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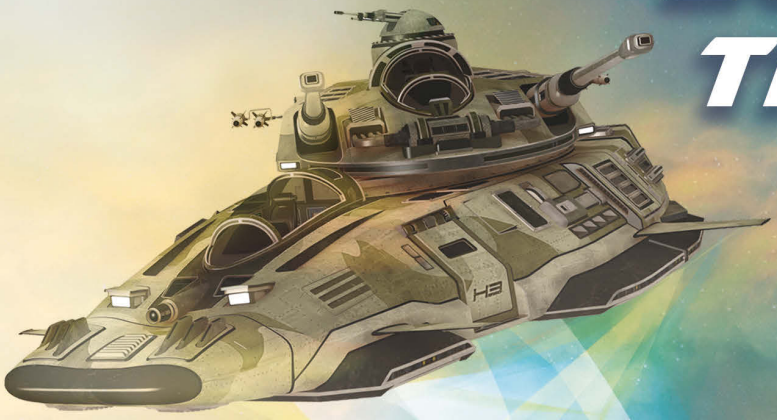
SUPPORTING THE FUTURE FORCE



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ARMY AL&T

FALL 2019

FROM THE AAE

SUPPORTING THE FUTURE FORCE

ON THE COVER

The Army Acquisition Workforce works every day to support the future force. From something as esoteric as a robotic patrol dog or a plasma pulse rifle, to something already nearing the prototype stage such as hypersonic, laser and microwave weapons, the future is in our sights.

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ARMY AL&T

FALL 2019

FEATURE ARTICLES

COMMENTARY

WORKFORCE

From the Editor-in-Chief

"The future cannot be predicted, but futures can be invented."

—Dennis Gabor, Nobel Prize-winning physicist

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In the not-too-distant future, a Soldier at the U.S. Arctic outpost Thunder waits outside in the frigid night—the barren, featureless terrain provides no shelter from the whipping winds. Seven-year Army veteran Sgt. Jonah Cross and his robotic K-9, Zeus, eagerly await the monthly resupply drone. They are in dire need of supplies, not having seen a resupply drone in weeks. Cross bounds up to the pod of food and materials the drone just delivered.

"All right, Zeus, let's see what headquarters thinks I need this time," Cross says to the unblinking video cameras that are Zeus' eyes, and then waves a glove over the locked box to release the latch. "Just what I needed," he says, pleasantly surprised as he rummages through the crate. "Nanogalvanic aluminum-alloy fuel cells for the new plasma rifles. Awesome. The hovercraft parts catalog drive and filament cartridges for the 3D printer—pretty soon we'll be airborne, buddy," Cross says hopefully. "Hey, Zeus, there's a sensor upgrade for your quantum processor so you can see through buildings—that will be helpful on patrol; and some nanotech frostbite repair kits, just in case we have another polar vortex on the border recon. Not that you have to worry about that." He gets to the bottom without finding what he really wanted. "I knew it, I just knew it. No fresh food, just replicate Z rations. Just once, I wish they'd actually send fresh fruit," Cross laments. "Is that too much to ask in the Arctic? Well, time to stow this gear and get ready for patrol. Come on, Zeus."

The journey that Sgt. Cross and Zeus are undertaking from this isolated outpost is an excursion into the unknown with the latest equipment and technology available. However, they're not alone. Behind them is a legion of acquisition workforce professionals who, years before, envisioned what the future might be and designed the equipment required to not only survive, but win, on any battlefield wherever and whenever it might be.

In fact, the yet-to-be-born Cross and Zeus are beneficiaries of what the Army Acquisition Workforce is working on today, every day—the future. Whether it's a robotic patrol dog, a plasma pulse rifle or Z rations, the future is what we make it in many ways. So, in line with the theme for this issue, Army acquisition is always "supporting the future force," because we are literally making it.

If you want to know how the future is made, and what it takes to make it, read Army Acquisition Executive Dr. Bruce D. Jette's article, "Modernization Through Unity of Effort," on Page 4. It lays out how a vision of the future comes into focus by explaining how U.S. Army Futures Command, the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology and U.S. Army Materiel Command work together to modernize and support multidomain operations.

And if Lt. Gen. L. Neil Thurgood and his team at the Rapid Capabilities and Critical Technologies Office have their way, the future may be sooner than you think. Learn how the Army is pushing to have hypersonic and microwave weapon and high-energy laser prototypes move from the laboratory to the field quickly in the article "Hypersonics by 2023," Page 108. Finally, since China has about 90 percent of rare-earth materials locked up (such as gadolinium, samarium and promethium, which are used in everything from magnets to nuclear batteries), see what we and our allies are working on to source new materials that can deliver the same or better results for the future in "An Elemental Issue," Page 88.

But wait, there's more! The journey to the future is never over … it continues online. See expanded coverage of these and other topics with our online magazine and digital platforms at **asc.army.mil**. Comments, ideas or concerns? Drop us a note at **ArmyAL&T@gmail.com**. We look forward to hearing from you.

Nelson McCouch III
Editor-in-Chief

CONCEPTS IN ACTION

Soldiers of 2nd Stryker Brigade Combat Team, 2nd Infantry Division take cover while assaulting an objective during Joint Warfighting Assessment 19 at Yakima Training Center, Washington, in May. Through assessments such as this one, the Army evaluates concepts, capabilities and formations of multidomain operations to provide insights and feedback on Army modernization efforts supporting the future force. (U.S. Army photo by Sgt. Gustavo Olgiati, Joint Modernization Command)

MODERNIZATION THROUGH UNITY OF EFFORT

The future force modernization enterprise has a vision to streamline acquisition and a way to get there.

Getting the right equipment and systems to Soldiers at the right time is not only essential to supporting our force today, but will also be essential in supporting the future force. The Army must prepare for the future while we continue to build readiness. How we manage system life cycles and integrate the design, production and sustainment processes into those life cycles will drive the Army's ability to modernize its capabilities and support multidomain operations.

The future force modernization enterprise is a concept created to change the Army's approach to modernization and better employ our resources. It comprises the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)), the U.S. Army Futures Command (AFC) and the U.S. Army Materiel Command (AMC); it also extends to several other organizations, including major Army commands, such as the U.S. Army Training and Doctrine Command, and across the Army, DOD and the joint community. In our modernization efforts, we also rely on external partners in industry and academia, and, finally, our allies and partners.

This enterprise concept describes the Army's expertise, organizations and infrastructure for rapidly and effectively developing and delivering the future force—the key is synchronization through inclusivity. Each of the organizations is focused on a particular portion of modernization, enabling them collectively to concentrate resources and expertise on every aspect of modernization through a synchronized effort. The concept reduces redundancy and makes use of a key imperative—unity of effort—to help ensure close collaboration.

This unity of effort means multiple organizations are working together in distinct but complementary ways toward the same objective. This drives early teaming among requirements development, research and development, test and evaluation, and the acquisition community to support rapid innovation through Soldier touch points, demonstrations,

prototyping, experimentation and analysis. This process will enable faster requirements validation and easier technology transition through the "valley of death," to support seamless progression into the acquisition life cycle. ("Valley of death" refers to the notorious difficulty of turning a promising technology into a fielded program.)

Here's how it works:

- AFC brings together modernization organizations previously scattered across the Army. It creates concepts for how Army forces will fight in the future and experiments to inform requirements that drive the acquisition process.
- ASA(ALT) acquires and fields materiel solutions that are sufficiently mature and of the most value to Soldiers at the speed of relevance.
- AMC will take those materiel solutions through the sustainment and divestiture processes.

MODERNIZATION ENTERPRISE

AFC is driving support for critical capabilities that need to be developed to ensure overmatch on the future battlefield through concept development, experimentation, modeling and simulation, organizational design, requirements determination and materiel solution validation. At the same time, ASA(ALT) continues its role of oversight, resource management, policy and, particularly with respect to the acquisition function, control of the broader materiel development and sustainment processes.

ASA(ALT) takes the concept and requirements from AFC and carries them through the engineering and manufacturing development, design and building, and developmental testing processes. Then, we move these materiel solutions

TECH TAKES FLIGHT

Pvt. Kesley Darnell with 3rd Brigade Combat Team, 82nd Airborne Division releases the Army's first personal unmanned aerial system fielded to Soldiers at Fort Bragg, North Carolina, in May. The new air vehicle, part of PEO Soldier's Soldier Borne Sensor program, supports preplanned and on-the-fly reconnaissance missions of the future force. (U.S. Army photo by Patrick Ferraris, PEO Soldier)

TEST BED

Soldiers use the Future Open Rotorcraft Cockpit Environment, or FORCE, simulator during a demo day in Huntsville, Alabama, in February. FORCE is a reconfigurable, extensible and portable platform that makes it possible to evaluate innovative technologies on a schedule of rapid integration. (Photo by Joseph Mendiola, U.S. Army Combat Capabilities Development Command (CCDC) – Aviation & Missile Center)

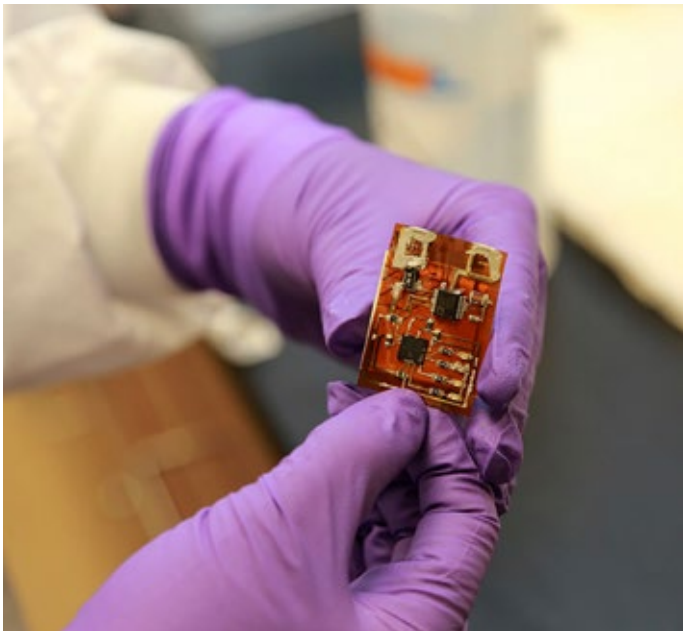
This unity of effort means multiple organizations are working together in distinct but complementary ways toward the same objective.

into production prototyping, operational testing and fielding equipment.

The establishment of AFC affords an opportunity to create a more collaborative working environment between its cross-functional teams and ASA(ALT)'s program executive offices (PEOs) to bring system concepts and designs to life. Each of the eight cross-functional teams has a primary PEO on the team, and each of the more than 30 signature systems within the cross-functional teams has a program manager representing the PEO on the team as well. This close working relationship between the cross-functional teams and the PEOs is extremely valuable: AFC and the cross-functional teams participate in deliberation over acquisition strategies, while the acquisition community contributes to the operational requirements development process—and everyone retains their own responsibilities. This kind of collaboration is at the heart of the enterprise and is critical to its success.

To effectively modernize the Army over the next decade and a half, the enterprise needs to develop future concepts that drive our materiel requirements, with a supporting architecture that ensures interoperability. We must realize information transparency that enables data-driven decisions by Army leadership and achieves an enterprise that is able to move and flex at the speed of advancing technology. In other words, the Army needs intelligence-driven requirements, concept-driven requirements, a system-architecture approach and integration of all of those things. Part of how we support that will be with the acquisition data domain.

In my last Army AL&T column, "The Zen of Data," I discussed managing data holistically to enable better decision-making, which is how the domain will be employed within the enterprise concept. The Army needs to be able to visualize its data, and I have to ensure that data is authoritative and accurate before allowing other parts of the modernization enterprise to make decisions on how to use it. The domain will help achieve a unified data environment for "vision, decision and precision," from requirements development to divestiture.



POTENTIAL GAME-CHANGER
Self-indicating colorimetric response materials, embedded into objects such as this microchip, can instantly alert warfighters to contaminated items. The early teaming that is possible through the future force modernization enterprise supports faster requirements validation and easier technology transition through the valley of death into the acquisition life cycle. (Photo by Shawn Nesaw, CCDC – Chemical Biological Center)

CONCLUSION

The Army has reorganized our entire modernization enterprise for greater speed, efficiency and effectiveness. This includes improving the way we do business. We are beginning to see the intended benefits of our efforts—unchanging priorities; less bureaucracy; sufficient investment; and greater access to innovation—to make us better stewards for the warfighter and the taxpayer.

I am proud that the ASA(ALT) organization has moved out quickly to enable initiatives designed to meet the Army's modernization priorities. Most importantly, we need to reduce the acquisition timeline to ensure that Soldiers have the weapons, equipment and tools they need, when they need them to deploy, fight and win future conflicts.


AUSA
Tusk

A *DIFFERENT KIND* of COMPETITION

The Army's xTechSearch competition creates an innovation pipeline to the small business ecosystem to enable next-generation technologies from nontraditional suppliers.

by Dr. Matt Willis

"The Army needs that private-sector innovation. We need to adapt and accept commercial technologies in a greater fashion."

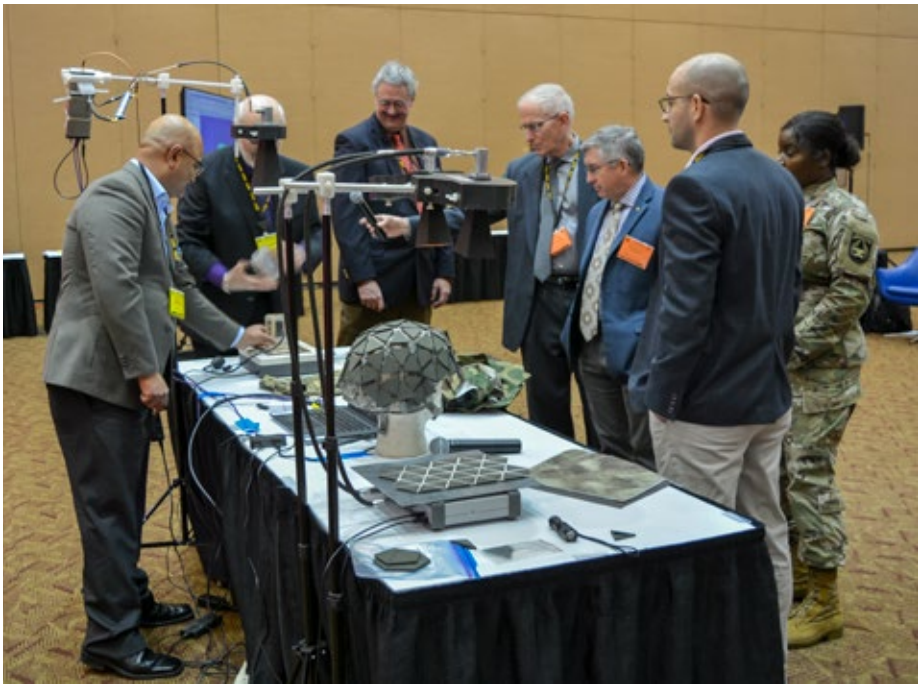
—Dr. Bruce D. Jette, assistant secretary of the Army for acquisition, logistics and technology

HIGH-LEVEL BRIEF

Dr. Steven Venticinque, center, co-founder and chief medical officer of Olifant Medical, explains his company's airway management technology to Maj. Gen. Cedric T. Wins, left, commanding general of the U.S. Army Combat Capabilities Development Command (CCDC), and Dr. Philip Perconti, director of the CCDC – Army Research Laboratory (ARL), at the Innovator's Corner during the AUSA 2019 Global Force Symposium and Exposition in March. (Photos by Patricia Riippa, Booz Allen Hamilton, supporting CCDC – ARL)

In the little more than a year and a half since its inception, the Army Expeditionary Technology Search (xTechSearch) competition has attracted a wide variety of technologies from nontraditional defense contractors that may never have come to the Army's attention without it. One such technology was first-round winner Adranos Inc.'s rocket fuel: It has the potential to increase a rocket's range by 40 percent (See related article, "Winning Is Just the Start," on Page 15), which fits perfectly with the Army's No. 1 modernization priority of improving long-range precision fires.

Kicked off in June 2018, each iteration of the prize competition has four phases. Each phase results in successful competitors receiving increasing monetary awards for advanced technology achievements relevant to the Army. The top prize was $200,000 for xTechSearch 1.0. The Association of the United States Army's (AUSA) 2019 Annual Meeting and Exposition will feature the grand prize winner of xTechSearch 2.0, who will



HOW IT WORKS

The Tangi-Tek LLC team demonstrates its technology—carbon fiber composite materials that can improve antenna performance and reduce electromagnetic interference—to xTechSearch judges. From left are Tangi-Tek's Adithya S. Ramachandran, co-founder and product development engineer; Kent G.R. Thompson, co-founder and principal engineer; and Dr. Robert L. Doneker, co-founder and president; and xTechSearch judges John Kincaid, U.S. Army Futures Command – Futures and Concepts Center; Dr. Augustus Fountain III, CCDC – Chemical Biological Center; Dr. Bryan Glaz, CCDC – ARL; and Maj. Katrina Patton, U.S. Army Futures Command – Futures and Concepts Center.

receive $250,000, and the 12 semifinalists for xTechSearch 3.0, who will each receive $120,000.

Over the last year, xTechSearch has evaluated more than 500 potential technologies and awarded $4.1 million in total prizes to 102 small businesses. The competition has proven to be a viable mechanism to rapidly screen and assess technologies; a traditional request-for-proposal process may take six to nine months to evaluate just a handful of contractors.

The modest prizes awarded to competitors in the first two phases are not only incentives to spur innovation, but they also function as working capital to help the companies—who are usually not particularly well-funded—take part in subsequent phases. The decision to make the search into a prize competition was meant to help lower the bar to participation and take contracting out of the picture. The Phase III awards are meant to provide funding to help the participants continue developing their technology and offset travel costs for the proof-of-concept demonstrations. The grand prize is meant to help them further continue the development of their technology.

While the prizes are small by DOD standards, for many contestants they are much-needed injections of funding. But when the competition is over, a frequent concern is, "What next?" Without a deal for their technology, what do competitors do to continue development? The answer just may be a program enacted in the 1980s to encourage domestic small businesses to engage in federal research and development: the Small Business Innovation Research (SBIR) program.

MUCH MORE THAN MONEY

xTechSearch was designed to institutionalize an innovation ecosystem that fosters continued engagement between the Army and small businesses. As part of the xTechSearch program, the competitors receive mentoring on the Army's research and development (R&D) process, its laboratories and technology-transfer and partnership opportunities.

For instance, xTechSearch invites representatives from the Army's Office of Small Business Programs and technology transfer experts from the Army's labs to provide briefings on the various ways industry can partner with the Army, such as through cooperative R&D agreements, commercial test agreements (in which Army labs test private-sector technologies) and the SBIR program.

Participating companies also benefit from public exposure and business development opportunities at the AUSA meeting in October in Washington, which hosts more than 700 exhibitors and 31,000 attendees, and the AUSA Global Force Symposium and Exposition in Huntsville, Alabama, in the spring, which hosts more than 200 exhibitors and 6,800 attendees. At these events, AUSA provides free admission for the xTechSearch competitors and

XTECHSEARCH PHASES

Phase I: 1,000-word white paper.

Phase II: In-person technology pitch.

Phase III: Value proposition pitch.

Phase IV: Proof-of-concept demonstration.

The competition is a platform to create considerable change on a budget of less than $5 million per year with a simple commitment to build trust and collaboration through conversation.

an Innovator's Corner, where companies in Phase III of the competition are given space to exhibit their technology or concept and time to make a formal presentation of their technology and concepts to attendees.

The value of the Innovator's Corner may be equal to the monetary prizes. Presence at AUSA's Innovator's Corner is a major incentive for the selected companies, providing opportunities for business development and networking. These can serve to identify new ways to use and develop their technologies, and to make connections for partnerships and contracts. It provides participants with exposure they would not otherwise have, as the competition gives them bragging rights and credibility.

AUSA also provides space for the proof-of-concept demonstrations, where companies in Phase IV of the competition demonstrate the viability of their technologies. The time that contestant companies are not making presentations or staffing a display table is open for conducting business development with the exposition's exhibiting companies.

OPENING THE DOOR

The key value proposition for the xTechSearch competition is generated by essentially eliminating bureaucratic barriers to collaboration, thus facilitating direct and continuous dialogue with the private sector. The contest also provides extended contact time and transparency among Army scientists, engineers and partnership experts and each company in the competition. During the pitch events with Army leaders, companies often learn how they can pivot existing commercial products to support an Army need.

The xTechSearch competition fundamentally realigns typical acquisition metrics (cost-schedule-performance) with new foundational values, including progressive nonmonetary (e.g., exposure) and monetary awards (e.g., prizes) to create a novel industry incentive to participate. The competition creates a multitude of business development and collaboration opportunities, through knowledge learned about the Army and exposure to defense contractors at each AUSA event, albeit at a much lower dollar value and participation cost than traditional contracts. The use of "prize competition" authority under 15 U.S.C. Section 3719 eliminated the use of contracts and reduced paperwork by requiring only that the winners at each phase of the competition submit an invoice to the

DISRUPTIVE TECHNOLOGY
Dr. Richard Wang, CEO and co-founder of Cuberg Inc., demonstrates disruptive fuel cells for future vertical lift during the xTechSearch proof-of-concept phase at the AUSA 2019 Global Force Symposium and Exposition.

INNOVATOR'S CORNER
Innovator's Corner at the 2019 AUSA Global Force Symposium and Exposition in the Von Braun Center at Huntsville, Alabama.

government for payment, with no requirements attached to their prize monies.

UNDERSTANDING THE COMPETITORS

At the conclusion of xTechSearch 1.0—while 2.0 was still underway—the xTechSearch staff surveyed 163 of the participants from xTechSearch 1.0 and 2.0 who had taken part in at least Phase II (technology pitches) of the competition. One survey question was: "What did your company feel was the most valuable part of xTechSearch?" The answers broke down into four common themes:

- **Exposure.** The competitors welcomed the opportunity to present their technologies to a large audience of potential clients and partners, as well as the opportunity to network and make contacts for collaboration and potential partnerships.
- **Feedback.** The competitors were encouraged by rapid, candid feedback and assessment of their technologies, and suggested steps forward from Army scientists, engineers, program managers and cross-functional teams, along with opportunities to learn what the Army's modernization needs were and how to better work with the Army.
- **Funding.** While the size of the xTechSearch prizes was relatively small, it allowed many of the small companies to continue developing their new technologies.
- **Credibility.** Formal Army recognition of the competitors' innovative technologies provided credibility and prestige, particularly in the DOD and Army business spaces, and made a noticeable difference in business development when talking with potential customers outside of the competition.

Dr. Amit Mehra of NOVI LLC, who participated in xTechSearch 2.0, said that he had "nothing but praise for this effort, as well as broader initiatives within the government to facilitate and simplify interactions with commercial entities outside of the typical R&D and procurement channels."

The competition is a platform to create considerable change on a budget of less than $5 million per year with a simple commitment to build trust and collaboration through conversation. Conversation among the Army and the small companies does not necessarily promulgate immediate business development. In fact, several companies that were not successful in xTechSearch 1.0 modified their technologies and have since applied and advanced to subsequent stages of xTechSearch 2.0 and 3.0. The result was the development of partnerships with Army or other service laboratories to take their technologies in directions they had not anticipated. "Failure" can work to the benefit of both the government and the company.

Companies also noted that the xTechSearch application and presentation process focused their research on competitive technologies and the Army's requirements to better position their products for DOD consideration. Jonathan Friedland, president of Megaray LLC, who participated in xTechSearch 1.0, said, "When I saw the caliber of participants, it is incredible how many breakthrough technologies exist that, if not for xTechSearch, may never land up on the Army's radar." Even the grand prize winner of xTechSearch 1.0, Adranos, was able to develop new uses for its technology. "Prior to xTechSearch, we failed to realize how significant of a role our solid propellant could have on the DOD's hypersonic initiatives," said Chris Stoker, co-founder and CEO. "We now believe that our propellant could be used to increase the range of not only any systems using solid rocket motors but numerous air-breathing systems, such as cruise missiles, as well."

A STEP BEYOND

A common concern among many small business competitors was that, while the competition was helpful in getting their companies in front of interesting audiences and being able to say they were a finalist for the early stages of commercialization and government engagements, the follow-on "what next" step was missing.

Several competitors added that while engagement with industry and the government can be a tough process, just how they would continue innovation and commercialization after xTechSearch was unclear. The biggest challenge to working with the government is the final step of awarding a contract. One competitor, Dr. Leaf Jiang, CEO of NODAR Inc., suggested that xTechSearch "open up follow-on activities, perhaps through SBIR topics."

These comments provided the impetus to take a closer look at other programs, such as the SBIR and Small Business Technology Transfer programs. Such programs may help companies get a contract and decrease the time between technology innovation and fielding to the hands of the warfighter. Companies applying for SBIR funding must show how their technology or concept will provide a solution to a SBIR topic identified by Army laboratories, program executive offices or other organizations.

Previously, the SBIR topics were meant to scope the problems down to specific individual needs. XTechSearch took the opposite approach by broadening its topics to the Army's six modernization priorities, plus medical and engineering needs, to attract innovative ideas that otherwise would have been overlooked. The result was the inclusion of the SBIR research topic, "Expeditionary Technology Search (xTechSearch) Dual-Use Technologies Applicable to Army Modernization Priority Areas," for technology solutions with both commercial and defense applications. (For additional information on the Army 19.2 SBIR proposal submission instructions, go to **https://smallbusiness.ll.mit.edu/sbo/sites/default/files/forms/01_Army_19.2_SBIR.pdf**). Companies were required to articulate how their technologies have an advantage over existing commercial technologies outside defense.

AN EFFECTIVE SUPPLEMENT

The SBIR program targets the same constellation of small, imaginative high-tech U.S. businesses as does xTechSearch. It provides the opportunity to respond to critical Army needs with innovative solutions. The goal of both programs is to widen the innovation aperture by increasing the number of potential companies engaging with the government. The addition of the SBIR topic opened a path for potentially adding up to 30 months of funding and support for the xTechSearch competitors. (Noncompetitors may also apply for SBIR funding under this topic.) The SBIR is a three-phased program that directly funds early-stage R&D by small companies. Eligible projects must fulfill an R&D need identified by DOD and have the potential to be developed into a product or service for commercial or defense markets. The xTechSearch topic was unique in that, rather than defining a prescriptive technology gap, the topic requested novel dual-use technologies that provide a benefit to both the Army and the commercial sector. The phases of the SBIR program are similar to the phases found in xTechSearch:

- Phase I (project feasibility) determines the scientific, technical and commercial merit and feasibility of the ideas submitted. Phase I contracts are typically $56,000 to $167,000 over a period of six months. (Amounts quoted are from the 2019-2 SBIR release.)

- Phase II (project development to prototype) is the major R&D effort, funding the prototyping and demonstration of the most promising Phase I projects. Phase II contracts are up to $1.5 million and usually span 24 months.

- Phase III (commercialization) is the ultimate goal of the SBIR program. Small businesses obtain funding from the private sector or government sources outside the SBIR program to commercialize the Phase II project for sale in the military and private sector markets.

SBIR is a good supplement to xTechSearch because the purpose of both is to help small companies identify, develop and commercialize their new technologies, with the goal of getting contracts with DOD, the organic defense industrial base or the nontraditional defense industrial base. While both progress along similar process lines, xTechSearch and SBIR can create technology development synergy for the nontraditional defense companies.

The competition's easy application and subsequent partnership sessions demystify working with Army laboratories and, through use of the AUSA expositions, provide many avenues to potential collaboration, partnerships and contract opportunities with DOD laboratories and commercial industry. The SBIR program provides the opportunity for significantly greater amounts of funding and time to continue the development of a company's novel technology while following up on the contacts made during the xTechSearch competition.

CONCLUSION

The mantra of the xTechSearch team has continuously been that while winning the xTechSearch grand prize is great, the real victory for xTechSearch competitors is eliminating bureaucratic barriers, gaining a better understanding of the Army and exploring potential contract opportunities.

xTechSearch has been successful in introducing and engaging with companies that previously would not have considered working with the Army. As xTechSearch conducts its third iteration, 21 companies have participated in two iterations and two companies have participated in all three. Four companies—Lumineye Inc., Halomine Inc. (previously named Antimicrobial Materials Inc.), AKHAN Semiconductor Inc. and MELD Manufacturing Corp.—used lessons learned from xTechSearch 1.0, including understanding the spectrum of Army modernization challenges, to advance as xTechSearch 2.0 finalists. Great Lakes Sound & Vibration Inc. partnered with another company to compete again in xTechSearch 3.0. Other participants have leveraged the contacts they made at xTechSearch to partner with Army organizations. For instance, Advanced Hydrogen Technologies Corp., which participated in xTechSearch 1.0 and 2.0, is now partnering with the U.S. Army Combat Capabilities Development Command – Army Research Laboratory to test its advanced armor manufacturing technology.

SIGINT Systems LLC, which has participated in all three xTechSearch iterations, connected with the Program Executive Office for Aviation at the 2019 AUSA Global Force Symposium and is now partnering with that organization to conduct an advanced technology demonstrator, which is scheduled to fly in March 2020. Finally, United Aircraft Technologies Inc. has leveraged contacts from xTechSearch to partner with British Aerospace to use United Aircraft's technology in its aircraft. United Aircraft Technologies is also evaluating licensing opportunities with the U.S. Air Force Research Laboratory.

The Army's victory is that the technology developed through DOD and commercial contracts will eventually find its way back to the warfighter, in either its current or an improved form. Adding an xTechSearch topic to the SBIR program is a good first step by xTechSearch to evolve and provide additional time and funding for companies to continue to develop their technologies while finding DOD and commercial partners to carry their technologies into production.

For more information, go to the xTechSearch website at ***https://www.xtechsearch.army.mil/*** *or the Army SBIR website at* ***https://www.armysbir.army.mil/****.*

DR. MATT WILLIS is director for laboratory management in the Office of the Deputy Assistant Secretary of the Army for Research and Technology. He holds a Ph.D. and an M.S. in chemical engineering from the University of Illinois at Urbana-Champaign and a B.S. in chemical engineering from Cornell University. He is Level II certified in science and technology management and is a member of the Army Acquisition Corps.

WINNING IS JUST THE START

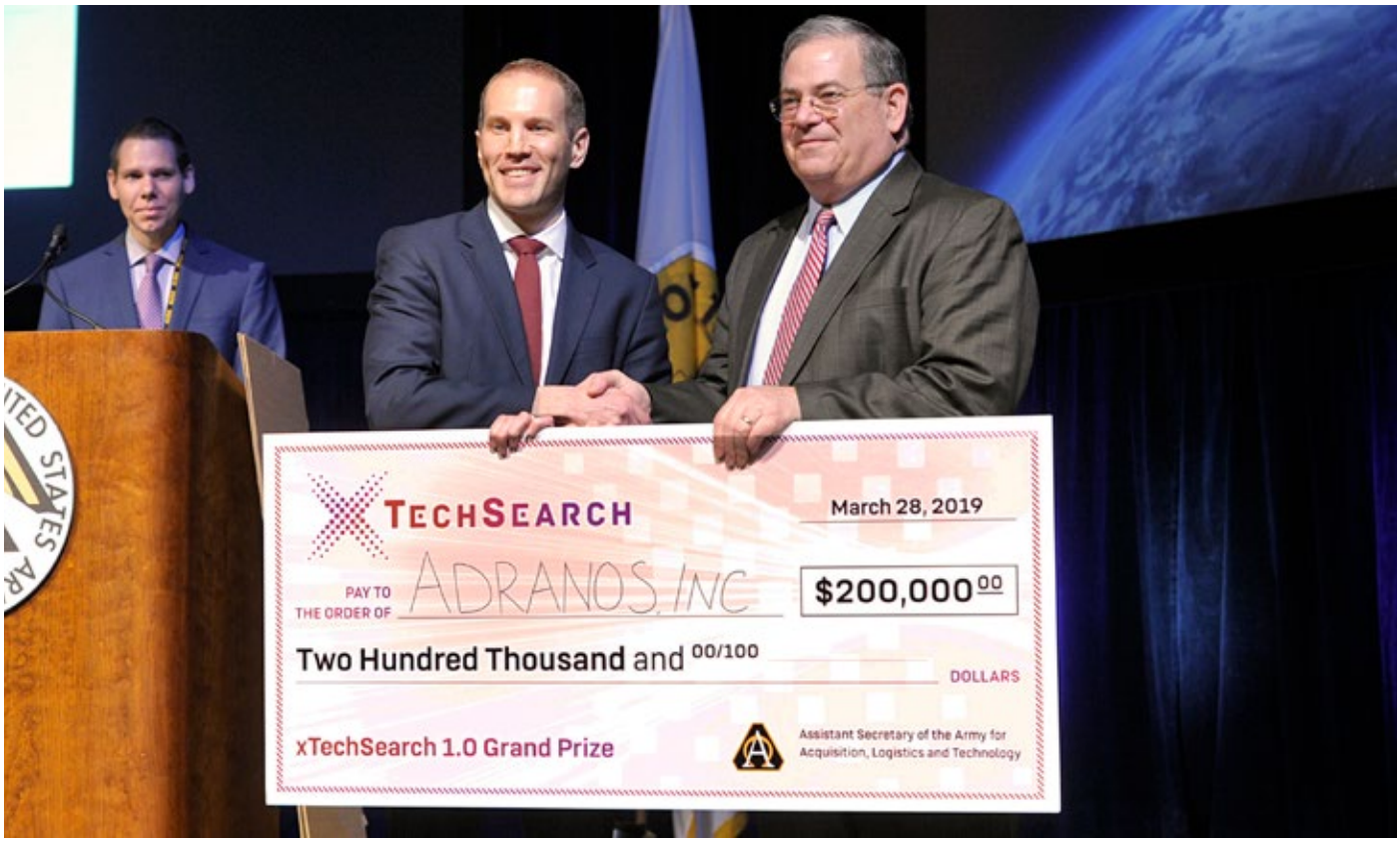
The winner of the first xTechSearch works to scale itself and its product.

TALKING POINTS
Chris Stoker, Adranos co-founder and CEO, presents the Adranos proof of concept demo at the 2019 Association of the United States Army (AUSA) Global Force Symposium and Exposition in March. (Photo by Patricia Riippa, Booz Allen Hamilton, supporting CCDC – ARL)

Adranos Inc. is a Purdue University-affiliated company that won the grand prize in the inaugural xTechSearch 1.0 for ALITEC, its high-performance, clean solid propellant for missile and space launch systems.

Adranos demonstrated a substantial performance increase over traditional propellants: ALITEC could increase the range of an Army Tactical Missile System by nearly 40 percent. Similarly, as a drop-in replacement for traditional solid propellant, ALITEC could increase the range of any other existing or future DOD missile systems, including rocket-assisted projectiles, hypersonic boosters and other similar applications. Adranos' launch video can be viewed at **https://www.youtube.com/watch?v=ps9KBeXYhxE&t=61s**.

The live flight demonstration enabled by xTechSearch garnered attention across DOD. For Chris Stoker, Adranos co-founder and CEO, the competition enabled his small company to get on



INNOVATION REWARDED
Jeffrey S. White, right, principal deputy to the assistant secretary of the Army for acquisition, logistics and technology, presents the xTechSearch grand prize to Chris Stoker, Adranos co-founder and CEO. At left is Dr. Matt Willis, Office of the Deputy Assistant Secretary of the Army for Research and Technology. (Photo by Luc Dunn, AUSA)

DOD's radar in a much more significant way than might otherwise have been possible. "The Army's xTechSearch competition set forth relatively broad goals and allowed companies to propose solutions to accomplish those goals," he said. "This approach was ideal for us, because funding opportunities that fit our specific solution were difficult to find. In addition, we were astonished at how quickly the Army progressed through all four phases of the competition. It enabled us to accelerate the development of our products so that we can implement them sooner than we would have been able to otherwise."

Adranos is applying for fiscal year 2019 funding from the Rapid Reaction Technology Office of the Office of the Assistant Secretary of Defense for Research and Engineering in partnership with the Aviation & Missile Center of the U.S. Army Combat Capabilities Development Command and the U.S. Air Force. It is also seeking fiscal year 2020 funding through the Joint Enhanced Munitions Technology Program. These funds will be used to perform additional tests and qualify ALITEC for use in specific platforms.

Additionally, Purdue University and the state of Indiana are putting together an incentive package for Adranos to build a research and development (R&D) and rocket motor manufacturing facility. The facility is expected to be operational by August 2020, producing midsize rocket motors for customers and performing the remaining R&D that will be necessary to field ALITEC.

—ZEKE TOPOLOSKY AND DR. MATT WILLIS

QUICK, COLLABORATIVE MEDICINE

OTAs are charting a new path to make sure warfighters in the future fight get innovative care.

by Ramin A. Khalili

Just a few hours after a trio of late-night shootings one early August weekend in Denver, Humacyte Inc. CEO Jeffrey Lawson received an email from a local surgeon who tended to one of the victims.

"He just sent me a quick message," said Lawson, a trained surgeon who's based out of the biotechnology firm's headquarters in North Carolina. "He wanted to tell me how he used our product to repair circulation in the shooting victim's left arm."

That lifesaving product was a pioneering technology called the human acellular vessel (HAV), which is an off-the-shelf, bioengineered blood vessel currently being studied for the repair and reconstruction of the various types of vascular injuries sustained in both military and civilian conflicts—in the case of the victim in Denver, domestic trauma.

"In simpler terms, the HAV is a regenerative vascular implant that physically becomes part of the patient," said Humacyte Inc. co-founder Juliana Blum. "And so for us, having military support has really been a key piece of our puzzle."

FULL OF PROMISE
The prototype FOAM device with application tool. The foaming agent expands and exerts pressure on internal organs and tissue, stopping internal bleeding until the Soldier can be transported to the next level of care. (Photo courtesy of Critical Innovations LLC)

LIFESAVING LINK
Surgeons handle a human acellular vessel during an operation. The off-the-shelf, bioengineered blood vessel is being studied for use in repairing and reconstructing various types of vascular injuries. (Photo courtesy of Humacyte Inc.)

Indeed, for DOD, that kind of capability—to limit blood loss, to restore blood flow to extremities—represents the future: the future of innovation, the future of medicine; in short, the future of a more resilient warfighter. Yet for years, the frustrating snags in DOD's plan to foster medical innovation were always the twin barbs of speed and collaboration. After all, what exactly is the simplest, most efficient way for an innovative company to dive into the complex world of military medical contracting with designs on creating, testing and finally delivering to the front lines a lifesaving, game-changing product?

Enter the other-transaction agreement.

INCREASED SPEED, FLEXIBILITY

In DOD, as everywhere, every second that ticks off the clock brings you one step further into the future and one step closer to your next obstacle. As the nation's military medical apparatus prepares for the future battlefield with a variety of concepts, tactics and products, it must also find a way to apply those tools quickly and efficiently, and at a pace likely exceeding those for previous efforts. For the Soldier entering the "future fight" on new and different battlefields—presumed to be thickly populated urban cityscapes where tools will need to be tougher, smaller and better than ever—nothing less will do.

In 2014, the U.S. Army Medical Research and Development Command (USAMRDC) received congressional authority to begin using a special type of contracting tool called an other-transaction agreement (OTA) to facilitate the delivery of advanced technology and therapeutic prototypes for a wide array of military-relevant injuries. What separates the other-transaction agreement from other standard contracting mechanisms—indeed, its defining characteristic—is that it allows for increased speed and flexibility for both parties.

Notably, it aims to set chosen projects in motion in months as opposed to the generally yearlong time span of standard agreements. That's made possible by the other-transaction mechanism's reliance on typically nontraditional defense contractors and a built-in flexibility in data rights and regulatory terms. Additionally, other-transactions allow for more conversation between the military and the performer as compared with traditional Federal Acquisition Regulation-based contracts.

"It's been exciting to watch the use of OTAs grow and expand at USAMRDC over the past few years," said Sara Langdon, the command's program manager (PM) for other-transactions with the Medical Technology Enterprise Consortium. "The flexibility has allowed for awards that involve complex collaborations

with multiple companies and government laboratories, in addition to several acquisition programs."

"It is critical for us to maintain solid industry partners," said Dawn Rosarius, USAMRDC's principal assistant for acquisition. "Our labs and academic partners conduct the early research of candidate technologies to reduce risk. With less risk, our PMs can then gain commercial industry partners to not only develop the capability we need for the warfighter, but also fund some of the development, sponsor FDA [U.S. Food and Drug Administration] approval, and ensure a commercial market to lower our costs once FDA-approved."

Within USAMRDC, other-transaction efforts focused specifically on prototypes are currently awarded through the aforementioned Medical Technology Enterprise Consortium (MTEC) program, which is a 501(c)(3) nonprofit corporation consisting of industry and academic organizations committed to developing medical tools that better manage, treat and rehabilitate those suffering from traumatic injuries on the battlefield. MTEC is organized and operated through Advanced Technology International via an award obtained through competitive solicitation in 2015. Since MTEC became fully operational in January 2016, USAMRDC has awarded 42 different prototyping projects through the consortium with $131 million in government funding, with private cost-sharing efforts kicking in an additional $24 million as of August 2019.

DEVELOPING NOVEL SOLUTIONS

Leigh Anne Alexander can testify to the behind-the-scenes impact of other-transaction agreements. As deputy project manager for the USAMRDC's Warfighter Expeditionary Medicine and Treatment Project Management Office, she has used the mechanism to try to help fill a high-priority capability gap via the continued development of the Fast Onset Abdominal Management (FOAM) hemorrhage control device.

"We are trying to develop solutions that are not commercially available and very novel—solutions that industry wouldn't otherwise invest in on their own," said Alexander. "And so the ability to preconfigure the contracting agreement with options benefiting both sides was key."

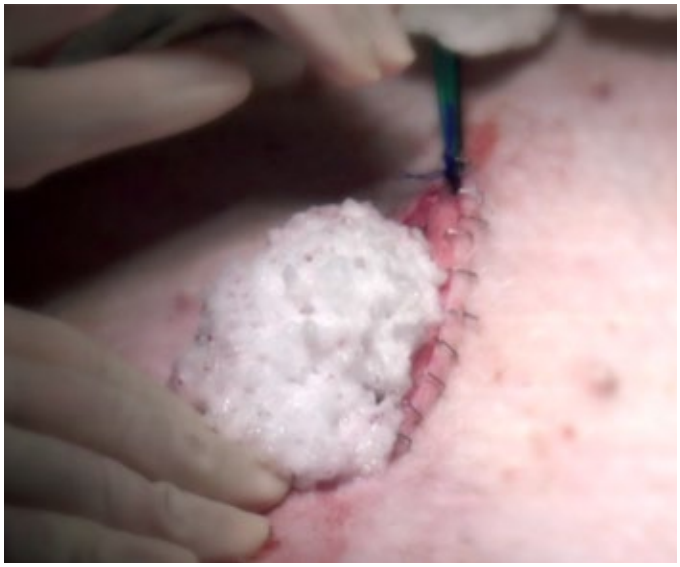
On the battlefield, certain types of injuries (and the eventual application of care to those areas) are naturally more complicated than others. While traumatic injuries to an arm or leg can be diagnosed relatively quickly and the resulting bleeding stanched with a tourniquet, traumatic injuries to the abdominal region—incidents of what is called noncompressible hemorrhage—require far more intricate care. As such, the FOAM device is designed to control severe intra-abdominal bleeding by delivering, into a Soldier's abdominal cavity, a foaming agent that eventually expands and exerts pressure on internal organs and tissue, thereby stopping internal bleeding until the Soldier can be transported to a higher level of care. At that point, the injected compound can simply be washed away by the attending surgeon.

The company behind the FOAM tool, Critical Innovations LLC was able to begin work on prototype delivery in just three to four months, using $600,000 in base other-transaction funding through the consortium. Further, the FDA granted the product its highly sought "breakthrough device" designation in an announcement in June. Alexander said the company is a full year ahead of schedule in terms of product development.

"The approach that Critical Innovations took was fantastic because they were working with the end user in mind," she said. "In the combat environment, you've got to think about the 18-year-old

A NEED FOR SPEED

Humacyte Inc., which developed the human acellular vessel, was able to accelerate the product by using other-transaction agreements issued through MTEC rather than going through a traditional Federal Acquisition Regulation-based contract. (Photo courtesy of Humacyte Inc.)



FILL IT UP
The FOAM device, deployed here in a porcine abdomen, is designed to control hemorrhage and allow for surgery to prevent further damage. Using an other-transaction agreement, USAMRDC and the company behind the FOAM tool were able to begin work on delivering the high-priority prototype in just three to four months. (Photo courtesy of Critical Innovations LLC)

on the battlefield who's been through 16 weeks of training and trying to save his buddy's life."

Alexander added, "And that's because, as an Army instructor of mine once said, 'Preservation of life is at the forefront of battle.' And so in order to win the future fight, we will have to treat Soldiers farther forward on the battlefield."

Processing an effort via an other-transaction agreement does come with a cost, however. For other-transaction agreement projects routed through MTEC—and other consortia, as well—the administrative costs incorporate the additional fee as part of general operating costs.

Regardless, the perks for using other-transaction agreements are plentiful for product developers. Broad insight into all research conducted under the MTEC umbrella allows for collaboration on projects that would otherwise be conducted in silos. In addition, organizations that deliver positive outcomes may be eligible to receive additional funding for work toward FDA approval, manufacturing and procurement without needing to repeat the proposal stage of the cycle.

CONCLUSION

Back at Humacyte, other-transaction agreements issued through the consortium ultimately allowed the company to climb a slew of developmental steps in a relatively short period of time—with the warfighter the ultimate beneficiary of that boost in systemwide speed and agility. In April, for instance, the company received the MTEC Large Project Prototype of the Year award recognizing the development of the human acellular vessel, while just one month later, military surgeons in Bethesda, Maryland, performed the military health system's first-ever transplantation of one on an Army veteran in danger of losing his leg from vascular disease.

"OTAs have played a key role not only in our manufacturing and development, but also in our trauma research and clinical studies capabilities," said Blum.

From the USAMRDC's viewpoint, that kind of framework could be the path to a new, more graduated plateau of warfighter care. By investing in the identification of cutting-edge medical technology and with the creation of a dedicated avenue by which resulting prototypes are realized, the USAMRDC is allowing for science to blossom at the pace needed to forge the future of military medicine.

Said Lawson, "It's very exciting to be a part of something this transformative."

