland** as the new deputy to the commanding general. Holland served more than 30 years in the Army, retiring from his role as deputy chief of staff at Army Futures Command (AFC) in 2021. While at AFC, Holland specialized in operational efforts and financial matters, among many others. Notably, Holland will serve as USAMRDC's first-ever deputy to the commanding general, and will be charged with aiding command leadership to execute mission-related goals on a number of fronts.





JOINT PROGRAM EXECUTIVE OFFICE FOR CHEMICAL, BIOLOGICAL, RADIOLOGICAL AND NUCLEAR DEFENSE

1: JPEO DEPARTS FOR HHS ROLE

The Joint Program Executive Officer for Chemical, Biological, Radiological and Nuclear Defense (JPEO-CBRND), **Jason Roos, Ph.D.**, relinquished his role as JPEO to serve as the chief operating officer at the U.S. Department of Health and Human Services (HHS) Coordination Operations and Response Element (H-CORE), where he will oversee the transition of the Countermeasures Acceleration Group (formerly Operation Warp Speed) to HHS. **Darryl Colvin**, who is currently the deputy PEO for Missiles and Space, took over as the acting JPEO, effective Nov. 29.

2: CHANGE OF CHARTER AT JPM CBRN PROTECTION

Then-JPEO-CBRND, **Jason Roos, Ph.D.**, hosted a ceremony in Stafford, Virginia, on Aug. 30, during which **Deborah C. Olson** assumed the charter of the Joint Project Manager for Chemical, Biological, Radiological and Nuclear Protection (JPM CBRN Protection). Olson is the former program manager for Engineer Systems, Marine Corps Systems Command, and is a certified Level III program manager with more than 18 years' experience in acquisition. (Photo by Dorothy McDowney, JPM CBRN Protection)

3: PROMOTION AT JPM CBRN MEDICAL

Col. Kara Schmid, right, Joint Product Manager for Chemical Defense Pharmaceuticals, was promoted during a ceremony hosted by **Col. Ryan Eckmeier**, the Joint Project Manager for Chemical, Biological, Radiological and Nuclear Medical (JPM CBRN Medical), Dec. 16 at Fort Detrick, Maryland. Schmid previously served as the Traumatic Brain Injury Product Manager for the Neurotrauma and Psychological Health Project Management Office at the U.S. Army Medical Materiel Development Activity. Currently, Schmid is responsible for providing research, development, acquisition management and joint service integration for U.S. Food and Drug Administration-approved medical countermeasures against chemical, radiological and nuclear threats. (Photo by Lisa Calloway, JPM CBRN Medical)

4: CBRN INTEGRATION WELCOMES NEW LEAD

Paul Gietka assumed the charter of the Joint Product Lead for Chemical, Biological, Radiological and Nuclear (CBRN) Integration on Dec. 1. In this role, he delivers integrated, layered CBRN defense across combined and joint all-domain operations for JPEO-CBRND. Gietka most recently served as the director for CBRN integration in the headquarters of the JPEO-CBRND

5: CHANGE OF CHARTER AT CBRN SENSORS

Col. Robert Carter III, incoming joint product manager CBRN Sensors, accepted responsibility from **Christopher Seacord** during a change of charter ceremony held Sept. 23 at Aberdeen Proving Ground, Maryland. Carter most recently served as the Medical Research and Development Command liaison officer and acquisition advisor to Army Futures Command headquarters in Austin, Texas.

6: RETIREMENT CAPS 30-YEAR CAREER

After 30 years of service to the U.S. Army, **Col. Tim Klenske** retired from active duty at a ceremony held on Dec. 3 at Aberdeen Proving Ground, Maryland. Klenske held several leadership roles at JPEO-CBRND and most recently served as the program manager for therapeutics and antivirals at the former Operation Warp Speed.

ARMY OFFICER ANNOUNCEMENT

Army Chief of Staff Gen. James C. McConville announced the following officer promotion:

Brig. Gen. Stephanie R. Ahern currently serving as director of Concepts, Futures and Concepts Center, United States Army Futures Command, Austin, Texas.

PROGRAM EXECUTIVE OFFICE FOR AVIATION

1: CHANGE OF RESPONSIBILITY AT PEO AVIATION

The Program Executive Officer (PEO) for Aviation **Brig. Gen. Rob Barrie**, right, passes the noncommissioned officer sword to **Sgt. Maj. Carlos Loeza** during a change of responsibility ceremony, Jan. 27, at Redstone Arsenal, Alabama. The outgoing sergeant major, **Roy "Woody" Sullivan**, center, relinquished responsibility after becoming the first-ever PEO Aviation sergeant major in June 2018. Sullivan retired with 38 years of service in a separate ceremony following the change of responsibility. Loeza comes to PEO Aviation from Fort Hood, Texas, where he previously served as the command sergeant major for the 1st Air Cavalry Brigade. (Photo by Paul Stevenson, PEO Aviation)

2: FARA WELCOMES NEW PM

Col. Greg Fortier, right, passes the Future Attack Reconnaissance Aircraft (FARA) colors to **Brig. Gen. Rob Barrie**, the PEO for Aviation, during a change of charter ceremony held Dec. 2 at Redstone Arsenal. Fortier, who became the first FARA project manager in 2019, relinquished responsibility as the project manager to **Col. Kevin Chaney**, left, who previously served as the project manager for Aircraft Survivability Equipment. (Photo by Paul Stevenson, PEO Aviation)

PROGRAM EXECUTIVE OFFICE FOR MISSILES AND SPACE

3: APEO HONORED WITH GERMAN AWARD

Thomas N. Doss, assistant program executive officer (APEO) for APEO International, was recently presented with "The Cross of Honor of the Bundeswehr in Silver" award, by the Federal Republic of Germany, for his exceptional work during development of the Tactical Air Defense System. The prestigious award, signed by former Federal Minister of Defense **Annegret Kramp-Karrenbauer** (not pictured) recognized Doss's work to strengthen cooperation between the U.S. and Germany, to the benefit of both countries. Doss served as chief negotiator for the U.S. government, and became a guarantor of successful and constructive talks. (Photo courtesy of PEO Missiles and Space)

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"It is a privilege for me to lead the Army acquisition, logistics and technology team in the early years of what promises to be the most significant equipment modernization effort the U.S. Army has undertaken in the last four decades."

—The Hon. Douglas R. Bush
Army Acquisition Executive and
Assistant Secretary of the Army for Acquisition,
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