For more information, contact Chelsea B. Bauckman, deputy public affairs officer for USAMRDC, at 301-619-8060 or ***chelsea.b.bauckman.civ@mail.mil****; or go to* ***https://mrdc.amedd.army.mil/*** *or* ***https://mtec-sc.org/****.*

RAMIN A. KHALILI is a writer with the USAMRDC Public Affairs Office. Before assuming his current role, he spent several years as the knowledge manager for the command's Combat Casualty Care Research Program. During his prior decade-plus as a broadcast journalist, he earned an Associated Press Award for his work in Phoenix before serving as chief NASA correspondent for CBS in Orlando, Florida. He holds a B.A. in communications from Penn State University.

This article intends to convey the sentiments of a private collaborator and does not intend to endorse this specific collaborator's goods or services in any way.

FAST TURNAROUND

Effective, innovative and agile medical product development fast-tracks MEDHUB device to warfighters.

by Jay Wang

Progress and change always go hand in hand. This is especially true for the latest changes affecting the U.S. Army Medical Research and Development Command (USAMRDC) as it transitions from the U.S. Army Materiel Command to the recently formed U.S. Army Futures Command (AFC).

The "progress" side has required aligning USAMRDC values with AFC's core principles. Because of this, USAMRDC's approach to medical product development will become even more agile to successfully deliver medical solutions to the warfighter.

AFC's core principles include the following:

- **Effective:** We must deliver what warfighters need, when they need it, in a timely and affordable manner.
- **Innovative:** We must create and cultivate a culture that front-loads smart risks through iteration and prototyping.
- **Agile:** We must be willing to fail early and responsibly, and learn from our failures and successes. We must be creative and not become victim to a "that is not how we do it here" mentality.
- **Unified:** We must become "one team" with a laser focus on creating speed through shared goals and understanding, disciplined initiative, enabled decision-making at the lowest level, and delivering valued outcomes for the Army.

THIS WON'T HURT A BIT

Medical personnel with the 44th Medical Brigade use mannequins to test MEDHUB in an operationally relevant environment at Fort Bragg, North Carolina. The system was developed to address the challenges medics face: They often treat multiple patients at one time and have limited bandwidth to contact hospitals and provide them with information about patients en route. (Photo by Ashley Force, USAMMDA Public Affairs)

Dawn Rosarius, a Senior Executive Service member and USAMRDC's principal assistant for acquisition, exercises program management and acquisition oversight of the USAMRDC's product development and procurement programs. Under her guidance, numerous military medical products within the USAMRDC are progressing successfully through the development pipeline.

"In many cases, I believe the USAMRDC already aligns to many of the AFC's core principles, as well as the mission of the assistant secretary of the Army for acquisition, logistics and technology, to develop, acquire, field and sustain the world's best equipment and services," said Rosarius. "With some of our medical solutions, we certainly are agile and effective in delivering quality sustainable solutions as efficiently as possible, to ensure we get the best product to our warfighters."

The Medical Hands-free Unified Broadcast (MEDHUB) system is a clear illustration of the AFC's tenets being incorporated into the critical work of the Medical Research and Development Command. MEDHUB is a product within the U.S. Army Medical Materiel Development Activity's (USAMMDA) Warfighter Health, Performance and Evacuation Project Management Office. USAMMDA's mission is developing and delivering quality medical systems to protect, treat and sustain the health of service members worldwide. MEDHUB is an automated electronic medical documentation and communication system designed to improve the way medics and hospitals share patient information, such as vital signs, injuries and treatments, during medical evacuations.

FIRST, AN EARLY FAILURE

The Transport Telemedicine System program originated in 2013; its goal was bidirectional communications, also known as telemonitoring. The first, manually intensive system was tested in 2017 with senior Army flight medics. The user feedback was definitive: "We cannot document while treating multiple

patients at the same time; this would be thrown out of the helicopter."

This 2017 test led to the program "failing early." Following that failure, a team of engineers working within the Warfighter Health, Performance and Evacuation Project Management Office changed direction and initiated a new MEDHUB concept to reduce the burden on medics and to alert and prepare a hospital for en-route patients through telemonitoring. With the help of acquisition professionals and industry partners, the program underwent a novel acquisition strategy that entailed rapid agile prototyping and accelerating the program schedule.

While investigating the significant medical documentation gap on the battlefield, the product team discovered additional hindrances that exist during medevac missions and patient care in the deployed environment. Field hospitals lack situational awareness of incoming patients' injuries and treatments because of limited communication networks between ambulances and hospitals. The effects are felt at the hospital when the medic must provide a short verbal report in a noisy, high-stress environment at time of arrival. These short verbal reports may not be comprehensive and are not available for further reference by the attending physician.

'TIME IS TISSUE'

MEDHUB was designed to automate and improve communication. Today's MEDHUB system leverages wearable medical devices cleared by the U.S. Food and Drug Administration to streamline communication between medics and receiving field hospitals.

The MEDHUB system includes a dashboard display at the receiving hospital, so clinicians can identify the number and status of inbound patients and the estimated time of arrival, instead of relying solely on the verbal reports from a medic. MEDHUB alerts the hospital before patients arrive, earlier than the current radio call, which gives hospital personnel extra time to plan by gathering the supplies and manpower necessary to effectively treat the patients once they arrive. MEDHUB simplifies patient care by providing a vital signs monitor for every patient, so the medic does not have to switch monitors between patients, and it provides additional drug safety through dosage calculators and visual cues for the medic.

"Why is this important? Because time is tissue," said Lt. Col. Christian Cook, deputy project manager for the Warfighter Health, Performance and Evacuation Project Management Office. "If receiving facilities know what types of injuries they need to treat—what type of blood they need to thaw—they can better prepare to provide emergency medical care when the ambulance or helicopter arrives with the patients."

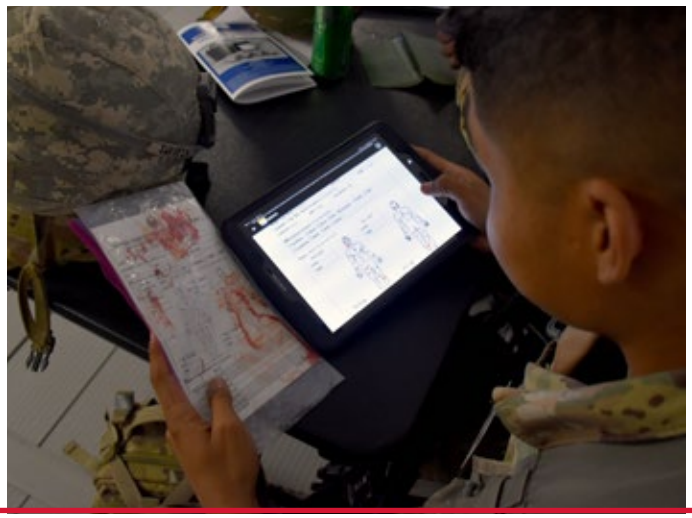
As a former medevac pilot, Cook understands the harsh reality of emergency medical evacuations and the importance of time in saving lives. "Minutes may be the difference between life and death," he said.

SAVING TIME AND MONEY

Throughout the acquisition process for MEDHUB, USAMMDA project and program managers oversee cost, schedule and performance. In keeping with the AFC principles, the MEDHUB product team focused on meeting an aggressive schedule through frequent operational evaluations. A new MEDHUB prototype was built and tested every six months for Soldiers to evaluate.

COLLECTION POINT

With MEDHUB, medics can use a tablet to complete a Tactical Combat Casualty Care Card electronically. At the receiving hospital, clinicians can see the data for incoming patients and ensure that they have proper staff and equipment on hand for treatment. (Photo by Ashley Force, USAMMDA Public Affairs)



URGENT CARE

Soldiers with the 44th Medical Brigade put the MEDHUB device through its paces at Fort Bragg, North Carolina. MEDHUB uses wearable sensors, accelerometers and other technology to improve communication among patients, medics and receiving field hospitals. (Photo by U.S. Army Medical Materiel Agency)

INFORMED AND PREPARED

Soldiers with the 44th Medical Brigade use MEDHUB during an operational test and training exercise at Fort Bragg, North Carolina. The system is now undergoing a 24-month developmental test to prepare for fielding in 2021. (Photo by Ashley Force, USAMMDA Public Affairs)

MEDHUB went from a concept on paper in March 2017 to a product that completed testing in an operationally relevant environment just two years later. Three different prototypes were tested with Soldiers in those 24 months, during which time the product's technology readiness level increased from 4 (validation in a laboratory environment) to 8 (completion and qualification through test and demonstration).

The system's performance was managed through discussions of the technical product capability with the vendor twice a week, starting with the paper concept in 2017. These biweekly discussions helped to define and create a product based on the requirements in a fast, efficient and cost-effective manner. This strategy for rapid development led to $15 million in cost avoidance by reducing the program schedule by two years.

To solve the lack of dedicated medical satellite radio networks, MEDHUB uses existing DOD tactical communication satellites connected to transceivers in tactical vehicles. Instead of having the commercial vendor be the prime network integrator, the Warfighter Health, Performance and Evacuation Project Management Office collaborated with the DOD communication commands that are the Army experts in satellite networks to provide dedicated bandwidth for MEDHUB. An integrated product team was formed that worked across program executive offices (PEOs), consisting of members from the PEO for Command, Control and Communications – Tactical, PEO Aviation and PEO Soldier. This team played a key role in MEDHUB's overall integration with existing and developmental technologies.

Leveraging the existing DOD tactical network and Army tactical handhelds,

modems and transceivers on medevac vehicles—and implementing the AFC tenets of innovation and agility—further reduced cost and time to field.

CONCLUSION

Today, the MEDHUB prototype is in a prolonged developmental test with the 44th Medical Brigade and Womack Army Medical Center at Fort Bragg, North Carolina. During the 24-month study, which is in preparation for MEDHUB fielding in 2021, health care providers are using the system to provide more complete medical documentation of care for drop-zone casualties, and to alert and prepare Womack Army Medical Center for such casualties. This continued testing ensures that the best possible product is fielded to the Soldier.

"The MEDHUB team is passionate and truly committed to the warfighter," said Col. Ryan Bailey, former USAMMDA commander. "Their commitment demonstrates that, working closely with industry, collaborating with other program executive offices, along with the user community, you can quickly develop and test a system, make fixes and keep pressing to deliver a capability that will ultimately make a difference."

The rapid development of the MEDHUB system can be credited to the product team's consistent, inventive and agile development and test strategy—which certainly can be modified and applied throughout DOD for product development. This acquisition approach will help the MEDHUB program reach milestone C within three years, and it exemplifies how the USAMRDC is following the AFC lead in quickly and effectively delivering novel capability to the Soldier.

"The MEDHUB team has been extremely innovative in finding solutions and development pathways to reduce time and still deliver a quality solution that can be used to assist our medics and clinicians in having the data they need to save more lives," said Rosarius.

With USAMRDC's support over the past three years, and especially with the encouragement of Rosarius, the MEDHUB team has successfully navigated acquisition pathways to produce a critical and necessary communication system that may be used by both military and civilian medical personnel. In creating this lifesaving product, the MEDHUB team clearly reflects AFC key principles in its willingness to learn from failure, listen to the user and rebound toward success.

For more information on the MEDHUB program and other projects being developed by the USAMMDA, go to the organization's website at ***https://www.usammda.army.mil/****.*

JAY WANG is a product manager for the USAMMDA's Warfighter Health, Performance and Evacuation Project Management Office at Fort Detrick, Maryland. He holds a master's degree in program management from the Naval Postgraduate School, a master's degree in organic chemistry from UCLA and a bachelor's degree in chemistry from the University of California, Berkeley. A member of the Army Acquisition Corps, he is Level III certified in program management and a Lean Six Sigma Green Belt. In 2014, he received the Superior Civilian Service Award for his work at the Joint Program Executive Office for Chemical and Biological Defense for innovatively managing and analyzing a complex acquisition program.

TEAM EFFORT

Participants at a MEDHUB test in March included: in front row from left, Alexandra Cholewczynski, Emily Krohn and the author, USAMMDA; Jan Cooke, Sierra Nevada Corp.; Mike Moore (U.S. Army Combat Capabilities Development Command – Aviation & Missile Center (CCDC-AVM)); and, in back row, Cory Anderson, CCDC-AVM; Duston Thompson, Sierra Nevada; and JT McNeil, Spencer Brooks, Capt. Gerrod Gomez and Torrence Moore, USAMMDA. PEO Soldier, PEO Aviation and PEO C3T also contributed. (Photo by Ashley Force, USAMMDA Public Affairs)

MAJ. JOHN M. CLOSE

COMMAND/ORGANIZATION: Product Director for Army Watercraft Systems, Project Manager for Transportation Systems, Program Executive Office for Combat Support and Combat Service Support

TITLE: Assistant product manager, Maneuver Support Vessel (Light)

YEARS OF SERVICE IN WORKFORCE: 1

YEARS OF MILITARY SERVICE: 11

DAWIA CERTIFICATIONS: Level II (educational requirements) in program management; Senior Logistician designation from the International Society of Logistics

EDUCATION: M.A. in organizational leadership, Baker University; B.A. in American history, University of Florida

AWARDS: Bronze Star Medal, Defense Meritorious Service Medal, Army Commendation Medal (second award), Army Achievement Medal (second award), Meritorious Unit Citation, National Defense Service Medal, Afghan Campaign Medal, Global War On Terrorism Medal, Army Service Ribbon, Overseas Service Ribbon, Armed Forces Reserve Medal with Mobilization Device, NATO Medal, Combat Action Badge, Parachutist's Badge

WHO'S WHO AND WHAT'S WHAT

A little more than one year removed from an acquisition classroom at Redstone Arsenal, Alabama, Maj. John Close has learned a great deal in his new role with the Program Executive Office for Combat Support and Combat Service Support (PEO CS&CSS). Asking questions and learning more about how the organization operates have been the keys to flattening the learning curve.

Close is assistant product manager for the Maneuver Support Vessel (Light) (MSV(L)) program, the first new developmental watercraft for the Army in nearly 40 years and the primary effort toward modernizing Army watercraft. The program was created to deliver a new vessel that enables Army mariners to transport combat-configured personnel and equipment into diverse littoral settings and give commanders greater ability to project firepower in support of maneuver operations. Expected to operate in five feet of water, the MSV(L) will be designed to carry a combat-configured main battle tank, two Strykers or four Joint Light Tactical Vehicles into a wide range of littoral environments. With a planned range of 360 nautical miles and a speed over 21 knots, it will improve the Army's ability to maneuver land power when and where commanders need it.

"This is a high-visibility project, and the Army really wants to get it right," said Close. "Not many people know that the Army has watercraft, and even among Soldiers, access to the vessels is pretty limited." The constraints of watercraft manufacturing and the number of stakeholders involved present additional challenges. "Unlike ground vehicle programs, our program has been limited to producing and testing one prototype vessel. We're incorporating a unique design for it, so there's a lot of planning, collaborating and risk-reduction efforts underway," he said. "There's that saying, 'Measure twice, cut once,' but we're measuring 15,000 times."

For Close, the most appealing part of the job "is serving with a diverse group of experts every day. I am always learning, and the myriad perspectives and personalities I get to engage with around the world and at all levels of government and industry make the assignment all the more enjoyable." The program puts him in contact with engineers, finance experts, naval architects, civilian contractors and other "green suiters," he said. "The goal is to foster collaboration, not just cooperation. We're debating the issues and collectively creating effective solutions. Building relationships with all our stakeholders and making decisions as a team has proven to be the key

to our success, and enhances our ability to provide warfighters the capabilities they need."

Close came to acquisition through the Army's Voluntary Transfer Incentive Program, after spending 10 years as a transportation and logistics officer. "While serving as a capability development officer at the [U.S. Army] Combined Arms Support Command at Fort Lee, [Virginia] I learned some basics about acquisition, and decided that applying my knowledge and experiences as a transportation and logistics officer in a unique and challenging career field was something that interested me," he explained. "What I find most satisfying about being part of the Army Acquisition Workforce is serving on a team of government and industry leaders, all of whom are empowered to address critical challenges."

He joined PEO CS&CSS a little more than a year ago, after completing the requisite coursework. "The instructors, staff and leaders responsible for the Army Acquisition Professionals Course in Huntsville, Alabama, are outstanding," he said. "The course provides an excellent opportunity for new acquisition officers and noncommissioned officers transitioning from the operational Army to learn in a very professional and supportive environment."

His advice for new acquisition officers in their first assignments is to focus their efforts on two main objectives: learning about their new assignment, and providing as much value for their team as possible. "I think the foundation for achieving both of these objectives is asking good questions—and asking them often. Doing so will to teach you something about your new career field, and will often help you lead your team toward solving a particularly challenging problem."

He noted that one of the most important lessons he has learned so far "is the value of understanding and mapping out your organization's communication networks and spheres of influence. This goes far beyond organizational structure and chain of command. As a new acquisition leader, you need to learn not only how the people within your organization communicate and influence each other, but also how they engage with others in outside agencies as well," he said. "The people with the most influence or communication reach are not always obvious, and they are not always in formal leadership positions. People outside your organization will have a great impact on your program, so it's important to identify and learn how to communicate effectively with them."

It's also important to accept what you don't know, Close said. "I knew, coming into this assignment, that I wasn't the technical or subject matter expert; my contribution is leading teams of people. Anyone who wants to make an impact in a position like this one needs to have a positive track record of serving in a range of leadership positions, leading different groups of people on different kinds of projects."

Another thing he has learned is that his decisions make a difference. "Even though programs have long life cycles and my assignment is likely to be relatively short in comparison, I still make decisions that have an impact on the program. To do that, it's important to focus on providing value to the organization. Busy doesn't always mean productive, and I'm trying to stay mindful of what's important, what brings value to the warfighter and what moves the project in the right direction."

—SUSAN L. FOLLETT

PAYING ATTENTION TO DETAILS
Close during a 2016-2017 trip to Afghanistan. (Photo courtesy of Maj. John Close)

THE INTEGRATED TACTICAL NETWORK AT WORK

A forward observer with the 1st Battalion, 508th Parachute Infantry Regiment, 82nd Airborne Division uses Integrated Tactical Network components during a live-fire exercise at Camp Atterbury, Indiana, in January. Developed and fielded through middle-tier acquisition, the system provides commercial components and network transport capabilities to lower echelons within the Army's tactical network. (U.S. Army photo by Justin Eimers, PEO C3T Public Affairs)

A HAPPY MEDIUM

Middle-tier acquisition authority features flexible prototype and fielding options.

by Douglas W. Burbey, Mindy Gabbert and Kathryn Bailey

The Army is employing one more option for programs of record to accelerate the way they usher Soldier technologies along the path from innovative concepts to fielded capability.

Middle-tier acquisition authority, granted by Congress in Section 804 of the National Defense Authorization Act for Fiscal Year 2016, allows the Army acquisition executive (AAE) to determine if a program of record can place its capability on a more flexible acquisition path to meet emerging military needs.

In doing so, a program of record's product or program manager should be prepared to break new ground every day when navigating the process of middle-tier acquisition. The time spent with every staff element along the acquisition path is crucial.

Situated between the acquisition pathways of "urgent" and "tailorable traditional DOD 5000.02," middle-tier acquisition is for programs that house mature prototypes from government and industry that should not require much additional development to begin production.

In May, the AAE empowered the Program Executive Office for Command, Control and Communications – Tactical (PEO C3T) to use the process for two of its top efforts—the Integrated Tactical Network and Unified Network Operations—both of which support the Network Cross-Functional Team and Army network modernization initiatives.

As part of the middle-tier acquisition approval process, the AAE determines if a capability warrants one of three acquisition courses of action: rapid prototyping, rapid fielding, or both. With rapid prototyping, programs must field a prototype that can be demonstrated in an operational environment, and also ensure operational capability within five years of an approved requirement. The rapid fielding designator, which inserts proven technologies into the field, requires production to begin within six months, and fielding to be completed within five years of an approved requirement.

The AAE designated the Integrated Tactical Network and Unified Network Operations as middle-tier acquisition prototype efforts, and named PEO C3T the decision authority and office of primary responsibility.

Middle-tier acquisition begins with a blank slate and allows the program, as decision authority, to build an acquisition process appropriate to the capability's maturity and mission needs. This enables programs to field capabilities in two to five years or sooner, versus the seven to 12 years often associated with the traditional acquisition process. With middle-tier acquisition, programs can forgo the multiple checklists, signatures and annexes. For PEO C3T, the familiar 200-page acquisition strategy is now a 17-page acquisition plan. Even though the middle-tier acquisition process is less structured, and allows programs to "tailor in" versus "tailor out" the artifacts or requirements often itemized on a checklist, it does not negate the need for structure.

"MTA [middle-tier acquisition] doesn't replace good program management," said Joe Welch, deputy program executive officer for C3T. "We still focus on cost, schedule and performance program fundamentals to ensure that we are doing right by the taxpayers and delivering the products Soldiers need as expeditiously as possible."

With that in mind, clearly describing the acquisition process you intend to use, and the resources you require, is crucial to achieving stakeholder and leadership buy-in.

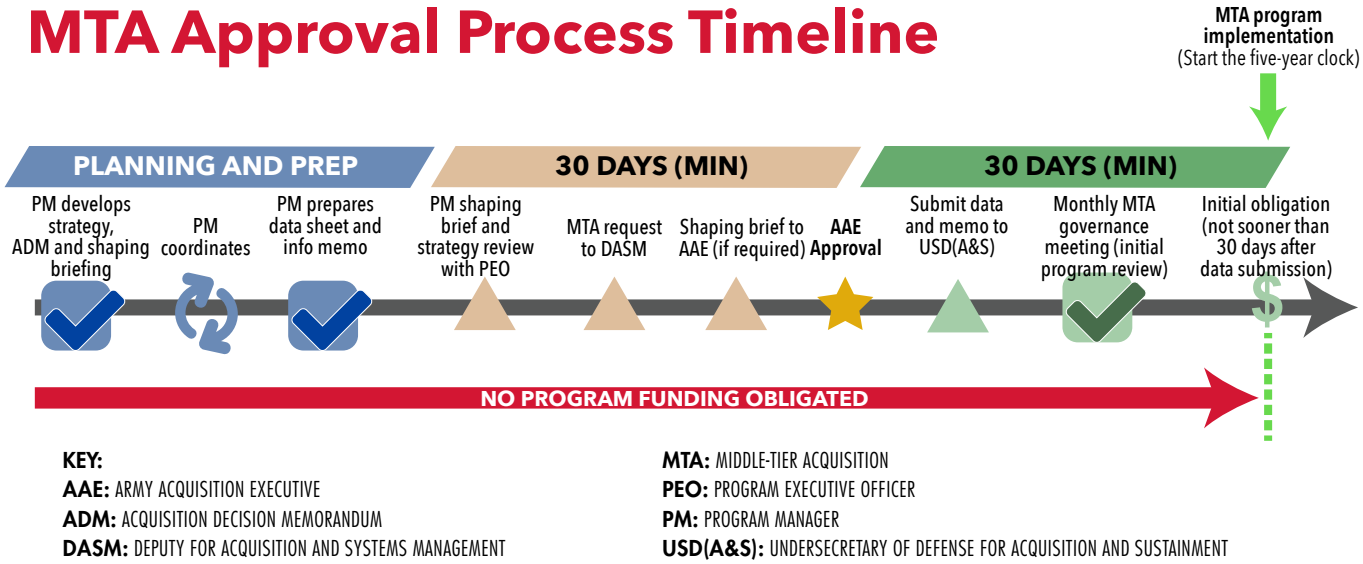
Depending on circumstances, PEO C3T may select other options in its acquisition toolkit, such as the more traditional Acquisition Category (ACAT) II or ACAT III, which can be highly tailored and effective when requirements are already well-established. Additionally, modifications and engineering change proposals to existing programs can be suitable alternatives to quickly add capabilities instead of starting new programs. No matter the acquisition "wrapper" that is used, programs can apply additional flexibilities, such as other-transaction authorities, which are contract vehicles especially well-suited for research and development, that can be used alone or with middle-tier acquisitions. Each of these flexibilities provides options to best structure acquisition efforts and put technologies into the hands of Soldiers.

RIGHT PROCESS FOR THE RIGHT TECHNOLOGY

Middle-tier acquisition provides programs the latitude to revise or revalidate requirements during both the prototyping and fielding phases of the program. This paradigm works well with the

NEW TACTICS

Soldiers from the 101st Airborne Division and the 10th Mountain Division test the Unified Network Operations user interface, which provides a common operating picture to signal brigades in theater, for strategic to tactical-level network management and increased situational awareness. (U.S. Army photo)



MID-TIER MILESTONES

The middle-tier acquisition process, authorized by the National Defense Authorization Act for Fiscal Year 2016, gives programs of record and other DOD organizations the authority to use alternative processes to accelerate the acquisition process through rapid prototyping and fielding. (Graphic by PEO C3T)

Integrated Tactical Network and Unified Network Operations development efforts, since both follow the developmental operations (DevOps) process of incorporating real-time operational feedback from Soldiers to generate requirements.

Developmental operations feed into the Army Network's capability-set plan, starting in fiscal year 2021, which will field new integrated network capability sets every two years to incrementally insert military and leading-edge commercial technologies to meet the Army's warfighting needs. The capability set process targets mature capabilities used in special operations forces, the Network Cross-Functional Team, other government agencies or industry for further prototyping and to validate technological concepts in large brigade combat team-size employments.

"MTA drops the imperative of establishing formal requirements approved by the Joint Capabilities Integration and Development System and DOD Directive 5000.01 before program initiation," Welch said. "This frees us up to get started on prototyping efforts with just a basic set of objectives, which can be iteratively refined throughout the effort to ensure they meet the needs of Soldiers."

INTEGRATED TACTICAL NETWORK

The Integrated Tactical Network effort is injecting new commercial components and network transport capabilities to lower echelons within the Army's tactical network environment to provide smaller, lighter, faster and more flexible communications systems with multiple connectivity options. Because it features separate components versus one piece of equipment, each component may have a slightly different acquisition path, which is easily managed with the middle-tier acquisition process.

Soldier touch-point tests for the Integrated Tactical Network will lead up to fielding four infantry brigade combat teams in fiscal year 2021, with subsequent experimentation informing Capability Sets 23 and 25. At program review points, the program will use preliminary and critical design review processes to inform capability-set network decisions.

Not all technologies transition from rapid prototyping to rapid fielding; the PEO has the option to transition any technology to its own program of record, and it will make that determination with the Integrated Tactical Network if and when warranted. Integrated Tactical Network components are expected to transition

from rapid prototyping to rapid fielding throughout the middle-tier acquisition strategy's five-year timeline.

One other scenario exists, and that is when a prototype proves unsuccessful. Failure requires a change of mindset that must be understood by all of the team members. "If it's not working, then that's OK; don't burn resources on prototypes that are not producing positive results," said Kelly Tisch, product manager for SATCOM/Tactical Cyber and chief of the Network Operations Business Management Division for PEO C3T's Project Manager (PM) for Tactical Network. "Our DevOps process, with positive and negative feedback, allows us to change direction."

UNIFIED NETWORK OPERATIONS

Unified Network Operations will provide common network planning, configuration, management and monitoring via open framework and standards.

Like the Integrated Tactical Network, the Unified Network Operations effort is benefiting from the middle-tier acquisition designation. As a software-based capability that leverages commercial technology to integrate across echelons, Unified Network Operations would have required input from multiple stakeholders just to form a set of requirements.

"Under DOD 5000, we would have had to develop a unified requirements document that addressed the tactical and enterprise network," Welch said. "The process to collaborate with all of the stakeholders would have been much more time-consuming, and costly. With MTA, we can move forward as a rapid prototype, and we did this with just receiving a memo out of the Cyber Center of Excellence."

In addition, by not needing formal requirements, the Army was able to quickly perform market research with industry to leverage its approach for developing an overarching network capability such as Unified Network Operations. Through requests for proposals and technical exchange meetings—initiated by the Network Cross-Functional Team—the team was able to determine options for integrating existing capabilities with minimum development efforts.

CONCLUSION

Middle-tier acquisition is part of a larger shift in culture within the acquisition community to identify capabilities suitable for accelerated prototyping and fielding efforts. PEO C3T has identified several key takeaways from its first mid-tier acquisition: Having flexible requirements means that a middle-tier acquisition does not deal in more stringent knowledge and skill criteria. Using middle-tier acquisition and other flexible acquisition mechanisms, the Army can leverage advanced commercial technologies, which are critical to modernizing the force.

Brevity is also critical—when leadership has a clear vision of the common objective of middle-tier acquisition, programs will reduce their documentation.

Finally, don't waste time in staffing when a clearly defined and simple plan allows you to begin your rapid integration of capabilities. Define your objective, establish a controlled but simple process to conduct your rapid acquisition and integration, have a recurring process to collect and incorporate user feedback, and be prepared to shift your direction quickly when needed.

"The MTA process is just another tool in our acquisition toolbox," Welch said. "Having flexibility in how we develop and field these capabilities gives Soldiers timely and advanced capabilities they need for successful missions."

For more information, go to the PEO C3T website at ***http://peoc3t.army.mil/c3t/*** *or contact the PEO C3T Public Affairs Office at 443-395-6489.*

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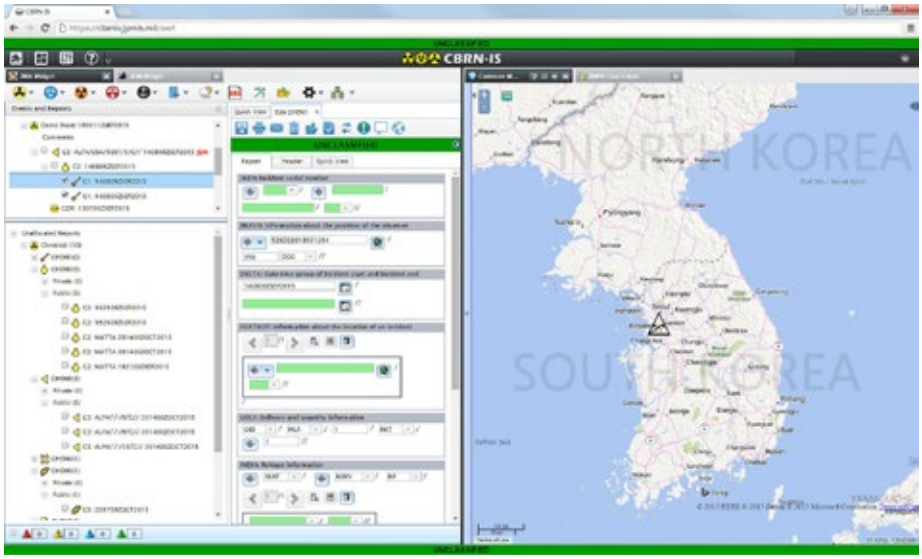
SMALLER, FASTER BITES STREAMLINE ACQUISITION

A more agile acquisition strategy got users excited about a joint system to report and map chemical, biological and radiological attacks, and prompted one service to change its mind about participating.

by Cmdr. J. Alan Schiaffino and Mary C. Baker

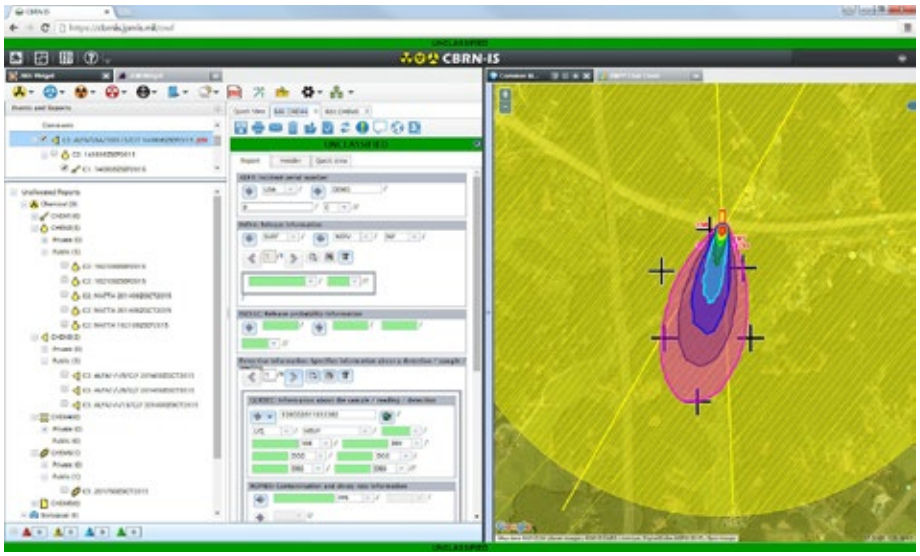
How do we measure our success in acquisition streamlining? In today's information-enabled military environment, it is more important than ever to use flexible, agile, mobile and user-friendly applications that provide information to our commanders at least as quickly as the enemy is able to operate. The information-sharing environment of our forces is constantly evolving, and for the program offices that deliver capability to our warfighters, fast implementation of new strategies or infrastructures is crucial to deliver tools that are still relevant by the time they reach the field.

The Joint Warning and Reporting Network (JWARN) and Joint Effects Model (JEM) are software applications being developed for all services and the National Guard. JWARN is a warning and reporting system that communicates information about chemical, biological, radiological and nuclear (CBRN) incidents across the chain of command and to affected units; JEM is a modeling-and-simulations application that can provide high-fidelity plots of an affected hazard area after a CBRN attack has occurred or to assist operational planning efforts as forces prepare for the possibility of a future incident. Both programs are



DATA SYNTHESIS

JWARN communicates information about CBRN incidents across the chain of command and to affected units. Its ability to overlay graphical depictions of CBRN events onto a command-and-control map that also shows the locations of friendly forces or known threats is of vital importance for a commander who needs to decide what to do after a CBRN event. (Photo courtesy of the authors)



JEM MODELS THE ATTACK

JEM uses current weather observations to create a detailed plot of the area affected by a CBRN attack to determine which part of the base is affected and which areas ground troops need to avoid. (Photo courtesy of the authors)

designed to operate on hardware provided by the services.

Each service's approach to the CBRN mission is different, because of the differences in missions of the services themselves. For example, the Army may have forward-deployed forces maneuvering through a battlefield where the enemy might employ chemical weapons in an attempt to prevent that maneuver; the Air Force's interest in CBRN events is more focused on defending a well-established air base that is (obviously) not maneuvering. Therefore, an Army command post needs to see a plot of where a chemical attack occurred and the area contaminated by that attack, and it needs to be able to plot that "picture" on command-and-control maps, which depict where friendly units are and what direction they are traveling. In the Air Force, the emergency management personnel who are charged with responding to CBRN events need to see where on an air base a chemical detection may have occurred and the parts of the base affected by that attack, so that they can adjust operations accordingly and begin decontamination efforts as needed.

Using current weather observations and forecasts, JEM can provide a high-fidelity plot of the affected area that the Air Force would need to determine which part of the base is affected; the Army can use the plots to anticipate which areas need to be avoided by ground troops in the area. Navy crews on ships and aircraft could be supporting relief efforts around a radiologically contaminated area, similar to the response to the Fukushima earthquake, for example, and may need to plan accordingly. And all services have a requirement to notify higher headquarters and other affected units if they observe a CBRN attack or incident, for which JWARN provides the messaging capability.

Furthermore, JWARN's ability to overlay graphical depictions of those CBRN events onto a command-and-control map that also shows the locations of friendly forces, as well as neutral (non-participating) units or known threats, is of utmost importance for an operational commander who needs to understand the tactical significance of a CBRN event and decide what to do next. The personnel managing a CBRN incident might only be concerned about events occurring in their immediate area of responsibility, but the cloud-based implementation of JEM and JWARN allows users to track events worldwide.

Each service operates in a different environment and with different constraints, with the result that each has developed its own command-and-control architecture tailored to its unique needs. The Army uses more robust command posts, complete with tactical servers dedicated to maintaining a tactical and operational picture of what is happening. The Marine Corps tends to take a more expeditionary approach to land warfare and relies on smaller, lighter systems—primarily its Joint Tactical COP Workstation (JTCW, where "COP" is an acronym for common operating picture). These ruggedized laptops perform a similar function to the larger systems used by the Army, but are smaller and lighter than the full complement of servers deployed by an Army brigade.

Air Force emergency management teams use ordinary Windows-based computers to perform their base defense functions. Navy ships have a customized architecture of command-and-control servers networked with personal computer workstations, and while the ships themselves maneuver through the battlespace, the computer networks onboard are pretty well locked into place—i.e., they are not taken down and later reassembled like those of an Army unit on the move.

Because of these different operational environments and considerations faced by the services, each has developed different approaches to how they handle their information and messaging needs. JWARN and JEM run on the hardware used by the services for their other command–and-control functions, and that means that JWARN and JEM developers must accommodate a wide variety of computer architectures. Those environments range from standard desktop computers used by the Air Force, to command post servers used by the Army, to a cloud-based implementation that can be accessed globally by anyone with a web browser and proper authentication. These complex systems pose a particular challenge to developers trying to field products into those environments. Because each service's architecture must integrate multiple programs and resources to field the overall system, a schedule issue for one component may have cascading effects across the entire system.

MULTIPLES AND MULTIPLES

That challenge is compounded for joint programs like JWARN and JEM that must integrate with multiple service architectures, while each architecture must itself integrate multiple programs and resources. For example, JWARN and JEM may be required to pass warning information via one method when installed in the Army's Command Post Computing Environment, but the Marine Corps' Joint Tactical COP Workstation may use an entirely different messaging protocol.

With a traditional "single step to full capability" approach to acquisition, that could spell unacceptable program delays. For example, as the Army's command-and-control system delivery schedule is built, the program management office in charge of that system is building the schedule around a complex series of applications being developed and integrated together. JEM and JWARN are two of those applications, but there are numerous others—many of which are unique to the Army. Meanwhile, the Navy builds its architecture around the integration of a similarly complex series of different applications. The same goes for the Marine Corps, Air Force and National Guard. The JWARN and JEM programs might never be able to field their software if they had to wait for a time when all services had "finished" building their computing environments.

'MAKE THE SOFTWARE MORE USEFUL'

The first iterations of JEM and JWARN had been developed, but operational users saw new opportunity for what the programs could do. By using a more modern web-based interface, the programs could be adapted to run in a wider variety of environments. The server that is actually "running" the software could be installed in a place that made sense—in some cases, on a local server at the command post, or perhaps in a cloud-based server that is globally accessible. The user would simply point a web browser to the appropriate server location. This web-based approach was one part of a three-pronged strategy to make the software more useful.

In 2014, the Joint Requirements Office for Chemical, Biological, Radiological, and Nuclear Defense approved the requirements documents for a second version of JWARN and JEM. This second version ("JWARN 2" and "JEM 2") would be where the newer web-based interface could be implemented. The Joint Requirements Office, the program offices for each application and the services' stakeholders also seized the opportunity to take a new

approach to software development. The commercial side of the software industry had been leveraging faster development cycles with an approach known as Agile development.

GET AGILE

Practitioners of Agile development subscribe to 12 principles outlined in the "Agile Manifesto." The first two of these principles describe the value of "early and continuous delivery of valuable software," and "welcoming changing requirements, even late in development." The thought of fluid, evolving requirements might make a traditional defense acquisition professional cringe, but the commercial world recognized that tackling software development challenges with smaller, more easily accomplished steps ultimately resulted in more useful and more relevant software than when developers attempted to make one monolithic delivery of a grand design.

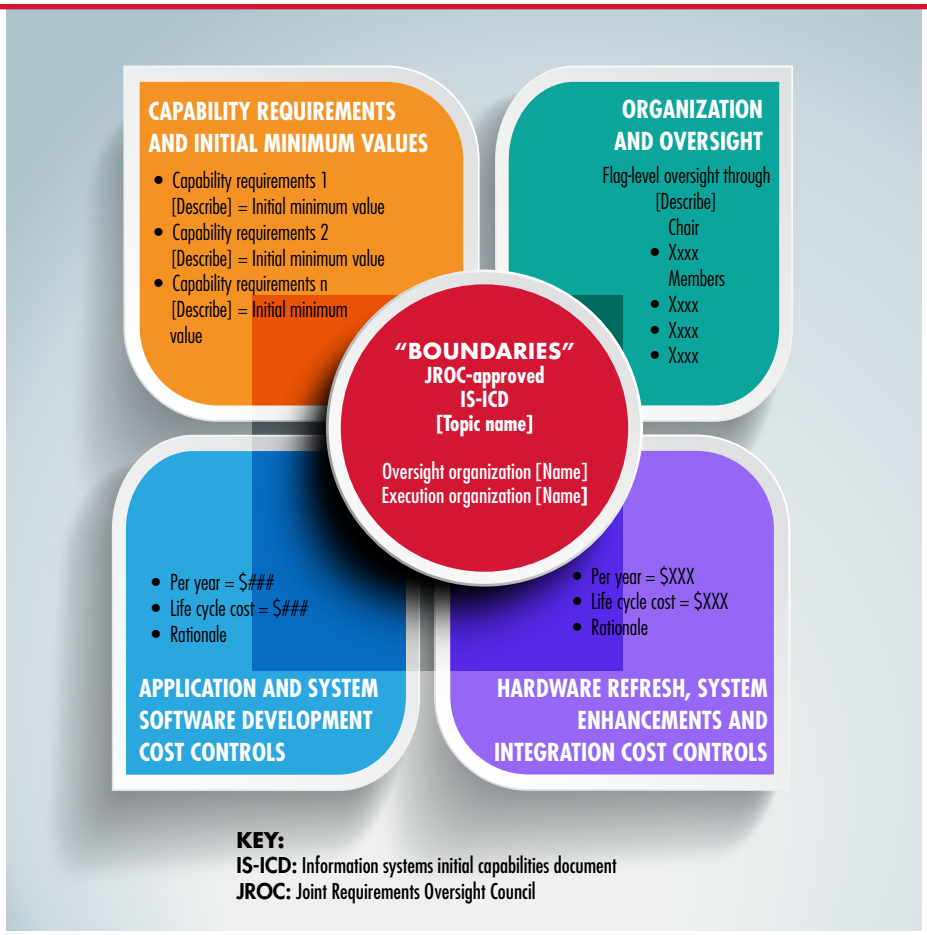
In 2012, the Joint Requirements Oversight Council updated its Joint Capabilities Integration and Development System (JCIDS) manual, the "instruction book" for how the requirements process works to acquire new defense systems and capabilities. One such revision made allowance for the fact that software development occurs in a context where the rate of change—in both the requirements and the environments in which software must operate—is so fast that it can often outpace the traditional acquisition system's very bureaucratic required processes. It offered an alternative model in which a system's requirements are bounded on four sides by "Organization and Oversight," "Hardware Refresh, Enhancements and Integration Cost Controls," "Application and System Software Development Cost Controls," and "Capability Requirements and Initial Minimum Values," (which could be simplified as "Oversight," "Hardware Cost Limits," "Software Cost Limits," and "Minimum Capability Required"). As long as a program is staying within the "box" bounded by those four areas, the requirements process can be delegated to a lower level, allowing for more rapid requirements-document updates, which in turn authorize more frequent updates and enhancements to the software itself.

In our personal lives, we are accustomed to software on our computers and mobile devices being updated on an almost daily basis, so this might still seem like an overly bureaucratic way of managing what is now "normal." But it's important to remember that without requirements documents stating a validated capability need, a program office is not authorized to spend money to develop or enhance something—even if it seems like the operational need is obvious.

On the other hand, the Defense Acquisition System is designed around holding programs (and their managers) accountable for fulfilling all of the requirements outlined in the programs' requirements documents, by a specified deadline. So, a requirements document that outlines a "blank check" of continuous updates and enhancements to be pursued indefinitely is not an option, either.

UPDATES ARE IN THE CLOUD

JWARN and JEM are available on milCloud, so any service member anywhere around the world can use the latest version without needing permission to download or install anything, or waiting for a new software package to be shipped to them. (Photo courtesy of the authors)



THE IT BOX

The JWARN program began a decade ago using an older, slower process better for acquiring hardware, and developed a reputation for moving too slowly for operational users. The IT Box, which permits software programs some more flexibility and speed as long as they stay within the four parameters, has sped up the program sufficiently to impress users and benefit from a loop of feedback and input. (Graphic courtesy of the authors and U.S. Army Acquisition Support Center)

An update to a third-party software application like JEM or JWARN might have been ready for months (sometimes a year or more) before the service would be ready to update its command-and-control system with new or updated software applications.

Yet we know from personal experience that that is exactly how software works in the 21st century. Requirements evolve, computing environments (e.g., operating systems, Java versions, message protocols, etc.) evolve, and if software doesn't evolve along with them, the obsolescence clock starts ticking as soon as that software development stops. The "Information Technology Box" (IT Box) was a compromise between the two realities, trying to blend the accountability and rigor of the traditional Defense Acquisition System with the reality of rapidly changing information technology requirements.

Dynamic requirements and frequent update cycles don't mesh particularly well with the traditional acquisition process, but by the time the initial capabilities documents for the second increments of JEM and JWARN were being written in 2014, the JCIDS manual had been updated and included provisions for a new, more agile approach to defense acquisition of software systems.

This new approach to software development in a defense context, the IT Box, was an initiative to bring some of the benefits of Agile development to a notoriously cumbersome defense acquisition system. It brought about a paradigm shift in the requirements-development process by breaking requirements into related functional groupings, known as requirements-definition packages, and then subdividing those into more manageable capability drops. So rather than an overarching requirements document tasking the program office to create a piece of software containing dozens (or hundreds) of new capabilities, each capability drop might only direct the addition of 10 or so new features.

More importantly, requirements approval and updates for those smaller packages and drops are delegated down to the O-6 (colonel) level to allow for more frequent updates. People representing the operational community for each of the services come together with leaders from the program offices and the Pentagon's Joint Requirements Office for CBRN Defense,

AN APP FOR FIXED AND RUGGED SETTINGS

All of the services need the capabilities JWARN and JEM provide to warn of, report and map chemical, biological and radiological attacks. But each service has a different architecture of computer hardware and software, and deploys it differently—from mobile command posts to stationary setups on ships. (Photo courtesy of the authors)

and form a collaborative group called an integrated capability team. This team meets regularly to talk about what has been delivered so far, the services' priorities for features still to be built, and feedback from everyone involved—whether it be the operational forces using the capability or those at the Pentagon who are overseeing and funding the program. This working group is able to hash out the best path forward, and then take those recommendations to an approval authority at the O-6 level, rather than staffing the updates up to the general or flag officer level. The program office and developer can begin to tackle the requirements that are known and stable while other requirements might still be in flux. The end result keeps the product relevant while minimizing the bureaucracy and delay.

IMPROVING THE UPDATE PROCESS

Combining two approaches has led to more user satisfaction and a sense of buy-in from the operational user community: using smaller, more frequent updates to the core software capabilities described in JWARN's and JEM's first requirements-definition packages; and targeting integration with the individual services as their systems are ready to receive the updates. Feedback has been overwhelmingly positive, both from operational users at user feedback events and training sessions, and at the services' stakeholder level in the integrated capability teams that represent the services to the Joint Requirements Office.

That positive feedback and increased demand was captured by a memo from the Army Staff's G-8 on Sept. 25, 2017, requesting that the fielding of the new version of JWARN be expedited to Eighth Army on the Korean peninsula. Furthermore, the development of a cloud-based capability for JWARN and JEM has made the software available to users even when their service's native command-and-control systems are not available—for example, when units are back home in garrison. Users are now able to see meaningful progress in software development and can use the functionality that is ready now, even as they wait for enhanced functionality to be introduced later.

Perhaps the clearest example of the benefits of this streamlined approach can be seen in the transition of the products to the Defense Information Systems Agency (DISA) milCloud. The milCloud provides a platform for users around the world to access JEM and JWARN software. Because it is a cloud-based software platform, users are able to see a hierarchical list of CBRN events being updated by themselves and other users around the world. Sites exist on both an unclassified and a secret network, and there are lists of events on a training site and an operational site for each security level (unclassified and secret).

Integrating JEM and JWARN with the services' command-and-control systems—which provide command-post personnel with situational awareness of friendly force disposition, neutrals and threats—is still an important requirement. However, in DISA's milCloud, the program office has control of that environment and is not beholden to the services' development schedules for its individual command-and-control systems.

Previously, an update to a third-party software application like JEM or JWARN might have been ready for months (sometimes a year or more) before the service would be ready to update its command-and-control system with new or updated software applications. Now, when a new capability drop is ready, it can be

fielded in milCloud and made available to users worldwide. Users accessing the cloud-based version of the software need only a web browser and an account on the system, and they can access the most up-to-date version of the software available. The user does not have to download, install or update any software locally, nor does the user's system administrator, since the software is delivered dynamically as a webpage from a server that is maintained by the program office. This speeds user adoption, training and feedback, and gets user feedback back to the developers more quickly, ultimately strengthening user satisfaction.

BETTERING A BAD REPUTATION

The JWARN 1 program of record began more than 10 years ago using the older JCIDS process, which was structured primarily to support hardware development. Unfortunately, JWARN 1 developed a dubious reputation in some circles because development was slow and costly, and didn't deliver product quickly enough for the return on investment to be obvious to the user.

When JWARN 2 adopted the IT Box concept and Agile development paradigm, it allowed the user more buy-in with a rapid and more streamlined cycle. The user sees multiple software builds of incremental capability solutions, the results of the development and a path forward.

The combination of stakeholder involvement in the requirements process by the integrated concept team, along with more frequent capability drops, has the operational user community excited about the product again. When the initial capabilities documents for the second increments of JWARN and JEM were being developed, the services were outlining their requirements for the implementations that would be fielded on their particular systems. The integration with the Army's Battle Command Common Services servers was the first iteration of JWARN 2 and JEM 2 to be tested, followed closely by a limited deployment on the DISA milCloud, which was the Air Force's chosen means of accessing the capability.

When the service-specific capability-drop requirements were first being written, the Marine Corps knew it would need a warning and reporting capability in the field. But when it came to the high-fidelity analysis for which JEM was intended, the Marine Corps opted instead to "outsource" its modeling needs to the Defense Threat Reduction Agency rather than having to maintain and support a modeling application and train its user base. So the Marine Corps did not even levy a requirement to integrate the software with their systems in the field.

However, after seeing the success the other services were experiencing with the new generation of JWARN and JEM, both on battlefield servers and in the cloud, the Marine Corps asked to "come back in" with JEM integration after all. Furthermore, the services gave unanimous support in August 2018 when the JPEO for CBRN Defense issued a first-of-its-kind multiservice fielding decision that made the version of the software on milCloud available to all services for operational use and training. The ubiquitous nature of the cloud and the similarity of the software across multiple environments made it possible to field to all services with one fielding decision.

CONCLUSION

There's a lot of talk about "acquisition streamlining" lately, and JWARN and JEM have shown just how effective it can be to use Agile development principles to tackle big challenges one little step at a time. By adapting the JCIDS process to allow for a faster, more fluid development approach, developers can provide users with results within a time horizon where individual users see results. When users see results, they buy into the process and the feedback loop gets even stronger. From a program with a reputation for slow development, to a new generation that's redefining what's possible by leveraging the cloud, the results have spoken for themselves.

For more information, go to ***https://www.jpeocbrnd.osd.mil****.*

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STRONGER AS A UNIT

Adaptive squad architecture will assist in identifying, defining and maintaining interfaces, which will enable the squad to be managed as an integrated platform. (Image by PEO Soldier)

THE SQUAD AS AN INTEGRATED PLATFORM

PEO Soldier, Soldier Lethality team apply a system-of-systems engineering approach to close combat squads to improve lethality and overmatch.

by Ross Guckert

Modernizing to achieve overmatch against potential current and future adversaries is one of the Army's top priorities, and is essential for the Army to respond to potential threats identified in the 2018 National Defense Strategy. By focusing on the squad as an integrated combat platform, the Army has positioned itself to enhance close combat capability, from partnering with industry to developing more technologically advanced equipment for Soldiers. The foundation to establish this integrated approach is the adaptive squad architecture (ASA), which henceforth will be the basis for all close combat squad capability priorities.

The architecture is being developed in close collaboration between the Program Executive Office (PEO) for Soldier and the Soldier Lethality Cross-Functional Team by applying a system-of-systems engineering approach to the squad. Treating it as an integrated combat platform is similar to what we do with air and ground combat platforms. The architecture addresses a key goal of the Close Combat Lethality Task Force based in the Office of the Secretary of Defense: to "develop, evaluate, recommend, and implement improvements to U.S. squad-level infantry combat formations in order to ensure close combat overmatch … against pacing threats and strengthen the combat, lethality, survivability, resiliency, and readiness of infantry squads."

Adaptive squad architecture "is a set of tools and processes that will offer the requirements developers, science and technology community and materiel developers the ability to regard the squad as a platform and develop equipment toward that goal," said Kathleen Gerstein, assistant program executive officer for Futures and Integration within PEO Soldier. ASA provides three essential functions: identification of interfaces, quantitative assessment of new capabilities and system-level configuration management.

"By definition, an architecture is a unifying or coherent form or structure that is used to build to a standard," said John Howell, adaptive squad architecture lead. "ASA is two software tools [the Architectural Assessment Tool (AAT) and the Configuration Database (CD)] that enable a number of capabilities supporting our key stakeholders. The assessment tool will allow stakeholders to do integration planning in a virtual environment to see how new or existing equipment works on a Soldier and squad.

"It provides the capability of systems to work at the Soldier [or] squad level; it can determine the critical interfaces; it has the ability to maintain the latest and greatest versions for use; and it provides the ability to quantitatively predict how much more effective a squad will be with new or upgraded equipment," Howell said.

PEO Soldier, the Soldier Lethality Cross-Functional Team and industry are partnering to develop the initial version of adaptive squad architecture in multiple phases over an 18-month period. ASA will be used to:

- Define the standards and interfaces for incorporating equipment in the future.
- Define approaches to centralized processing and power.
- Enable wireless communications across the squad.
- Provide the tools and processes to address integration issues and more accurately identify the problems associated with Soldier load.

AFTER-ACTION REVIEW

Soldiers perform an after-action review through their IVAS devices after navigating through a shoot house. IVAS is designed to increase Soldier lethality, mobility and situational awareness by providing enhanced night and thermal vision capabilities, map displays and data collection capabilities. (Photo by PEO Soldier)

By applying a systems approach to the Soldier and squad, we will achieve significant efficiencies and enable and encourage innovation by our industry partners, resulting in a more lethal and effective combat platform. In addition, ASA will enable speed of delivery for new capabilities to ensure that we keep pace with emerging threats.

The Integrated Visual Augmentation System (IVAS) will be the first program to leverage the new architecture. IVAS is among the first systems approved as a middle-tier acquisition prototyping program, which provides streamlined authorities related to requirements and DOD 5000 policy.

The IVAS program provides enhanced situational awareness compared with current capability, resulting in better lethality, mobility and survivability for the Soldier. It does this through the fusion of advanced sensors, waveguide heads-up display technology, artificial intelligence, augmented reality, and integration with the tactical network and the Soldier's weapon sight. It is being designed so that Soldiers can fight, rehearse and train on the same equipment, supported by augmented reality and leveraging the synthetic training environment being developed by the Synthetic Training Environment Cross-Functional Team.

THE CLOSE COMBAT SQUAD ENVIRONMENT

ASA's quantitative assessment of new capabilities is being executed through the Soldier Performance Module, an iterative, three-pronged, "crawl, walk, run" approach leveraging the Soldier Squad Performance Research Institute in Natick, Massachusetts; the Soldier Integration Facility being built at Fort Belvoir, Virginia; and the Maneuver Battle Lab at Fort Benning, Georgia. This close combat squad development environment is also being done in close partnership with the U.S. Army Combat Capabilities Development Command (CCDC) Army Research Laboratory, the CCDC C5ISR Center and industry.

The Soldier Squad Performance Research Institute will operate in a controlled laboratory environment. It will validate performance and training approaches and optimize the measures of performance associated with Soldier and squad overmatch. The Soldier Integration Facility will operationalize the technical solution to help determine its operational utility in addressing Soldier capability gaps. Again, the intent is to optimize Soldier and squad performance and effectiveness. Finally, full operational validation will occur at the Maneuver Battle Lab, using an experimentation force and addressing the full spectrum of doctrine, organization, training, materiel, leadership and education, personnel and facilities solutions.

What we learn from each stage will then be inserted back into the cycle as required to update and refine requirements and improve solutions, eventually resulting in the optimal capability for the Soldier and squad. The architecture sets the framework and standards for how we insert and integrate new capabilities in this assessment process.

LIGHTENING THE LOAD

Overall, the architecture's purpose is to create a squad architecture that enables the rapid but deliberate delivery of integrated capabilities to the force, initially focused on close-combat formations, to ensure a lethal overmatch against current and future threats.

The adaptive squad architecture will also allow the Army to make more informed decisions on upgrading or replacing equipment. It also will provide a single, authoritative technical database of all squad equipment and assist in analyzing, defining and maintaining interfaces, which will make it possible to manage the squad as an integrated platform. Leveraging standard interface protocols, the ASA will specify a set of common hardware requirements, networks and connections. This will allow the creation of a system that will link, interoperate and be interchangeable as new technologies and mission needs arise. It also will reduce the weight that Soldiers bear. "We are overburdening our Soldiers," Gerstein said. "We must find a method to consider the many aspects of developing equipment which alleviates that overburdening." By taking a systems approach to Soldier load, we are able to allocate size, weight and power across the subcomponents to further optimize mobility, effectiveness and, ultimately, lethality.

Howell explained that the initiative was a response to the challenge the Army has had in the past with this task, historically assessing the individual Soldier's load rather than the load integrated across the squad. The focus of the Close Combat Lethality Task Force, by contrast, "is how to improve the lethality, survivability, resilience and readiness of close combat formations in the Army, Marine Corps and Special Operations Command. Much of the challenge associated with this task comes from the fact that infantry squads have never been viewed as a platform and addressed in a holistic manner," he said.

Across DOD, Howell noted, "the services manage their pacing platforms, such as combat aircraft or tanks, as systems to ensure that critical variables such as weight, power, protection and communication are all optimized for that system. We absolutely must do the same for the close-combat Soldier and squad." By taking a centralized approach to power and processing, applying

TIGHT SQUEEZE
At Fort Benning's Maneuver Battle Lab, a Soldier is put through activities that resemble challenges that warfighters face in current combat situations. (Photo by PEO Soldier)

innovative approaches to eliminating cables, and setting size, weight and power allowances across the subcomponents, we can realize significant efficiencies across these domains and help Soldiers reduce their load. The adaptive squad architecture will be a key enabler to achieve these efficiencies.

"Now, with ASA, the terms 'extensibility' and 'modular open-systems approach' that are normally associated with information technology systems or larger weapon systems will apply to the close combat Soldier and squad," Howell said. "The Army materiel enterprise must now be planning for integrated capabilities right from the start of the acquisition process."

CONCLUSION

As new, advanced equipment is developed, the adaptive squad architecture will provide the means to integrate it. Additionally, it will give other platform PEOs (aerial, ground and maritime, for example) a way to ensure that their platforms can incorporate and accommodate the situational awareness, logistics and lethality needs of the Soldiers who use them.

"It's time to stop making the Soldier figure out how all the equipment needs to fit together. The ASA will help us get a little closer to that goal," Gerstein said.

"There have been many valiant efforts over the years to create a Soldier-squad architecture," said Howell. "Unfortunately, there have always been significant challenges, either operational, financial, technical or otherwise, that have prevented success.

"The partnership between PEO Soldier and the SL CFT [Soldier Lethality Cross-Functional Team], as well as the support of Army leadership and our Soldiers, has enabled the realization of the ASA and the Soldier Performance Module," he said. "The time has definitely come to build and use the architecture that will finally allow the Soldier and squad to be treated like an integrated platform."

The PEO Soldier and Soldier Lethality Cross-Functional Team partnership is vital to achieving the goal of the squad as an integrated combat platform. Together, these organizations are improving the Army's ability to keep pace with emerging threats by leveraging the adaptive squad architecture to synchronize capability gaps and technology development, ultimately providing Soldiers with the capability they need for overmatch.

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

ROSS GUCKERT is the deputy program executive officer for Soldier, supporting the program executive officer in leading the development, integration, testing, acquisition, fielding, sustainment and modernization of more than 150 diverse programs of record. He holds an M.S. in national resource strategy from National Defense University's Industrial College of the Armed Forces; an M.S. in engineering management from George Washington University; and a B.S. in electrical engineering from the University of Pittsburgh. He is Level III certified in program management, engineering, and science and technology management. He is Level I certified in test and evaluation. He is a member of the Senior Executive Service and the Army Acquisition Corps.

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STAFF SGT. CHARLES PRIHODA

COMMAND/ORGANIZATION: 901st Contracting Battalion, U.S. Army Mission and Installation Contracting Command – Fort Hood

TITLE: Contracting noncommissioned officer

YEARS OF SERVICE IN WORKFORCE: 3

YEARS OF MILITARY SERVICE: 13 (9 in the U.S. Army; 4 in the U.S. Marine Corps)

DAWIA CERTIFICATIONS: Level I in contracting

EDUCATION: J.D., Cleveland-Marshall College of Law, Cleveland State University; B.A. in history, Ohio University

AWARDS: Army Commendation Medals (two oak leaf clusters (OLCs)), Army Achievement Medal (one OLC), Navy and Marine Corps Achievement Medal, Army Good Conduct Medal (two knots), Marine Corps Good Conduct Medal, National Defense Service Medal, Global War on Terrorism Service Medal, Humanitarian Service Medal, NCO Professional Development Ribbon (Bronze Numeral 2), Army Service Ribbon, Overseas Service Ribbon, Navy Sea Service Deployment Ribbon, Basic Parachutist Badge and Air Assault Badge

STAYING ON TOP OF THE GAME

It has been a busy year for Staff Sgt. Charles Prihoda. He completed his first forward acquisition assignment, spending nine months in Poland in support of 1st Brigade, 1st Cavalry Division. Right after his return, he began training for the upcoming Best Warrior Competition and was ultimately selected to represent the U.S. Army Contracting Command (ACC) in the next round of the contest. And he's a newly minted Texas attorney, having passed that state's bar in the spring.

Prihoda is a contracting noncommissioned officer (NCO) for the 901st Contracting Battalion, part of the U.S. Army Mission and Installation Contracting Command (MICC) – Fort Hood, Texas. The 901st, which comprises five contracting teams, is responsible for planning and executing contingency contracting in support of Army and joint operations, preparing warfighters to accomplish operational contracting support missions, and training and deploying contingency contracting teams. In garrison, the battalion works with MICC – Fort Hood to provide contracting support for the 1st Cavalry Division and the installation.

Prihoda's job is to facilitate the contracting needs of units in garrison and in deployed environments. "In some cases, I act as a business adviser to unit commanders, recommending appropriate acquisition strategies that will save money and comply with federal regulations," he explained. "When I tell people about my job, they are surprised to find out that the Army contracts for so many different things, both large and small."

Prihoda earned his law degree in 2010 and relies in part on what he learned in law school for his contracting work. "I've always enjoyed contract law, and one of the things lawyers learn is how to understand language and interpret statutes. Both of those skills come into play in my work now." He noted that the most enjoyable aspect of his job was one that he didn't expect: seeing the direct impact of his work. "I knew that contracting was an important part of acquisition, but I didn't realize I'd see the impact it has so directly—on maintaining readiness, for example, or supporting a training mission."

Acquisition is a dynamic field, he added. "With changes in policy and changes in regulation, you can't get set in your ways. It's really important to read policy updates and stay proficient in your career field so you can remain on top of your game." He also relies on—and shares—advice that was given to him by a contracting officer he worked with at MICC, Staff Sgt. Louis Olvera. "His advice was to be eager to handle requirements, and

to get involved in as many different requirements as early as you can to gain experience."

Prihoda has been in the acquisition workforce for three years, following six years as an infantry Soldier with the 82nd Airborne Division at Fort Bragg, North Carolina. His military service also includes four years with the Marine Corps, where he served before attending college and law school. "I applied to become a 51C [contracting NCO] in 2015, and accessed into the field in 2016. What appealed the most to me was being able to use past experiences in the field of purchasing, and working with federal regulations."

Fort Hood is Prihoda's first acquisition duty station, and his nine-month stint in Poland was his first forward assignment as a contracting NCO. "It was a great experience to be forward with the units we support, and to see how contracting efforts have an immediate and direct impact on the mission," he said. It was also somewhat of a baptism by fire. "In garrison, the contracting process has a fairly long timeline. But in a forward assignment, someone will come to you on Monday and ask you for something they needed yesterday. Missions change rapidly, so there's a much shorter turnaround time. It really required me to think and move quickly."

His return from Poland coincided with a request from a fellow Soldier to join him in training for the Best Warrior Competition. In May, he beat out nine other Soldiers in a weeklong event and was named ACC Best Warrior of the Year. He represented ACC at the U.S. Army Materiel Command's Best Warrior Competition, which was held at Camp Atterbury, Indiana, in July. (Sgt. 1st Class Reginald Alexander, a contracting NCO with the 921st Contracting Battalion at Wheeler Army Airfield, Hawaii, came out on top at that event.)

The competition includes physical fitness as well as knowledge of Army tasks and exercises. Prihoda and the other participants completed the Army physical fitness test, an 8-mile road march, weapons qualification, combat water survival, warrior battle drills and land navigation, as well as an interview with a board of ACC senior NCOs, a written test and an essay.

"Sergeant Prihoda is the total package, and well-deserving of the title of ACC's best NCO," said ACC Command Sgt. Maj. Jill Crosby. "He is articulate, in amazing physical condition, and exceeds the standards in all the best warrior competition events."

—SUSAN L. FOLLETT

BEING THE BEST

Prihoda represented Army Contracting Command at the 2019 Best Warrior Competition. (Photo by Ben Gonzales, MICC)

WITH THANKS

Lt. Gen. Stephen G. Fogarty, commanding general of U.S. Army Cyber Command, toured the Forge facility on May 16 and left a note of appreciation for Forge staff and their work. (Photo by Cecilia Tueros, PEO EIS)

FORGING the ARMY'S CYBER DEFENSE

The Forge is an open door for industry to collaborate with the Army on cybersecurity operations, fostering innovation and speeding solution delivery.

by Ellen Summey

It's a lesson most of us learned as children, playing the game of "telephone": The more people involved in passing along a message, the greater the likelihood that things will go awry. That concept also applies to acquisition. Requests are submitted, formatted and passed through so many sets of hands that in some cases, a final result may no longer meet the original intent.

"A lot of information in acquisition and procurements is lost in translation," explained Joe Kobsar, director of Applied Cyber Technologies at the Program Executive Office for Enterprise Information Systems (PEO EIS). "A Soldier will express a need for something. By the time it reaches paper format, it's been transformed into this entirely new creature. People just keep adding things to them, which were never part of the initial requirements. That doesn't work for rapid acquisition."

To tackle this problem, PEO EIS is bringing everyone to the table. Through its Defensive Cyber Operations (DCO) project, it has created an innovation hub called "The Forge" at Fort Belvoir, Virginia. Tucked away between the bowling center and the Specker Field House, the Forge is inconspicuously located inside the former garden center building. Though unassuming from the outside, its interior is bright and modern. It provides office space for roughly a dozen full-time staff, representing the U.S. Army Cyber Command's Data Warfare Division, Army Contracting Command – Rock Island (ACC-RI), the DCO program office, the U.S. Army Test and Evaluation Command and the U.S. Army Communications-Electronics Command, with ample meeting rooms and event spaces for collaboration with industry.

"The Forge is a location we created to foster collaboration between industry and government," explained Lt. Col. Scott Helmore, then-product manager for Cyber Platforms and Systems at PEO EIS and a driving force behind the initiative. "It is a location where people can come and talk about common problems, work on those

GRAND OPENING
Lt. Gen. Stephen G. Fogarty, commanding general of U.S. Army Cyber Command, and Chérie Smith, PEO EIS, mark the official opening of the Forge May 16 at Fort Belvoir. (Photo by Cecilia Tueros)

problems, and then start to integrate and develop products into actual solutions that we can take off the shelf and insert into the warfighter's hands," he said.

"It's great to see the Forge connecting those dots and linking everyone together, bringing speed to the acquisition process like we've wanted to for a long time," added Brendan Burke, deputy program executive officer for EIS. No more games of telephone.

IT'S ALL ABOUT SPEED

The Forge worked with ACC-RI to establish its very own other-transaction authority agreement, which they named COBRA. It has its own unique parameters, specific to the Forge, and functions as a sort of blanket purchasing authority. Agreements under other-transaction authority allow DOD to bypass many procurement regulations for certain prototype projects. Bonnie Evangelista, a procurement analyst with ACC-RI, works at the Forge full time, and explained the advantages of other-transaction agreements for defensive cyber. With other-transaction authority, "you have a lot of flexibility and opportunity to enable the things the Forge is designed to do," she said. "Not just prototyping, but innovation, collaboration, the speed of operational relevance."

Helmore explained that flexibility as a mandate from Army leaders. The only limitation, he said, is the requirement to stay within the boundaries of the "IT Box," a mechanism introduced in 2014 to allow greater flexibility for certain technological capabilities. (See related article, "Smaller, Faster Bites Streamline Acquisition," Page 33.) "Most folks in traditional acquisition are told, 'Go buy or get me this,' " Helmore said. "We're not told that. We're told, 'Go get me something that you think can solve these types of problems.' We have a ton of flexibility."

Beyond the obvious benefits of speed and flexibility for cyber defense, Evangelista said other-transaction authority is great for cyber and for nontraditional government contractors because the barriers to entry are lower. "You can bring in companies that normally don't do business with the government," she said (though other-transaction agreements can also be used to contract with traditional defense contractors, as long as they agree to cost-sharing). Because the Forge's other-transaction agreement uses layman's terms and allows simplified submissions (white papers, technical charts or fact sheets, rather than formal proposals). "You don't have to be a great proposal writer. You just submit your idea or your commercial solution or technology."

"Everybody talks about bringing innovation," said Col. Chad Harris, project manager for Defensive Cyber Operations, which houses Applied Cyber Technologies and the Forge, "but then it has to be transitioned to programs of record, and then it has to be sustained long term. The Forge sits at a unique point, bringing innovators together with our programs of record." The Forge is using other-transaction authority to spark those new relationships and solutions, and is setting the stage for those innovations to eventually comply with the Federal Acquisition Regulation (FAR).

USING WHAT WE PAY FOR?

If you buy a new computer at a big-box retailer, chances are good that it will come preloaded with lots of software. Some you will use frequently (the web browser, for instance), but other pieces of software, you may never open. It is a package deal, so there's no use declining the spreadsheet software you didn't want. The price won't change.

When it comes to the Army's cyber protection teams, however, their deployable cyber kits aren't purchased that way. Each processing unit (core), each tool and each piece of software is specifically chosen and purchased for the identified threat. Joe Kobsar, director of Applied Cyber Technologies at PEO EIS, wants to understand how effectively those tools are being used to make sure government dollars are spent wisely.

After the kits are deployed and used, they are returned to Defensive Cyber Operations. "When the kits are done, they come back to us and we extrapolate the data," Kobsar said; the team physically connects the kits to computers at the Forge to extract the data, because the Army's networks aren't generally equipped to handle the amount of data the kits contain and some regulations prevent this kind of cyber data from being sent electronically. "We want to find out which tools are being used, so we can better pinpoint and refine our numbers. How many software licenses do we need? Are we actually using all these software licenses we're procuring? Right now, the answer is, 'We don't know.' In acquisition, for us to justify spending those dollars, we need that data."

That data can also help with size, weight and power, the trio of competing forces for computers. Increased processing power might mean a larger, heavier product, so it's about determining the right balance of all three. If DCO can eliminate unused software and tools on those cyber kits, it frees up memory for other uses.

—ELLEN SUMMEY

NO LONGER AT ARM'S LENGTH

Under traditional, FAR-based contracting, the government is limited in how it can communicate with industry. The idea is to ensure fairness, but this approach can be problematic for technology and cybersecurity projects. "Everything is firewalled," Helmore said. "You can't tell one contractor about another contractor." This is sometimes referred to as the "arm's length" principle, which would discourage any sort of collaborative relationship between buyer and seller in the name of bargaining.

"We don't have that," said Helmore. "The purpose of the [other-transaction authority] was to collaborate—to find a way to make industry feel like they can come to you and foster an idea with you, refine that idea, turn it into a prototype capability." In fact, the Forge team hopes to encourage collaboration between contractors through the System of Systems Consortium, which serves as the administrative organization for its other-transaction authority. In simple terms, the consortium is the prime contractor for the Forge, and it handles day-to-day administration and management of all subcontracts. This arrangement simplifies communication between the Forge and consortium members.

"Quite a few times," Helmore said, "we have recognized the potential for collaboration with another consortium member, and we have directly recommended that they consider working together to strengthen their offering or solution. On one of our most recent projects, we took a piece of hardware that was being built by one company but was missing a good software component, and we put those two companies together, and that end result was recently awarded a production contract for us."

"We've got to turn to our industry might," Helmore added. "Use the brains of all the commercial entities that are out there, that have been working on these problems and are analyzing it, and put them together. That's what the Forge is about."

REDUCING RISKS THROUGH EXPERIMENTATION

When you're dealing with new technologies and planning to introduce them to the Army's network, there is inherent risk. How do cyber experts know the products are trustworthy and effective? The Forge provides a "sandbox," or cyber test environment, to allow for safe, controlled access to government systems. This way, industry can demonstrate how well their solutions would actually monitor and detect attacks on the Army's networks.

"We meet with hundreds of companies and they always say, 'We have the best product, just use our product,' " Helmore said.

"Show me. Take it back here, put it on a platform, and show it to me. We need to have industry build their capability and show us how it fits into our network."

Test-driving the software is one thing, but the Forge takes it a step further. The Army's networks face a constant barrage of cyberattacks, and its cyber protection teams rely on lessons learned from prior attacks to improve their defenses. "We are able to do a side-by-side comparison," Helmore said. "I can rerun that entire attack here (in a controlled or simulated environment) and take a look to see how new technologies could have prevented it, or take a look at the things we've already done, and see how we could fine-tune what we've already bought to stop a future attack."

A tweak here, a change there; Helmore sees it all as a science experiment. Take away the acquisition-speak and the fancy technology and it's really simple. "Go back to basic science," Helmore said. "What did you do? You changed one or two variables and you saw what happened. That's all we're doing here." The Forge is not looking for one end-all, be-all solution, but is building cyber defense through incremental improvements.

CONCLUSION

The Forge and PEO EIS are keenly aware that they are in a literal race for cyber dominance. "As fast as we build a capability to defend the network, three other [threats] have been found to penetrate it," Helmore said. "On a daily basis, we have hundreds of thousands of attacks on our networks."

Training and retaining Soldiers with advanced technical skills sets is another challenge, as many are tempted to leave the Army for high-paying jobs in the private sector. Kobsar, director of Applied Cyber Technologies, is centralizing some of those technical duties to allow Soldiers with basic cyber skills to operate their deployable kits and defend the network.

"Previously, the Soldiers would have to maintain all the kits themselves," Kobsar said. "DCO has taken that over for them. We have something called an Armory. It's a small building that has enough space to hold all the kits. The Armory has a network connection, so when I have an update, I push it to all the kits that are connected in that facility down there. It's automatically updated. It's not taking the Soldiers away from their mission. It's done automatically for them."

This race for cyber dominance is a balancing act. It's about supporting tomorrow's cyber protection Soldiers, collaborating with industry partners and staying a step ahead of adversaries. Kobsar sees the cyber front as the Army's new battlefield. "We're just not flying airplanes anymore," he explained. "I'm taking a virus, or I'm taking control of your nuclear power plant, or I'm taking control of that dam, or I'm going to turn your entire power grid off. That's the battlespace today."

Much as the United States relied on industry partners to outmanufacture and out-compete its opponents in World War II, Kobsar believes industry will be the key to victory in tomorrow's battles. "We have to enable them to help us," he said.

"That's the whole vision for the building," Evangelista explained. "We're trying to foster that relationship and that trust with industry, so they start to take the reins and feel at home in this building. Like Lt. Col. Helmore and Mr. Kobsar often say, 'Government is not going to solve these problems alone. Industry has the answers. You've just got to let them in.' " Open the door.

For more information, email ***usarmy.peoeis@mail.mil*** *or go to* ***https://www.eis.army.mil/programs/dco****.*

ELLEN SUMMEY provides contract support to PEO EIS at Fort Belvoir, Virginia, for Bixal Solutions Inc. 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 has more than a decade of communication experience in both the government and commercial sectors.

KEY:

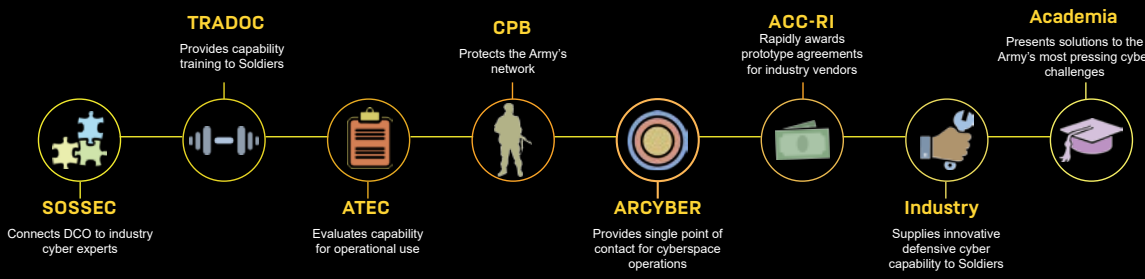
ACC-RI: ARMY CONTRACTING COMMAND – ROCK ISLAND
ARCYBER: U.S. ARMY CYBER COMMAND
ATEC: U.S. ARMY TEST AND EVALUATION COMMAND
CPB: CYBER PROTECTION BRIGADE
DCO: DEFENSIVE CYBER OPERATIONS
SOSSEC: SOSSEC INC., WHICH ADMINISTERS THE SYSTEM OF SYSTEMS CONSORTIUM
TRADOC: U.S. ARMY TRAINING AND DOCTRINE COMMAND

MEET THE FORGE
What the Forge does, and who's involved.
(Graphic courtesy of PEO EIS)

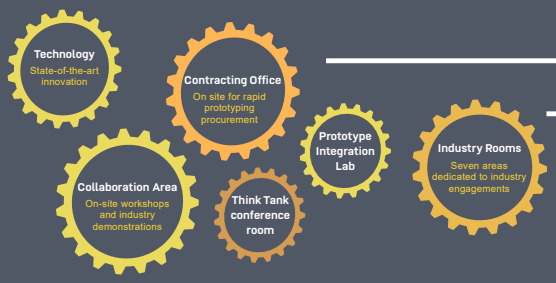
US ARMY PEO EIS
PEO Enterprise Information Systems

Forge Facts

The Forge is DCO's cyber innovation center dedicated to identifying, assessing, procuring and integrating defensive cyber capability and prototypes, all in one central location. Industry, DCO personnel, Soldiers and stakeholders maintain a continuous presence at the Forge for a collaborative approach to advancing capability innovation to integration.



Inside the Forge



Industry benefits

- **Ongoing** product demonstration opportunities
- **Direct** feedback from end users
- **On-site** Contracting Office/Rapid Agreement Awards
- **Partnership** and networking opportunities with other vendors

Forge-Facilitated Events

Forge Storm
On-site trade show with vendors and experts

Coliseum
Prototype demonstrations for on-site awards

Labyrinth
Process that solves IT problems collaboratively

Constellations
Consortium members that participate at Labyrinths

Forge Trivia

$25M The Forge has facilitated DCO's ability to award $25 million in obligated funds, including $17.8 million in prototyping for FY19.

41 DCO will equip 41 cyber protection teams with advanced defensive cyber solutions that protect the Army's network.

11 The number of programs of record that will be supported based on prototypes procured through the Forge and COBRA.

200+ Forge Storm, DCO's first in-house trade show, attracted more than 200 participants and 23 companies.

APPLIED CYBER TECHNOLOGIES


ARMY

CYBER QUEST

Cyber Center of Excellence program aims to expand partnerships and close capability gaps through experimentation.

by Maj. Christian Abney

As the Army modernizes its forces to achieve its vision of deploying, fighting and winning decisively against any adversary by 2028, finding opportunities for government, industry and academia to collaborate has become increasingly important. The U.S. Army Cyber Center of Excellence (CCOE) is using an experimentation event called Cyber Quest to partner with talented organizations and leverage their strengths to solve Army challenges.

The CCOE is the Army's proponent for cyberspace, signal and communications networks, information services and electronic warfare. Along with educating the cyber and signal forces, one of its key focus areas is to conduct the functional solutions analysis necessary to modernize doctrine, organization, training, materiel, leadership and education, personnel, facilities and policies within the cyber and signal communities.

The Cyber Battle Lab, part of the Capabilities Development and Integration Directorate, is a tool that the center offers the requirements and acquisition communities to identify new technologies with the potential to fill capability gaps. The Cyber Battle Lab uses modeling, simulation and live experimentation in relevant operational environments to determine whether technologies are mature enough for prototyping. It leverages innovative signal, cyber and electronic warfare technologies to support the warfighter and to inform the requirements and acquisition communities.

FIELD TEST

Staff Sgt. Jacob Rascon, assigned to 21st Brigade Engineer Battalion, 3rd Brigade Combat Team, 101st Airborne Division (Air Assault), helps test potential field equipment during Cyber Quest 2019 at Fort Gordon in June. This year's event included increasing cyber situational understanding; exploring automated defensive cyber operations; and extending the tactical network's range. (U.S. Army photo by Spc. TaMaya Eberhart, 55th Combat Camera)

Additionally, the lab partners with other Army research and development labs, industry and academia to synchronize, coordinate and accelerate the development process while codifying user, developer and industry efforts to maximize technological advancements.

Each year, the Cyber Battle Lab hosts Cyber Quest, a prototyping experiment conducted at the CCOE at Fort Gordon, Georgia, to identify new technologies that can benefit Soldiers by closing capability gaps in cyberspace operations and electronic warfare. Cyber Quest "is a reflection of how the Army is trying to solve problems," said Maj. Gen. Neil S. Hersey, commanding general of the CCOE, during his opening remarks at Cyber Quest 2019's Distinguished Visitors Day, held at Fort Gordon on June 14. The event gives the Army, industry and academia the opportunity to team up to develop a force capable of maintaining overmatch against current and future military threats.

The mission of Cyber Quest is to conduct prototyping experiments that demonstrate capabilities with the potential to close high-priority technology gaps. To better enable the Army to achieve the priorities of the Hon. Bruce D. Jette, assistant secretary of the Army for acquisition, logistics and technology—accelerating the fielding of useful materiel solutions to Soldiers and expediting the development of technologies that provide military advantage—Cyber Quest provides operational, scenario-based testing of emerging technologies against identified capability requirements. A major goal of the exercise is to "figure out how to get kit [equipment] in the warfighter's hands faster so we are prepared to fight the next war," said Col. Brett Riddle, director of the Cyber Battle Lab.

To expedite the development and acquisition of relevant technologies, the Cyber Battle Lab focuses on the assessment and demonstration of products that are at Technology Readiness Level 6 or 7, as well as commercial off-the-shelf technologies.

While Cyber Quest focuses largely on identifying and assessing new equipment and software applications, it also provides opportunities to discover how the Army can apply non-materiel solutions to overcome capability gaps, such as by improving doctrine, more effectively resourcing organizations and enhancing training. Ultimately, the goals of Cyber Quest are to:

- Define requirements for new capabilities.
- Define requirements for updates to existing capabilities.
- Identify candidates for rapid acquisition.
- Support acquisition risk reduction.

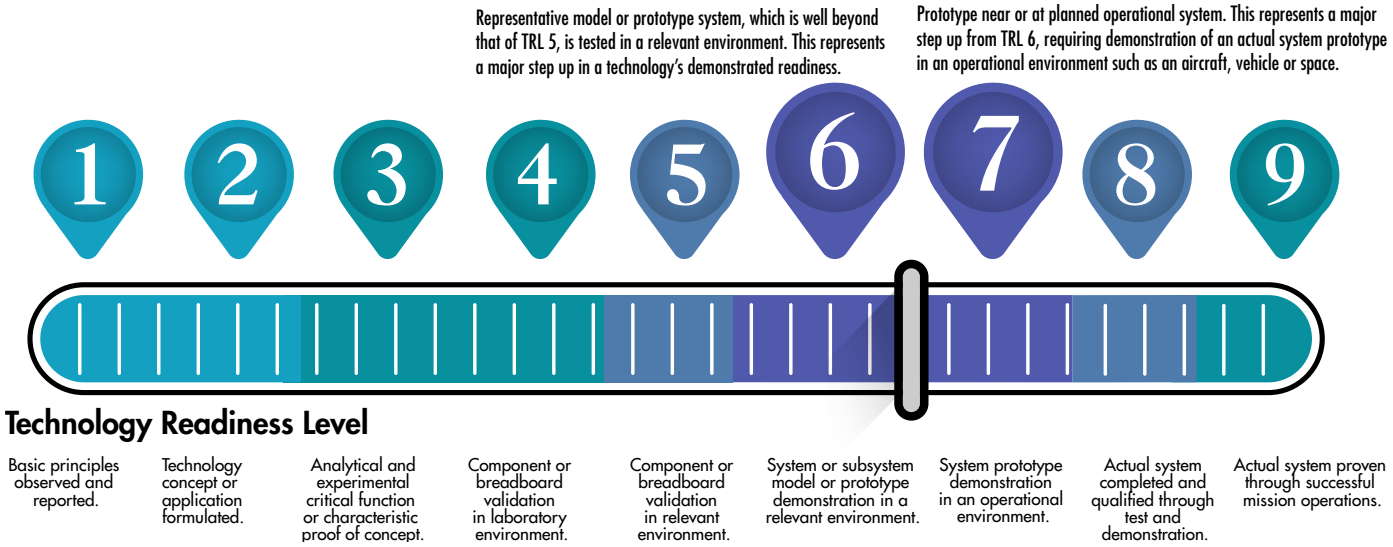
WHO PARTICIPATES?

Each year, the program's sponsors, which include program management offices, U.S. Army Training and Doctrine Command capability management (TCM) offices, Army cross-functional teams and the Cyber Battle Lab determine the focus areas for Cyber Quest. Focus areas are based on input from each sponsor regarding the

PARTNERSHIP POTENTIAL

Soldiers and industry partners collaborate during the Cyber Quest 2019 experimentation event. Although the Cyber Center of Excellence works with industry vendors at different events throughout the year, Cyber Quest provides a more hands-on experience for Soldiers and vendors. (U.S. Army photo)

Levels of Technology Readiness



LEVEL UP

Technology readiness levels are a method for estimating the maturity of technologies during acquisition. They were developed to enable consistent, uniform discussions of technical maturity across different types of technology. The Cyber Battle Lab assesses and demonstrates products that are at Technology Readiness Level 6 or 7. (Graphic courtesy of the author and U.S. Army Acquisition Support Center)

most significant capability requirements for each organization. (See sidebar, Page 58.) Therefore, each annual experimentation event is unique.

Once the program sponsors have determined the focus areas, the Cyber Battle Lab invites interested vendors to take part in an informational industry day. This event provides the program sponsors and vendors with an opportunity to collaborate and determine if and how teaming will provide value. After the program sponsors and vendors have committed to partnering, they begin the critical work of determining what objective and subjective data the evaluators will capture that will define product success and support acquisition decisions.

The announcement of Cyber Quest priorities and industry day generally take place in August, with the exercise itself taking place the following spring. For example, the 2019 priorities were announced in August 2018, and exercises were conducted in June 2019 at Fort Gordon. Priorities are spelled out in broad agency announcements released through the Federal Business Opportunities website. Each announcement outlines the objectives and key events of the experiment and provides interested industry and academia partners with the framework for participation. Typically, the announcements seek technology submission forms from interested colleges and universities, nonprofit research institutions, commercial firms, small businesses, small disadvantaged business concerns, historically black colleges and universities, and minority business enterprises and institutions.

HOW DO STAKEHOLDERS BENEFIT?

Cyber Quest provides government sponsors with two important opportunities. First, it gives sponsoring organizations the chance to develop and refine requirements for what the Army needs. Second, it provides program offices with an additional resource to reduce risk throughout the acquisition process.

Take, for example, the experience of the Project Manager (PM) for Mission Command, within the Program Executive Office for Command, Control and Communications – Tactical, and TCM Networks and Services. Working together over the past year, PM Mission Command and TCM Networks and Services established criteria for testing tactical server infrastructure hardware and software tools for defensive cyber operations. PM Mission Command, TCM Networks and Services and the Cyber Battle

In 2017, Cyber Quest focus areas included ways to:

- Improve the capacity, reach and security of tactical communications.
- Better enable the mission visualization, planning and management of defensive cyber operations.
- Advance mission visualization, planning and management for electronic warfare.
- Expand situational understanding of the battlefield.

In 2018, the experiment focused on opportunities to:

- Improve the commander's situational understanding of the threat environment.
- Conduct radio-frequency-enabled offensive cyber operations.
- Better enable unified network operations.
- Implement advanced wireless solutions for command posts.
- Explore applications for protected waveforms with low probability of detection and low probability of intercept.

In 2019, the experiment focused on identifying opportunities to:

- Increase situational understanding, analysis and exploitation of cyber.
- Explore automated capabilities for defensive cyber operations.
- Implement local and remote management and planning of tactical electronic attack and electronic warfare assets.
- Extend the tactical network's range.

Lab established testing criteria and provided Soldiers participating in the exercise with the opportunity to operate the systems and provide user feedback. Data from the experiment was used to inform installation, operation and maintenance procedures; to examine how well the equipment and software operated on the network; and to define fielding schedule requirements.

Vendors, particularly nontraditional industry partners who have less experience working with the government, are encouraged to participate in Cyber Quest because it enables access to a realistic network environment to exercise new technologies, offers exposure to high-level decision-makers, and provides an opportunity to understand Army needs and shape future programs.

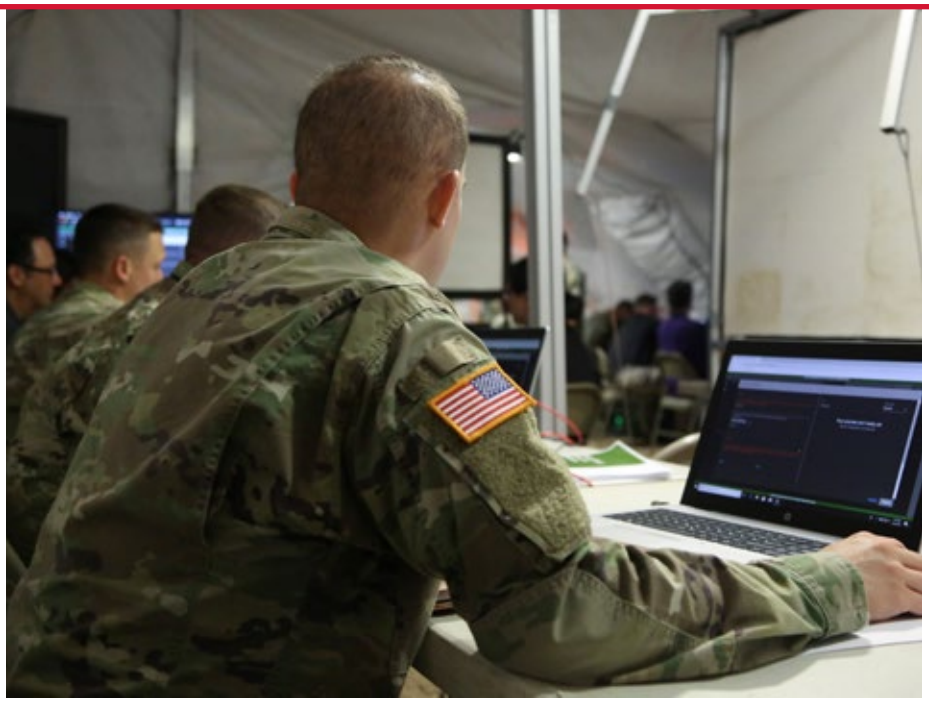
This year, 18 large and small business industry partners received government sponsorship and participated in the exercise. Each company was integrated into the experiment's military network, and each was afforded the opportunity to put their product into the hands of Soldiers. This provided immediate feedback to the vendors on their product's capabilities.

One participating company specializing in enterprise software products that demonstrated its concept for how the Army can manage digital identities for secure system access noted that Soldier feedback enabled its team of computer and software engineers to make quick but necessary adjustments that made their product's user interface more intuitive.

Following the event, each vendor receives written feedback on how well their product performed in achieving its objectives. Additionally, each company gets a direct audience with Army senior leadership from the CCOE, cross-functional teams and the acquisition community. During Distinguished Visitors Day, each company provides a briefing on its products and fields questions directly from top decision-makers.

CONCLUSION

The CCOE is using its experience from Cyber Quest to make adjustments that will create more collaboration opportunities. While Cyber Quest traditionally has involved coordination and buildup to a single annual exercise, future iterations will include smaller events throughout the year to evaluate technologies that do not require the full resourcing in personnel and equipment necessary for the larger-scale annual exercise. The goal is to provide partners from industry and academia with greater access to integrate new technologies into the government's test environment and get needed equipment in the hands of Soldiers.



COMMUNICATIONS SCREENING

Soldiers analyze cyber communications during Cyber Quest 2019. The mission of Cyber Quest is to conduct prototyping experiments that demonstrate capabilities with the potential to quickly close high-priority technology gaps. (U.S. Army photo by Spc. TaMaya Eberhart, 55th Combat Camera)

HANDS-ON TECH

Staff Sgt. Jacob Rascon, right, and Sgt. David Hendrixson, both assigned to 3rd Brigade Combat Team, 101st Airborne Division (Air Assault), analyze prototyped cyber field equipment during Cyber Quest 2019. While the event traditionally has built up to a single annual exercise, future iterations will include smaller events year-round. (U.S. Army photo by Spc. TaMaya Eberhart, 55th Combat Camera)

Additionally, the director of the Cyber Battle Lab hopes to increase awareness of Cyber Quest and incorporate more participation from academic institutions. Increasing awareness of the experimentation event and creating additional opportunities to participate throughout the year will lead to more opportunities for government and university partnerships. In 2016, the CCOE was fortunate to include the Georgia Tech Research Institute as a sponsoring organization in Cyber Quest. Its participation enabled the Georgia Tech team to evaluate the performance of tools for cyber situational understanding, benefiting both the research institution and the Army. The Cyber Battle Lab hopes to include more opportunities like this to enable success through teaming with academia.

In all, Cyber Quest is an example of how Army organizations are working to develop the Army of the future by building partnerships today. Each exercise brings the Army closer to developing the right requirements and making better-informed materiel solution decisions necessary to fight and win in a multi-domain environment.

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CARRY THAT WEIGHT

A Marine with the 24th Marine Expeditionary Unit carries cold weather gear on a march across the Icelandic terrain in October 2018, in preparation for NATO Exercise Trident Juncture 2018. Given the warfighter's need to carry big loads such as this one, any reduction in equipment weight promises to increase mobility, survivability and lethality. The cartridge case is a prime target for weight reduction in small-caliber munitions. (U.S. Air Force photo by Capt. Kylee Ashton, 368th Public Affairs Detachment)

EVERY OUNCE MATTERS

Army, Marines, U.K. collaborate to develop lightweight ammunition to reduce Soldiers' load.

by Todd Townsend

As the conflicts in Afghanistan and Iraq intensified in the early 2000s, images of American warfighters carrying impossible loads while moving into operational theaters were all over the media. These images began an intense debate over how much we were asking our warfighters to carry and how materiel developers needed to prioritize lightening the load. The development community across the services took a hard look from the warfighter level at each piece of equipment to reduce ounces or pounds.

For small-caliber ammunition, efforts across the services were in the early stages of technical maturity. Because of technical advances in this area in the past few years, the U.S. Army and the U.S. Marine Corps formed a Joint Lightweight Ammunition Integrated Product Team to synchronize these efforts with the goal of decreasing the weight of ammunition by at least 10 percent. This approach will ensure collaboration during development that will yield a better, faster, cheaper solution for the future warfighter.

Any reduction in equipment weight, often referred to as "warfighter load," will enhance warfighters' readiness and increase mobility, survivability and lethality. In post-combat surveys, weight carried by the warfighter is frequently among the top concerns of combat veterans. While there are many pieces of equipment that add to this overall load, one common denominator across the services is ammunition. The cartridge case is the heaviest and hence the most logical area for initial weight reduction efforts in small-caliber munitions.

BRASS HAS ITS ADVANTAGES

The cartridge case is a critical component that has remained largely unchanged since the advent of brass-cased ammunition in the mid- to late 19th century. The Army has investigated the use of lighter materials for the past 50-plus years, always falling back on the performance, ease of manufacturing and robustness of brass case designs. Brass is a tough material that not only can stand up to firing pressures exceeding 70,000 pounds per square inch, but can spring outward under those firing pressures to seal the chamber and then spring back for easy extraction. Brass cases also can function and withstand storage at extreme temperatures of -65 degrees F to more than 160 degrees F.

Those factors, combined with a reasonable material cost, good availability, scrap recyclability and ability to reload, make it a challenge to replace brass. Other services have also looked at possible alternatives, but had the same technical challenges in their own searches. Scattered efforts over time across the services did not yield successful designs.

Within the past few years, emerging technologies and manufacturing improvements have created the opportunity for a fresh look at lightweight ammunition. With focused investments in research and development, improvements in ammunition cartridge cases are possible and with development can be ready for military use.

In 2016, the Project Manager for Maneuver Ammunition Systems (PM MAS) within the Joint Program Executive Office for Armaments and Ammunition (JPEO A&A, formerly the PEO for Ammunition), along with the Marine Corps, led an effort to establish a charter among key stakeholders that would help bring together requirement and materiel developers from all services.

The purpose of the Joint Lightweight Ammunition Integrated Product Team is to document the approach and to synchronize activities and investments across programs to achieve lightweight ammunition goals. The mission of the team is to collaborate on combat requirements, materiel developer solutions and joint qualification of lightweight ammunition using alternative case materials that would meet or exceed the performance of current brass-cased ammunition in standard service weapons. The objectives include activities that will support a successful transition to the single manager for conventional ammunition, which is represented by PM MAS. Moreover, the integrated product team used active international partnerships to gain valuable insight into active lightweight efforts within Britain's Ministry of Defense.

POLYMER HAS POSSIBILITIES

These 7.62 mm casings are made using polymer, a promising material for reducing the weight of ammunition. (Photo by JPEO A&A)

Before the establishment of the team, each of the services was exploring lightweight ammunition, with little or no coordination. The efforts were often overlapping, and resources were not optimized to ensure product development within an established plan to deliver lightweight ammunition to the warfighter.

In the Army, the Joint Capabilities Integration and Development System-approved Family of Ammunition requirements (5.56 mm, 7.62 mm, .50-caliber) call for reducing the weight of ammunition. The Marine Corps and the U.S. Special Operations Command (SOCOM) continued to investigate lighter ammunition not only for their warfighters but for their aircraft operations as well. Reducing the weight of the ammunition allows aircraft to carry more ammunition to support critical missions, allows room for other critical supplies or creates additional fuel capacity for extended missions. The need to collaborate and learn from each service's efforts is clear. The chartered integrated product

team enabled the services to craft a joint road map that yielded immediate benefits by creating a common understanding of technologies available in industry.

FOCUS AREAS

The Joint Lightweight Ammunition Integrated Product Team meets twice a year, hosted by one of the core members, but remains continuously engaged to coordinate efforts. The focus of the biannual team meeting is to review ongoing efforts, look at test results and establish focus areas for upcoming activities.

During initial meetings, the services outlined the status of each of the ongoing and future programs and planned a joint road map, an overall approach to coordinating lightweight ammunition programs. Based on the working partners' priorities, initial efforts fell into the following focus areas:

- Army—7.62 mm.
- Marine Corps—.50 caliber.
- British Ministry of Defense—5.56 mm.

Additionally, SOCOM continued to explore commercially available solutions that fit niche capabilities, thus increasing the knowledge base across the integrated product team. This has allowed each partner to successfully leverage emerging data from multiple industry solutions in various calibers to minimize the workload and maximize resources.

Under the integrated product team, the joint services assessed lightweight case solutions from seven potential sources, including traditional defense contractors as well as small businesses, which are considered nontraditional sources. The assessments looked strictly at requirements to demonstrate reliable function in legacy weapon systems while maintaining military-specified performance, which is more stringent than commercial standards. Primary challenges made apparent in testing include the ability to function reliably across extreme temperatures, the ability to maintain pressure and muzzle velocity, and the ability for the cases to properly eject from the weapon.

These robust performance requirements are balanced with the expected cost of manufacturing and any current capacity limitations on vendors for future manufacturing requirements. By coordinating within the Joint Lightweight Ammunition Integrated Product Team, the services can leverage results from multiple test events, which eliminates redundant testing and allows for a broad assessment across industry.

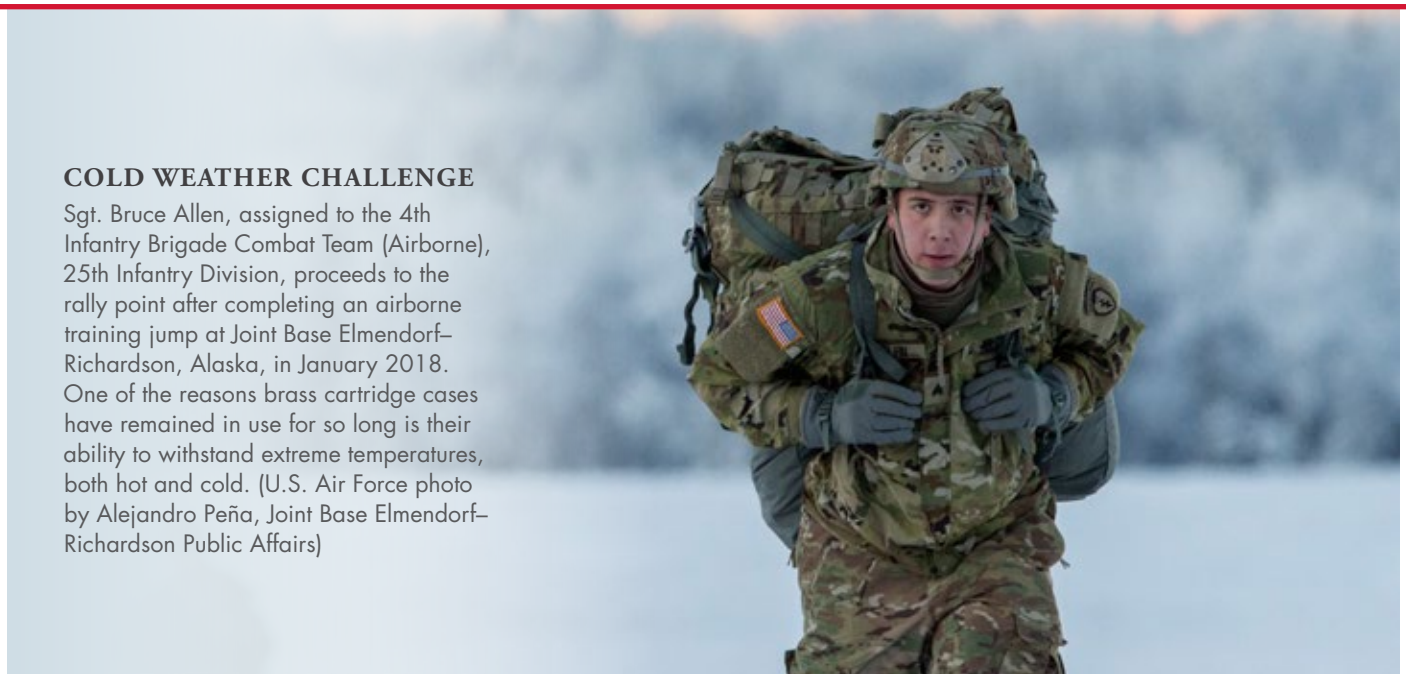
BRASS

STAINLESS STEEL

POLYMER

LOOKING TO THE FUTURE

JPEO A&A has been evaluating concepts for new 7.62 mm ammunition casings for their weight and operational performance compared with traditional brass ammunition, top. The concepts include composite casings, bottom, with a stainless steel base and a polymer body, and stainless steel casings, center. (Photos by JPEO A&A)



COLD WEATHER CHALLENGE
Sgt. Bruce Allen, assigned to the 4th Infantry Brigade Combat Team (Airborne), 25th Infantry Division, proceeds to the rally point after completing an airborne training jump at Joint Base Elmendorf–Richardson, Alaska, in January 2018. One of the reasons brass cartridge cases have remained in use for so long is their ability to withstand extreme temperatures, both hot and cold. (U.S. Air Force photo by Alejandro Peña, Joint Base Elmendorf–Richardson Public Affairs)

Lightweight ammunition technology and joint qualification efforts are moving forward thanks to the integrated product team's activities. The 7.62 mm lightweight case program is a prime example of successful collaboration. Test results from lightweight case assessments by the Army, the Marine Corps, SOCOM and Britain's Ministry of Defense demonstrated that several lightweight case technologies had the potential to meet military requirements. Based upon these assessments, the Army issued three competitively awarded contracts, the last of them in March. The funding came from the Marine Corps and the Office of the Secretary of Defense Manufacturing Technology program to conduct a series of tests on early production designs. This limited test event, scheduled for October, will provide the information required to narrow down the top-performing design before engaging in final development and qualification test events.

Future activities for the integrated product team will include joint qualification of lightweight ammunition through a series of performance tests in current weapons. By establishing joint test plans, the team will reduce the number of test events and the quantity of rounds fired, thereby reducing the cost of qualification. Each service has distinct ammunition requirements within unique weapon systems, such as temperature and transportation environments. This coordination will ensure that the lightweight ammunition meets safety requirements as well as robust military uses in the various systems and is delivered to the joint warfighter much more rapidly than if tested and qualified independently.

Future activities also will include exploration of other efforts to save weight, including in ammunition links, (when ammunition is carried in a linked configuration) and in packaging, which will reduce the logistical burden during transportation.

CONCLUSION

As the services prepare for a future fight against highly capable adversaries, materiel developers will continue collaborating to increase operational capabilities and maintain overmatch. Combat and materiel developers will share and identify advancements in technologies across all weapon systems to reach that end.

Ammunition, as a fundamental component in warfighter load, is a key aspect of maintaining overmatch through technology. Collaboration through the Joint Lightweight Ammunition Integrated Product Team with the services and a key allied partner will lead to solutions that will significantly reduce ammunition weight and greatly enhance warfighter survivability and lethality through increased mobility on the ground.

For more information, contact the author at ***todd.n.townsend.civ@mail.mil****, or go to* ***https://jpeoaa.army.mil/jpeoaa/*** *or* ***https://jpeoaa.army.mil/mas/****.*

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LONG-RANGE PARTNERSHIP

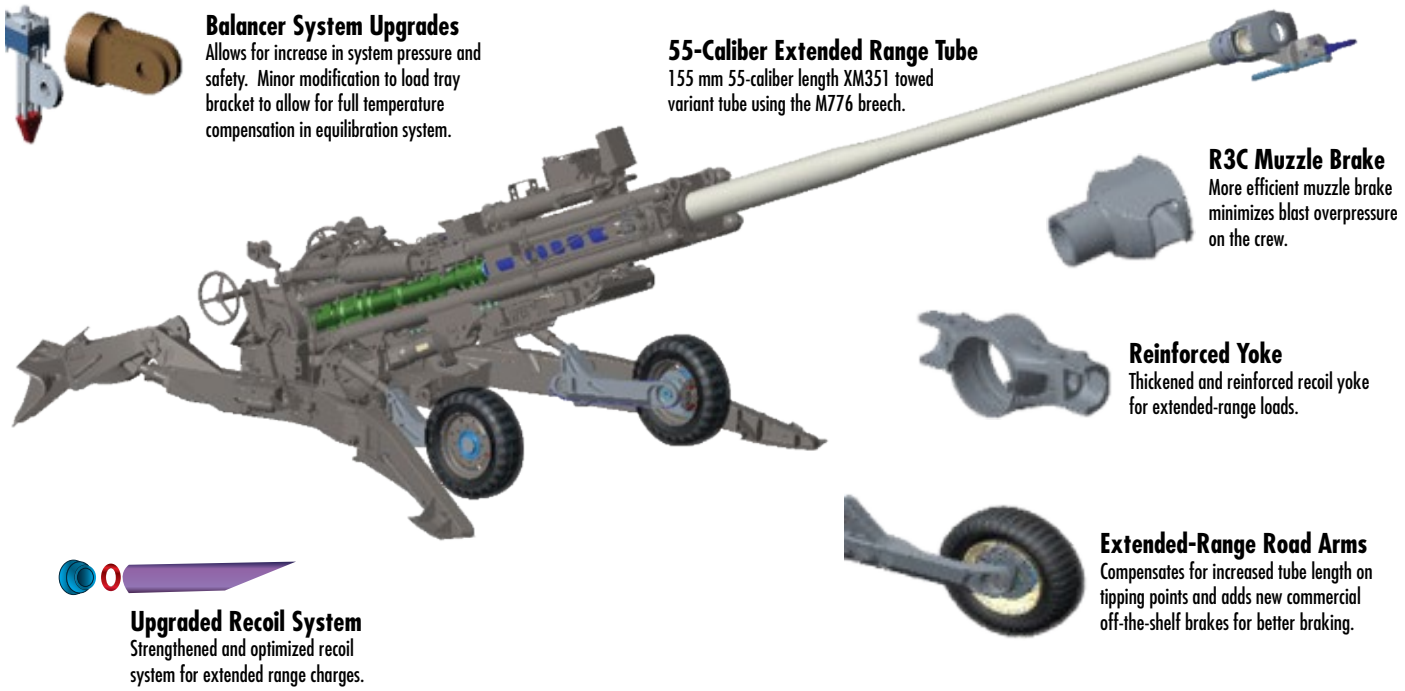
Team effort by Army, Marine Corps and Australia improves range and accuracy of the M777A2 howitzer.

by Capt. Luis Gaitan-Tovar and Katherine Bound

Rapid modernization, interoperability and improved relationships with partner nations are among the must-have elements in our military's toolkit for dominating by land, air, sea, space and cyberspace—a combination of efforts known as multidomain operations.

The Joint Program Executive Office for Armaments and Ammunition (JPEO A&A) has partnered with the U.S. Army Combat Capabilities Development Command – Armaments Center, the U.S. Army Rapid Capabilities and Critical Technologies Office and the U.S. Marine Corps to increase the range and accuracy of the M777A2 howitzer, a potential move toward the enhancement of joint multidomain operations. This collaborative effort is termed the Long Range Cannon project.

Modernizing long-range precision fires capability is a top Army priority, and JPEO A&A and the U.S. Army Combat Capabilities Development Command – Armaments Center, both located at Picatinny Arsenal, New Jersey, are responsible for research, development, production, procurement and delivery of lethal armaments and ammunition for the joint warfighter. The organizations seized an opportunity to expand the boundaries of their partnership by taking advantage of international agreements that facilitated collaboration with U.S. allies, including the Australian Defence Force (ADF).



KITTED UP

Multinational agreements in place since 2012 have provided the Army with new avenues for improving and evaluating the M777, which will receive several upgrades to improve range and accuracy. The components, known collectively as the ER Kit, can be quickly retrofitted onto existing howitzers. (Image courtesy of the authors)

LEVERAGING EXISTING TECHNOLOGIES

The genesis of the Long Range Cannon project was the M777 Extended Range (ER) Howitzer project, a 2014 prototyping initiative to significantly extend the range of the currently fielded M777A2 variant. That effort involved the incorporation of a longer cannon tube for extended-range firing; a more efficient muzzle brake to minimize blast overpressure on the gun crew; a reinforced recoil yoke for higher firing loads; longer road arms to compensate for the increased tube length; an upgraded recoil system for extended-range charges; and upgrades to the balancer system. In all, no structural changes are needed, as all of these are bolt-on assemblies. Dubbed the ER Kit, the prototype components can quickly be retrofitted onto existing howitzers.

In 2018, Army leadership prioritized the M777ER for acceleration and expanded the scope of the effort by adding the condition of improved accuracy at extended ranges. That, in turn, called for a new name—the Long Range Cannon. To achieve the dual goals of expanded range and improved accuracy as expeditiously and cost-effectively as possible, the Long Range Cannon team hopes to maximize use of existing resources and leverage several technologies already in development.

Through a system-of-systems approach, the Long Range Cannon program integrates the M777ER with several high-potential, extended range and GPS-degraded or -denied artillery technologies, including the Location and Azimuth Determining System for more secure and accurate survey control and target acquisition; a projectile tracking system for improving impact accuracy; and a high-explosive, rocket-assisted projectile along with a supercharged propellant to achieve the desired maximum ranges.

The team plans to use the extended range armament to modernize the current weapon-ammunition interface, in an effort to further

TARGET IDENTIFIED

A lance bombardier with the Australian Army readies an M777 howitzer for a fire mission during an exercise in 2017. Extending the range and accuracy of the M777 is an important component of U.S. Army efforts to modernize long-range precision fires and enhance joint multidomain operations. (Photo by Cpl. David Said, ADF)

increase the maximum effective range that the M777ER can achieve. The information resulting from the interface modernization will also provide early data points for the Army's emerging Mobile Howitzer program.

CREATING NEW OPPORTUNITIES

Many of the improvements to the M777A2 howitzer have resulted from multinational agreements put in place several years ago, and new synergies resulting from those agreements are beginning to carry into the Long Range Cannon effort.

The synergies take the form of information sharing. Engineering, program management and logistics representatives from each of the participating nations meet biannually to exchange lessons learned, provide program updates and plan improvement projects for the M777. Participants include personnel from the ADF's Combat Support Systems Program Office, Land Maneuvers Systems Branch and Land Systems Division as well as U.S. Marine Corps and Army staff assigned to the Program Manager for Towed Artillery Systems within JPEO A&A. Those meetings have yielded bilateral and multilateral agreements for M777-related research, development, testing and evaluation, production, repairs and sustainment.

In September 2016, the defense departments of the U.S. and Australia endorsed a project arrangement for M777 improvement and sustainment activities that ultimately increased the reliability, availability and effectiveness of the howitzer. In a nutshell, the arrangement enabled interoperability and configuration commonality—key focus areas of multidomain operations.

"The Australian Army's introduction into service of the M777A2 howitzer has successfully digitized and increased the responsiveness of the land component of ADF joint fires," said Brig. R.A. Vagg, ADF director general for systems and integration. "The Australian Army has a strong desire to maintain interoperability with the U.S., inclusive of common weapon configuration."

EXPANDING U.S.-AUSTRALIA COLLABORATION

Discussions during this year's cooperation meeting led to the formation of an integrated product team focused on long-range artillery efforts. Two major outputs resulted from the first team engagement.

The first output defined Australia's collaboration in mobility and transportability trials to support the Long Range Cannon project. The major objectives here are to determine overlapping requirements and to maximize the benefit of data obtained.

Along with collaborating in those trials, the ADF is contributing to the production of operator and maintainer white papers for M777 logisticians and operators from Australia and the U.S., which are critical in supplementing M777 logistics products. ADF also expressed interest in contributing to additional testing activities for the Long Range Cannon effort, the extent of which will be determined through a follow-on team meeting.

Through a system-of-systems approach, the Long Range Cannon program integrates the M777ER with several high-potential, extended range and GPS-degraded or -denied artillery technologies.

TEAMING WITH POSSIBILITIES

Representatives of the Joint Fires Group within the Systems and Integration Branch of the Australian Defense Force; PM TAS; and the U.S. Army Combat Capabilities Development Command Armaments Center meet in August at Picatinny Arsenal, New Jersey, to discuss efforts for promoting American and Australian artillery interoperability. (Photo by Capt. Luis Gaitan-Tovar, PM TAS)

CHARGING AHEAD

An Australian Army gunner loads charges into an M777 lightweight towed howitzer in 2018. Three years ago, the United States and Australia endorsed a project arrangement that increased the reliability, availability and effectiveness of the M777 by enabling interoperability and configuration commonality. (Photo by Cpl. Oliver Carter, ADF)

The second output of the initial team meeting was a determination of in-country support for the Long Range Cannon project. Through the project arrangement, Australia acquired ER Kits that will be used for demonstrating the capabilities of the system in different terrain and climates. U.S. engineers will provide technical assistance as needed.

An inaugural meet-and-greet involving stakeholders from both nations was held in August in the United States. Part of the engagement included a demonstration of the Long Range Cannon capability.

CONCLUSION

As the operational landscape continues to evolve, U.S. forces strive to demonstrate commitment for free and open societies—a critical effort that spans the continuum of armed conflict, multidomain operations and natural disaster relief. In leveraging existing modernization efforts to increase long-range precision fires capability and existing international collaboration vehicles to expand partnerships with U.S. allies, Team Picatinny remains on path with the Army's strategic vision for 2028.

For more information, contact the authors at ***luis.a.gaitantovar.mil@mail.mil*** *and* ***katherine.a.bound.civ@mail.mil****.*

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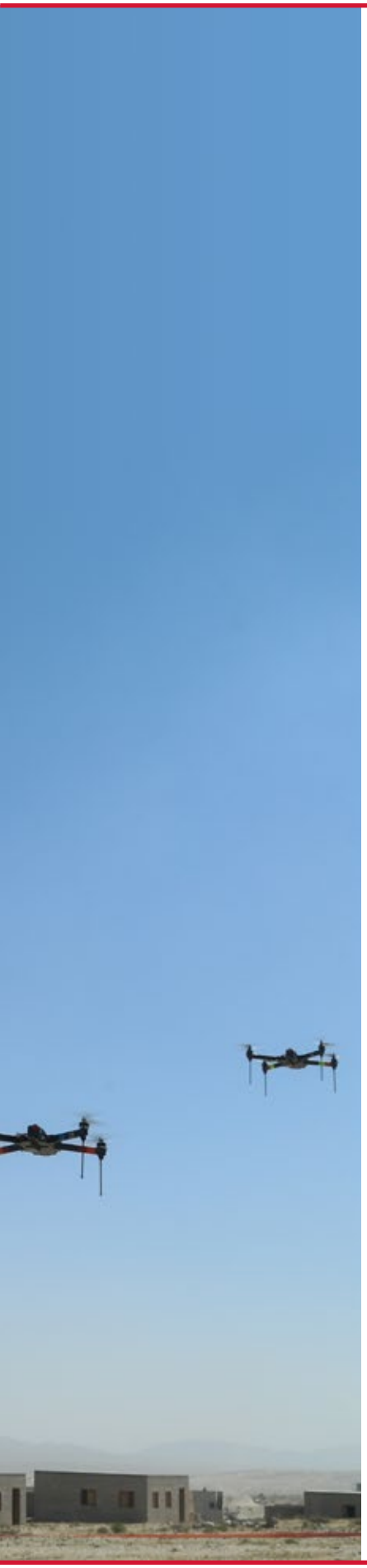
KATHERINE BOUND is the international acquisition operations officer for PM TAS. She holds an M.S. in management from the American Military University and a B.S. in engineering from the Cooper Union. She is Level II certified in engineering.

QUAD SQUAD
The 11th Armored Cavalry Regiment and the Threat Systems Management Office push a swarm of 40 unmanned aerial systems through town May 8 at the National Training Center at Fort Irwin, California. (U.S. Army photo by Pvt. James Newsome, 11th Armored Cavalry Regiment)



CCDC'S ROAD MAP TO MODERNIZING THE ARMY: AIR and MISSILE DEFENSE

Fifth in a series of articles on how the U.S. Army Combat Capabilities Development Command is supporting the Army's six modernization priorities.

By Maj. Gen. Cedric T. Wins

A fleet of unmanned aircraft systems moves into an area while Soldiers on the ground maneuver into position. Several Soldiers are armed with the latest laser weapon system, while others are tracking enemy missiles using heads-up displays on their helmets. Attack helicopters carrying rockets and missiles fly overhead, waiting with ground-based launchers for the signal.

While each system in this scenario performs a different task, combined they are a powerhouse of resources to defeat the complex threats our military forces face. Coupled with advanced radar technology that determines the range, elevation, size and speed of incoming aircraft and projectiles, and laser systems that complement missile and gun system lethality and range, these capabilities will create tiered, layered defense, which is one of the key tenets of the National Defense Strategy.

To support the National Defense Strategy and the Army modernization strategy, which target 2028 for a multidomain operations-ready force, we need to strike the right balance among near-, mid- and far-term technology to provide overmatch against peer adversaries and evolving air and missile threats. We accomplish this by conducting in-house

TIP OF THE BLADE

Ballistic Low Altitude Drone Engagement, or BLADE, prototypes are mounted on trucks during an engineering test in June at Fort Dix, New Jersey. BLADE is integrated with an armament system to shoot down smaller unmanned aerial systems at close ranges. The test proved that the BLADE system can hit them with only a short burst of fire. (Photo by Marian Popescu, CCDC Armaments Center BLADE team)

research and engineering and by working with industry to leverage emerging technology that can be adapted for military use. We also collaborate with academic partners, as well as other government agencies, the Army Rapid Capabilities and Critical Technologies Office (RCCTO), program executive offices and Soldiers to develop and demonstrate technology to make it available as quickly as possible.

This strategy is integrated into the U.S. Army Futures Command's (AFC) modernization effort, which is ensuring that Soldiers are ready and armed with the latest technology. As part of the AFC, the U.S. Army Combat Capabilities Development Command (CCDC) supports the effort by helping to shape future concepts and by synchronizing and integrating science and technology across the future force modernization enterprise.

Our priorities and investments are driven by guidance and directives defined by the secretary of the Army, the chief of staff of the Army and our higher headquarters, AFC. Weekly communication with Gen. John M. Murray, AFC commander, provides an opportunity to highlight key events and technology developments across the CCDC enterprise, ensuring that we are aligned to support the Army's No. 1 priority—readiness.

We work closely with the cross-functional teams by providing a lead person and experts who support each modernization priority. Monthly modernization priority update meetings give representatives from the cross-functional teams an opportunity to share information about their work. While each cross-functional team drives modernization for its respective area, all of the teams work with the science and technology (S&T) community so that their efforts are positioned to transition into programs of record in program executive offices.

The CCDC air and missile defense S&T portfolio is focused on key projects that support the Army's strategy. While the CCDC Aviation & Missile Center is leading the effort across the Army air and missile defense modernization priority, other CCDC centers round out the team; these include Armaments; Army Research Laboratory (ARL); the Data and Analysis Center; and Command, Control, Computers, Communications, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR), along with the U.S. Army Space and Missile Defense Command and the U.S. Army Engineer Research and Development Center.

The team also leverages investments and maintains close contacts with the other services, the Missile Defense Agency, the Defense Advanced Research Projects Agency and others. While CCDC is responsible for most of the S&T funding in the air and missile defense portfolio, these partners have been key in identifying joint opportunities for air and missile defense modernization and interoperability improvements.

A critical part of the Army's strategy involves moving away from stovepiped

capabilities that are not interconnected and cannot communicate with each other toward layered defenses that will work together to protect against a full spectrum of air and missile threats. For example, to communicate, Soldiers rely on remote systems such as satellites and aircraft, both manned and unmanned, as well as computers. Communication among joint forces and across multiple domains will be particularly important in future battles, where adversaries will attack land, air, sea, space and cyber operations.

CCDC is increasing combat capability by providing technology and engineering expertise to support the Army's air and missile defense strategy. The technologies will become critical capabilities that will increase in lethality and range to create domes of protection. (See sidebar, Page 74.) These domes of protection will work together and provide layers of defense, giving Soldiers the weapons they need to dominate any adversary and to protect U.S. and friendly forces and high-value assets.

DOMES OF PROTECTION

Layer 1: BLADE (smallest, most mobile dome of protection)

At the tactical edge, maneuvering Soldiers need to have local protection to shoot moving targets such as unmanned aerial systems (UAS), which range from Group 1 (very small UAS) to Group 5 (the largest UAS). The Ballistic Low Altitude Drone Engagement (BLADE) is a set of enabling technologies that are integrated with an armament system to defeat smaller unmanned aerial systems at close ranges, which includes the distance a Soldier can see a UAS without using binoculars. Its intuitive interface makes the BLADE easy for Soldiers to use.

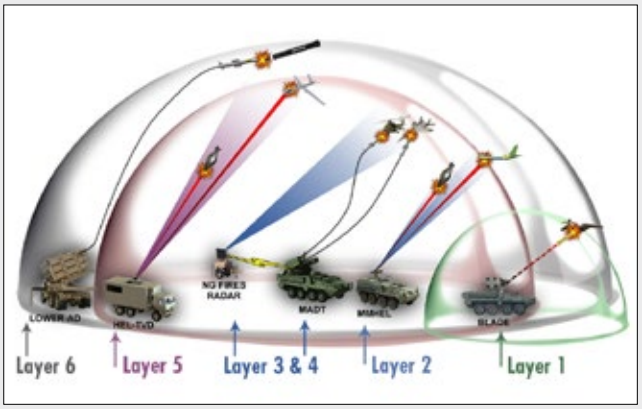
The BLADE system works with the Common Remotely Operated Weapon Station (CROWS), and uses advanced fire control and precision targeting enablers to detect, track and defeat unmanned aerial systems. Mounted on a tactical vehicle, CROWS contains a sensor suite and fire control software that allow the warfighter to remotely engage targets. CROWS can engage targets during the day or at night, and includes a daytime video camera and a thermal camera.

Anyone who has fired a machine gun knows how difficult it is to hit a moving target; the radar and fire control software in the BLADE enabled it to hit a small UAS with a short burst of fire during an engineering test that the BLADE team conducted on prototypes in June at Fort Dix, New Jersey.

A final Level 6 technology readiness demonstration for the BLADE system will be conducted later this year. Technology readiness levels refer to the maturity of a technology and range from Level 1 to Level 9. (See "Levels of Technology Readiness" graphic, Page 57.) Level 6 is a model or prototype that has been tested in an operational environment, such as an aircraft or vehicle. Once we get a technology to the point where it can transition out of CCDC, which is typically Level 6, it transitions to program managers and program executive offices who make the technology a program of record, which

CHECK FOR INCOMING

A close-up of the BLADE prototype mounted on a truck during an engineering test in June at Fort Dix, New Jersey. Along with the BLADE system, advanced radar technology helps determine the range, elevation, size and speed of incoming aircraft and projectiles. (Photo by Marian Popescu, CCDC Armaments Center BLADE team)



TIERED DEFENSE

Air and missile defense capabilities are being developed that will create a tiered, layered defense.

Layer 1: The Ballistic Low Altitude Drone Engagement is used with the Common Remotely Operated Weapon Station to shoot down unmanned aerial systems.

Layer 2: The Multi-Mission High Energy Laser, a laser weapon system integrated onto a combat platform, can engage and destroy incoming munitions and drones.

Layer 3 and 4: Maneuver Air Defense Technology interceptor technologies are designed for integration into the Maneuver – Short-Range Air Defense platform to enable a greater level of protection by hitting larger aircraft at increased ranges. Eventually the missile interceptor technologies will operate with next-generation fires radar technology via the network.

Layer 5: The High Energy Laser Tactical Vehicle Demonstrator will protect sites from rockets, artillery and mortars, and unmanned aerial systems.

Layer 6: Low-Cost Extended Range Air Defense missile interceptor technology will defeat subsonic cruise missiles and lethal unmanned aerial systems, leaving the advanced Patriot interceptors for the more stressing threats.

(SOURCE: CCDC)

means funding has been approved so the program can move forward.

Layer 2: MMHEL

One of the key areas the Army is accelerating is solid-state high-energy laser (HEL) technology. More-efficient laser technology will enable laser-directed energy to be carried on smaller, more mobile Army platforms, which will increase combat capability and improve sustainment. Solid-state laser systems can engage and destroy incoming munitions and drones at a low cost per kill compared with fielded air and missile defense systems.

CCDC's Army Research Laboratory supports the Army by developing and maturing new fiber laser technology that gives lasers higher power and more efficient output with reduced size, weight and complexity. These higher-power laser systems will have increased lethality and range. The main advantage of fiber lasers is that the laser beam quality is extremely high, which enables the laser beam to focus tightly at long distances. Delivering the laser power into a small area is the key to lethality at long ranges.

The Multi-Mission High Energy Laser (MMHEL), a laser weapon system integrated onto a combat platform, is part of the family of laser technology that the Army is developing. In addition to lethal effects, high-energy lasers can be used for long-range surveillance and tracking.

A Level 7 operational demonstration with the MMHEL will be conducted in fiscal year 2021 using a variety of targets. Then, in fiscal year 2022, RCCTO will field a platoon of four Stryker vehicles with an experimental MMHEL prototype with residual combat capability in support of Maneuver – Short-Range Air Defense.

Layers 3 and 4: MADT and Next-Gen Fires Radar

The Maneuver Air Defense Technology (MADT) project is developing critical technologies to enable a greater level of protection by hitting larger aircraft at increased ranges compared with fielded Short-Range Air Defense Systems.

The MADT missile interceptor technologies are designed for integration into the Maneuver – Short-Range Air Defense (M-SHORAD) platform. The Army recently announced that the first five prototypes of that platform will be delivered for testing

beginning in October. These short-range air defense systems will be mounted on a new Stryker variant with a turret that will initially hold two HELLFIRE missiles, an M230LF 30 mm chain gun, a 7.62 mm machine gun and four Stinger missiles. M-SHORAD will provide 360-degree air defense protection for Stryker and armored brigade combat teams.

As part of a complex system of ground-based radars, satellite sensors and interceptor missiles, missile interceptor technologies work by using infrared sensors on satellites to monitor heat signatures produced by launching rockets. Once a launch is established, tracking is transferred to radar systems that help verify the missile's trajectory.

Missile interceptor technologies are also designed to operate with current and next-generation fires radar technology via the network. Next Generation Fires Radar is a collaborative CCDC, Aviation & Missile Center, ARL and C5ISR project to develop technology for an all-digital radar system that will substantially increase performance and reliability over current and planned radars by enabling multiple target tracking and adaptive beam forming. Multimission systems enabled by Next Generation Fires Radar will provide Soldiers with a more resilient capability because they will be able to operate across multiple radar bands for improved performance and survivability.

We are designing, developing and integrating advanced software architecture and digital components into a state-of-the-art radar test bed with an open systems software environment. A government-owned test bed and open architecture software will enable the Army to field new capabilities more quickly and increase competition for best-of-breed upgrades. The test bed, which is planned for fiscal year 2021, will demonstrate improved readiness by allowing Soldiers to perform maintenance and upgrade cycles primarily through software changes.

Layer 5: HEL-TVD

Many of our projects begin as prototypes or technology demonstrators, which enable us to refine technologies and inform the Army's path ahead. The High Energy Laser Tactical Vehicle Demonstrator (HEL-TVD) is a good example.

The current HEL-TVD is a 100 kilowatt -class laser system on a Family of Medium Tactical Vehicles platform. It consists of a laser projected through a high-velocity, target-tracking beam control system; power and thermal management systems to power and cool the subsystems; and agility to defeat complex targets. During the past few years, Army S&T work on this effort made significant progress in integrating a militarily significant power level on a tactically relevant platform.

Now the Army is leveraging that progress to merge the HEL-TVD with similar efforts by the Navy and the Office of the Secretary of Defense. This partnership

READY TO ENGAGE

A Common Remotely Operated Weapon Station – Javelin mounted on a Stryker. Soldiers at the tactical edge need to be able to shoot moving targets such as unmanned aerial systems. (U.S. Army photo by Markus Rauchenberger, Training Support Activity Europe)

REMOTE CONTROL

A Soldier uses CROWS to engage targets with a .50-caliber machine gun in April during Operation Gauntlet at Fort Riley, Kansas. CROWS works with the BLADE system to detect, track and defeat unmanned aerial systems. (U.S. Army Reserve photo by Sgt. 1st Class Brent C. Powell, 76th U.S. Army Reserve Operational Response Command)

will allow the services to achieve a higher-power system that can protect sites from rockets, artillery and mortars and unmanned aerial systems, as well as more stressing threats—significantly increasing the warfighting capability being transitioned.

While the RCCTO pursues this rapid prototyping initiative, the S&T work continues on the next-generation capability. ARL is currently developing proof-of-concept fiber lasers and components and plans to reach Technology Readiness Level 4 (or higher) in 2028.

Layer 6: LOWER-AD (largest dome of protection)

The Patriot missile system is instrumental in protecting forward-deployed forces, friends and allies against incoming air and missile threats. The CCDC Aviation & Missile Center is developing and demonstrating the Low-Cost Extended Range Air Defense (LOWER AD) missile interceptor technology that is smaller and less costly than larger systems. The LOWER AD project will demonstrate critical technologies to defeat subsonic cruise missiles and lethal unmanned aerial systems, leaving the advanced Patriot interceptors for the more stressing threats.

The LOWER AD technology will make it possible to reduce the size of the missile, which in turn will allow more missiles per launcher. Internal components of the LOWER AD missile technology will include improved navigation and a low-cost seeker and warhead, which will maximize its capability to protect defended areas and troops.

LOWER AD will conduct a flight test in fiscal year 2021, using various targets at extended ranges to demonstrate Level 6 maturity of the technology. A flight test with the ballistic test vehicle will be conducted in the fourth quarter of fiscal year 2019 to verify key component performance.

PARTNERSHIPS

To develop air defense technologies for a maneuverable, multimission force, we work closely with other government,

academic and industry partners. Some of the key projects include digital radar technology, missile interceptor components, air defense gun technology and integrated fire control. We collaborate with industry by leveraging traditional contracting methods, Small Business Innovation Research initiatives, cooperative research and development agreements and a number of different collaborative consortiums, including the Defense Ordnance Technology Consortium and the Aviation and Missile Technology Consortium.

With academia, we have teamed with Carnegie Mellon University to develop advanced algorithms that can be applied to air defense, and the University of Oklahoma to work on advanced radar hardware. CCDC ARL has cooperative agreements and grants with the University of Oklahoma and the Johns Hopkins University Applied Physics Laboratory to develop algorithms and techniques, as well as digital array operation. ARL has also established a cooperative agreement with Penn State University to develop advanced fiber lasers, and the CCDC Data and Analysis Center has a biannual agreement with the University of Alabama Industrial and Engineering Management Department.

A critical part of the Army's strategy involves moving away from stovepiped capabilities that are not interconnected and cannot communicate with each other.

The CCDC enterprise is closely integrated and synchronized with the Air and Missile Defense Cross-Functional Team, which maintains a prioritized list of air and missile defense S&T projects. We have aligned our S&T portfolio 100 percent with the Air and Missile Defense Cross-Functional Team priorities, and we work closely with them to support the air and missile defense modernization priority.

CCDC supports the Air and Missile Defense Cross-Functional Team by providing research, development and engineering expertise to demonstrate near-, mid- and far-term technology. CCDC engineers who work with the cross-functional team keep leadership informed about their activities, and coordinate with representatives from the other centers. These representatives provide periodic cross-functional team and CCDC execution reviews, and they meet regularly for road mapping and status updates, including program executive office and program manager transition agreement partnerships.

The representatives also reach back to their respective centers for information to support the cross-functional team. For example, when the cross-functional team requested a cost-benefit analysis of air and missile defense technology, a CCDC Data and Analysis Center representative pooled the expertise of a group of analysts who quickly conducted risk and performance analyses to support the project.

The CCDC Data and Analysis Center also provides feedback on new equipment training, developmental testing, operational testing and flight tests as they relate to human-systems integration, including how to increase Soldier system performance and reduce physical and mental workload.

CONCLUSION

Together, CCDC and our partners are developing air and defense capabilities for a maneuverable, multimission force. These capabilities will support multidomain operations by creating not only a tiered, layered defense, but also domes of protection to keep Soldiers—on the ground and in the air—safe. These domes will provide the future force with innovative technologies and capabilities that will give Soldiers and our allies a decisive edge.

For more information, go to the CCDC website at ***https://www.army.mil/ccdc****.*

MAJ. GEN. CEDRIC T. WINS is the commanding general of CCDC. He graduated from the Virginia Military Institute and was commissioned in the field artillery in July 1985. His military education includes Field Artillery Officer Basic and Advanced Courses, U.S. Army Command and General Staff College and the National War College, where he earned an M.S. in national security and strategic studies. Wins also holds an M.S. in management from the Florida Institute of Technology.

At Work

Profile: PROGRAM EXECUTIVE OFFICE FOR SOLDIER

The third in a series, ASA(ALT) at Work, which looks into ASA(ALT) organizations, what they do and where they do it.

PEO Soldier's mission is to rapidly deliver agile, adaptive, leading-edge Soldier capabilities to provide combat overmatch today and be more lethal tomorrow. Commanded by Brig. Gen. Anthony Potts, PEO Soldier will be releasing the first product partnered with the U.S. Army Futures Command (AFC)—the Enhanced Night Vision Goggle – Binoculars (ENVG-B). In addition to partnering with AFC on capabilities such as Next Generation Squad Weapons and the Integrated Visual Augmentation System, PEO Soldier delivers 130 programs of record and 253 products and non-programs of record, such as essential capabilities from body armor, helmets, sensors and lasers, to legacy weapon systems.

Headquartered at Fort Belvoir, Virginia, PEO Soldier comprises some 1,438 personnel—military, government civilians and contractors providing systems engineering and technical assistance support.

WHAT SHOULD WE KNOW ABOUT PEO SOLDIER?

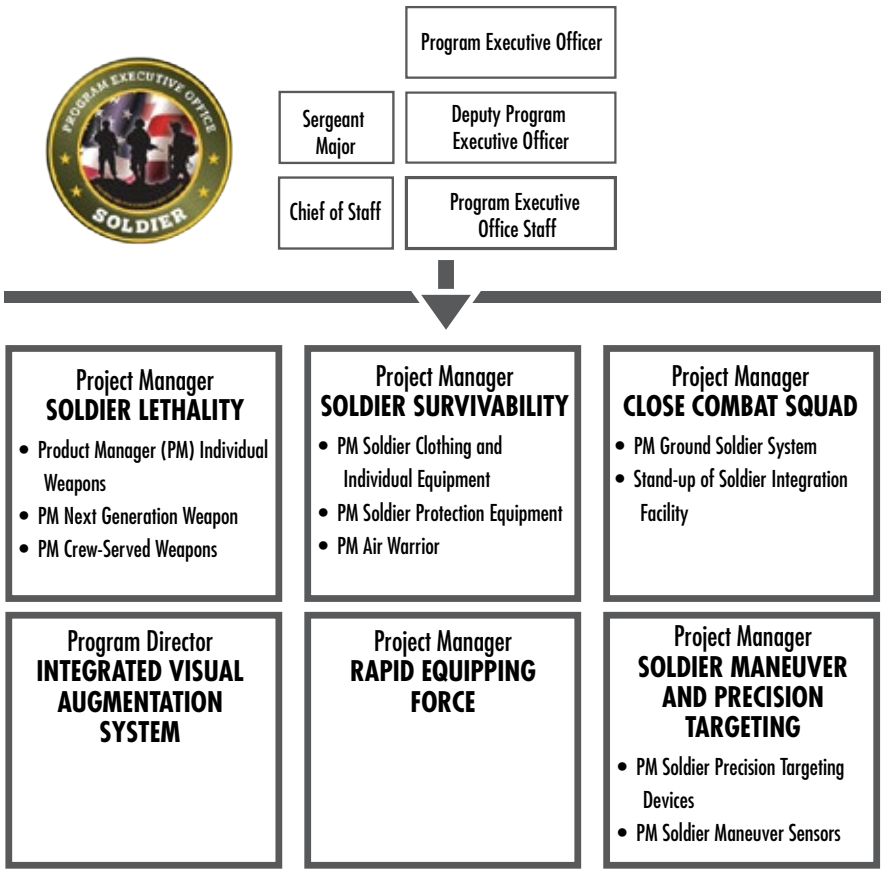
PEO Soldier provides the processes and tools to ensure a collaborative, iterative Soldier-centered approach to delivering integrated capability to Soldiers and squads.

HOW DOES PEO SOLDIER SUPPORT THE FUTURE FORCE?

Our focus is making sure that Soldiers have enhanced capabilities in lethality, mobility, survivability, situational awareness and sustainment. We treat the Soldier as an integrated weapon system and the squad as an integrated combat platform, from their uniforms

SHOWING THE WAY

Sgt. Gabrielle Hurd of the New Hampshire Army National Guard shows her team the route they will take on an overnight hike to the summit of Mount Monadnock, New Hampshire, during an ENVG-B Soldier touch point July 10-12. PEO Soldier incorporates Soldier feedback into the ENVG-B product and many others, which helps the Army integrate the current needs of Soldiers with the Army's future, multidomain battlefield. (Photo courtesy of PEO Soldier Public Affairs)



ALL SYSTEMS GO

A Soldier does a check with the Integrated Visual Augmentation System (IVAS) and his compass during a Soldier touch point in March at Fort Pickett, Virginia. IVAS is designed to increase a Soldier's lethality, mobility and situational awareness by providing enhanced night and thermal vision capabilities, map displays and data collection capabilities. (Photo courtesy of PEO Soldier Public Affairs)

to their personal protection to their weapons. Soldiers of the future will have adaptive, agile, modular and scalable equipment that will be optimized for the mission without sacrificing capability or performance.

HOW HAVE YOUR CHALLENGES CHANGED?

The Army has been asked to deliver capability sooner by assuming prudent risk and leveraging existing and new authorities. We are addressing these challenges and supporting the Army's priorities by leveraging middle-tier acquisition authorities and using other-transaction authority contract vehicles in prototyping and delivering key capabilities, such as the Integrated Visual Augmentation System and the Next Generation Squad Weapon.

WHAT'S AHEAD FOR PEO SOLDIER?

A key enabler for taking a systems approach to the Soldier and squad and treating them as integrated combat platforms is the Adaptive Squad Architecture (See related story, "The Squad as an Integrated Platform," Page 40.) This architecture will be foundational for all close-combat capabilities by defining standards and interfaces and allocating size, weight and power across the subcomponents. This will

enable the assessment and optimization of new capabilities across doctrine, organization, training, materiel, leadership, personnel and facilities, and take advantage of the resources at integration facilities being established by PEO Soldier, the Soldier Lethality Cross-Functional Team and the Maneuver Battle Lab at Fort Benning, Georgia. This iterative, Soldier-centered approach ensures that we deliver capability that achieves overmatch and incorporates innovative ideas from Soldiers and industry.

QUICK CHANGE

Sgt. Evan Fuller, a signal adviser with 54th Security Force Assistance Brigade, practices transition drills in which a Soldier fires an M4 carbine and then changes to the M17 pistol while continuing to engage his target. Soldiers play a pivotal role in PEO Soldier's iterative development process. (U.S. Army photo by Staff Sgt. Carmen Fleischmann, Florida National Guard Public Affairs)

BIGGEST CHALLENGE?

Our greatest challenge is delivering on our promise to our Soldiers to deliver next-generation combat capability. Working closely with the Soldier Lethality Cross-Functional Team, we are planning to deliver the ENVG-B in September 2019, and over the next few years we are planning to deliver the Next Generation Squad Weapon and the Integrated Visual Augmentation System. These are extremely accelerated acquisitions, and each of these cross-functional team programs will deliver significantly enhanced capability over current capability and leverage state-of-the-art technology to achieve overmatch. PEO Soldier oversees the execution of these critical programs through close partnership with AFC, the Soldier Lethality Cross-Functional Team and the rest of the Army materiel enterprise.

BIGGEST SUCCESS?

Our biggest successes are our people and the collaboration across the Army materiel enterprise. We have an amazing civilian, military and contractor workforce that delivers day in and day out, despite manpower shortfalls and other constraints. We deliver literally millions of pieces of kit every year that help Soldiers accomplish their missions and come home alive.

Within the new Army materiel enterprise, we have seen a significant increase in collaboration, including cross-functional teams, the science and technology community, the user community,

COLLABORATIVE PROCESS

Joint service members and civilians prepare for a Soldier touch point on the ENVG-B system. PEO Soldier encourages frequent collaboration among industry, Soldiers, civilians and contractors on programs like this to ensure that the Army's top modernization priorities are carried out successfully. ENVG-B signifies the first program from PEO Soldier to deliver an AFC capability set. (Photo courtesy of PEO Soldier Public Affairs)

▲ **INTEROPERABILITY CRITICAL**

Sgt. 1st Class William Roth, technical adviser for the Soldier Lethality Cross-Functional Team, models Capability Set 19 for Soldiers. Capability Set 19 includes ENVG-B goggles, the Integrated Head Protection System with universal helmet mount assembly, Family of Weapons Sight Individual and Nett Warrior. Capability sets' interoperability is crucial to effectiveness for the Soldier. (Photo courtesy of PEO Soldier Public Affairs)

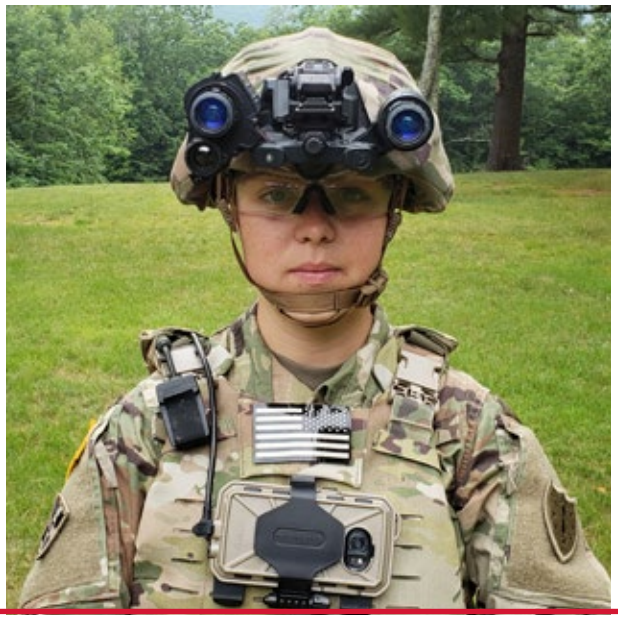
the life cycle and sustainment commands, and industry. This collaboration has led to streamlined requirements, accelerated acquisition strategies, and well-funded and well-supported programs across the stakeholder community. It is proving to be a good model.

WHAT ROLE DO SOLDIERS PLAY IN PEO SOLDIER?

As our name indicates, Soldiers are a part of everything we do. Soldiers work on our acquisition teams, provide needed feedback during Soldier touch points, and are ultimately the motivating factor in why our workforce is passionate about developing enhanced capabilities. With the iterative, Soldier-centered design approach that's in place across our organization, Soldiers play a pivotal role in ensuring that we deliver the most lethal and effective force ever.

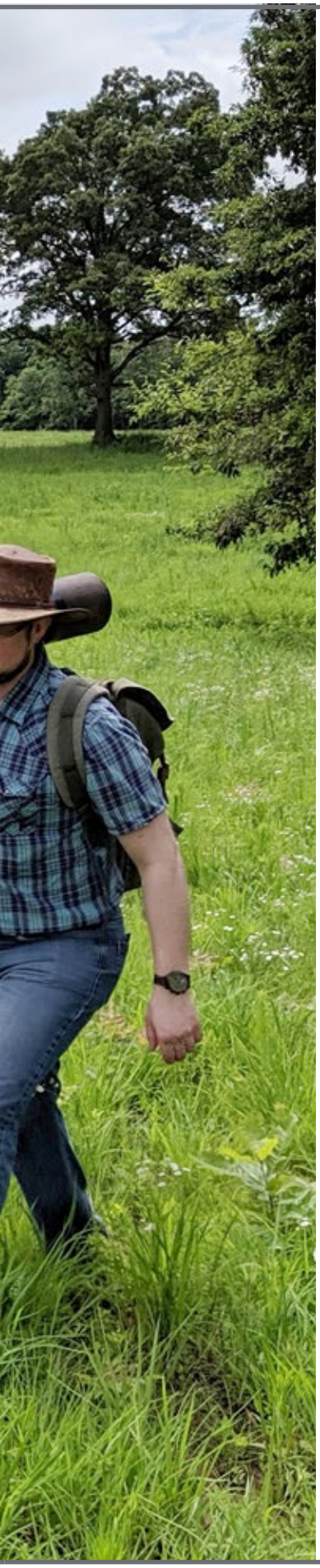
▼ **DESIGN OPTIONS**

Sgt. Gabrielle Hurd of the New Hampshire Army National Guard shows off one of the wearable positions of the ENVG-B during a Soldier touch point in Manchester, New Hampshire, in July. The ENVG-B's capability of assuming various positions is one of the many features of the system decided by Soldier feedback. (Photo courtesy of PEO Soldier Public Affairs)



WALK THIS WAY

Soldiers from the 101st and Dr. Matthew Yandell, chief innovation officer of HeroWear and recent Vanderbilt graduate, carry howitzer rounds to simulate the physical demands of field artillery missions. (Photo by Dr. Karl Zelik, Vanderbilt University)



IT STARTED WITH A WRENCH

Soldiers of the 3/101 BCT and Vanderbilt University develop a new business model without any explicit direction or permission from highest levels of leadership.

by 1st Lt. Austin Herrling

GPS, duct tape, microwaves and computers—these everyday items have one thing in common: Each was invented, in part or in whole, as the result of U.S. military research. The military's rich history of innovation continues today, at numerous labs and engineering centers and focused on high-level problems. There is a gap, however: There are myriad problems at the warfighter level that Army labs never encounter. Soldiers from the 3rd Brigade Combat Team (BCT) of the 101st Airborne Division (Air Assault) and researchers from Vanderbilt University are addressing this issue head-on, and are building a partnership to identify and solve tactical problems with Soldier-inspired solutions.

A WRENCH IN THE WORKS

The relationship between 3rd BCT and Vanderbilt began in early 2018 with a simple question: Can we 3D-print tools to make jobs easier? First Lt. Andrew Shaughnessy, a howitzer platoon leader in 3rd BCT, noted that some of the wrenches his platoon used on the guns were unwieldy and expensive. He realized that additive manufacturing (or 3D printing;

the terms tend to be used interchangeably) was an ideal method of making Soldiers' jobs easier; 3D-printed wrenches would be simple, fast and cheap to manufacture right where they were needed. He also realized that he needed a design partner, as he lacked the technical knowledge to design and print the wrench he had in mind. Shaughnessy reached out to Dr. Kevin Galloway, an associate professor of mechanical engineering and director of making at Vanderbilt University, to see if he was interested in collaborating.

Located just a short hour's drive away from the 3rd BCT's home base at Fort Campbell, Kentucky, Galloway's lab had both the equipment and ability to help. Galloway oversees the Wond'ry Makerspace, a lab outfitted with fabrication and manufacturing equipment for rapid prototyping. Galloway and Shaughnessy designed and produced a few wrenches, and the innovation partnership was underway.

This relationship existed in large part because of the culture of innovation within 3rd BCT. Col. John Cogbill, commander of 3rd BCT, has written at length about building a culture of innovation. With innovation as one of his command priorities, he has worked to enable Soldiers to become problem-solvers, free to identify opportunities for change and test their ideas in tactical settings. Even before 3rd BCT began working with Vanderbilt, the brigade hosted a number of innovation forums, including "Shark Tank"-style open-mic nights where Soldiers brought ideas to a panel of leaders from within the organization. Including Vanderbilt in the innovation process has led to a robust relationship with 3rd BCT, which now includes regular visits between Fort Campbell and the Vanderbilt campus as well as substantial growth in the number of collaborative projects.

WHY IT'S DIFFERENT

Though the initial scope of the collaboration was small, Soldiers in the 3rd BCT quickly realized that they had a winning formula on their hands. This led to a question of scaling: How could ideas generated through discussion be prototyped, tested and fielded to the Army as a whole? An additional partner was needed, one with the ability to formalize the relationship, and with the resources to take projects from ideas to products. This partner came in the form of the U.S. Army Futures Command (AFC). On April 9, AFC and Vanderbilt signed an education partnership agreement that allows 3rd BCT and Vanderbilt to freely share ideas and opportunities. Education partnership agreements had been signed in the past, but this was the first time a brigade was specifically included as an official partner to such a pact.

The 3rd BCT-Vanderbilt model can serve as a template for similar relationships among each division in the Army and nearby universities and research institutions. On June 4, representatives from each of the parties in the agreement briefed Gen. John M. Murray, AFC commander. The purposes of the briefing were to demonstrate the effectiveness of

THE WOND'RY

Command Sgt. Maj. Alvaro Pertuz, senior enlisted adviser for 3rd BCT, looks at a prototype for a potential replacement for outdated entrenching tools during a tour of the Vanderbilt University Wond'ry facility in June. The 3rd BCT and Vanderbilt have turned the conventional innovation process on its head, collaborating to solve problems from the bottom up and forging strong ties between Soldiers and experts. (Photo by Staff Sgt. Cody Harding, 3rd BCT Public Affairs)

EASY DOES IT

Erik Lamers, of Vanderbilt's CREATe Lab, demonstrates the use of a spring-powered exosuit with existing Army gear. Working with members of 3rd BCT, researchers from Vanderbilt developed the suit and other biomechanically assistive tools to reduce injury and lighten Soldiers' loads. (Photo by Joe Howell, Vanderbilt University)

the partnership between 3rd BCT and Vanderbilt, to discuss the steps necessary to make the relationship permanent, and to envision how the model could be applied across the Army. Taking part in the brief were Cogbill and Command Sgt. Maj. Alvaro Pertuz of the 3rd BCT; AFC Command Sgt. Maj. Michael Crosby; Adam Jay Harrison, AFC command innovation officer; Col. Rex Eiserer, deputy director of the AFC University Technology Development Division; Dr. Padma Raghavan, Vanderbilt vice provost for research; and Dr. Douglas Adams, chair of Vanderbilt's Department of Civil and Environmental Engineering,

"I look at what Vanderbilt and the 101st are doing as a new business model that was being prototyped within the Army without any explicit direction or permission from highest levels of leadership," Harrison said at the event. "Now we at Army Futures Command want to formalize that relationship and make sure it has the resources to scale and grow beyond the opportunities it would have on its own."

On June 20, the same group briefed Maj. Gen. Brian E. Winski, commander of the 101st, on expanding the 3rd BCT and Vanderbilt relationship into a 101st and Vanderbilt relationship. Both briefs focused on the idea of creating irreversible momentum: How can we formalize and expand this culture of innovation and collaboration?

This challenge is not as insurmountable as it may seem. Because the 3rd BCT model is centered on Soldier-inspired innovation, it allows Soldiers to identify problems that affect them daily, and enables them to solve these problems themselves or to connect with researchers who can help. This process creates its own momentum—as Soldiers are empowered to solve problems, their peers are similarly empowered to solve problems of their own.

HANDS-ON PROBLEM-SOLVING
Vanderbilt University faculty and representatives from the 101st Airborne Division (Air Assault) participate in a design workshop in the EAGLEWERX Innovation Lab at Fort Campbell targeted toward improving air assault operations. The two groups plan to hold similar events at multiple echelons, including quarterly innovation symposiums at the division level. (Photo by Capt. Daniel Vazquez, 3rd BCT)

The 3rd BCT and Vanderbilt are collaborating to solve problems from the bottom up, with direct links between Soldiers and experts in academia. Traditionally, innovation in the Army has been defined by a top-down approach, whereby program managers and general officers direct efforts toward a small set of problems. For example, the chief of staff of the Army has a set of six modernization priorities that meet this definition. These high-level directives do not describe every problem Soldiers can encounter, however. Soldiers in 3rd BCT have access to much more localized problems that—while certainly of a smaller scope than, for example, future vertical lift platforms—still affect warfighters both inside and outside of the brigade. These smaller, Soldier-inspired problems are the target of the new partnership.

SCOPE

What began with 3D-printed howitzer firing-pin wrenches now includes 12 (and counting) Soldier-inspired and Soldier-informed projects, including:

- Improving how Soldiers dig fighting positions. When Soldiers dig hasty fighting positions, they do so with small, collapsible entrenching tools that are difficult and time-consuming to use. A design class taught by Galloway is tackling the issue with ideas like rapidly deployable fillable barriers and redesigned shovels. They are partnered with the 3rd Battalion, 320th Field Artillery Regiment in the 3rd BCT.

- Lift-assisting exosuits. Dr. Karl Zelik, assistant professor of mechanical engineering, biomedical engineering and physical medicine and rehabilitation at Vanderbilt, discovered that more than 1,000 Soldiers are diagnosed with back injuries every day. He and his team are working on biomechanically assistive garments that can reduce load on Soldiers' bodies and improve their effectiveness.

- Helmets, traumatic brain injury (TBI) and Soldier performance. Adams, chair of the Civil and Environmental Engineering Department, and Tonia Rex, an associate professor with the Vanderbilt Eye Institute, visited training events held by the 3rd Battalion, 187th Infantry Regiment in the 3rd BCT. Their initial project focuses on incorporating sensors into helmets to gauge their effectiveness and protect against TBI, and assessing and predicting TBI in Soldiers. Discussion with the unit, however, led to a new idea of exploring cognitive markers for improving Soldier performance in stressful situations, leveraging assets like the Electronic Skills Trainer within the 101st.

Material results are only one of the benefits provided by the relationship. On June 20, Vanderbilt faculty and commanders and staff from across the 101st participated in an innovation workshop, hosted in the newly designated EAGLEWERX Innovation Lab at Fort Campbell. Roughly 30 attendees undertook a crash course in the innovative design process, which is a structured approach to product development that includes problem identification, idea generation and prototyping. In just four hours, the group devised a broad range of technologies, processes and organizational changes tailored toward improving air assault operations. Following the success of this "design sprint," the 101st and Vanderbilt will be conducting similar events at multiple echelons, including quarterly innovation symposiums at the division level.

CONCLUSION

Future opportunities for collaboration are endless, and there are several plans in the works. One such opportunity is a recurring series of classes that teach Soldiers how to use 3D printers, laser cutters, mills and other manufacturing equipment to bring their ideas from sketch to minimum viable product—one with just enough features to satisfy early users and allow them to provide feedback that will inform future iterations. Another is permanent innovation positions within the division, with liaisons from AFC to the 101st, and from the 101st to Vanderbilt. Conferences, experimentation, joint training events and fellowships are all additional possibilities.

Soldiers today must operate on a fast-paced and dynamic battlefield. This partnership is preparing them for uncertainty in the best way possible: enabling Soldiers to identify and solve problems as they encounter them, often in the absence of orders; improve the methods the Army has traditionally used; and create an entirely new status quo. As the 101st, Vanderbilt and AFC shape the future of Army innovation, the only limit is the creativity of the Soldiers and civilians involved.

For more information, contact the brigade innovation officer at (270) 412-5198.

1ST LT. AUSTIN HERRLING is the chief innovation officer and knowledge management officer for 3rd BCT. He holds an M.S. in operations research from the Massachusetts Institute of Technology and a B.S. in mathematics and computer science from the United States Military Academy at West Point.

AN OFFICIAL FIRST

Dr. Padma Raghavan, vice provost for research for Vanderbilt University, signs an education partnership agreement between AFC and Vanderbilt April 9 in Nashville, Tennessee. The agreement marked the first time a brigade has been specifically included as an official partner to such a pact. With Raghavan were Col. John Cogbill, commander of 3rd BCT; Command Sgt. Maj. Michael Crosby, senior enlisted adviser for AFC; representatives from Vanderbilt and, at far right, Adam Jay Harrison, AFC command innovation officer. (Photo by Staff Sgt. Cody Harding, 3rd BCT Public Affairs)


An
ELEMENTAL
ISSUE

China controls roughly 90 percent of the rare-earth materials used in high-tech manufacturing, but the United States, Australia and Japan are exploring new sources that could end the Chinese monopoly.

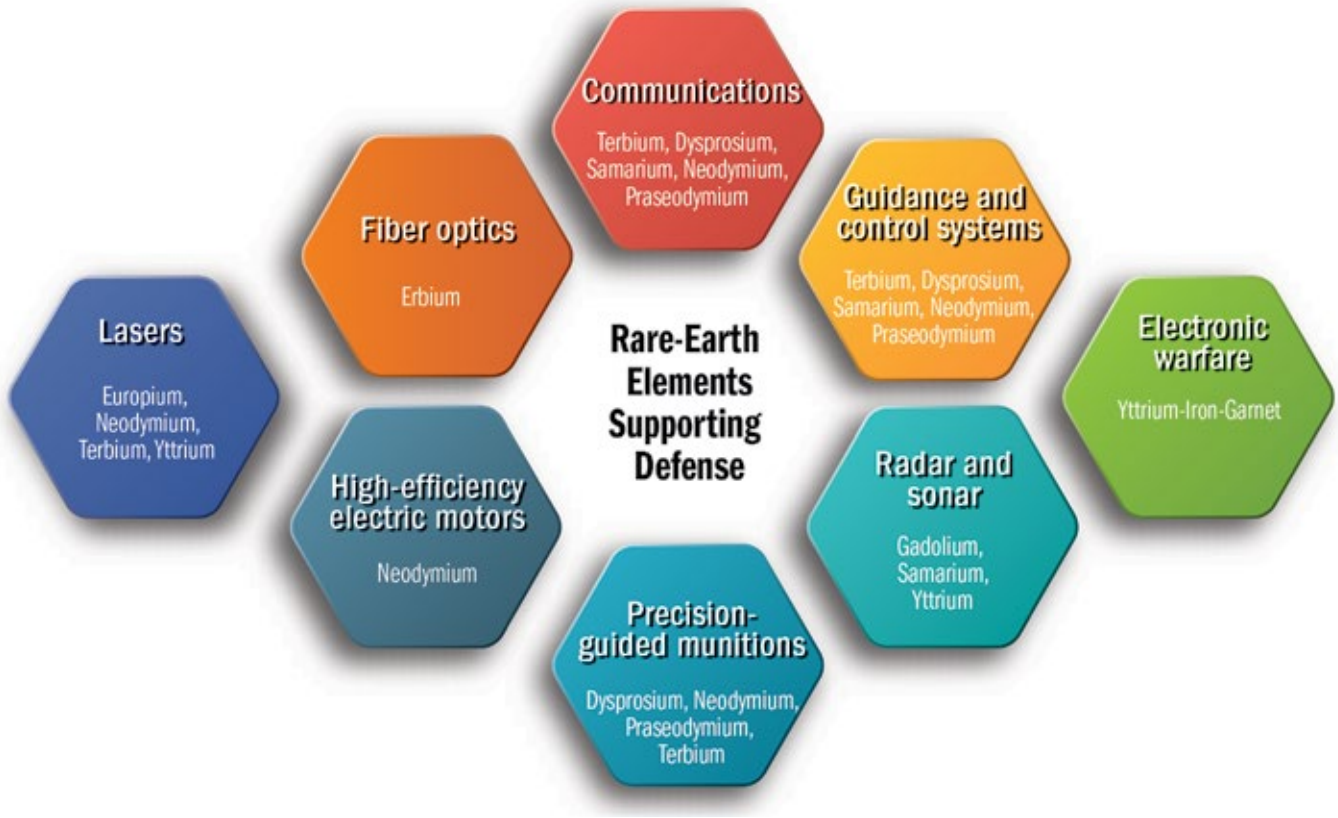
by Russell Parman

The U.S. military is facing a potential crisis at the very bottom of its supply chain. Rare-earth elements have become the new oil, playing a major role in the technological advancements made in the last 50 years. Everything from GPS navigation capability, cell phones, fiber optics, computers, automobiles and missiles relies heavily on rare-earth elements for development and production. (See Figure 1, Page 90.) For example, according to a 2013 report from the Congressional Research Service, each F-35 Lightning II aircraft requires 920 pounds of rare-earth materials. Rare earths, including yttrium and terbium, are used for laser targeting and weapons in combat vehicles.

The "rare" in rare-earth elements is a historical misnomer; the persistence of the term reflects unfamiliarity with the elements rather than true scarcity. The U.S. Geological Survey finds the more abundant rare-earth elements are as common in concentration as other industrial metals such as chromium, nickel, tungsten or lead. Even the two least abundant rare-earth elements (thulium and lutetium) are nearly 200 times more common than gold. Where "rare" comes into play is that, in contrast with ordinary base and precious metals, rare-earth elements have little tendency to become concentrated in exploitable ore deposits. Consequently, most rare earths come from a small number of sources.

What makes rare-earth elements so unique? Among the many beneficial characteristics, rare-earth batteries offer greater energy density, better discharge characteristics and fewer environmental problems upon disposal. High-strength rare-earth magnets have allowed numerous electronic components

FIGURE 1



EXPLODING DEMAND, SHRINKING SUPPLY

Once largely self-sufficient in the production of rare-earth elements, the U.S. gets more than 90 percent of what it currently needs for industrial applications from deposits in China. (Image courtesy of the author and the U.S. Geological Survey)

used in appliances, audio and video equipment, computers, vehicles, communication systems and military gear to be miniaturized. Fiber-optic cables that use erbium can transmit signals over long distances because the erbium amplifies the signal.

As rare-earth elements grow in importance, they have become both carrot and stick for international political trade negotiations. In the past 20 years, according to the U.S. Geological Survey, China has emerged as the biggest player, controlling approximately 90 percent of the world's rare earth either through territorial control or exclusive mining rights. Additionally, China is less burdened with environmental or labor regulatory requirements that can greatly increase costs incurred in mining and manufacturing rare-earth products.

The rare-earth supply problem will have no easy solutions. According to the U.S. Government Accountability Office, it would take 15 years to overhaul the defense supply chain, meaning that any changes to it need considerable lead time. The American Mineral Security Act, passed in 2015, is meant to determine which minerals are critical and diversify the supply chain, according to the NATO Association of Canada. Currently, switching from present suppliers (e.g., China) would cause major disruptions to supply chains.

Rare earths are a critical part of laser- and precision-guided missile technology. Lockheed Martin Corp. is working on a small, high-power laser weapon, heavily reliant on the rare earths erbium and neodymium, that the U.S. Air Force Research Laboratory wants to test in a tactical fighter aircraft by 2021.

Rare-earth elements are widely used in strong, permanent magnets that are impervious to temperature extremes. The permanent magnets are used in fin actuators (which control flight patterns in missiles) in missile guidance and control systems; disk drive motors installed in aircraft and tanks; satellite communications; and radar and sonar systems. Samarium-cobalt magnets are more resistant to demagnetization than those made from any other material. This quality—called high coercivity—means that they do not lose magnetic strength when exposed to high temperatures. That makes them the best choice for many military applications, according to Air Force Lt. Col. Justin C. Davey, in a 2011 Air War College report. Neodymium-iron-boron magnets are very strong, light and relatively low-cost. By weight, they are almost 10 times more powerful than traditional ferrite magnets. That makes them ideal for use in the tiny electronic components such as disk drives that have helped make possible decades of computer-driven innovation.

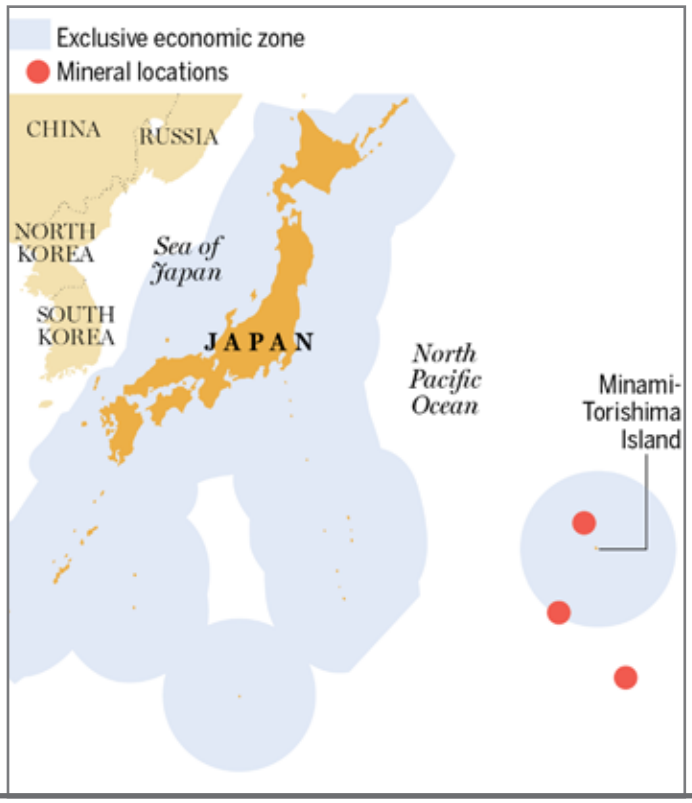
HOW DID WE GET HERE?

For most of the 20th century, the United States was largely self-sufficient, with all of its rare-earth needs being met at the Mountain Pass rare-earth mine in California. This began to shift in the 1990s as a result of several factors.

First, China entered into a number of free trade agreements with the United States and, with its lower labor costs and regulatory requirements, became a less-expensive alternative supplier. Second, China greatly expanded its electronics manufacturing infrastructure to take advantage of its rare-earth resources. Finally, problems with water supply pollution and stricter regulations at Mountain Pass forced the eventual shutdown of the plant. These factors created an opportunity for the Chinese to establish dominance in rare-earth mining and production. (See Figure 2, Page 93.)

Chinese efforts to monopolize rare earth do not end with domestic sources. China has aggressively pursued rare-earth mines in Africa, often exchanging infrastructure development or the sale of excess defense articles for exclusive mining rights. In the Democratic Republic of the Congo, China gained rights to the country's lithium, cobalt and coltan mines. These minerals are used in electric vehicle batteries and electronics, including smartphones and laptops. In exchange, China agreed to build much-needed projects such as urban roads, highways and hospitals.

Kenya is another Chinese target. The East African nation has huge mineral potential, and its exploration efforts have picked up in the last five years with the awarding of commercial licenses in prospecting for oil, gold, coal, geothermal minerals and rare



RARE EARTHS UNDER THE SEA

Experts claim that a recently discovered deposit of rare-earth minerals—estimated at 16 million tons—near Japan's Minamitori Island has the potential to meet demand for more than 400 years. However, the technology to extract the minerals from the ocean floor doesn't yet exist. (Image courtesy of the author)

earths. In April 2019, Kenya secured $666 million from China to build a data center in a tech city (likely comprising data centers designed to facilitate internet and communications) currently under construction in Konza, about an hour from Nairobi. Other African countries in China's crosshairs include Cameroon, Angola, Tanzania and Zambia. Tanzania is of particular interest because of the presence of several military-critical rare earths, including neodymium and praseodymium, which are key components in precision-guided munition technology.

China has also become a significant new economic actor in Latin America and the Caribbean. China-Latin America trade increased from almost negligible levels in 1990 to $10 billion in 2000 and $270 billion in 2012; the largest portion of this exchange takes place between South America and China. In 2012, an $8.4 billion rare-earth deposit was discovered in Brazil. Over the past few years, China has become Brazil's undisputed top trade partner.

PARTNERSHIPS TO BREAK THE STALEMATE

Any efforts to boost U.S. access to rare earths require a combination of technological advancement, driven by necessity, and partnerships to reach the regions where these elements are located in abundance. Fortunately, technology is providing plenty of opportunities to enhance our abilities to discover and extract rare-earth elements.

Massive deposits have recently been discovered in Japan's far eastern territorial waters, for example, and that discovery will complicate China's efforts to corner the rare-earth market. Experts say there might be enough yttrium, europium and terbium in this deposit to meet global demand for hundreds of years. The only problem is that the deposits are at the bottom of the ocean. Several companies specialize in underwater mining, but the process is extraordinarily difficult, and more advances must be made to fully benefit from this discovery.

The process for diversifying supply sources for rare earths will likely be expedited by recent events, including the recent U.S.-China trade conflict as well as China's recent history of cutting rare-earth exports to Japan. In 2010, China restricted rare-earth trade with Japan, a restriction that ended only after mediation by the World Trade Organization in 2014.

In addition to Japan, Australia is a potential partner for the United States that has a common interest in competing with China for rare-earth market share. Australia-based Lynas Corp. is currently the world's largest producer of rare earths outside of China. Lynas recently announced a joint venture with U.S.-based Blue Line Corp. to develop a rare-earth separation facility in the United States. The company currently uses a processing plant in Malaysia, and in May, Lynas unveiled plans to invest $34 million to ramp up production and allay the regulatory concerns raised by Australian shareholders that Malaysian regulations did not provide adequate environmental protection.

Other international companies could be a factor in developing alternative supply sources as well. The Rainbow Rare Earths mining company is focused on production from, and expansion of, the high-grade Gakara Rare Earth Project in the East African nation of Burundi. Gakara, characterized by exceptionally high quality, is the only rare-earths mine in Africa and just the second outside of China.

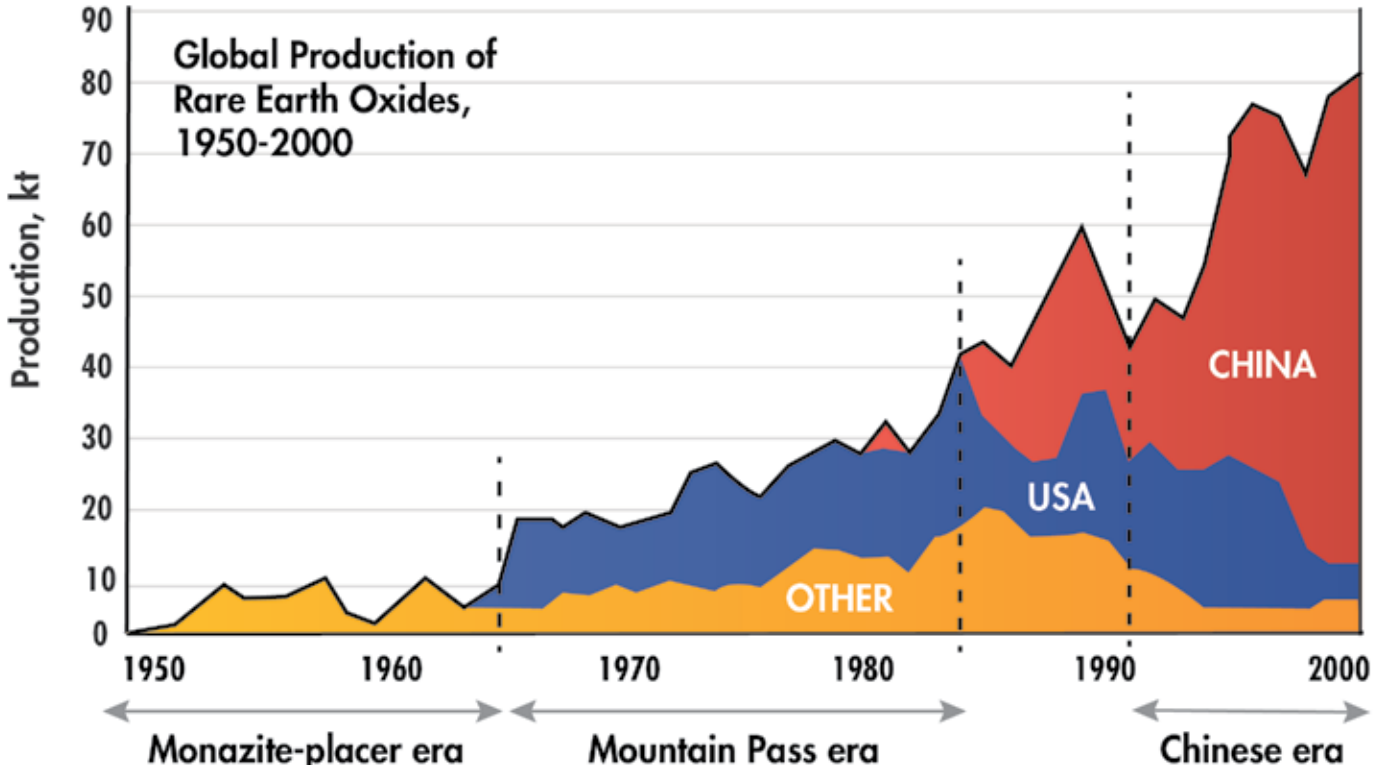
Closer to the United States are significant deposits in Kvanefjeld, Greenland. Kvanefjeld's ore reserves of 108 million metric tons support an initial 37-year mine life, and the project is expected to be one of the largest global producers of neodymium, praseodymium, dysprosium and terbium, along with uranium and zinc byproducts. Greenland Minerals Ltd., in close cooperation with China-based Shenghe Resources, is working toward maximizing the potential of this reserve.

CONCLUSION

The U.S. military supply chain is highly vulnerable to any Chinese efforts to limit access to rare earths. The Chinese have already used rare-earth minerals as a weapon. The result of the resumption of rare-earth trade was a global collapse in prices, which eliminated the incentive for private industry to perform any additional rare-earth exploration or to establish new plants

As rare-earth elements grow in importance, they have become both carrot and stick for international political trade negotiations.

FIGURE 2



ACTUALLY, THEY'RE NOT SO RARE

Technological applications of rare-earth elements have exploded over the past couple of decades, with the compounds now used in lasers, batteries, fiber-optic cables, polishing glass and transporting hydrogen. Militarily, rare earths are used in munitions, electric motors and in radar, sonar and communications systems. (Image courtesy of the author)

for processing. The price collapse did not keep Japan from seeking out its own domestic supply, however.

The United States is in the process of building a new rare-earth processing plant in Texas with Lynas, which should alleviate some of the pressure provided by any trade restrictions posed by China. Until this happens, DOD will be vulnerable to disruptions to the rare-earth supply chain that affect cost, scheduling and the availability of the necessary resources to modernize the military to maintain its competitive edge.

For more information, contact the author at ***russell.d.parman.civ@mail.mil****.*

RUSSELL PARMAN is a foreign intelligence officer at the U.S. Army Aviation and Missile Command and a 17-year civilian member of the intelligence community (Marine Corps Intelligence Activity, U.S. Army Contracting Command G-2 and Aviation and Missile Command G-2). He is a National Guard captain, presently serving as an Officer Candidate School platoon trainer. He has authored academic articles, including "The Social Roots of Terrorism" in the 2006 edition of the World of Transformations and "Terrorism in a Unipolar World" in the 2005 McNair Research Journal. His article "Bringing Intel to Contracting" appeared in the Summer 2019 edition of Army AL&T. He has an M.A. in international relations and comparative politics from Vanderbilt University and a B.S. in political science from Middle Tennessee State University.

Cleaning *out the* Garage

Security Assistance Command explores how to expedite the process of getting rid of the Army's old equipment.

by Marcus Mackey

The U.S. Army Security Assistance Command (USASAC) is demonstrating a concept that could offset millions of dollars in divestiture expenses for the U.S. Army as it removes excess equipment from inventory and modernizes the force.

For decades, the Army has consolidated its excess equipment—helicopters, mobile rocket launchers, tanks and tactical wheeled vehicles, for example—at various Army depots and stored it for years with the idea of having a reach-back capability for future programs or in the event of a national emergency. Unfortunately, the stored equipment is minimally maintained and deteriorates over time, until a decision is made to either declare the equipment as "excess defense articles" or to demilitarize it—eliminating its functional capabilities and inherent military design features by either removing or destroying the critical features, or by total destruction: cutting, tearing, crushing, mangling, shredding, melting, burning, and so on.

Excess Defense Articles is a security assistance program managed by the U.S. Department of State that enables the modernization of partner forces. USASAC, a subordinate command of the U.S. Army Materiel Command (AMC), is the Army's implementing agency for foreign military sales, by which the United States provides partners and allies with a capability to conduct military operations with or without U.S. forces in their region for security and stability.

In 2011, the Army became aware that it had too much equipment and needed a strategy to reduce the inventory. After 10 years of war, senior Army leaders realized they would not be able to sustain the current equipment while also working to modernize the force. The projected shipping, storage and maintenance costs associated with the excess equipment would create an enduring burden to the taxpayer, and that was unacceptable. The Excess Defense Articles mission transfers equipment declared excess by the Army to U.S. foreign partners at low or no cost. The approval process goes through the Army and interagency staffing before ultimately being presented to Congress for approval—which historically has proven to take a long time.

The Army's solution was to create a working group to identify excess equipment and determine the most efficient and cost-effective way to quickly remove it from the Army's property books. While the working group has had several names over the years, including the Army Divestiture Working Group, Equipment Redistribution and Divestiture Readiness Strategy and, currently, the Total Equipment Management Strategy, its goal has remained the same: to build Army readiness while purging excess and obsolete equipment—as soon as possible.

With this new expedited approach, once equipment was determined to be excess, disposition instructions were created: Ship to another unit; ship to Army depots for long-term storage; or, in most cases, ship to the Defense Logistics Agency Disposition Services for demilitarization. The velocity of these turn-ins created a

EXPENSIVE WRAPPING

Shrink-wrapped Kiowa Warrior helicopters await loading on a U.S. Navy ship en route to Iraq in 2003. The Army originally wanted to store the helicopters at Davis-Monthan Air Force Base, Arizona—at a cost of roughly $35,000 each to prep for storage and as much as $500,000 to bring each helicopter back to operational status. (U.S. Navy photo by Bart Jackson)

BIRD IN THE HAND

Kiowa helicopters destined for a foreign partner arrive at Redstone Arsenal Airfield in Alabama in July 2015. Storing the aircraft in flight-ready condition saved the Army and the foreign partner money: The Army avoided the transportation and storage prep cost, and the foreign partner avoided the regeneration cost that would have been incurred with bringing them out of storage. (U.S. Army photo by Michelle Miller, Program Executive Office for Aviation)

challenge for USASAC: Equipment being divested was no longer going to depots for storage, and the Excess Defense Article program's ability to staff and approve transfers to partner nations, which typically takes three to six months, was being overwhelmed. Opportunities to support our partners' modernization efforts and build partner capacity were missed; a change was needed.

Recognizing the lost opportunities, USASAC's Excess Defense Articles team started to explore a new approach. They needed to be able to identify equipment and partners' requirements earlier and to develop a more streamlined approval process. Therefore, USASAC had to figure out how to get operational equipment—condition code F (repairable) or better—directly from units and transfer it to partner nations without slowing down divestiture or costing the Army money.

Lem Williams, chief of the Mission Support Division within USASAC G-3, leads the effort. "Having USASAC formally inserted into Army processes will give us the visibility to get in front of divestiture decisions, and enables us to align partner requirements with COCOM [combatant command] commanders' requirements prior to final disposition instructions," he said.

Williams and his team have been able to leverage the Army's Decision Support Tool to identify excess equipment and forecast potential opportunities for U.S. partners. In coordination with the Logistics Data Analysis Center, formerly the Logistics Support Activity, the team was instrumental in creating the Foreign Military Sales Function within the tool, which will empower USASAC to vet equipment and provide the Army another option to source equipment.

To share its vision, the Excess Defense Articles team planned, coordinated, hosted and steered multiple working groups with HQDA, AMC, the U.S. Army Sustainment Command, the U.S. Army Tank-automotive and Armaments Command and the Logistics Data Analysis Center. In 2017, the team's work started to pay off. The working group developed a proof of principle that would be executed at Fort Campbell, Kentucky: USASAC would receive light medium tactical vehicles directly from units and transfer them to partner nations on-site at no cost to the Army.

The proof of principle will involve the transfer of 100 excess operational M1078, M1083 and M1084 Light Medium Tactical Vehicles to Morocco. Historically, the unit would pay to prepare and ship a vehicle to another installation or depot; it will not have to do so for the proof of principle. Participating units have turned in or will turn in the equipment; USASAC will receive the equipment; and the partner will pay to have the equipment stored and shipped to its final destination. Most of the equipment the units have turned in to the 406th Army Field Support Battalion is in better condition than code F, and most is serviceable without qualification or better.

By transferring the trucks at the source of supply, the Army will save taxpayers millions of dollars that would otherwise

have been paid to consolidate, transport or demilitarize this equipment. In this case, these trucks will help Morocco in its efforts to modernize its military, provide interoperability and build relations needed in today's multidomain battlefield.

Through September 2019, USASAC had transferred and shipped 50 vehicles to partner nations; the last 50 should be shipped by the end of fiscal year 2019. This speed is unprecedented: Most excess defense articles cases typically take three to six months for the approval process and sometimes several years to complete. Once the final 50 vehicles are shipped, this case will have been implemented and closed within one year.

USASAC has previously tested this theory, but could not completely codify it, during the Army's divestment of OH-58D Kiowa Warrior helicopters. The Army initially issued a directive to divest all OH-58Ds, but amended its plans to "partial divest" and wanted to store them at Davis-Monthan Air Force Base in Arizona. Each retained aircraft cost the Army approximately $35,000 to prepare for type A storage (which involved encasing the engine and electronics in shrink or bubble wrap for long-term storage). After type A storage, the cost to bring each helicopter back to operational status is $350,000 to $500,000.

USASAC had foreign partners—Croatia, Greece and Tunisia—that were interested in the OH-58Ds, and the Excess Defense Articles team created a plan that would transition the aircraft and generate cost savings for the Army and the partners. The plan included storing the aircraft in flight-ready condition, paid for by the customer (at a cost of $3,000 a month), at Redstone Arsenal Airfield, Alabama. The Army thereby avoided the transportation and storage prep costs, and the foreign partners avoided the regeneration cost that would have been incurred with sending them to Arizona.

CONCLUSION

This commonsense thinking has been the driving force behind USASAC's efforts to transform the Excess Defense Articles program from a reactive pseudo-solution to a proactive force multiplier. Being able to identify up front which allies or partners may be able to use the Army's outdated, excess equipment speeds up the process of removing it from the Army's inventory and helps build capacity in allies and partners. The result is a win-win situation for Army and ally and partner readiness. The Army divests excess equipment quickly at the unit level, which also speeds up modernization of the unit and saves money. Additionally, partners and allies receive military equipment at a reduced cost while gaining both a capability and interoperability with U.S. forces.

For more information, contact the author at 256-450-4750 or contact Lem Williams, chief of the USASAC Operations Division, at 256-450-4043.

MARCUS MACKEY is the USASAC G-3 Excess Defense Articles Modernization program manager at Redstone Arsenal. He is a retired Army veteran with more than 20 years of service as a logistician with multiple deployments to Iraq, Somalia and Bosnia. He was recently inducted into the Madison County, Alabama, Hall of Heroes 2018 class. He holds a B.S. in management from the University of Phoenix.

UPWARD MOBILITY

Contractors working for a foreign partner's freight forwarder load an M1078 Medium Tactical Vehicle for transport. USASAC has transferred and shipped 50 vehicles to Morocco so far this year, and will ship 50 more by the end of fiscal year 2019. (U.S. Army photo by the author)

LAURA L. WICHLACZ

COMMAND/ORGANIZATION:
Assistant Program Executive Office for Corporate Information, Program Executive Office for Ground Combat Systems

TITLE: Web Applications Team lead; lead program analyst

YEARS OF SERVICE IN WORKFORCE:
11 years (including 2 as a contractor)

DAWIA CERTIFICATIONS: Level III in program management and in information technology; Army Acquisition Corps member

EDUCATION: M.S. in program management, Naval Postgraduate School; B.S. in management information systems, Oakland University

AWARDS: Commander's Award for Civilian Service; Performance Awards (2); Certificate of Appreciation (2)

DOING > TALKING

When it comes to leadership, Laura Wichlacz favors action over lip service. "Leadership is about results," she said, "and people are more focused on what you do than what you say. Always have a plan and make sure you are moving toward it—don't talk a good game, walk a great game. Follow through."

Wichlacz is part of the Program Executive Office for Ground Combat Systems (PEO GCS), serving as the Web Applications Team lead in the Assistant PEO for Corporate Information. "I lead a team in developing and sustaining Army web applications and project management capabilities. These web applications take business processes and automate them into solutions that bring the warfighters' vision to life." Her team has deployed a variety of systems, including a task management system, a document staffing solution, a weekly significant activities reporting system and an application that manages contracts and deliverables after contract award.

She is also responsible for managing the tool that enables enterprise project management across PEO GCS, allowing the organization to better manage programs, products and projects: Microsoft Project Server is designed to assist program and project managers as they develop schedules, assign resources to tasks, track project progress, analyze workloads and create integrated master schedules. The Project Manager for Armored Fighting Vehicles uses Project Server to manage the process from initial planning to the final step of getting retrofitted vehicles to warfighters. "They decompose the overall process into manageable activities such as engineering, testing,

documentation and fielding, and generate forecast reports for their teams," said Wichlacz. "They manage dependencies between functional program teams and supplies and consolidate this information into an integrated master schedule."

The Project Director for Main Battle Tank Systems used Project Server to develop a master fielding schedule that housed all of its fielding activities in one place. "The master schedule synchronizes planning, fielding, training, and reset of command, control, communications, computers, intelligence, surveillance and reconnaissance across the PEO," said Wichlacz. "That provides the warfighter a single interface to the field, and provides transparency to mission-essential logistics, training and fielding information."

Despite the software-oriented work she does, most of Wichlacz's days are not spent staring at a screen. "People are often surprised how much interpersonal skills it takes to manage a web application team. Most think that you have to be highly technical, but research proves interpersonal skills are twice as important as technical competence in determining how successful someone will be in their career and in life," she said. "Communication, teamwork, empathy and the ability to motivate are critical skills that often are overlooked."

"Leadership is about results. Don't talk a good game, walk a great game."

She noted that the biggest challenge she faces in her work is "establishing a team that's empowered, with people who know that their ideas are heard and valued. I overcome that by communication: by encouraging open communication, by listening to the ideas and recommendations of others, and by telling my team that I trust them."

Wichlacz's project management experience dates back nearly 20 years, when she started working at General Motors Corp. as a scheduler and project planner in the Powertrain Division, responsible for creating and maintaining project plans. "My contribution resulted in an on-time launch and acceleration to full production in less than four months," she said. "It was a great experience and required a lot of teamwork across the entire cross-functional program team." Her work there caught the attention of a defense contractor supporting PEO GCS and, after working as a contractor for two years, she joined the organization as an Army civilian in 2010.

She recently earned her master's degree from the Naval Postgraduate School (NPS), and noted that the master's program has been a turning point in her career. "This program helped me focus on problem-solving and decision-making within the acquisition environment by using case studies, team exercises and research," she said. In a class on production and quality management, Wichlacz briefed the Lean Six Sigma Green Belt project she completed, which used the Agile software methodology to improve the software development life cycle in the Assistant PEO for Corporate Information. The project will now be a part of the NPS curriculum as an example of the successful use of lean methodology in the workforce. "The professor indicated that it was an excellent success story on how eliminating waste and redundancy can be efficient while cutting costs," she said.

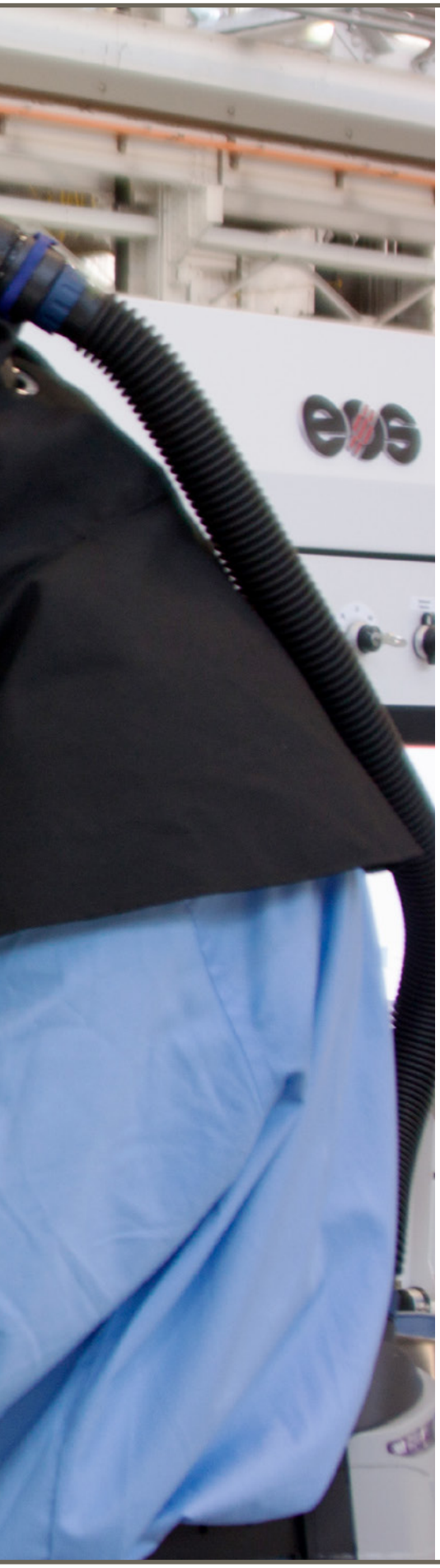
Her education continues with her involvement in the PEO GCS Emerging Leader Program, which matches participants with coaches from a leadership and organizational development company. "It provides challenges that help stretch me to my highest potential by examining habits and enhancing use of empowering language; engages me in self-awareness and behavioral exercises; and provides developmental strategies and practices. It doesn't focus on analyzing the past, but on the actions I can take in the present to move toward my goals."

She had this advice for newly minted acquisition professionals: Discuss career aspirations and development with a supervisor or team lead. "Be sure to take continued job training and education, as they are important for professional development," she said, "and take advantage of developmental positions to gain new skills and become a more informed and well-rounded employee. Finally, find mentors you can trust: They are key to success and an important resource to help understand the organization and the way it works."

—SUSAN L. FOLLETT

CENTER OF EXCELLENCE

Prototype parts are 3D-printed in May at the new Advanced Manufacturing Center of Excellence at Rock Island Arsenal – Joint Manufacturing and Technology Center (RIA–JMTC). The center will serve as the focal point for advanced manufacturing in sustainment matters. (U.S. Army photo by Debralee Best, RIA–JMTC)



GETTING STARTED NOW

The Army needs to embrace advanced manufacturing at the beginning of new system development to surpass potential foes.

by Dr. Alexis Lasselle Ross

In the future, advanced manufacturing techniques like 3D printing could allow Soldiers to replace parts for systems and equipment almost at the point of need. Back home, the use of artificial intelligence and robotics on the factory floor could streamline and optimize the manufacturing process, saving time and other resources. New, innovative weapon systems, produced using a variety of advanced manufacturing methods and materials, could give Soldiers superior capabilities necessary to defeat rapidly advancing near-peer adversaries.

But to fully realize these benefits, the Army must embrace advanced manufacturing at the beginning of the acquisition process and incorporate it throughout the life cycle of the system.

FROM CONCEPT TO CAPABILITY

Recently, we've heard quite a bit about additive manufacturing—better known as 3D printing—because it's one of the most understandable and prevalent forms of advanced manufacturing. However, advanced manufacturing is much broader than just 3D printing; it includes both new *ways* to manufacture existing products and new *products* resulting from advances in technology. (See sidebar, "Optimized by Design," on Page 104.) It often combines new manufacturing techniques with traditional methods; for example, 3D-printing

a part and then using machining and heat treating to get the desired surface finish and material properties, all the while using robotic monitoring for quality control.

Advanced manufacturing has the ability to fundamentally change the way we design, deliver, produce and sustain our capabilities. It can allow us to modernize and innovate our systems like never before. It can decrease design limitations imposed by traditional manufacturing methods and allow us to more easily produce complex parts. Let's look at an example. Traditionally, an aircraft engine component may be the combination of 200 parts that are welded together into a complex design. But what if, instead of welding together 200 distinct, intricate parts, we could 3D-print the whole component as one piece? We're going from 200 parts to one, eliminating all fusion points—that are really possible failure points—thereby increasing reliability.

It can also enable the production of specialty or tailored items. Helmets, for example, could be customized to fit individual Soldiers. These capabilities will fundamentally change how we design a component; instead of designing around the confines of traditional manufacturing, engineers can concentrate on the design that achieves the greatest operational performance. Advanced manufacturing can also allow us to innovate with unparalleled speed. Using advanced methods, we can quickly produce prototypes, determine if they are viable, and transition them to production faster than ever before.

But to optimize our use of advanced manufacturing, we have to change our thinking about what materials we use as well. That same aircraft engine component we just discussed, which was designed and manufactured using advanced methods, could also be generated using—you guessed it—advanced materials. The use of certain composite materials, such as spun ceramic, allows for components that are lighter than ever before—which is especially critical for things like aircraft components and Soldiers' equipment.

The Army has begun and will continue to incorporate these advanced methods and materials into all aspects of the system development life cycle.

Beyond the new methods and materials used to produce this component, advanced techniques can also transform the industrial operations at the facility where the component is produced. Combining artificial intelligence, robotics, sensors and a digital network on the factory floor enables the connection between machines, products and people, leading to efficiencies such as improved quality control, predictive maintenance or automatic ordering of supplies. It also allows people to monitor the entire process, from individual machine performance to the environmental conditions in the factory—you can digitally follow a part from raw material to final production.

MODERNIZATION AND READINESS

Advanced manufacturing also provides the promise of production scalability. Producing parts or systems using traditional manufacturing methods requires a significant amount of time and money to establish or restart a production line. Using advanced methods, we can quickly establish a line and increase throughput with one company or by contracting with multiple companies. As a result, advanced manufacturing has the potential to lower the barrier to entry for small businesses because there's no need for large space and machinery, which is usually required for a large production line.

On top of the modernization benefits just outlined, Dr. Bruce D. Jette, assistant secretary of the Army for acquisition, logistics and technology (ASA(ALT)), is excited about the possibilities these technologies present for Army readiness. If employed to the maximum extent, advanced manufacturing could revolutionize our battlefield logistics footprint through on-demand fabrication of parts close to the point of need, thus reducing the large number of parts that would have to be stored and transported around the globe. Advanced manufacturing can also be used to address obsolete parts, hard-to-get parts and diminishing sources of supply. Previously, in urgent situations, innovative solutions were put together with things like duct tape and wire, but now, with 3D printers, better solutions can be produced.

Currently, the Army is assessing the value and utility of advanced manufacturing in tactical environments through a limited user experiment that began in April 2018.

POINT OF NEED

Advanced manufacturing could revolutionize the logistics footprint on the battlefield through on-demand fabrication of parts close to the point of need. Such a capability would reduce the large number of parts that would have to be stored and transported around the globe. (Photo by RIA–JMTC)

The experiment consists of adding 3D scanning and 3D polymer printing capabilities to a select set of 10 metalworking and machining shop sets (MWMSS) fielded by the Product Manager for Sets, Kits, Outfits and Tools in the Program Executive Office for Combat Support and Combat Service Support. The MWMSS system already contains a robust point-of-need metalworking and machining capability, and adding advanced and additive manufacturing tools is expected to increase its ability to address urgent user needs at the tactical edge. Feedback from the experiment will be used to inform future requirements for forward capabilities in advanced manufacturing and the value to the warfighter.

From innovative methods and materials, optimized designs and increased performance to improved industrial operations and enhanced battlefield logistics, advanced manufacturing will deliver on two of the secretary of the Army's top priorities: modernization and readiness.

POLICY

To implement and fully realize the potential of advanced manufacturing, we are developing an Army advanced manufacturing policy that is scheduled for release in fall 2019. At its core, the policy will direct Army organizations to consider and incorporate advanced manufacturing in all aspects of a system's life cycle, from early design and development through sustainment.

Through this policy, we are attempting to move the entire acquisition system toward advanced manufacturing, from the development of requirements, to system design, to production and sustainment. This endeavor will undoubtedly require close coordination and partnership from stakeholders involved across the life cycle of a system. To that end, the policy will apply to the requirements, acquisition and sustainment communities—the U.S. Army Futures Command (AFC), the Office of the ASA(ALT) and the U.S. Army Materiel Command (AMC). We have been working very closely with AFC and AMC, as well as with other key stakeholders, to ensure that the policy takes a holistic approach to address advanced manufacturing in the entire life cycle of a system, and it will be effectively implemented in the coming years.

There are several key elements underpinning the new policy:

- ***Strategic Investment***
  First, the Army and its industry partners must actively invest in advanced manufacturing. While transitioning to advanced

Advanced manufacturing has the ability to fundamentally change the way we design, deliver, produce and sustain our capabilities.

methods and materials may require significant resources, it will play a critical role in our ability to modernize our weapon systems and industrial base. Others, including near-peer adversaries, are already ahead of us in this endeavor. In order to keep pace, we must begin making investments now. To that end, the policy requires that a holistic, threat-based strategy be developed for the investment in and application of advanced methods and materials. Importantly, executing such a strategy will require partnership from the private sector.

Currently, companies across industry are employing advanced manufacturing in different ways. Some have fully embraced advanced manufacturing and are incorporating it into production lines, while others are developing an additive manufacturing capability to sell as a service to other companies and the government. We currently are engaging with the breadth of industry to determine the best way to mature and leverage advanced manufacturing and incorporate it into weapon systems.

- ***Systemic Adoption***
  Second, we must incorporate advanced manufacturing upfront and throughout a system's life cycle. Advanced manufacturing methods and materials will have the largest impact and will provide the greatest return when they are integrated early in system design. As such, the policy directs that advanced manufacturing be incorporated into the upfront design of systems when analysis indicates it offers the best value to the government. To facilitate this, AFC will write capability requirements based on performance and readiness gains made possible by advanced manufacturing methods and materials. For example, harking back to the aircraft engine component I discussed earlier, the reduced weight of critical aircraft parts could be a performance gain that the requirements and acquisition communities seek. Additionally, AFC is now responsible for

OPTIMIZED BY DESIGN

In the future, what we call advanced manufacturing today will just be manufacturing. That doesn't mean it will be obsolete, just that it will get more advanced. Henry Ford's revolutionary assembly line is both outdated and not. We have plenty of assembly lines, just as Ford envisioned, but they're vastly more efficient and effective—something he probably did not foresee. Even assembly lines outfitted in the past 30 years or so are no longer considered advanced, because the central quality of advanced manufacturing is that the technologies used are cutting-edge and near fruition.

"Computer numerical control [NC] in machining was considered advanced manufacturing in 1980," said H. Edward Flinn, director of the Advanced Manufacturing Center of Excellence at Rock Island Arsenal – Joint Manufacturing and Technology Center (RIA–JMTC). "It shifted the workload from the shop floor, where a machinist manually operated a cutting tool path, to the office environment where an NC programmer wrote computer code to control the tool path." Advanced manufacturing via artificial intelligence and feature-based recognition—algorithms that classify by feature—are now working "to minimize the need for NC programmers in the platform that would be used to machine a part, the tools that will be used and, of course, the tool path."

The Advanced Manufacturing Center of Excellence reached full operational capacity in May. Its ultimate goal is to improve Soldier readiness, said Flinn. To do that, the center plans to use advanced manufacturing methods such as process simulation, artificial intelligence, and 3D printing or additive manufacturing.

Flinn worked closely with the Army development and engineering centers (the former DECs, now part of the U.S. Army Combat Capability Development Command) to specify the capabilities the

center of excellence should house. He has coordinated with HQDA to help develop a policy on supporting tactical use and requirements of advanced manufacturing, and has begun working with organic industrial base locations on their advanced manufacturing needs. Not only has the center been working with the organic industrial base, but it has also been working with private industry, academia and the other services to leverage their best practices, he said.

Flinn said 3D printing offers point-of-use fabrication options, is competitive for small production and is a new method of manufacturing that opens up design freedom. In the past decade, 3D printing has gone from a method of making prototypes with little manufacturing applicability to becoming an integral part of the manufacturing process. Improvements in printing speed and accuracy, materials, cost and computer modeling-and-simulation systems have dramatically accelerated the technology's use in manufacturing, he said. The technology can help the tactical Army right now, by providing on-demand, temporary replacement parts, he added.

While the center is currently focused on 3D printing, other advanced manufacturing techniques are being introduced into mainstream processes within RIA–JMTC. Those include the use of robotics, process simulation and material optimization, Flinn said. "Robotics is being used at the arsenal in the welding and investment casting processes to remove repetitive motion and improve process stability." Investment casting comprises precise wax parts created using an injection-molding machine and a die that contains the shape of the part to be made, Flinn said. Smaller parts can be attached to a tree—a frame that enables batch-creation of the parts' shells. This process can create almost any part for any piece of equipment—any part that can be created in wax can go through this process.

The wax object is then dipped in and coated with a wet refractory material—a ceramic slurry and sand that, when hardened, won't be degraded by heat—and then the whole assembly goes to an autoclave that melts the wax away for reclamation, then on to the furnace to harden the ceramic refractory material, creating a shell. Any wax that's left will be burned away in the furnace. Then, metal goes into the mold to make the part. Robotics helps to increase the efficiency, volume and speed of the process. Robotics "also allowed us to expand weight of the [investment casting] mold, which increased our yield and our range of parts that we could [make bigger]. The robot's job is finished once the 'dipping' of the shell is completed. From there, it is removed from the process and hand-delivered to all follow-on operations." (For more on how the process works, go to **https://www.facebook.com/RIAJMTC/videos/670254872464/?v=670254872464**.)

The center is also using process simulation whereby "we can, through mathematic models, recreate solidification and stress that are induced during the transformation of metal from a liquid to a solid." This, Flinn continued, reduces the need to have a casting expert on hand. It also helps to reduce costs by eliminating trial-and-error iterations on the shop floor. "The present system has shifted the need from a casting [expert] to a modeling and simulation [expert]." That parallels what happened with computer numerical control machining after its introduction.

Artificial intelligence has the potential to aid in shifting repetitive tasks from humans to machines—for example, combining artificial intelligence with process simulation. "In combining the two, much of the human interface necessary to write NC programs, prepare process plans, design tooling and manage the logistic chain will be minimized, if not eliminated," Flinn said.

Advanced manufacturing will be key to the Army's future overmatch capabilities. "It provides opportunities to improve readiness, optimize design and lethality, drive down cost and expand the manufacturing base," he said.

—JACQUELINE M. HAMES

PARTS ON DEMAND

Advanced manufacturing, which includes techniques like 3D printing, could allow Soldiers to print replacement parts—like the one pictured—at their location as a stopgap measure until official replacement parts can arrive from the supply chain. (Photo by Army Staff Sgt. Armando R. Limon, American Forces Network Humphreys)

the laboratories and technical centers within the Army, so they will be developing new manufacturing techniques and materials for use in weapon systems. ASA(ALT) program offices will be responsible for working with industry to incorporate advanced manufacturing into system design and development. As this is the phase where contracts and agreements are entered into with industry, it is where the rubber meets the road.

And on the sustainment side, AMC will be responsible for incorporating advanced methods and materials into already fielded systems when readiness challenges or cost-benefit analyses call for it. AMC will integrate advanced manufacturing into supply chain processes and provide support to tactical units procuring advanced manufacturing equipment and services. AMC has recently established the Advanced Manufacturing Center of Excellence at Rock Island Arsenal, Illinois, which will serve as the focal point for the application of advanced manufacturing in sustainment matters. They are making great strides in using advanced manufacturing to address diminishing sources of supply and obsolescent parts for fielded systems.

- ***Thoughtful Use***

  Finally, we must deliberately and thoughtfully leverage advanced manufacturing. It is worth noting that advanced manufacturing is not appropriate for all systems and all situations, and that certain considerations must be made before its use. The policy takes care to provide flexibility to Army organizations to determine whether to use advanced manufacturing, based on cost-benefit analysis and anticipated value to the government. Incorporating advanced manufacturing into

already fielded systems takes time, money and significant engineering analysis, but in some cases, it is warranted to increase readiness. Further, the policy requires that any readiness and performance benefits offered by advanced manufacturing be balanced with warfighter safety, which is always of the utmost importance. For example, only organizations that are authorized and trained to work with explosives may fabricate or modify such items.

Lastly, and importantly, when pursuing advanced manufacturing, we must carefully consider intellectual property matters. Consistent with the Army's recently released intellectual property policy, program offices must plan early for the intellectual property required to support advanced manufacturing, negotiate with industry for the necessary—not all—intellectual property and for the license rights to use it, and communicate these requirements early and often. With the transformation of engineering and manufacturing, we must also look to new ways to manage intellectual property. For example, if we are considering 3D-printing parts close to the point of need during sustainment, a good approach to handling intellectual property might be a fee-based agreement, or "pay-to-print." Instead of spending a lot of money for an extensive intellectual property license, the Army could pay a reasonable fee to the company that holds the intellectual property every time a part is printed.

This policy represents the first Armywide step toward truly leveraging the immense potential of advanced manufacturing. We will look to work with partners across the Army, DOD and industry as we implement the policy in the coming months and years.

CONCLUSION

Undoubtedly, these technologies will fundamentally change the way the Army designs, develops, produces and sustains systems. The Army has begun and will continue to incorporate these advanced methods and materials into all aspects of the system development life cycle. The technologies involved in advanced manufacturing techniques are complex and rapidly evolving, and commercial industry and our adversaries are already well on their way.

We must start down the same path as quickly as possible to maintain our readiness and overmatch. The future of the Army's readiness and modernization lies with advanced manufacturing.

For more information, go to ***https://www.asaalt.army.mil/About-Us/Deputies-Assistant-Secretary-of-the-Army/****.*

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MANAGING IP AND 3D

Printing parts at the point of need during sustainment will need a good approach to handle intellectual property—like a fee-based agreement, or "pay-to-print" concept, whereby the Army could pay a fee to the company that holds the IP every time a part is printed. (U.S. Army photo)

HYPERSONICS

Laser weapons, high-powered microwave weapons and hypersonic weapons are on the horizon for the Rapid Capabilities and Critical Technologies Office. The office takes the products out of the lab, transitioning them into prototypes with combat utility.

by Lt. Gen. L. Neil Thurgood

DIRECTED-ENERGY FAST-TRACK

The Army is fast-tracking directed-energy systems, awarding a contract to accelerate its first combat-capable laser system, the Multi-Mission High Energy Laser (MMHEL) prototype. Here, a Stryker Mobile Expeditionary High Energy Laser (MEHEL), an earlier technology that provided risk reduction for the MMHEL, participates in the Maneuver Fires Integrated Experiment in December 2014 at Fort Sill, Oklahoma. (Photo by Monica K. Guthrie, Fort Sill Public Affairs)

BY 2023

It's 2023, and a battery in a strategic fires battalion, part of the U.S. Army's Multi-Domain Task Force, is newly equipped with an unprecedented asset: the Army's first hypersonic weapon.

This land-based, truck-launched system is armed with hypersonic missiles that can travel well over 3,800 miles per hour. They can reach the top of the Earth's atmosphere and remain just beyond the range of air and missile defense systems until they are ready to strike, and by then it's too late to react. Extremely accurate, ultrafast, maneuverable and survivable, hypersonics can strike anywhere in the world within minutes. For the battery, the task force and the U.S. Army, they provide a critical strategic weapon and a powerful deterrent against adversary capabilities.

Around since the early 2000s, hypersonic technology itself is not new, yet it is newly important. Today the United States is battling to outpace similar efforts from our adversaries.

To address those threats, the Army is accelerating the fielding of its own long-range hypersonic weapon to deliver, by fiscal year 2023, an experimental prototype with residual combat capability—meaning Soldiers have it and can use it in combat if needed—to a unit of action. In this case, the unit is a battery in a strategic fires battalion.

The Army is using the same approach—accelerating a prototype to provide residual combat capability—with directed energy, another leap-ahead technology. The Army's first meaningful laser weapon system for tactical use will be fielded by fiscal year 2022. These 50-kilowatt (kW)-class lasers, heading to a platoon of Strykers, will improve Soldiers' defense against rocket, artillery and mortar threats, and an increasing number of unmanned aerial systems.

The Army's path for fast-tracking both hypersonics and directed-energy systems began in late 2018, when it renamed and refocused the efforts of the Rapid Capabilities and Critical Technologies Office (RCCTO). As part of the overall Army modernization strategy, Army leaders asked RCCTO to lead the hypersonic and directed-energy efforts as they transition from the science and technology (S&T) community into the hands of operational units.

Immediately, RCCTO moved out with the two missions and in turn set a new course of delivering experimental prototypes with residual combat capability.

PUSHING FORWARD

Developing hypersonic weapons for a national mission set requires constant cross-service coordination. Collaborating across services, agencies and with the Office of the Secretary of Defense through a joint service memorandum of agreement on design, development, testing and production, the Army, Navy, Air Force and the Missile Defense Agency (MDA) are all accelerating initiatives to field hypersonic weapon systems using a Common Hypersonic Glide Body (C-HGB). The Navy leads design of the C-HGB, while the Army will lead production and build a commercial industrial base. This cooperation enables the services to leverage one another's technologies as much as possible, while tailoring them to meet specific design and requirements for air, land and sea.

RCCTO is charged with one mission when it comes to hypersonics: Field a prototype long-range hypersonic weapon to the strategic fires battalion by fiscal year 2023. This includes hypersonic missiles with the C-HGB, existing trucks and modified trailers with new launchers, and an existing Army command-and-control system. (See Figure 1, Page 112.) To do this, RCCTO's Army Hypersonic Project Office issued contract awards in August, following program approval in March, to produce key hardware items for the long-range hypersonic weapon.

Starting in 2020, the Army will participate in a series of joint tests with the Navy, Air Force and MDA, focusing on range, environmental extremes and contested environments. The tests will be complemented by training events so Soldiers can learn to employ the new technology.

The Army's directed-energy efforts, which include both lasers and high-powered microwaves, are moving forward in a similar rapid prototyping effort. In April, the secretary of the Army signed a memo designating RCCTO responsible for oversight and execution of all Army directed-energy efforts. Shortly thereafter, Army leadership approved a new directed-energy strategy for RCCTO, developed in partnership with the U.S. Army Futures Command.

Quickly, RCCTO began accelerating the fielding of the 50kW-class high-energy laser for a platoon of Stryker vehicles by fiscal year 2022. High-energy lasers use the light generated by the laser to "heat up" a threat and neutralize it. This prototype laser weapon at the platoon level is part of the Army's Maneuver Short Range Air Defense (M-SHORAD) in support of a brigade combat team.

UNIQUE AUTHORITIES

The author, director of Hypersonics, Directed Energy, Space and Rapid Acquisition, delivers the keynote at RCCTO Industry Open House, held in Huntsville, Alabama, in June. The Army is leveraging the unique authorities of RCCTO, which Thurgood directs, to advance experimental prototypes in hypersonics, directed energy and other critical capabilities. (Photo by Bryan Bacon, Redstone Rocket)

RCCTO announced its contract award for the 50kW-class effort in July. After a technology maturation phase, the Army will execute a high-energy laser demonstration against a number of M-SHORAD threats. After evaluating the results, the Army plans to make a final selection and award for three additional Stryker prototypes.

Also in directed energy, as part of a joint service effort, RCCTO will deliver an experimental prototype high-power microwave (HPM) weapon with residual combat capability by fiscal year 2024. The HPM capability differs from high-energy lasers as it uses radio frequency to affect the electronics of a threat, making it inoperable or negating it in some way. HPM weapons can disrupt communications to, for example, throw off a swarm of unmanned aerial vehicles.

NAVIGATING CULTURE CHANGE

Delivering first-of-a-kind capabilities like hypersonics and directed energy to a unit of action years ahead of schedule is no simple task. But it also doesn't have to be overly complicated. That's where RCCTO comes in. Answering to a board of directors made up of Army leadership and equipped with a unique charter that includes in-house contracting, RCCTO is built for speed. It's now using that speed to move out on rapid prototyping and fielding of strategically important capabilities that address operational needs of high risk and opportunity.

To do this, RCCTO must cross experimental prototypes over what's often called the "valley of death," where a gap exists between transitioning S&T efforts to a formal acquisition program of record. As it navigates this gap, our team has to understand that in prototyping hypersonics and directed energy, we are not delivering the perfect solution. Instead, the goal is to deliver a prototype that Soldiers can use and that the Army can choose to move forward with, or choose to move in a different direction.

Whatever path the Army chooses, it has not invested years into a "too-large-to-fail" project. And although they are prototypes, once completed the equipment has residual combat capability, is deemed safe, operational and effective, and is placed into the hands of Soldiers, who will continue to refine, improve and train with the capability.

Perhaps most unique about this new path is that the team involved from the beginning of the capability's concept moves with it. Both the hypersonics and directed-energy teams came from the S&T community to RCCTO. With them came the knowledge, background and familiarity that comes only from years of working on these capabilities. With the addition of acquisition experts, RCCTO established a complete team for successful execution. Much like the commercial world, these teams of experts will aggregate or de-aggregate based on what phase the mission is in.

Yet this concept doesn't work just one way. It also, from the very beginning of a project entering RCCTO, incorporates the program-of-record side of the Army acquisition team. When hypersonics and directed energy eventually transition out of RCCTO prototype phase and into a program executive office (PEO) and a program of record, the team will change once again. And, as before, the knowledge, background and familiarity will move with them.

FIGURE 1

ONE MISSION

RCCTO must field a prototype long-range hypersonic weapon by fiscal year 2023. Collaborating across services, RCCTO must produce a common hypersonic glide body, existing trucks and modified trailers with new launchers, and an existing Army command-and-control system. (Graphic by Army RCCTO)

For example, once the long-range hypersonic weapon is fielded, the prototyping effort will cease and RCCTO will hand the program over to the program of record team, in this case the PEO for Missiles and Space. They will then build on the foundation of the prototype as they develop the hypersonics program of record. However, PEO Missiles and Space will not be new to the project at the point of transition: They've had a group embedded with RCCTO from day one. They know what is coming in order to plan for testing, funding, contracting and other crucial elements years in advance.

In other words, RCCTO is using its unique authorities and focus to fuse what the S&T community can do with what the program-of-record community can do. Of course, not every S&T idea will become a program of record. So when the prototyping effort is finished, RCCTO will take the results to Army leadership to make one of three decisions: stop all efforts; go back to S&T for more development; or move it out of prototyping into a program of record. With this model in place, all three options—failing fast, more research, or production—are acceptable outcomes.

WHAT'S NEXT?

As RCCTO expedites hypersonics and directed energy, we also continue to execute previously assigned projects and to scout emerging technologies that may not yet be on the Army's radar.

Past projects, in areas including electronic warfare, sensor-to-shooter communications, and position, navigation and timing, are all either concluding or transitioning to the respective programs of record. RCCTO's work in prototyping and advancing those capabilities will lay the foundation for future efforts.

Take, for example, in electronic warfare: RCCTO partnered with the Project Manager for Electronic Warfare and Cyber (PM EW&C) within the PEO for Intelligence, Electronic Warfare and Sensors to deliver integrated electronic warfare systems for brigade and below, and new "phase two" systems were delivered this summer. Those capabilities, fielded to the 2nd Cavalry Regiment and 173rd Airborne Brigade, include improved performance, simplified interfaces, extended ranges and enhanced tactical mobility and survivability. After that phase two fielding, the effort is transitioning into PM EW&C with two years' worth of Soldier training, feedback and experience.

Our Computer and Electronic Security Dominance team, which stemmed from one of RCCTO's original focus areas in cyber, continues to work with other Army cyber programs, focusing on applying innovative technology to address pressing capability gaps such as cyber-enabled counter-unmanned aerial systems. RCCTO's Advanced Concepts and Experimentation (ACE) Project Office, formerly known as the Emerging Technologies Office, continues to scout and quickly transition emerging, disruptive technologies such as short-range radars for active protection systems, wireless for combat platforms, and applying machine learning to electronic warfare and directed energy.

ACE, which holds quarterly "Shark Tank"-type innovation days with industry, serves as a quick reaction office for research and analysis, prototyping, experimentation and assessment of emerging technologies. It also serves as a conduit to nationwide experts in academia, industry, startups and other services to ensure that RCCTO is connected with those who know what technology is on the cusp of a breakthrough.

PROMOTION
Ryan D. McCarthy, then-undersecretary of the Army, hosted the promotion ceremony for the author at Redstone Arsenal, Alabama, in April. Thurgood's wife, Shauna, to whom he paid tribute during the ceremony, assisted. (Photo by Bryan Bacon, Redstone Rocket)

CONCLUSION

The Army's No. 1 priority is readiness, followed by modernization. RCCTO enables these priorities by moving needed capabilities from the S&T community to an experimental prototype with residual combat capability to a unit of action.

This is a big undertaking and one that can't be done alone. Critical to our success will be the resilient partnerships we are forming across the Army, DOD, industry and academia to improve the speed of technology and capability development and enable the Army's implementation of the National Defense Strategy. As we engage in a great power competition with near-peer competitors, these critical technologies must be harnessed, and harnessed in an acceptable timeframe, so our Soldiers can defeat any adversary on the battlefield.

For more information on RCCTO, go to ***https://rapidcapabilitiesoffice.army.mil/****.*

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HANDS ON

What if more acquisition exercises were like the rotations at the Army's combat training centers? (Graphic by the U.S. Army Acquisition Support Center (USAASC))

BEEN THERE,
DONE THAT

An EXERCISE to EXPERIENCE

Acquisition professional education could be more like the rigorous, hands-on rotations at the Army's combat training centers. Here's how.

by Dr. Charles K. Pickar

Tiger Woods made a comeback and won the Masters Tournament in April. The U.S. women's national soccer team won the World Cup this year as well—for the fourth time. Now think about these champions and how they got to the winner's circle. It wasn't by reading a book or being lectured to in a classroom on the finer points of choosing the right club or heading a ball into the goal. Instead, they spent a lot of time on the golf course and the soccer field in relentless practice.

Playing the game—experiencing what works and what doesn't—is the most effective way to succeed, not to mention the most fun. This is experiential learning: education through firsthand experience. And its importance goes way beyond sports.

The Army is the premier land force in the world, in no small part because of the way it trains for war. Our warfighting brethren use a mix of education and training with capstone exercises built on the Combat Training Center experience, defined by a controlled and simulated environment. This active learning is represented by tactical unit rotations at the National Training Center, and for divisions and above by the Mission Command Training Program. Experiential learning prepares us to deal with new situations, doing and then translating the doing into knowledge.

The Army Acquisition Workforce spends significant time learning its trade, whether in the classroom or online, training or pursuing formal degrees. Firsthand experience from opportunities like Training with Industry notwithstanding, the workforce learns through passive methods, for the most part. It is no exaggeration to say that passive learning is like listening to someone read from PowerPoint slides; it has limited utility in preparing acquisition officers to deal with the challenges of today's complex weapon system acquisition programs.

Dealing with complexity, whether it means contracts with thousands of pages, congressional staffers' questions on budget details or the technological detail of our systems, simply cannot be taught in a classroom. In the Army, we tend to teach Soldiers to deal with complexity using the sink-or-swim method known as OJT—on-the-job training. OJT works, but it isn't the most effective way to learn, is rarely efficient and almost always has hidden costs. In a realistic environment, experiential learning is effective and efficient, offering an immediate payoff.

Acquisition program management is a series of decisions connected in something that will one day become a fielded weapon system.

The Army trains division and corps staffs through the Mission Command Training Program. This isn't a physical center like the National Training Center, although the command posts do deploy to the field. Instead, commanders and staffs do battle in a simulated environment on a virtual battlefield located in a simulation center. Shortly after graduating from the U.S. Army School of Advanced Military Studies at Fort Leavenworth, Kansas, I was assigned to the 1st Cavalry Division as a plans officer. 1st Cav was scheduled for a warfighter exercise the year I arrived. As the plans officer, I engaged with the operations staff and commanders and reacted to enemy and friendly fire and maneuver. It was an eye-opening opportunity to experience how a division commander and staff interact, make decisions and win. No plan survives first contact, but experiencing the execution of a plan, even simulated, builds confidence and, above all, learning.

THE BENEFITS OF HANDS-ON LEARNING

Experiential learning can make a difference in the education and training of our acquisition warriors. An Army acquisition exercise using the Army's proven "learning by doing" approach would provide an experience similar to a National Training Center rotation. Such an exercise would be cross-functional, focused on providing Army program managers and staffs—acquisition leadership teams—with the executive, managerial, teaming and technical skills necessary for success in managing complex acquisitions.

Think of this as taking a systems approach to acquisition education, the same approach the Army has been using for training since World War II. A system in this case is a set of interrelated and interdependent events, with inputs that lead to outputs through processes. The system operates under constraints and rules that are applied by a mechanism, usually people. A systems approach recognizes the causes and effects, or feedback loops, of our interactions with our environment.

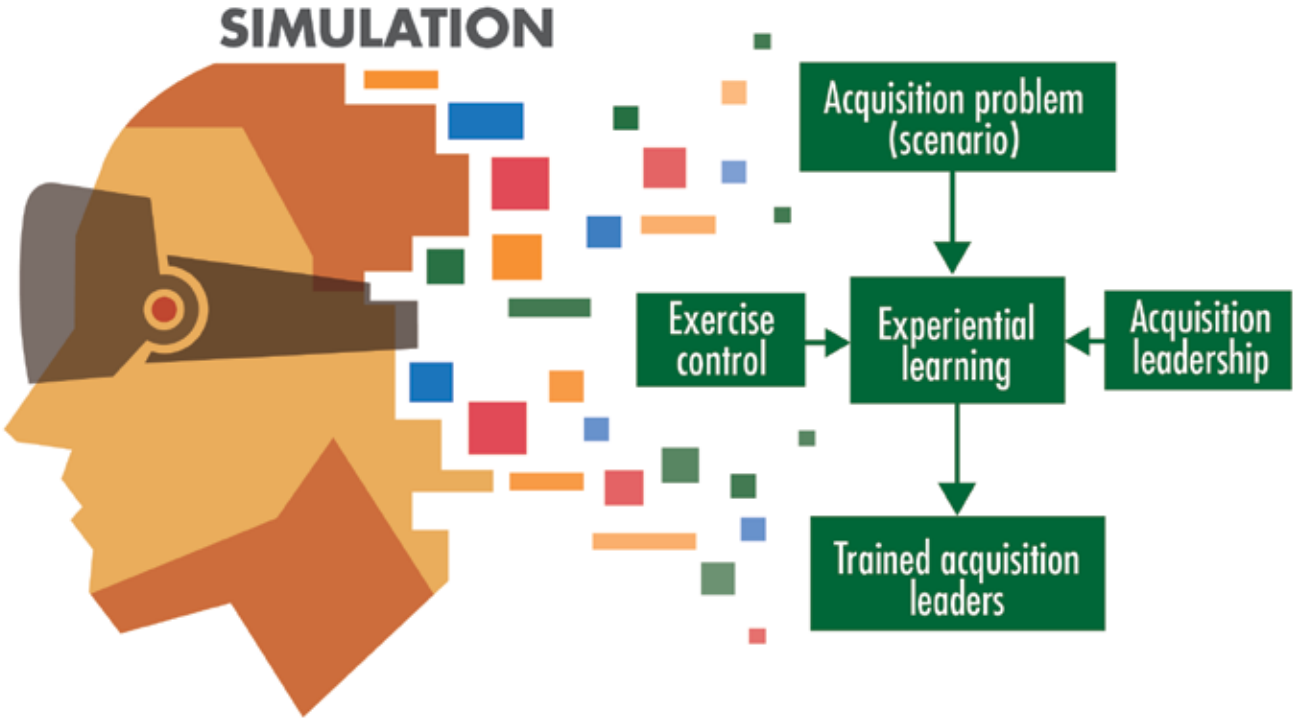
The three core pieces of this proposed systems approach to acquisition education are acquisition leadership, which represents the system mechanism; experiential learning, providing the system process; and a third factor, collaborative analysis, a kind of wargaming, which provides the inputs and captures the outputs. The foundation of this approach is a simulated but realistic environment where acquisition leaders can experience and learn from both success and failure before actually managing a weapon system development. (See Figure 1.)

DEVELOPING LEADERS

The complexity of technology and project management forces people to specialize. The benefit of specialization is that we have dedicated experts in management, systems engineering, contracting, finance and other fields. The downside is that we have fewer people with broader backgrounds who can make sense of the bigger picture. Given the technical and managerial scope of acquisition programs today, no one person, the program manager (PM) included, has all the knowledge and information to make effective decisions on their own.

The Army embraces teams because it is built on teams—infantry, armor, artillery, etc.—that fight together, from fire team to corps. So it is with the teams that manage weapon system programs. Teams are central to the successful execution of Army

FIGURE 1



GROUP DYNAMICS
The foundation of a systems approach to acquisition education—bringing together acquisition professionals who are often trained separately—is a simulated environment where acquisition leaders can experience and learn from success and failure before managing development of an actual system. (Graphic courtesy of the author and USAASC)

operations, in both combat and acquisition. To accomplish the overall mission as well as individually assigned tasks, teams must train to work together and communicate effectively.

In the Army acquisition culture, the focus currently is on the PM—the individual—as the primary decision-maker in weapon system development. While it is true that regulations specify that the PM is in charge, PMs manage complex system development as leaders of a team, not as individuals. How the team works together, the way it perceives problems and the solutions it devises are central to the success of any weapon system development project.

As a new contractor PM, I was confident in my skills—too confident, as it turned out. My mentor had told me, "Find a leadership team, and keep it." For my first two programs, I was able to do just that. I built a strong team, and I successfully completed two small programs.

During the execution of my third program, an international contract, I lost my best engineer and program controller to a higher priority. I received substitutes, but in the space of three weeks, I got into trouble. Some government-provided equipment didn't show up and I didn't know about it. In addition, I was blindsided by a designated subcontractor that installed the wrong electrical specs for a command building—all because we hadn't become a team. We had never worked together; therefore, we did not know how one another worked, nor did we trust one another. That lack of learning and the trust that grows out of it, simple as it is, was enough to prevent us from communicating effectively.

I learned two lessons from this experience. First was an appreciation of the importance of program leadership teams. Sure, I knew this from the Army, but this time it hit hard with consequences. The second lesson was to make sure I communicated with my leadership team and insisted on the importance of collaboration. The systems approach proposed here not only would foster familiarity; it would also provide insight into the ways each team member thinks.

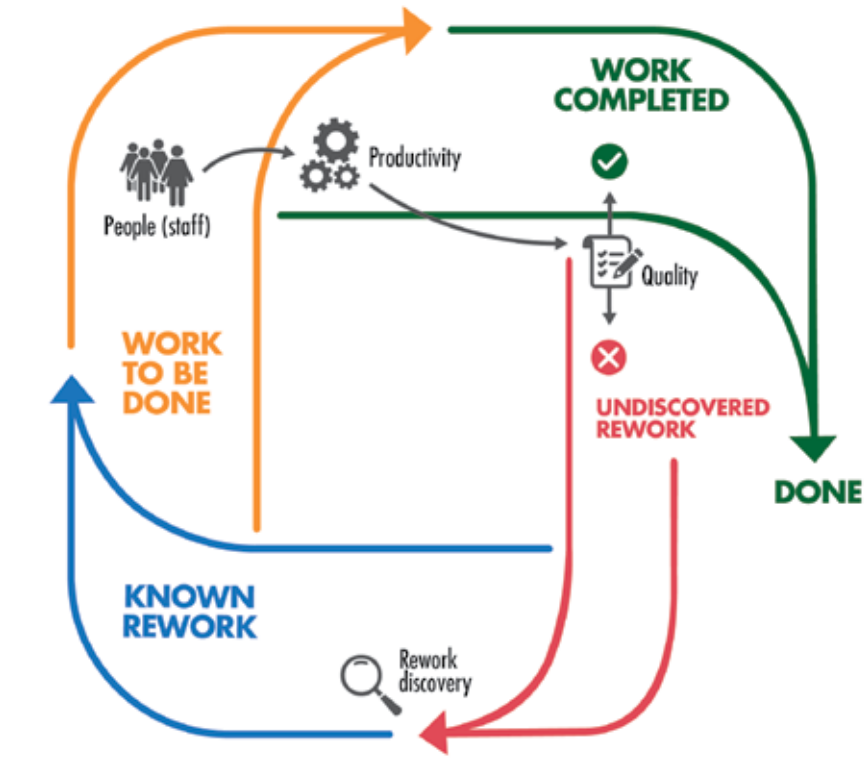
The Army is the world leader in establishing, educating and employing teams, but we are not taking advantage of that expertise and training knowledge, particularly in experiential learning, by using it to educate the Acquisition Corps.

EXPERIENTIAL LEARNING

Today we educate and train PMs, systems engineers, contracting officers and budget specialists separately. This approach is logical because each discipline has its own knowledge and educational principles. However, no educational or training environment exists to take these talented specialists and mold them into a functioning team. The emphasis is still on preparing the individuals.

As a seasoned Navy captain once told me during a conversation about the qualifications of a particular officer nominated for a job in our command, "The Navy assigns officers to a role because they know they will be successful." No surprise there, nor is the observation unique to the Navy. However, this line of thinking begs the question of whether simply assigning officers or senior civilians to acquisition leadership roles is enough to ensure project success. Training for the sake of training is not in anyone's interest, but neither is simply assigning competent individuals, putting them together and expecting them to excel as a unit. This is where experiential learning can be so valuable.

FIGURE 2



BOXED IN

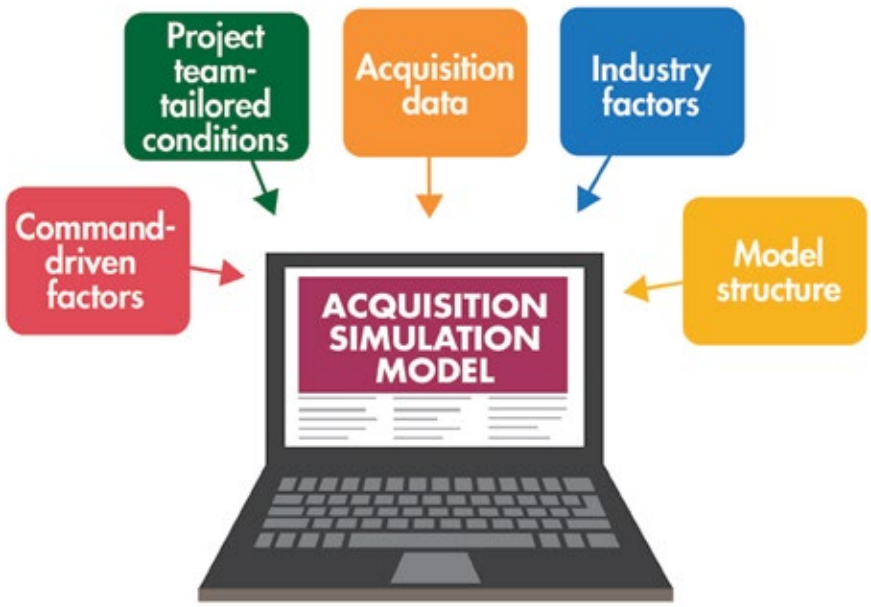
The rework cycle illustrated here is a basic component of system development. Rework is common in a development project, either because a task was done incorrectly or something changed in the larger system that necessitated redoing it. Understanding the dynamics makes it possible to trace the actions and decisions that caused the problem. (Graphic courtesy of the author and USAASC)

Experiential learning is ambiguous and at times uncomfortable. It places us in situations where we must make decisions with significant uncertainty. Experiential learning also provides the ability to stop, to think about what you did or said and how you responded—an important part of learning. This kind of learning also affords the participants the ability to unlearn skills, decision-making processes and ultimately the way one sees the world and the way it operates. And the best part is that the decisions made, and their consequences, won't cost time or money.

COLLABORATIVE ANALYSIS

No tactical commander would deploy teams without first giving them the opportunity to train together. And while no one would directly compare fighting a brigade or division with managing a complex weapon system development program, there are some similarities. Both require information and coordination, resulting in decisions, while performing effectively as a

FIGURE 3



LEARNING BY DOING

A cross-functional exercise—one involving PMs, systems engineers, contracting officers and budget specialists—that incorporates historical acquisition data, industry factors and command-specific issues would provide acquisition professionals an opportunity to develop and hone the executive, managerial, teaming and technical skills needed for managing complex acquisitions. (Graphic courtesy of the author and USAASC)

Playing the game is experiential learning: education through firsthand experience.

team. Commanders, through their staffs, direct battle activities to accomplish military missions. Program managers, through their staffs, direct technology development activities to field capable weapon systems. Combatant commanders use collaboration at its most basic level—the act of working together with the key individuals of their organization—to solve a common problem.

In a systems approach to acquisition education, the third core principle calls for an analytical environment that places the PM and key staff in a simulated, high-tempo technology development environment and effectively compresses time to greatly accelerate the learning. In other words, the simulation places leadership teams in a situation akin to a Combat Training Center rotation, an intellectually and emotionally challenging environment that forgives the mistakes of the participants.

Collaborative analysis is a problem-solving process. In collaborative exercises, players use their own rules and processes to analyze, understand and learn, resulting in a quantifiable outcome. Collaborative analysis is most effective in a controlled, simulated environment, a combination of computer modeling and an exercise structure.

Acquisition is dynamic. A common project management example is that of rework, having to redo a task in a development project, either because it was done incorrectly or something changed in the larger system that necessitated redoing the task. Understanding the dynamics makes it possible to trace the actions and decisions that cause rework.

System dynamics can track the results of any decisions made in a development project and provide feedback on a decision. Take, for example, a system development that is falling behind schedule. The PM, in an attempt to make up time, directs the staff to work overtime. The more the staff works, the more tired they get. The more tired they get, the more mistakes they make. So, now, the PM has to direct more overtime, and so on. The participants must react to what is becoming a serious problem. Through simulation, the team—all of its members, from the systems engineer to the contracting officer—deals with these kinds of problems in accelerated time. (See Figure 2.)

The exercise simulation is driven by defense acquisition data. Actual programs provide a vast amount of data from which to derive the environment. They also allow us to compare simulation performance with a program's actual performance and outcome.

CONCLUSION

Acquisition program management is a series of decisions connected in something that will one day become a fielded weapon system. Those decisions are not made in a vacuum, nor are they driven exclusively by the project manager. In fact, PMs lean heavily on their leadership teams to help make these decisions. This proposed Army acquisition exercise provides an evolutionary mechanism to build on the excellent education and training available to the Army.

U.S. Strategic Command and U.S. Army Futures Command have been briefed on this concept and have expressed interest in learning more about the approach and how it could help their commands.

For more information, contact the author at ***ckpickar@nps.edu****.*

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HOW IT WORKS

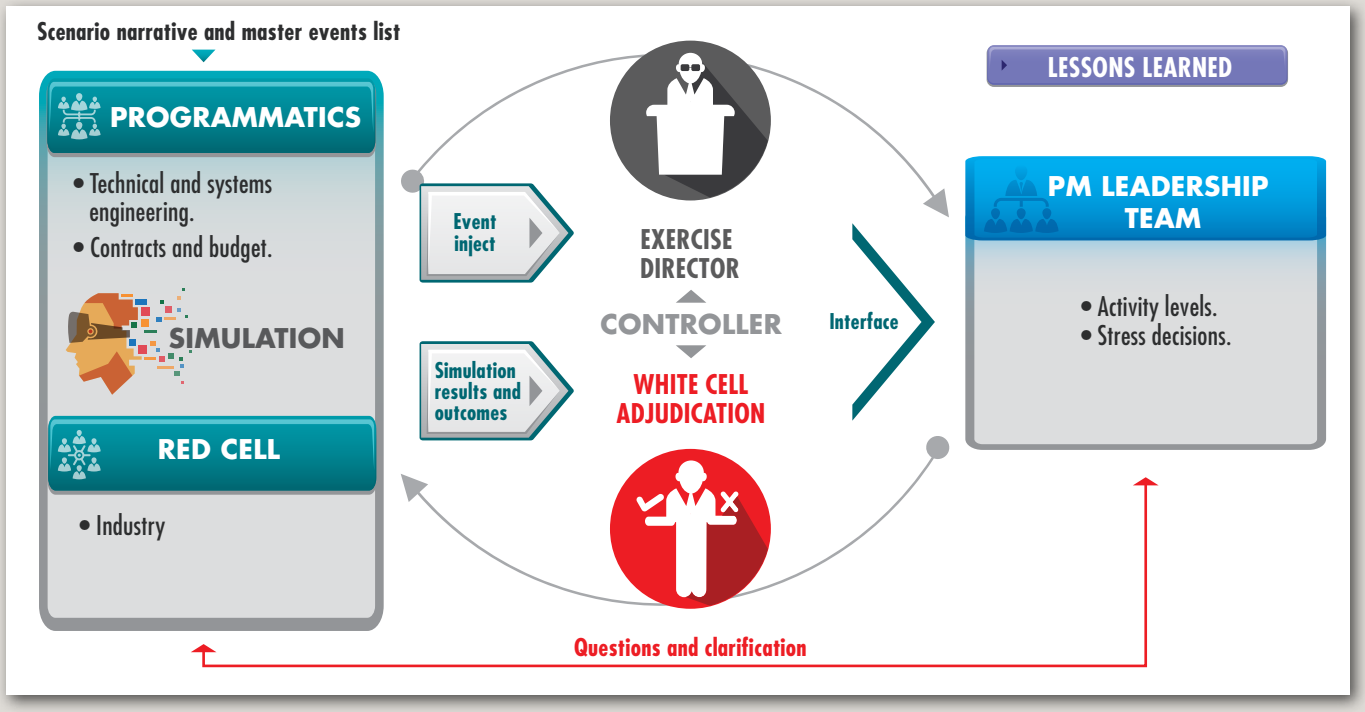
It's about 0630 on a Tuesday. People who will be overseeing this week's simulation exercise have arrived. The exercise director quickly reviews the master events list with the assembled group of acquisition experts. The senior mentor briefs the group on the training objectives. A short time later, the exercise attendees start arriving.

This isn't happening at a tactical simulation center, but in a building at the participants' home station. There are also virtual attendees dialing in as necessary. This rotation's PM and her key leadership team of acquisition specialists are getting ready to participate in an intense and sometimes stressful simulation to hone their acquisition skills.

In the main conference room, the exercise director and senior mentor welcome the PM and staff and meet the exercise team. Then the participants head to their designated spaces—four computer-equipped conference rooms—for the two-day exercise. The PM and her team have prepared for today's event over the past month through briefings and discussions with the organization conducting the exercise. They have heard about these exercises and are looking forward to a meaningful learning experience. The list of scenarios derives from acquisition "big data." The exercise itself, however, is free play, meaning the direction that it takes will be driven by the decisions the PM makes with her leadership team. (See Figure 3, Page 119.)

Participants will encounter the full spectrum of issues that would require them to make decisions in the day-to-day management of an acquisition program. (See "A full slate of challenges," Page 122.) The exercise will provide feedback on the participants' decisions in accelerated time, with one day in the exercise roughly representing two to three years of program operation. (It's important to note that this is not a rigid formula. The exercise director can extend or compress events, and the participants' responses to simulated events during the exercise also affect the pace at which time unfolds.) Overall, feedback regarding a decision on a requirements change that normally would reach the PM team over weeks or months will happen quickly, at times within minutes.

Here's how the exercise unfolds:



LOTS OF MOVING PIECES

The author's proposal for an acquisition exercise features numerous components and exposes participants to a full spectrum of issues, requiring them to make decisions in the day-to-day management of an acquisition program and giving them the chance to quickly see the consequences of those decisions. (Graphic courtesy of the author and the U.S. Army Acquisition Support Center)

DAY ONE

0900: The PM and key leaders set up in their assigned conference room. The exercise mentor, a retired senior-level PM or program executive officer, greets the exercise participants, and they discuss the agreed-upon goals, which could include expected issues such as rework problems, or more complex issues such as tackling problems that arise with cost and schedule overruns. The exercise begins.

0925: The participants review status reports on various aspects of the program defining the scenario, including cost, schedule and performance, as well as risk. The PM has an initial phone call with her contractor counterpart. The chief engineer and contracting officer begin to work through the details of the information they've received. So far, things are quiet … but not for long.

0957: While the exercise team reviews the acquisition status, the contractor PM calls the government PM to discuss a problem: A key component in the manufacture of the low-rate initial production units was installed incorrectly. The rework necessary to correct the problem will take seven weeks to resolve and cost approximately $700,000. The contractor PM knows this will delay the already-planned initial operational test and evaluation (IOT&E). What does the government want to do?

Meanwhile, the exercise controllers are teeing up the next event. The simulation controllers will take the decision that the PM and team provide and run it through the simulation. The individual playing the industry PM discusses the government PM's guidance from their initial call. Unlike most tactical simulations, this one is going to reflect the decisions and the dynamics they provoke. The results will be accelerated through the system—in this case, the seven weeks will be over in 30 minutes.

1015: The unit selected for IOT&E calls the PM to say they are having trouble with the training materials provided. (They don't know about the potential delay.) Further, the contractor personnel who were supposed to do the training have been called back to the company. The IOT&E unit is stuck and can't move forward on the training. What does the PM want them to do?

(Why the contractor's training team was called back is deliberately ambiguous so as not to predetermine how the PM and her team respond: Will they question the action? Insist that the contractors come back? Ask why and how the underlying issue could be mitigated? This is the guts of the learning that will take place.)

1027: The program executive office calls to say they may have an extra $2 million available from end-of-year sweeps; what can the program do with this money, and what will the effect be on the program?

1031: (Seven weeks later in simulated time) The contractor PM calls again to say that the low-rate initial production problem is bigger than first thought. Rework will now take at least another 90 days. He is still working the new cost estimate and will provide it ASAP.

Exercise controllers are generating reports and forwarding them to the PM. The latest earned-value results, for example, show a schedule performance index of 0.76 and cost performance index of 0.81—a sign of potential problems, as the values are less than 1. Throughout the exercise, earned-value data will be reported to gauge reactions of the PM and team.

1045: The PM and her staff are slowly getting acclimated to the hectic pace of the exercise. They receive updated earned-value information. Shortly thereafter, the program executive office calls and wants to schedule a meeting with the PM on earned-value results and problems in IOT&E.

The exercise continues to a natural pause around 1800, when the senior mentor leads an after-action review. The exercise team walks through the day's events. The PM and staff provide their feedback. The PM and team will receive the results of the review at the end of the exercise so they have a record of what happened and why. Then they are released until the next morning.

A FULL SLATE OF CHALLENGES

During a simulation, participants will encounter a variety of issues that would require them to make decisions in the day-to-day management of an acquisition program. These are some of the potential issues, among many others and variants:

- Administrative changes to schedule, including updates to the acquisition program baseline, changes to the acquisition decision memorandum, decision delays and associated secondary delays.
- Technical delays.
- Testing delays.
- Delay in availability of key capabilities or facilities (e.g., vehicles, testing facilities, initial operational test and evaluation units).
- Budget and funding delays.
- Delays attributed to the contractor.
- Delays because of rework.
- External events such as inflation, earthquakes, labor strikes, etc. (force majeure).
- Delays because of contracting, contract negotiation and award delays.

DAY TWO

As on the previous day, the PM and her team are pushed to react to an ever-increasing tempo of acquisition management events. Generic events drawn from acquisition data but tailored to this exercise drive the pace. The events are designed to cause reactions from all team participants. They range from direction received from the Office of the Secretary of Defense and Congress, to reviews and restrictions, to funding instability, to requirements changes and force majeure, keeping the participants on their toes.

The day ends with the final after-action review, and the exercise concludes. Data from the exercise feeds future exercises to ensure continuous improvement.

—DR. CHARLES K. PICKAR

SOMETIMES SOFTWARE DOESN'T FIT

Software acquisition doesn't really fit with the Federal Acquisition Regulation. What is it—a product or a service?

by Dante E. Milledge

SQUARE PEG, ROUND HOLE

Forcing software acquisition into the standard FAR framework is akin to trying to hammer the proverbial square peg into a round hole, in the author's view. (Image by Colin Anderson Productions pty ltd)

The world of software acquisition, which I work in, is often overlooked and misunderstood, and for good reason. When it comes to information technology (IT) acquisition, hardware is what usually comes to mind because it's the part you see and touch every day. I'd like to try to bring software out of the shadows so the challenges faced in acquiring it are more clearly understood.

The Federal Acquisition Regulation (FAR) governs the acquisition process by which executive agencies of the U.S. government acquire supplies and services by contract. Issued pursuant to the Office of Federal Procurement Policy Act of 1974, the FAR has been updated over the years. But when it comes to establishing a multiple-award, indefinite delivery, indefinite quantity (IDIQ) contract for commercial off-the-shelf software, sometimes the FAR requirements just do not fit.

IS SOFTWARE A SUPPLY OR SERVICE?

IDIQ contracts are used when the exact times or exact quantities of future requirements and deliveries are not known at the time of contract award. Multiple-award IDIQ contracts provide for an indefinite quantity of services for a fixed time. IDIQ contracts are most often used for acquiring services, but they fit software acquisition quite well. The government places delivery orders or task orders against a basic contract for individual requirements. Minimum and maximum quantity limits are specified in the basic contract as either number of units or dollar values. The government uses an IDIQ contract when it cannot predetermine the precise quantities of supplies or services that it will require during the contract period.

If, for example, you need a contract to acquire a software product for the entire Army that allows individual agencies and offices to place their own orders, then an IDIQ is for you. More on this later.

One of the first things an acquisition professional must do before developing the framework for a contract is to define the requirement. One of the questions that must be answered: "Is the requirement considered primarily a supply or a service?" The definitions provided in the FAR to make this first basic determination follow:

"Supplies" means all property except land or interest in land. It includes (but is not limited to) public works, buildings and facilities; ships, floating equipment and vessels of every character, type and description, together with parts and accessories; aircraft and aircraft parts, accessories and equipment; machine tools; and the alteration or installation of any of the foregoing.

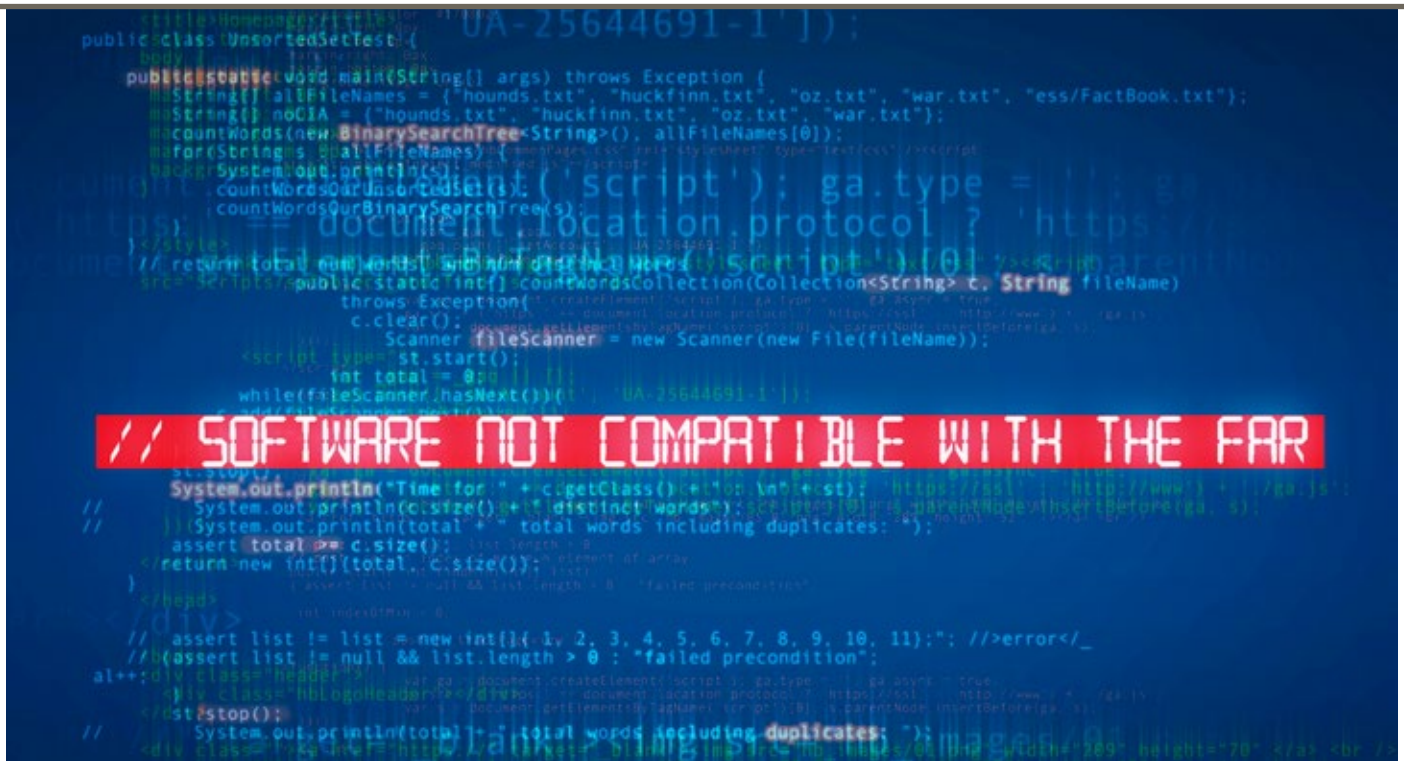
"Service contract" means a contract that directly engages the time and effort of a contractor whose primary purpose is to perform an identifiable task rather than to furnish an end item of supply. A service contract may be either a nonpersonal or personal contract. It can also cover services performed by either professional or nonprofessional personnel, on an individual or organizational basis.

Commercial software is more like a service when it comes to government contracting. For clarification, I am not referring to software-as-a-service. I am referring to the familiar "term" and "perpetual" software license definitions. A traditional term license grants rights to use the software for a specified period of time. A traditional perpetual license grants rights to use the software indefinitely. In reality, the only thing perpetual about software is the relationship you will have with the people who make it, if you want the product to function safely and securely.

For example, the government spends millions of dollars on software like Microsoft Office. We install the program and expect our applications to work day after day. But when the developer stops supporting the software in favor of a new version, the support stops, and we no longer have access to bug fixes, security patches or upgrades. We may have a perpetual license and "own" the software, but it's no longer as secure as we need it to be without a support stream, and therefore it is useless.

Similar to an IT service contract, you purchase the service for the period of time it's funded for, and when that period is up, the service ends. In this regard, software is similar to an IT service contract: You purchase the service for the period of time and when that period is up, the service ends. With software, it's support that you purchase for a period of time; when that ends, so does the support.

Just as technology changes over time, the methods by which we acquire it should also change.



HOW TO ACQUIRE THESE 0S AND 1S?
Software can have characteristics of both a product and a service, two categories of things that are usually acquired via different methods. (Image by USAASC/Hoxton/Martin Barraud)

DOES MEANINGFUL PRICE EVALUATION REALLY HAPPEN?

Just as there are different definitions for supply and service requirements, there are different instructions for how to establish contracts and evaluate proposals for these requirements. It's been my experience that commercial software does not always fit neatly into either the supply or service box when it comes to writing evaluation factors and conducting proposal evaluations.

When we conduct hardware acquisitions, writing salient characteristic requirements is usually black and white. For example, we can clearly define evaluation factors for hard drive size, amount of memory, processor performance, what temperatures the machine should be able to operate in and so on. This makes evaluation of hardware requirements more simple and straightforward. Who makes the hardware is not really that important. I can mix and match almost any keyboard and mouse, for example, and have no problem at all. We can award contracts to many different hardware manufacturers for the same hardware, and as long as the hardware meets the minimum requirements, it will function on the government's network.

When we acquire commercial software, it's not so simple. We cannot so easily mix and match software products on the government network. For this reason, we tend to contract for specific software products from a specific software vendor but from multiple sources. So that's where the "multiple" in multiple-award IDIQ comes in. Although the requirement is for Microsoft Office, the competition is between the various vendors on the multiple-award IDIQ contract that can offer it to the government. The software evaluation is now about evaluating the vendors offering to sell the software and not about the software at all, just like a services contract evaluation. The important evaluating factors become the company's corporate capability, customer service response and troubleshooting resolution times, supply-chain risk management, and adherence to specific license usage terms and conditions.

This is another case where software requires a hammer to fit the FAR. Anyone who has ever done a justification and approval knows what this hammer looks like. According to FAR 11.105, "Agency requirements shall not be written so as to require a particular brand-name, product, or a feature of a product, peculiar to one manufacturer, thereby precluding consideration of a product manufactured by another company," unless certain exceptions

CONTRACT, CONFIGURE AND GO

Spc. Jeffery D. Maddox, an information technology specialist in the U.S. Army Reserve assigned to the Signal and Communication Office for the 415th Chemical, Biological, Radiological and Nuclear Brigade, configures laptops in February during a command post exercise. The author argues that as hardware and software change, the methods by which the Army acquires it should also change. (U.S. Army Reserve photo by Sgt. Stephanie Ramirez, U.S. Army Reserve Command)

apply. Rather, FAR clause 52.211-6, "Brand Name or Equal," should be invoked.

FAR 15.404 requires price-cost analysis as an evaluation factor for multiple-award contracts. This price-cost analysis is completed so that prices may be established at the base-level contract. This refers back to the "multiple award" in multiple-award IDIQ. The awardees were not selling anything at the time the IDIQ contract was put in place. They were only given a contract that allows government agencies to purchase from them as needed for a specific period of time. This is known as the base contract. When an agency needs to purchase software, all the vendors on the multiple-award IDIQ will submit a quote that will then be evaluated for price. The software buys are called task orders or delivery orders. Once again, we are in trouble with the FAR as we have no real price comparison until agencies place task orders and delivery orders.

But there does actually appear to be a solution: It's called a deviation. A deviation allows you to not follow the FAR in very specific cases, and there happens to be a FAR deviation that appears to fit this issue. The FAR reads as follows: "Contracting officers, at their discretion, when issuing a solicitation that will result in multiple-award contracts issued for the same or similar services may exclude price or cost as an evaluation factor for the contract awards." The deviation permits contracting officers to evaluate cost or price only at the task-order level. Unfortunately this deviation does not apply to software acquisitions, but one like it would go a long way to mitigate the price evaluation issue.

When we conduct a price evaluation for hardware, we can start by going to Best Buy, Staples, Office Depot or any one of a zillion websites such as Amazon.com to research the price that a piece of hardware is generally being sold for. It's not as simple for commercial software. Most times, the government must contact the company directly to discuss baseline public-sector pricing. The price for one copy of a piece of software on the shelf in a store is not the same as when you purchase tens of thousands or sometime hundreds of thousands of software licenses. The unit cost of a license often goes down as the number of licenses purchased goes up, but the discount rate is not a fixed number. In many cases, you only get what you negotiate.

In addition, price evaluation cannot be done accurately by looking at previous prices paid by the government. Those previous prices take into account several variables: number of units purchased, end-of-quarter discounts, and whether the government does other business with the company. Another complexity when evaluating commercial software is the variety of use models (subscription, perpetual, as-a-service, etc.) and metrics. For example, say Company A has a commercial software product that can be sold or purchased in the following ways (metrics):

- Per device.
- Per virtual machine.
- Per processor.
- Per named user.
- Per operating system.
- Per portable license unit.
- Per server.
- Per powered-on virtual machine.

Just one commercial software product offering can generate hundreds of lines on a spreadsheet to list all the permutations. So, you can't simply compare two similar commercial software products; the ways in which they are sold must also be considered. Many times, an equal comparison can't be done, because not all like commercial software products can be sold in the same ways. Given a big enough hammer and a lot of time, something that satisfies the requirements of FAR 15.404 for price evaluation can be produced, but I question if it is meaningful or valuable for the time and effort spent.

The real competition and price evaluation take place in earnest at the delivery-order level; this is why the previously mentioned class deviation allows this task to be delegated at the order level. When a request for quote (RFQ) is placed for commercial software at the delivery-order level, multiple companies respond. It's at this time that the price can be compared and evaluated for a single product as specified in the customer's RFQ. Additional discounts above and beyond the base contract can also be negotiated because the requirement is firm; requirements are not firm when establishing a base-level IDIQ. The base-level IDIQ only contains broad, high-level nonnegotiable terms and conditions that can be enhanced if doing so would benefit the government, but cannot be diminished.

This is another case where software requires a hammer to fit the FAR. Anyone who has ever done a justification and approval knows what this hammer looks like.

WHAT FACTORS ARE IMPORTANT?

Normally with an IT product, the technical factor is the most important part of the evaluation to determine if the product meets the customer's minimum specifications. Other factors, such as past performance, are important, but they typically are not considered if the minimum specification technical requirement has not first been satisfied.

With commercial software, we usually don't have a minimum technical specification to evaluate, as most traditional software contracts are for a single specific product or a range of products from a single maker. In the case of the Army Computer Hardware Enterprise Software and Solutions (CHESS) IDIQ contract, Information Technology Enterprise Solutions – Software (ITES-SW), we didn't know what products or brands would be offered until after the vendors proposed.

The ITES-SW contract is catalog-based. The vendors were given four categories in which to submit proposals. As long as a proposed product fit in one of the categories and was deemed worthy to be on the Army's network, it was accepted in the vendors' catalog. What products each vendor put in their catalog was unknown, and the catalogs are updated and changed often. The result is an evaluation that really focuses on the company's ability to fulfill the stated requirement and not so much on technical specifications.

Typically, software acquisition teams spend months working with software makers during acquisition development and negotiation, hammering out language for the base-level IDIQ that's agreeable to the vendor and the government. With all of this back-and-forth and round-and-round, I don't recall a single issue that was about a product. The primary effort was centered around the company's willingness and ability to agree on terms and conditions.

CONCLUSION

I recommend to first extend the FAR class deviation published in 2017 to supply contracts as well as service contracts. Doing so would give a contracting officer the discretion to exclude price or cost as an evaluation factor when developing software acquisitions. This would save significant time in the acquisition process currently being spent on a requirement that does not add value. It's time to revisit and revise how we classify commercial software and the procurement of commercial software in the FAR. Just as technology changes over time, the methods by which we acquire it should also change.

For more information, go to ***www.chess.army.mil****.*

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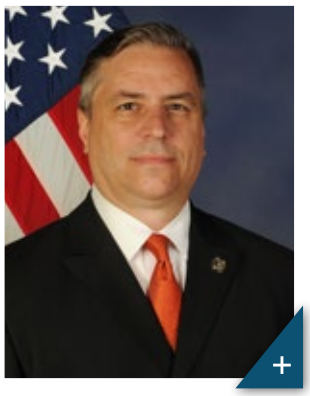

DIGGING DEEPER

Supporting the future force by building a more technically savvy Army Acquisition Corps.

PUTTING DOWN STAKES
The Army Acquisition Corps established a presence in August at branch orientation during the Cadet Summer Training Advanced Camp at Fort Knox, Kentucky. During the orientation, cadets have the opportunity to talk with representatives of the basic branches and participating functional areas. (Photos by Lt. Col. Gerald A. Lyles IV, U.S. Army Acquisition Support Center)

You can only get out of a system what you put into it.

We currently have a high-quality process that we have used to get stellar, remarkably talented military acquisition officers. But our existing system, however successful, doesn't necessarily get us a handful of some very specific types of officers we're looking for. Today, the vast majority of officers who have science, technology, engineering and mathematics (STEM) education and experience are leaving the Army before we have a chance to bring them into acquisition. Historically, more than 20 percent of commissioned officers possess a STEM degree at the start of a cohort year group. By the time that year group is available to us through the Voluntary Transfer Incentive Program, less than 5 percent remain whom we can access into Functional Area 51 (FA51).

In looking at that and other datasets, we realize that our best opportunity to shape what the future FA51 officer population will look like is to modify the intake process, which starts very early in the officers' careers. We have developed a robust recruitment effort to identify and target the types of officers we think will be the best force multipliers for us several years into the future, at a point and time much earlier in their careers than we have traditionally approached them.

OUTREACH TO THE FORCE

In early August at the annual Cadet Summer Training Advanced Camp at Fort Knox, Kentucky, we set up, for the first time, an Army Acquisition Corps tent at branch orientation, which provides an opportunity for the basic branches and participating functional area representatives to talk directly with cadets. The tent was staffed by Soldiers from the Army Director, Acquisition Career Management (DACM) Office, the Acquisition Management Branch of U.S. Army Human Resources

INTRO TO ACQUISITION
Capt. Samuel Leslie briefs cadets on what PEO Soldier does for the warfighter. PEO Soldier was one of the Army program executive offices that, in addition to the Army DACM Office, staffed the Army Acquisition Corps tent at Cadet Summer Training Advanced Camp in August.

Command, the Program Executive Office (PEO) for Soldier, PEO Aviation, PEO Missiles and Space, PEO Combat Support and Combat Service Support and PEO Ground Combat Systems. Many of the cadets had never heard of Army acquisition, nor of the benefits of joining the Acquisition Corps—advanced college education paid for by the Army, a chance to do work critical to the warfighter, an opportunity to be involved in groundbreaking research, and so much more.

We also want to make sure that every officer has an opportunity to have successful company command before joining acquisition. We truly value the basic branch experience and leader development.

The initial feedback was very positive. Although those cadets are years away from the point in their careers when they could move into acquisition, we've at least planted the seed. This is part of our strategy: We are engaging officers at a different point in their careers than we have in the past. One of the things we've learned is that a lot of younger officers didn't know about acquisition, didn't know what potential opportunities existed for them.

In addition to Advanced Camp at Fort Knox, we're planning to develop a partnership with the United States Military Academy at West Point, with large ROTC programs and Officer Candidate School, following through at the Basic Officer Leaders Course and the Captain's Career Course, right on through the window, six or seven years into their careers, when officers can move into acquisition through the Voluntary Transfer Incentive Program process.

We don't know yet to what degree this effort will entice some to stay in the Army who typically were not staying, or even whether we'll be able to identify the few attractive candidates that we haven't been able to identify in the past. We're going to attack this problem from several avenues. But we feel that if we open our aperture, in terms of both the target population and the time frame when we typically would talk to officers, we'll have an opportunity to better shape the future of FA51 officers.

COMPLEX SKILLS NEEDED

We all know that the environment we're in today—creating a U.S. Army capable of fighting and winning across multiple domains: land, air, sea, space and cyber—will require an evolving set of skills, behaviors and competencies. The people business is one that takes a long time to influence. In addition to what we know today, we expect that we will learn about additional skill sets and competencies that we need inside of our formations over the next several years. We have to focus on that process so that we can attract those officers who have the highest degree of aptitude for success in some areas that

traditionally were not what we had been looking to get in the past.

We want to create the best possible conditions for success. And it doesn't stop at just recruitment. It will take some focused, continual contact with those officers. Then, for the ones that we do access, it will take a robust and deliberate training and development program so that we can properly foster the professional growth of those officers in order to meet the future demands of the acquisition community.

While we have a model right now whereby we try to target various populations, we also want to make sure that every officer has an opportunity to have successful company command before joining acquisition. We truly value the basic branch experience and leader development that every Army officer gets before becoming an FA51 acquisition professional.

Unless we have entree points into other communities, many of the population that might be desirable for us to target wouldn't have any idea of who we were as a functional area. Getting that kind of interaction started early in careers, and maintaining it until the point when we need to do a full-court press to get them into the acquisition community, requires a major effort on our part.

CONCLUSION

By reaching out early and often to officers with STEM degrees, we hope to bring vitally needed skill sets and capabilities into the Army Acquisition Corps. And by reaching out early and often to all Army officers to inform them of the possibilities of a career in acquisition, we can make certain that the Army Acquisition Workforce will support the future force.

READ ON

Literature offered to cadets at the branch orientation during Cadet Summer Training Advanced Camp. Many of the cadets had never heard of Army acquisition, nor of what Acquisition Corps membership offers, such as advanced college education at the Army's expense, a chance to make a critical difference for the warfighter and opportunities to take part in cutting-edge research.

IN GEAR

A PEO Soldier display in the Army Acquisition Corps tent.

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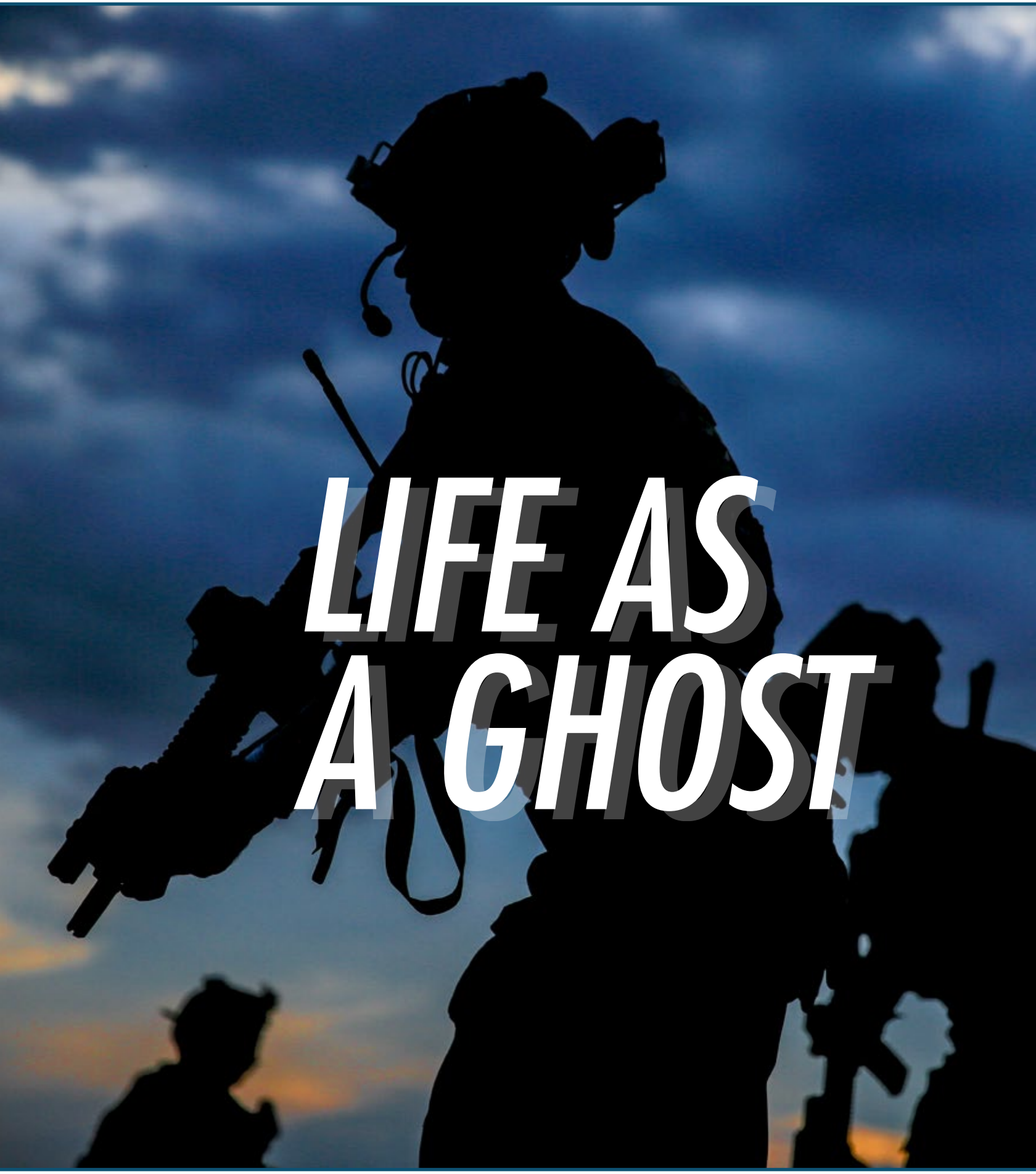

LIFE AS A GHOST

Internship program gives participants a look at SOCOM's approach to acquisition.

by Maj. Jonathan Harmeling

FOCUS ON THE OPERATOR
SOF operators, such as these Green Berets of 3rd Special Forces Group (Airborne) conducting urban movement training in July at Fort Bragg, North Carolina, are assigned throughout the SOF AT&L organization to provide feedback whenever needed. (U.S. Army photo by Spc. Peter Seidler, 3rd Special Forces Group (Airborne))

"Very few people will ever be able to say they have been here," the U.S. Special Operations Command (SOCOM) acquisition executive said to me as we pulled into one of the organization's Special Mission Unit facilities. On the outside I tried to appear calm and professional, while on the inside, I felt like a kid pulling up to a toy store. As a teenager, I used to play video games pretending to be one of these warfighters, and now I would get to work directly with them, as a Ghost with the Special Operations Forces Acquisition, Technology and Logistics (SOF AT&L) Center.

The SOCOM Ghost Program is a unique broadening opportunity for junior Army acquisition professionals to directly support SOF warfighters during a 90-day rotation at MacDill Air Force Base, Florida. Ghosts are immersed in a fast-paced, rewarding joint environment. During their assignment, they lead a rapid acquisition project that delivers tangible results to meet the needs of SOF operators. Ghosts then take their experiences and lessons learned back home to their organizations with the goal of improving their own Agile processes and accelerating acquisition practices. Agile refers to a methodology in product development whereby requirements and solutions evolve over time, usually guided by cross-functional teams.

An additional benefit of this program is that the Ghosts contribute to a more robust network of relationships among the SOF community and its larger service components.

The Ghost Program originated with the U.S. Air Force, whose service members commission directly into acquisition as second lieutenants. The Air Force program has been running for more than 10 years, with approximately 190 Ghosts participating over that time. Most Air Force Ghosts are assigned to the Program Executive Office (PEO) for Fixed Wing within SOF AT&L, but their reach extends well into each of the other PEOs under the SOF AT&L umbrella. SOF AT&L comprises eight PEOs—Command, Control, Communications and Computers; Fixed Wing; Maritime; Rotary Wing; SOF Support Activity; SOF Warrior; Services; and Special Reconnaissance, Surveillance and Exploitation—and four directorates: Comptroller; Logistics/J-4; Procurement; and Science and Technology.

Although some Air Force graduates have returned to SOF AT&L later in their careers, most leverage their experience at SOCOM in their service component. The first Air Force Ghost recently achieved the rank of colonel and is now serving as a senior acquisition leader in the Air Force.

JOINT BENEFIT

As a result of the success of the Air Force's Ghost Program, the SOCOM commander directed that a joint program be established. It started in 2018, with the first Army Ghost completing the program late that year. SOF AT&L has also seen its first graduates from the Marine Corps, and the Navy plans to participate soon. (Insert friendly interservice joke here.)

This joint environment fosters a powerful network of relationships connecting SOF AT&L and the service components. Additionally, acquisition leaders will now have more ties to the special operations community, and those connections will pay dividends over time as the network continues to grow and as more organizations across the services adopt rapid acquisition practices following SOCOM's lead. Better teamwork across the DOD acquisition community benefits the warfighter, who is the focal point for everything we do.

BUILT FOR SPEED

Approximately 92 percent of the programs in SOF AT&L are in Acquisition Category (ACAT) III, meaning the total program cost is less than that of the larger ACAT I and II programs. The lower-dollar ACAT status pushes the decision authority down to the lowest level possible, which facilitates speed—and speed, as one can imagine at SOCOM, is critical.

Another structural component that lends itself to speed is the accessibility of decision-makers and approval authorities throughout the SOF AT&L organization. In most cases, the PEO is down the hall, while the acquisition executive is upstairs and the commander of SOCOM is next door. Each program incorporates end users throughout its life cycle, including user representatives and current SOF operators, who work throughout the organization. They are readily available to hold, touch, see, feel and use the gear and equipment that SOF AT&L is engineering and to provide feedback early and often.

MY EXPERIENCE

About 75 percent of my time was allocated to tackling a complex problem set that revolved around command-and-control tools used by the community. This challenge fit my background and experience with Agile software development (an intentional pairing), which allowed me to engage stakeholders in every service component and every field across the SOF enterprise—engineering, contracting, finance and testing, among others—to help define and prioritize requirements. Approaching this problem set with an Agile development methodology was critical, as it enabled the cross-functional team to make continuous progress while adapting to evolving requirements.

One guiding principle of the Ghost Program is that its participants work on meaningful problems that have tangible results during their short tour at SOF AT&L. I never felt I was doing busywork; rather, I was working through the necessary actions to help warfighters get what they need. It was incredible to experience rapid acquisition firsthand; it was amazing to see how fast an idea can come to life.

The remaining 25 percent of my time was allocated to professional development, which allowed me to explore the many facets of the SOF enterprise. In this results-oriented environment, each person is tasked to be the expert in their field. I was fortunate to meet with a slew of impressive professionals: government civilians, military, contractors, industry teammates and leaders from partnered nations.

SUPPORTING THE FORCE

To work in SOF AT&L, directly supporting warfighters like these Special Warfare Combatant–Craft Crewmen among other operators, is a unique professional experience for acquisition personnel. The SOCOM Ghost Program provides this opportunity to junior Army acquisition professionals during a 90-day rotation at MacDill Air Force Base, Florida. (Photo courtesy of SOCOM Media Relations)

WHERE THE DETAILS COUNT
Green Berets assigned to 10th Special Forces Group (Airborne) carry an inflatable boat for a company team-building event in October 2018 at Fort Carson, Colorado. They represent the end users of equipment and services developed and procured by SOF AT&L, which incorporates user feedback throughout the life cycle of each program. (U.S. Army photo by Sgt. Connor Mendez, 10th Special Forces Group (Airborne))

The SOF acquisition leadership encouraged everyone to take ownership of their areas of responsibility. Decision-making authority was intentionally delegated to the lowest level possible, which fostered a culture of trust and speed. Failing small and fast while innovating was acceptable, so long as that experience informed a better way to achieve success.

The program also offered immense flexibility for travel. I was able to visit multiple sites, attend demonstrations, participate in test events, sit in on decision briefs and engage stakeholders at every level, from college intern to general officer.

The key is that each Ghost must take the initiative to learn and make the most of their experience at SOF AT&L.

CONCLUSION

The Army Ghost Program is continuously accepting applications and has flexible start dates throughout the year. SOCOM is primarily looking for high-performing acquisition captains and majors (O-3 or O-4) with two to four years of acquisition experience. The program is funded by the Defense Acquisition Workforce Development Fund, so the applicant's command incurs no cost.

Although there are many takeaways from my time as a Ghost, what most impressed me was the talent within the SOF AT&L community. I was fortunate to work with a seasoned team of professionals who displayed an inspiring dedication to serving our SOF operators in a culture that replaces the phrase "No, we can't" with, "Here's how we get to yes."

I strongly encourage anyone interested in this opportunity to apply now and begin the conversation with SOF AT&L. I would also encourage leaders across the Army to share this opportunity with their high-performing acquisition officers; if you lend SOF AT&L your best officers, you'll receive even better performers when they return.

To apply, or for more information, send an email to ***ghost-recruiting@socom.mil****.*

MAJ. JONATHAN HARMELING is the acquisition officer with the Army Cyber Institute at the United States Military Academy at West Point. He is also an adjunct professor in the Department of Systems Engineering and teaches project management. He has an MBA from Liberty University and a B.S. from the United States Military Academy. He is Level III certified in program management and Level I certified in information technology.

KEVIN KIRKWOOD II

COMMAND/ORGANIZATION: C5ISR Center's Product Realization Systems Engineering and Quality Directorate (PRD), U.S. Army Combat Capabilities Development Command, U.S. Army Futures Command

TITLE: Acting deputy product lead, Aerostats; branch chief, Electronic Sensors

YEARS OF SERVICE IN WORKFORCE: 12

DAWIA CERTIFICATIONS: Level III in engineering

EDUCATION: Currently pursuing Master of Engineering degree in systems engineering, Stevens Institute of Technology; B.S. in electrical engineering, New Jersey Institute of Technology; Systems Supportability Engineering Certificate, Stevens Institute of Technology

AWARDS: Black Engineer of the Year Award, Medallion of Excellence from the Assistant Secretary of the Army for Acquisition, Logistics and Technology; Medallion of Excellence from the Deputy Commanding General of U.S. Forces – Afghanistan; Commander's Award for Civilian Service; Civilian Service Award (2); Certificate of Appreciation, C5ISR Center PRD

TRUST THE PROCESS

Let's be clear: An aerostat is more than just a blimp. Explaining that is a task that often falls to Kevin Kirkwood, deputy product lead for Aerostats within the Program Executive Office for Intelligence, Electronic Warfare and Sensors (PEO IEW&S). Kirkwood leads a team of roughly 90 materiel developers for the platform, which carries different types of sensors to altitudes of up to 5,000 feet to provide overwatch for military support. "Many people see the aerostat, associate it with a blimp and then merely think of it as a floating balloon," he said. "In reality, it's an extremely dynamic system of systems that requires intensive management to ensure that modifications made to the system are cohesive and continue to carry out their functions. Also surprising are the many functions the system provides simultaneously: communications relay, multiple-domain networking, detections of all types, support for processing exploitation and dissemination activities, GPS processing, targeting and more. It is one of the key assets in force protection for our forward-deployed Soldiers, civilians and contractors."

Kirkwood's work puts him face-to-face with Soldiers in a variety of environments. That direct engagement "has positioned my team and me with a better understanding of warfighter requirements, and it demonstrates the commitment the program office maintains. It's also one of the privileges I'm most thankful for in my career," he said.

While he supports PEO IEW&S, Kirkwood is actually assigned to the C5ISR Center's Product Realization Systems Engineering and Quality Directorate (PRD) within the U.S. Army Combat Capabilities Development Command. Federal service is pretty much the Kirkwood family business: His mother is a former federal employee, and all of her six siblings served in the military. Kirkwood's uncle, Lt. Gen. Robert S. Ferrell (USA, Ret.), was the Army chief information officer/G-6 and commander of the U.S. Army Communications-Electronics Command (CECOM) and Aberdeen Proving Ground, Maryland. His aunt, Monique Y. Ferrell, is principal deputy auditor general for the U.S. Army Audit Agency at Fort Belvoir, Virginia. Kirkwood's wife works for the CECOM Security Assistance Management Directorate, to which one of his brothers is assigned (while he works for the C5ISR Center PRD). Kirkwood started his federal acquisition career with the CECOM directorate in 2007, assigned from the C5ISR Center PRD as a communications-electronics engineer and assisting in the oversight of foreign materiel sales acquisitions.

"The most rewarding times were when I had an opportunity to travel to different parts of the world to meet the requirements' owners," he said. "You hear a lot about international problems on the news, and they seem far away and almost surreal. Actually traveling to these environments changes that reality; it provides more of an urgency to help." In Colombia, for example, Kirkwood visited high-risk outposts and met with Colombian Soldiers fighting against the Revolutionary Armed Forces of Colombia, to better understand their intelligence system requirements. "This trip strengthened the bond for future telecoms with the Colombian military because we better understood the person on the other end of the phone."

In 2013, he transitioned to program management, working on programs assigned to the Product Manager for Meteorological and Target Identification Capabilities within the Project Manager for Navigation Capabilities and Special Programs. "That switch was a huge turning point in my career," he said. "In the course of five years, I grew from being the lead acquisition technical leader to the technical director and then the acting deputy director and acting deputy product lead for a billion-dollar program."

Kirkwood continues to work on developing his career. He recently completed the Systems Supportability Engineering program that is led jointly by Stevens Institute of Technology and the C5ISR Center PRD. Kirkwood called the certificate program "the highlight of my educational progression thus far." The course aims to increase technical competency in systems engineering and better support weapon system sustainment. "I was able to immediately apply lessons learned during the course and improve the outcome of the program office," Kirkwood said. "I support a quick reaction capability program that is very schedule-driven. When working at that pace, it's great practice to have structure and a record of our work. Working with a system of systems, there are many fast-moving parts that make program management even more complex. The course taught me that I could reduce this complexity through order."

He tries to pass on what he has learned over the course of his career, through mentoring programs outside of the office and in his work as a branch chief of Electronic Sensors. In that role, he leads a team of 75 systems engineering technical assistance contractors in identifying ways to better support the customers to whom they are assigned. "Providing structure and guidance to help define and work toward career goals helps identify the right fit for employees and the customers they serve, ensuring higher satisfaction for both groups," he said.

ENGINEERING THE BEST

Black Engineer of the Year Award staff, including Pamela McAuley, left, and Dr. Kendall Howard, right, present Kirkwood with his award in February 2018. (Photo courtesy of Kevin Kirkwood)

With more than a decade of federal service behind him, Kirkwood noted that the most important lesson he has learned "is to be patient, trust the chain of command, and always maintain the code of ethics and law. Trust the process, so that the process can reflect its strengths and weaknesses—and leadership can address those accordingly. We often try to circumvent a process, and there are times that may need to be done. But if we find ourselves constantly disregarding it, we're only preventing leadership from seeing a flaw in it," said Kirkwood, who will soon begin a six- to 12-month assignment as executive officer to the C5ISR Center's director.

When problems arise, he said, confront them—don't avoid them. "Run toward problems and embrace change—it's OK to be uncomfortable. There's reward and growth in conflict and in problem-solving."

—SUSAN L. FOLLETT

AWARD-WINNING SMILES

Kirkwood, left, Gen. Dennis L. Via (USA, Ret.), center, former commanding general of the U.S. Army Materiel Command, and Courtney Coulter, an engineer with the C5ISR Center's Intelligence and Information Warfare Directorate, at the Black Engineer of the Year Award event in February 2018. (Photo courtesy of Kevin Kirkwood)

ON THE MOVE

U.S. ARMY CHIEF OF STAFF

1: NEW CHIEF ASSUMES RESPONSIBILITY

The **Hon. Ryan D. McCarthy**, acting secretary of the Army, swore in **Gen. James C. McConville** as 40th chief of staff of the Army at a change of responsibility ceremony Aug. 9 at Joint Base Myer-Henderson Hall, Virginia. Command **Sgt. Maj. Michael A. Grinston** was sworn in as the 16th sergeant major of the Army.

McConville, the first aviator to become the Army's top officer, succeeds **Gen. Mark A. Milley**, who becomes chairman of the Joint Chiefs of Staff in October. McConville most recently served as the Army's vice chief of staff. He has also served as commanding general of the 101st Airborne Division (Air Assault); commanding general of Combined Joint Task Force-101, Operation Enduring Freedom; deputy commanding general (Support) of the 101st Airborne Division (Air Assault); and deputy commanding general (Support) of Combined Joint Task Force-101, Operation Enduring Freedom. He holds an M.S. in aerospace engineering from the Georgia Institute of Technology and a B.S. from the United States Military Academy at West Point, and was a National Security Fellow at Harvard University. (U.S. Army photos by Spc. Zachery Perkins)

2: SMA SWORN IN

Grinston replaces **Sgt. Maj. Daniel A. Dailey**, who retired from the Army and was awarded the Distinguished Service Medal at the Aug. 9 ceremony. Grinston most recently served as senior enlisted adviser for the U.S. Army Forces Command at Fort Bragg, North Carolina. He is a combat veteran who has served in every leadership position from team leader to division command sergeant major. His deployments include two tours each to Operations Iraqi Freedom and Enduring Freedom, as well as Desert Shield, Desert Storm and to Kosovo. As the 1st Infantry Division command sergeant major (CSM), Grinston served as senior enlisted leader for the Army's first deployment of a division headquarters in support of Operation Inherent Resolve, and as the CSM for I Corps. He has a B.A. in business administration from the University of Maryland University College. (U.S. Army Reserve photo by Sgt. Stephanie Ramirez, U.S. Army Reserve Command)

U.S. ARMY ACQUISITION SUPPORT CENTER

1: DEPUTY DIRECTOR RETIRES

Col. Lee J. MacGregor, deputy director of the U.S. Army Acquisition Support Center (USAASC), received a certificate of retirement from **Craig A. Spisak**, USAASC director, at a July 25 ceremony at Joint Base Myer-Henderson Hall, Virginia.

MacGregor received his commission from the Virginia Military Institute in 1992 and joined the Army Acquisition Corps in 2000. He served as a contingency contracting officer for U.S. Army Signal Command at Fort Huachuca, Arizona; chief of contracting for the Flight Concepts Division at Fort Eustis, Virginia; chief of operations for the Sustainment Division at the Army Capabilities Integration Center at Fort Monroe, Virginia; and commander of Army Contracting Command – Qatar. His operational deployments include Operation Joint Forge, Bosnia-Herzegovina; Operation Enduring Freedom; and Operation Iraqi Freedom. (Photo by Ann Vaughan, USAASC)

U.S. ARMY AVIATION AND MISSILE COMMAND

2: SECOND STAR FOR AMCOM COMMANDER

Gen. Gustave F. Perna, left, commanding general of the U.S. Army Materiel Command, administered the oath of office to **Maj. Gen. K. Todd Royar**, commanding general of the U.S. Army Aviation and Missile Command (AMCOM), after pinning Royar's second star in a promotion ceremony July 11 at Redstone Arsenal, Alabama. Royar, who assumed command of AMCOM June 10, previously served as deputy commanding general (Support) for the 101st Airborne Division (Air Assault) at Fort Campbell, Kentucky, and as AMCOM's chief of staff. (Photo courtesy of AMCOM)

U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND

3: COMMANDING GENERAL TO RETIRE

Maj. Gen. Cedric T. Wins, top photo, commanding general of the U.S. Army Combat Capabilities Development Command (CCDC), retires from the Army Nov. 1 after 34 years. Wins was the first commanding general of CCDC. He was the commanding general of the U.S. Army Research, Development and Engineering Command (RDECOM) and assumed the same role when RDECOM transitioned to the U.S. Army Futures Command as CCDC in February.

Before coming to RDECOM, Wins served as director of Force Development in the Office of the Deputy Chief of Staff, G-8. During his career, he held leadership and staff assignments in the 7th Infantry Division (Light), Fort Ord, California; the 2nd Infantry Division, Eighth Army, Korea; HQDA and the Joint Staff, the Pentagon; the 4th Infantry Division (Mechanized), Fort Hood, Texas; Strategic Planning, J-8, U.S. Special Operations Command, MacDill Air Force Base, Florida; and the Requirements Integration Directorate, Army Capabilities Integration Center (ARCIC), Joint Base Langley-Eustis, Virginia.

Replacing Wins is **Maj. Gen. John George**, bottom photo, who most recently served as deputy director and chief of staff of the U.S. Army Futures Command Futures and Concepts Center. He has also served as director of Force Development, HQDA G-8 and as ARCIC's deputy director and chief of staff.


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U.S. ARMY COMMUNICATIONS-ELECTRONICS COMMAND

1: CHANGE OF COMMAND AT CECOM

Maj. Gen. Mitchell L. Kilgo, left, accepted the colors as commanding general of the U.S. Army Communications-Electronics Command (CECOM) and senior commander of Aberdeen Proving Ground, Maryland, at a June 20 ceremony led by **Gen. Gustave F. Perna**, center, commanding general of the U.S. Army Materiel Command. Kilgo replaces **Maj. Gen. Randy S. Taylor**, right, who now serves as chief of staff at U.S. Strategic Command at Offutt Air Force Base, Nebraska. (Photo by Sean Kief, CECOM Public Affairs)

U.S. ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND

2: NEW COMMANDER TAKES CHARGE

Brig. Gen. Michael J. Talley, right, was installed as commanding general of U.S. Army Medical Research and Development Command (USAMRDC) at a change of command ceremony July 24 led by **Gen. John M. Murray**, center, commanding general of the U.S. Army Futures Command, at Fort Detrick, Maryland. Talley succeeds **Maj. Gen. Barbara R. Holcomb**, left, who occupied the role for three years and who will retire later this year. The command marked several notable advancements during Holcomb's tenure, including U.S. Food and Drug Administration approval of the anti-malarial drug tafenoquine and emergency-use authorization for the application of freeze-dried plasma on the battlefield.

Talley served most recently as deputy commanding general for the Regional Health Command – Atlantic at Fort Belvoir, Virginia. (Photo by Erin Bolling, USAMRDC Public Affairs)

3: CHANGE OF COMMAND AT USAMMDA

Incoming commander **Col. Gina E. Adam**, second from left, received the guidon of the U.S. Army Medical Materiel Development Activity (USAMMDA) from **Maj. Gen. Barbara R. Holcomb**, then USAMRDC commanding general, at a ceremony June 26 at Fort Detrick. Adam assumed command of USAMMDA from **Col. John R. Bailey**, second from right. **Lt. Col. Tyra D. Fruge**, left, USAMMDA deputy commander, assisted with the ceremony. (Photo by Jeffrey Soares, USAMMDA Public Affairs)

4: R&T LEADER RETIRES

Dr. George Ludwig, USAMRDC principal assistant for research and technology and member of the Senior Executive Service, retired May 31 after more than 30 years of service. Ludwig began working at Fort Detrick in 1989, as a National Research Council postdoctoral fellow at the U.S. Army Medical Research Institute of Infectious Diseases. Over the course of his career, he was a member of the first team to isolate West Nile virus in North America and helped develop a diagnostic test for that illness. He was named to the Senior Executive Service in 2017.

U.S. ARMY MISSION AND INSTALLATION CONTRACTING COMMAND

5: PROMOTION, CHANGE OF CHARTER AT MICC

Brig. Gen. Christine A. Beeler assumed leadership of the U.S. Army Mission and Installation Contracting Command (MICC) during a change of command ceremony hosted by

Maj. Gen. Paul H. Pardew, left, commanding general of the U.S. Army Contracting Command (ACC), July 9 at Joint Base San Antonio-Fort Sam Houston, Texas. Beeler assumed command from **Brig. Gen. William M. Boruff**, who is now assigned to ACC as deputy to the commanding general for operations outside the continental United States.

Beeler was promoted to the rank of brigadier general in a ceremony conducted by Pardew before the change of command. Her father, **Donald Roman Sr.**, and her sister, **Rebecca Roman,** pinned on her new shoulder boards. Beeler, who comes to MICC from ACC, joined the Army Acquisition Corps in 1998 and has held numerous command and staff positions throughout her career. (Photos by Daniel P. Elkins, MICC Public Affairs)

U.S. ARMY RAPID CAPABILITIES AND CRITICAL TECHNOLOGIES OFFICE

6: SES APPOINTMENT, NEW DEPUTY DIRECTORS FOR RCCTO

Robert Strider, deputy director of the Army Hypersonics Project Office within the Army Rapid Capabilities and Critical Technologies Office (RCCTO), received a limited-term appointment to the Senior Executive Service at a ceremony led by **Lt. Gen. L. Neil Thurgood**, RCCTO director, Aug. 23 at Redstone Arsenal, Alabama.

During the ceremony, Thurgood also welcomed **Marcia Holmes** and **Stanley Darbro** as RCCTO deputy directors. Holmes will serve as deputy director, Technical, and Darbro will serve as deputy director, Business. (Photo by Bryan Bacon, Missile Defense Agency)

U.S. ARMY SECURITY ASSISTANCE COMMAND

7: EUCOM/AFRICOM DIRECTOR OF REGIONAL OPERATIONS RETIRES

Maj. Gen. Jeff Drushal, left, commanding general of the U.S. Army Security Assistance Command (USASAC), presented **Col. Mike Morton**, director of USASAC's U.S. European Command (EUCOM) and U.S. Africa Command (AFRICOM) Regional Operations Directorate, with his retirement certificate July 24 at USASAC headquarters at Redstone Arsenal, Alabama. Morton, who also received a Legion of Merit award, retired after more than 30 years of Army service.

As director, Morton contributed to regional stability in the EUCOM and AFRICOM areas of responsibility through the direct oversight of $30 billion in security assistance. His success in enhancing and sustaining the combat readiness of U.S. military units, allied military forces and partner nations by strengthening a regional defense network contributed to the continued security and stabilization in both regions. (Photo by Tim Hanson, USASAC)


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1: NEW PM FOR SAUDI PARTNERSHIP

Col. John DiGiambattista assumed the responsibilities of the Office of the Program Manager for the Saudi Arabian National Guard (OPM-SANG) Modernization Program at a change of charter ceremony June 23 in Riyadh, Saudi Arabia. DiGiambattista replaces **Col. Kevin Lambert**, who now serves as chief of staff for the 1st Infantry Division at Fort Riley, Kansas.

DiGiambattista, a 1991 graduate of the United States Military Academy at West Point, joins OPM-SANG after serving on the Joint Staff at the Pentagon. OPM-SANG is a subordinate organization of USASAC, which executes the Army's security assistance and foreign military sales programs. (Photo by Jerome Mapp, OPM-SANG)

2: NEW LEADERSHIP AT USASATMO

Col. Scott Malone assumed command of the U.S. Army Security Assistance Training Management Organization (USASATMO) July 19 at Fort Bragg, North Carolina. He replaces **Col. Eric Flesch**, who now serves as commander of the 165th Infantry Brigade at Fort Jackson, South Carolina. Malone's 32-year career includes assignments as an officer and noncommissioned officer in multiple Special Forces, 75th Ranger Regiment and Airborne assignments.

USASATMO is a brigade-level subordinate command to USASAC that employs security assistance teams worldwide to support Army security assistance requirements and missions, primarily outside the continental United States. The organization provides training, financial and foreign military sales case management services, as well as oversight for the Foreign Military Sales, Foreign Military Financing and Building Partner Capacity programs led by DOD and the U.S. Department of State. (Photo by Staff Sgt. Tyrone Wilson, USASATMO)

U.S. ARMY TANK-AUTOMOTIVE AND ARMAMENTS COMMAND

3: NEW LEADERSHIP AT JMTC

Col. Martin J. "Jimmy" Hendrix III, left, assumed command of the Rock Island Arsenal [Illinois] Joint Manufacturing and Technology Center at a change of command ceremony May 29 at the Advanced Manufacturing Center of Excellence led by **Maj. Gen. Daniel G. Mitchell**, right, commanding general of the U.S. Army Tank-automotive and Armaments Command (TACOM). Hendrix assumed command from **Col. Kenneth Letcher**, center, who now serves as chief of staff for the Combined Security Transition Command – Afghanistan. Hendrix's recent assignments include chief of the Personnel Development Office within the U.S. Army Ordnance School and assistant chief of staff for Support Operations for the 3rd Expeditionary Sustainment Command. (Photo courtesy of TACOM)

4: SIERRA ARMY DEPOT CHANGES COMMAND

Lt. Col. Russell Henry, left, assumed command of Sierra Army Depot, California, and accepted the depot's guidon from **Maj. Gen. Daniel G. Mitchell**, TACOM commander, at a July 17 ceremony at the Sierra Army Depot Parade Field. Henry took command from **Lt. Col. Benjamin Johnson**, who led the depot for the past two years through several workforce and mission improvement efforts. Henry previously was assigned to the Logistics Directorate of the U.S. European Command, where he served as a joint strategic logistics planner. (Photo by Lloyd Gubler, Sierra Army Depot)

5: NEW LEADERSHIP AT ANNISTON

Col. Marvin Walker, left, assumed command of the Anniston Army Depot, Alabama, and accepted the depot's guidon from **Maj. Gen. Daniel G. Mitchell**, TACOM commander, at a July 25 ceremony at the depot's Nichols Industrial Complex. Walker assumed command following the retirement of **Col. Joel Warhurst**, who commanded the depot for the past two years. Walker previously served with the 1st Theater Sustainment Command as chief of strategic plans for Operation Inherent Resolve. (Photo by Mark Cleghorn, Anniston Army Depot)

JOINT PROGRAM EXECUTIVE OFFICE FOR CHEMICAL, BIOLOGICAL, RADIOLOGICAL AND NUCLEAR DEFENSE

6: NEW PRODUCT MANAGER FOR CDP

Lt. Col. Kara Schmid accepted the charter of the Joint Product Manager for Chemical Defense Pharmaceuticals from **Col. David P. Hammer**, then joint project manager for Medical Countermeasure Systems (JPM MCS), June 7 at Fort Detrick, Maryland. Schmid replaces **Col. Matthew G. Clark**. (Photo by A. Scott Brown, JPM MCS)

7: JPM MCS CHANGES LEADERSHIP

Douglas Bryce, joint program executive officer for Chemical, Biological, Radiological and Nuclear Defense, welcomed **Col. Ryan R. Eckmeier**, incoming JPM MCS, at a change of charter ceremony June 28 at Fort Detrick. Eckmeier assumed command from **Col. David P. Hammer**, who will retire from the Army on Oct. 31. (Photo by A. Scott Brown, JPM MCS)

8: CHANGE OF CHARTER AT BIODEFENSE THERAPEUTICS

Lt. Col. Charles DiTusa, left, assumed the charter of the Joint Product Manager for Biological Defense Therapeutics at a change of charter ceremony June 24 led by **Col. David P. Hammer**, right, then JPM MCS, at Fort Detrick. DiTusa succeeded **Lt. Col. Michael F. Ingram**, who is now with the U.S. Army Medical Research Institute of Infectious Diseases. (Photo by A. Scott Brown, JPM MCS)

PROGRAM EXECUTIVE OFFICE FOR ASSEMBLED CHEMICAL WEAPONS ALTERNATIVES

NEW SITE MANAGERS NAMED

The Program Executive Office for Assembled Chemical Weapons Alternatives (PEO ACWA) announced new project managers in June for its sites in Colorado and Kentucky.

Walton Levi now serves as project manager for the Pueblo Chemical Agent – Destruction Pilot Plant in Colorado. Levi has been with PEO ACWA for 11 years, previously serving as acting project manager and deputy project manager. As the senior government manager on-site, Levi will lead the pilot plant's 43-person field office and oversee execution of the systems contract by the Bechtel Pueblo Team.

Dr. Candace Coyle is project manager at the Blue Grass Chemical Agent – Destruction Pilot Plant in Kentucky. Coyle previously served as chief scientist for the ACWA program at Aberdeen Proving Ground, Maryland. She is responsible for overseeing the project to design, construct, operate and close the plant, which will destroy the chemical weapons stockpile at the Blue Grass Army Depot.

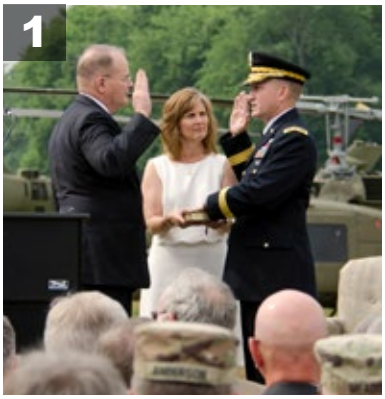
PROGRAM EXECUTIVE OFFICE FOR AVIATION

1: PEO PROMOTED TO MAJOR GENERAL

Maj. Gen. Thomas H. Todd III, program executive officer (PEO) for Aviation, recited the oath of office administered by **Brig. Gen. Edward Harrington** (USA, Ret.) at a June 5 ceremony at Redstone Arsenal, Alabama, marking Todd's promotion from brigadier general. Todd's wife, **Tracey**, assisted in the event. Todd later unfurled his two-star flag, assisted by Harrington and **Sgt. Maj. Woody Sullivan**, left, PEO Aviation's senior enlisted adviser.

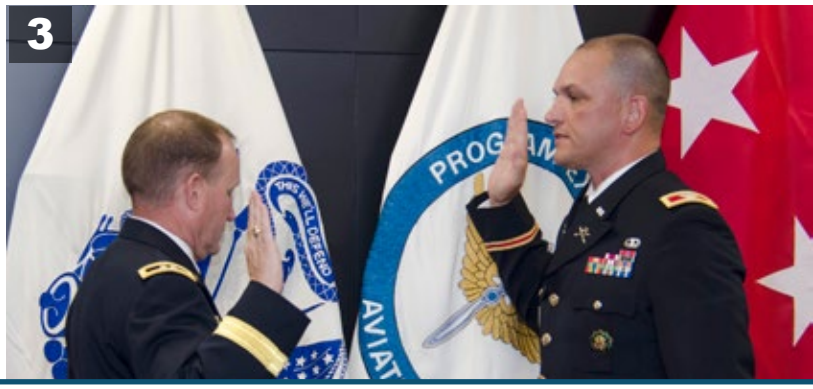
Todd has served as PEO since January 2017. He previously served as deputy commander of the U.S. Army Research, Development and Engineering Command (now the Combat Capabilities Development Command) and senior commander at the U.S. Army Natick Soldier Systems Center. He also served as project manager for Utility Helicopters and product manager for the CH-47 Improved Cargo Helicopter within PEO Aviation. (Photos by Michelle Miller, PEO Aviation)

2: NEW LEADERSHIP AT CARGO HELICOPTERS

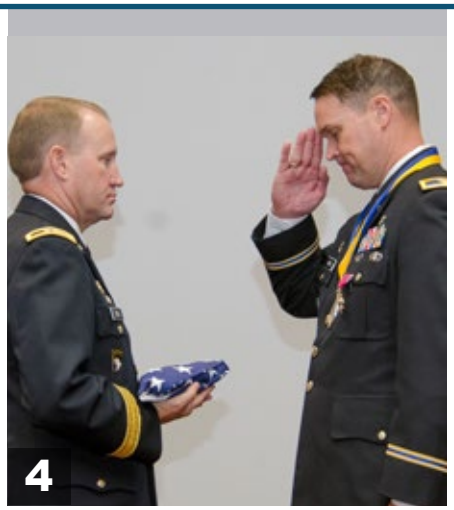


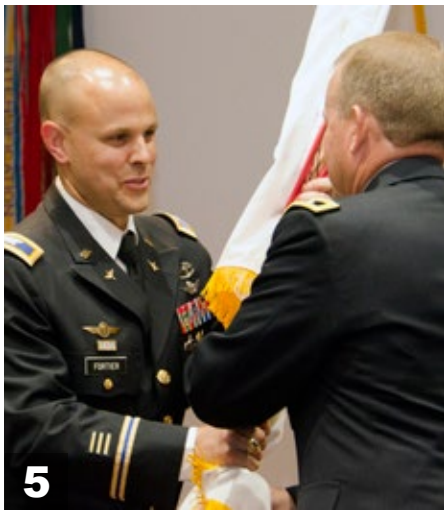
Col. Al Niles, left, accepted the Cargo Helicopters Project Office flag from **Maj. Gen. Thomas H. Todd III**, PEO Aviation, at a change of charter ceremony July 11 at Redstone Arsenal. **Sgt. Maj. Woody Sullivan**, right, PEO Aviation's senior enlisted adviser, assisted in the ceremony. Niles takes over from **Col. Greg Fortier**, who now oversees the Future Attack Reconnaissance Aircraft Project Office. (Photo by Michael Hart, PEO Aviation)

3: PROMOTION AT CONTINGENCY OPERATIONS



Maj. Gen. Thomas H. Todd III, PEO Aviation, administered the oath of office to **Col. Brian Watson**, right, during a June 18 ceremony at Redstone Arsenal marking Watson's promotion from lieutenant colonel. Watson will lead contingency operations and assist in maintaining operational readiness between PEO Aviation staff and combatant commands' senior staffs. (Photo by Michelle Miller, PEO Aviation)





4: CONTINGENCY OFFICER RETIRES

Col. Chad Smith, right, accepted a certificate of retirement from **Maj. Gen. Thomas H. Todd III**, PEO Aviation, July 12 at Redstone Arsenal. Smith, who retired after a 27-year career, also received the Legion of Merit and Order of St. Michael awards during the ceremony. The Order of St. Michael, presented by the Army Aviation Association of America, recognizes individuals who have made significant contributions to Army aviation. Smith served as contingency operations officer at PEO Aviation since 2017. (Photos by Michelle Miller, PEO Aviation)

5: NEW ORGANIZATION, LEADERSHIP FOR FVL

Col. David Phillips, right, accepted the charter of the Future Long-Range Assault Aircraft (FLRAA) Project Office from **Maj. Gen. Thomas H. Todd III**, PEO Aviation, at a change of charter ceremony July 12 at Redstone Arsenal.

The ceremony marked the reorganization of PEO Aviation's Future Vertical Lift Project Office into two new project offices: FLRAA and Future Attack Reconnaissance Aircraft (FARA). **Col. Greg Fortier**, left, accepted the flag for the FARA Project Office at a change of charter ceremony at Redstone Arsenal led by Todd and assisted by **Sgt. Maj. Woody Sullivan**, right, PEO Aviation's senior enlisted adviser. (Photos by Michelle Miller, PEO Aviation)

6: FVL PROJECT MANAGER RETIRES

Col. Steve Clark, right, received the Legion of Merit medal from **Maj. Gen. Thomas H. Todd III**, PEO Aviation, July 12 at Redstone Arsenal, in honor of his 27 years of service. Clark served as project manager for PEO Aviation's Future Vertical Lift (FVL) Project Office. (Photo by Michelle Miller, PEO Aviation)

7: RETIREMENT CAPS 30-YEAR CAREER

Todd Miller, deputy project manager for the FVL Project Office, received a certificate of retirement from **Col. Steve Clark**, then project manager for FVL, at a June 24 ceremony at Redstone Arsenal. Miller retired after more than 30 years of federal service. (Photo by Michelle Miller, PEO Aviation)

8: UAS EXPERT TOURS REDSTONE

Helen Greiner, seated in helicopter, highly qualified expert for robotics, autonomy and artificial intelligence within the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology, toured PEO Aviation facilities at Redstone Arsenal July 9. The visit included a demonstration of manned-unmanned teaming between an Apache AH-64E helicopter and the Gray Eagle unmanned aircraft system (UAS) and an update from **Patrick H. Mason**, deputy PEO. Greiner also participated in the launch of a Raven UAS and saw demonstrations of capabilities for electric, fueled and hybrid UAS propulsion systems. (Photo by Josh Nichols, PEO Aviation)

PROGRAM EXECUTIVE OFFICE FOR COMMAND, CONTROL AND COMMUNICATIONS – TACTICAL

1: DEPUTY PEO INSTALLED

Joseph Welch was formally assigned as deputy program executive officer for Command, Control and Communications – Tactical (C3T) July 7 at Aberdeen Proving Ground, Maryland. Welch, whose January appointment to the Senior Executive Service was honored by **Maj. Gen. David G. Bassett**, left, program executive officer (PEO) for C3T, previously served as PEO C3T's technical director. (Photo by Ryan Myers, PEO C3T)

2: CHANGE OF CHARTER FOR WAVEFORMS

Lt. Col.(P) Timothy Sugars, left, passed the charter of the Product Manager for Waveforms to **Lt. Col. Sherida Y. Whindleton** during a ceremony July 11 at Aberdeen Proving Ground hosted by **Col. Garth Winterle**, center, project manager for Tactical Radios within PEO C3T. Sugars is now director of the Army Applications Lab at the U.S. Army Futures Command. (Photos by Kathryn Bailey, PEO C3T, and Barbara Schirloff, Project Manager (PM) for Tactical Radios)

3: NEW LEADERSHIP AT SATCOM PRODUCT OFFICE

Col. Greg Coile, left, then project manager for Tactical Network, presented the charter of the Product Manager for Satellite Communications to **Lt. Col. NaTasha Wayne**, top right, during a change of charter ceremony July 3 at Aberdeen Proving Ground. Wayne takes over from **Lt. Col.(P) Jenny Stacy**, middle right, who received the Meritorious Service Medal during the ceremony. (Photos by Lynn Harkins, PM for Tactical Network)

4: CHANGE OF CHARTER AT TACTICAL NETWORK

Col. Jack "Shane" Taylor, center right, accepted the charter of the Project Manager for Tactical Network from **Maj. Gen. David G. Bassett**, center left, PEO C3T, during a ceremony July 15 at Aberdeen Proving Ground. Bassett awarded **Col. Greg Coile**, right, outgoing project manager, the Legion of Merit at the ceremony.

Coile served as project manager for Tactical Network for the last four years. His innova-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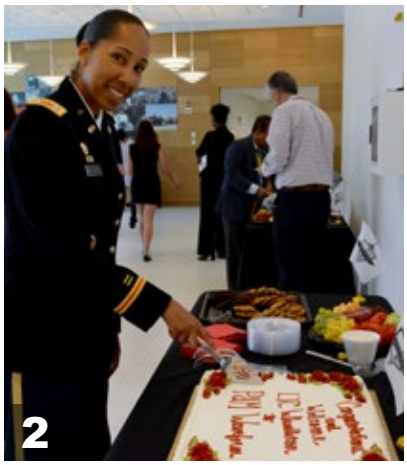
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tive One Network mission and vision were instrumental in the modernization of the Army's tactical network and helped lay the foundation for the network of the future. He now serves with the U.S. Mission to NATO in Brussels. (Photos by Lynn Harkins, PM Tactical Network)

5: TACTICAL CYBER CHARTER CHANGES HANDS

Lt. Col. Sung In, right, accepted the charter of the Product Manager for Tactical Cyber and Network Operations from **Col. Greg Coile**, then project manager for Tactical Network, during a July 2 change of charter ceremony at Aberdeen Proving Ground. In takes over from **Lt. Col. Kelvin Graves**, who received the Meritorious Service Medal from Coile at the event. (Photos by Lynn Harkins, PM Tactical Network)

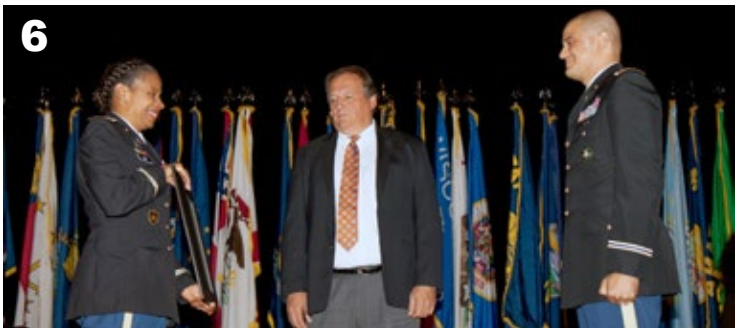
PROGRAM EXECUTIVE OFFICE FOR INTELLIGENCE, ELECTRONIC WARFARE AND SENSORS

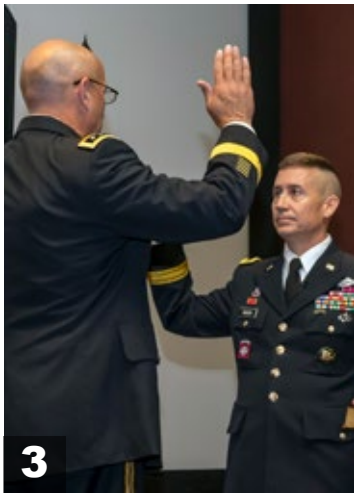
6: CHANGE OF CHARTER AT EO/IR

Outgoing product manager **Lt. Col. Kecia M. Troy**, left, passed the charter for Electro-Optical/Infrared Payloads to **Lt. Col. Melvin Mitchell**, right, in a ceremony May 23 at Fort Belvoir, Virginia. The event was led by **Christian Keller**, center, product director for Sensors – Aerial Intelligence within the Program Executive Office for Intelligence, Electronic Warfare and Sensors (PEO IEW&S). (U.S. Army photos by Heather Harris, PEO IEW&S)

7: NEW PROJECT MANAGER AT DOD BIOMETRICS

Col. Senodja Sundiata-Walker, left, accepted the charter of the Project Manager for DOD Biometrics from **Brig. Gen. Robert M. Collins**, program executive officer for IEW&S, at a July 3 ceremony at Fort Belvoir. Sundiata-Walker takes over from **Col. Donald Hurst**. (Photo by Esther VanCleave, PEO IEW&S)





1: NEW DEPUTY SWORN INTO SENIOR EXECUTIVE SERVICE

Mark C. Kitz was sworn in as a member of the Senior Executive Service and named deputy PEO for IEW&S June 24 by **Brig. Gen. Robert M. Collins**, PEO IEW&S, at Fort Belvoir. Kitz had served as director for acquisition and engineering at PEO IEW&S since 2015, and held multiple assignments with the Intelligence and Information Warfare Directorate of the U.S. Army Communications-Electronics Research, Development and Engineering Center. He holds a master's degree from the New Jersey Institute of Technology and a bachelor's degree from Lafayette College. (Photo by John Higgins, PEO IEW&S)

2: SYSTEMS ENGINEER RETIRES

"You learn a lot when someone retires by how the crowded the room is," said **Brig. Gen. Robert M. Collins**, PEO IEW&S, at a May 30 ceremony marking the retirement of **Dr. Yen-Chou Chou**, "and it's clear you will be missed." Chou, a systems engineer at Aberdeen Proving Ground, Maryland, retired after a career that included 15 years with PEO IEW&S. (Photo by Joanne Gallagher, PEO IEW&S)

PROGRAM EXECUTIVE OFFICE FOR MISSILES AND SPACE

3: PEO PINS ON SECOND STAR

Lt. Gen. L. Neil Thurgood, director of the U.S. Army Rapid Capabilities and Critical Technologies Office, hosted a ceremony July 8 at Redstone Arsenal, Alabama, marking the promotion of **Maj. Gen. Robert A. Rasch Jr.**, program executive officer for Missiles and Space (PEO MS), from brigadier general. Rasch's wife, **Shawndell**, and his daughter, **Darby**, attended the event. (Photos by Henry S. Norton, Cruise Missile Defense Systems (CMDS) Project Office)

4: CHANGE OF CHARTER AT RADARS PRODUCT OFFICE

James S. Childress, center, project director for Counter-Rocket, Artillery and Mortar, passed the colors of the Product Manager for Radars to **Lt. Col. Adrian F. Jasso**, left, at a July 9 change of charter ceremony at Aberdeen Proving Ground, Maryland. Jasso takes over from **Lt. Col. Jason F. Tate**, right, who will attend the U.S. Army War College at Carlisle Barracks, Pennsylvania, and has been selected for promotion to colonel. (Photo by Peter Culos, Product Manager for Radars)

5: PRECISION FIRES GETS NEW PROJECT MANAGER

Col. Guy Yelverton III, left, accepted the colors of the Project Manager for Precision Fires, Rocket and Missile Systems from **Maj. Gen. Robert A. Rasch Jr.**, PEO MS, at a change of charter ceremony July 15 at Redstone Arsenal. Yelverton replaces **Col. James C. Mills**, right, who now serves as project manager for the Common Hypersonic Glide Body Production Division within the Army Hypersonic Project Office. (Photos by Henry S. Norton, CMDS Project Office)

6: SES APPOINTMENT FOR DEPUTY PEO

Maj. Gen. Robert A. Rasch Jr., PEO MS, hosted a ceremony July 9 at Redstone Arsenal marking the selection of **Darryl Colvin** to the Senior Executive Service. Colvin was selected as the deputy PEO for Missiles and Space on July 7. His wife, **Griselde**, attended the ceremony. (Photos by Henry S. Norton, CMDS Project Office)

THE CHIEF OF STAFF, ARMY

ANNOUNCED THE FOLLOWING OFFICER ASSIGNMENT:

Maj. Gen. John George, deputy director and chief of staff, Futures and Concepts Center, U.S. Army Futures Command, Joint Base Langley-Eustis, Virginia, to commanding general, U.S. Army Combat Capabilities Development Command, U.S. Army Futures Command, Aberdeen Proving Ground, Maryland.

THEN & NOW
1969 & 2019

LAYING THE FOUNDATION

To look back 50 years at Army aviation is, in some ways, to look ahead a decade.

Back in 1969, in the thick of the Vietnam War and at the height of the Cold War, Army aviation had a relatively small part in America's thinking about how to defeat the Soviet Union should armed conflict develop. Back then, the focus of Army aviation was on Vietnam, and its mainstays were the UH-1 Iroquois, popularly known as the Huey, the CH-47 Chinook transport and AH-1 Cobra attack helicopters. The Army's Aviation Branch would not even come into existence until 1983.

But in Vietnam, where all three of those helicopters saw extensive use, the Army was finding that there was much to learn about their capabilities and limitations. Helicopters did heavy duty in transport, reconnaissance, strike and medevac missions. Could they carry more? Fly farther? Strike harder? "See" more?

Fifty years ago, the Army began laying the foundation for a more robust and diversified helicopter fleet that could play a decisive role in a possible war against the Eastern Bloc. Today, the Army is laying the foundation for a more versatile, lethal and survivable fleet of aircraft that will support U.S. overmatch on a battlefield that is far more complex than in 1969, encompassing the multiple domains of land, air, sea, cyber and space.

Some of the same questions asked in 1969 are driving the current modernization of Army aircraft, captured in the U.S. Army Futures Command's Future Vertical Lift initiative, with a target delivery date of 2028 to 2030.

NEW WORKHORSE

The lead story in the February 1969 issue of Army Research and Development, the precursor to Army AL&T magazine, laid out the aviation and other priorities contained in DOD's annual posture statement, "The 1970 Defense Budget and Defense Program for Fiscal Year 1970-74."

In it, Secretary of Defense Clark M. Clifford, who by then had been succeeded by Melvin R. Laird, outlined a plan to initiate the design of a new Army Utility Tactical Transport Aircraft System (UTTAS), capable of carrying "about double the number of troops (plus a crew of three) currently carried in the UH-1 Huey helicopter, the workhorse of the U.S. Army in Vietnam."

(Indeed, a short staff-written article on Page 35 of that issue reported that medevac statistics released by the Army's Office of The Surgeon General for the first 10 months of 1968 in Vietnam reflected "almost a doubling of the workload of helicopter and medical crews, compared to 1967 statistics. … Army Medical Department helicopters transported more than 170,000 patients in 1968, as compared to 94,000 during the same period in 1967.")

The lead article, also staff-written, continued, "The Huey was designed to carry 11 troops with a crew of two, but additional protective armor and the need for two side-door gunners reduced the payload to between six and eight men.

A NEW GENERATION

Members of the 82nd Combat Aviation Brigade receive their initial fielding of the new Echo Model Apache, replacing the previous generation's Delta Apache helicopter, at Fort Bragg, North Carolina, in August. The AH-64E Apache is designed with increased power margins, reliability and lethality to ensure that it is a viable fighting force in large-scale combat operations. (U.S. Army photo by Pfc. Chantel Green, 49th Public Affairs Detachment)

"The report states [the] estimated 10-year system cost of a UTTAS-equipped helicopter force 'could be only a little more than half the cost of operating a UH-l force with an equivalent lift capability over the same period of time.' "

The UTTAS would end up being the prototype model of the UH-60A Black Hawk, which succeeded the Huey in its workhorse utility role. It continues in that role to this day and will for years to come, with incremental upgrades, according to Army aviation officials.

The posture statement also cited plans for continued modernization of existing Army aviation assets, including the first large procurement of the AH-56A fire support helicopter—375 aircraft over a three-year period.

BETTER, STRONGER, FASTER

The Army's plans for its aviation fleet of 2030 are more complex than that posture statement of 1969, in large part because of the leaps-and-bounds advancements in technology since then, and in part because of the much more complex battlefield. The plans center on Future Vertical Lift (FVL), the name given to the No. 3 of six Army modernization priorities.

The thrust of FVL is to develop a family of next-generation aircraft that improves on the current fleet in virtually every dimension. The aircraft will be required to have:

- Lighter and stronger airframes and rotors.
- Greater range and speed.
- Greater mission flexibility.
- Greater payload capacity.
- Improved capability to inflict harm on the enemy.
- Improved capability to survive the fight and get Soldiers back to safety—supported by, among other technologies, the capability to operate in degraded environments such as sand, smoke, smog, clouds, fog, rain, snow, and brownout or whiteout conditions.
- Advanced capability for manned-unmanned teaming, including optionally piloted missions in some cases.

SEARCH AND DESTROY
U.S. Army UH-1D helicopters airlift Soldiers during a search-and-destroy mission northeast of Cu Chi, South Vietnam, in 1966. The UH-1 Iroquois, popularly known as the Huey, was a mainstay of Army aviation during the Vietnam War. (U.S. Army photo by Sgt. 1st Class James K.F. Dung)

At the top of the list of FVL aircraft is the Future Attack Reconnaissance Aircraft, designed to carry a variety of payloads to defeat enemy unmanned systems and support ground troops. Also high on the priority list is the larger Future Long-Range Assault Aircraft, which "will provide lethality by moving the force to the decisive point at the decisive time," said Gen. James C. McConville, then vice chief of staff of the Army and now chief of staff, during his keynote speech April 15 at the Army Aviation Association of America (Quad-A) annual meeting in Nashville, Tennessee.

"The Future Attack Reconnaissance Aircraft is the No. 1 priority" in Army aircraft modernization, said McConville, the first aviator to rise to the position of Army chief of staff.

The Army is developing both aircraft on an accelerated schedule using a competitive prototyping process. The Joint Multi-Role Technology Demonstrator for Future Vertical Lift will enable the Army to conduct ground and flight demonstrations; the results of those demonstrations will, in turn, inform FVL requirements.

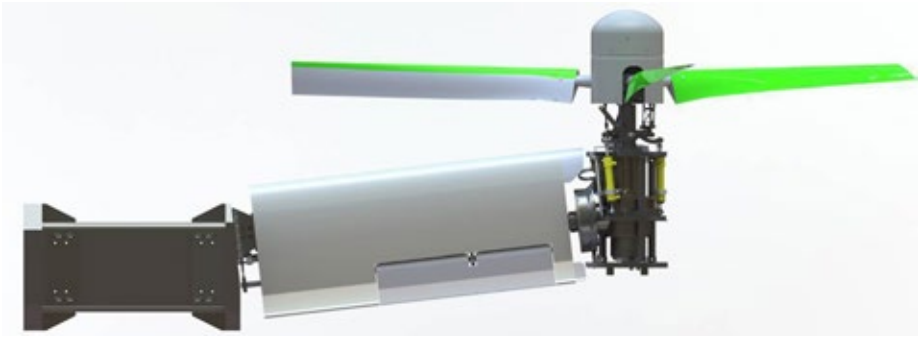
Initial fielding of the new attack and assault aircraft is anticipated in 2028-30, with the attack aircraft going to air cavalry squadrons. The assault aircraft will go to units that have forced or early-entry missions, such as the 101st Airborne Division (Air Assault), 160th Special Operations Aviation Regiment, 82nd Airborne Division and certain high-priority National Guard units, McConville said.

As it moves FVL from concept to reality, the Army is not simply going to divest its legacy aircraft. Like the Apache, which McConville noted will remain in the attack battalions and undergo incremental improvements, the Black Hawk and Chinook will certainly continue to fulfill critical missions and be upgraded as technology permits.

The open question is, how many more useful years are left on these aircraft? Judging from discussions at the Quad-A annual meeting, a decade or more.

—MARGARET C. ROTH

ADVANCED TILTROTOR AIRCRAFT
Army researchers ready a unique tiltrotor model to support analysis and design of advanced tiltrotor aircraft, a possible key to achieving Army modernization goals for Future Vertical Lift. (U.S. Army illustration)



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"The Army has reorganized our entire modernization enterprise for greater speed, efficiency and effectiveness. This includes improving the way we do business. We are beginning to see the intended benefits of our efforts—unchanging priorities; less bureaucracy; sufficient investment; and greater access to innovation—to make us better stewards for the warfighter and the taxpayer."

Dr. Bruce D. Jette
Army Acquisition Executive
Page 4

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