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## CAPABILITIES TRANSFORMATION FORWARD

The U.S. Army's newest enterprise, Army Futures Command, is tasked with helping DoD build a 21st century-ready force.

By LTC Thomas "Bull" Holland, COL Dennis McGurk, and Dr. Shawn M. Walsh

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**MG Doug Gabram**  
 Director For Test, U.S. Missile Defense Agency  
 Fmr. Commander, U.S. Army Aviation and Missile Command

**Cover:** Soldiers assigned to 278th Armored Cavalry Regiment conduct tube-launched, optically-tracked, Wire-guided (TOW), live fire exercise at Fort Campbell, KY. The "TOW" missile is an anti-tank missile that forms part of the Bradley fighting vehicle. (U.S. Army)



**COMMANDER'S CORNER**  
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**RADM Michelle C. Skubic**  
 Commander  
 U.S. Naval Supply Systems Command  
 Chief of Supply Corps

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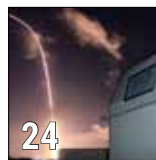
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## INSIGHTS

The March/April issue of *Armor & Mobility* gives us a look at Joint DoD efforts to modernize above and beyond proven legacy systems and prepare the world's most powerful military for the future of combat. From network integration to life cycle management, what drives America's military readiness is as much hardware as it is the men and women who make that hardware perform.

With the advent of the U.S. Army's newest enterprise, Army Futures Command (AFC), the globe's most lethal land-based force is renewing focus on identifying systems and processes long proven effective, but on the verge of losing their effective application in a rapidly changing international theater of operations. In two exclusives to A&M, AFC leadership, to include Commanding General John Murray, speaks to primary challenges the Army continues to grapple with in staying on the cutting edge of force design, training and doctrine, and sustainment of materiel. The advantages of partnerships between government and academia in producing new test capability failures before capabilities become viable products, has become more critical than ever in saving DoD time and money. A big part of what is expected to comprise DoD's 21st century Army is an integrated communications and data delivery system that keeps everyone from combatant commanders to combat soldiers in the operations loop.

From real-world to training scenarios, weapons systems are only as lethal as they are operable. Without effective life cycle management, there is no telling when life cycle extent is reached. As such, Army Aviation and Missile Command (AMCOM) has developed a comprehensive plan to address Army initiatives in materiel availability and sustainment in support of future force requirements. MG Doug Gabram, former AMCOM Commander and current Director of Test, U.S. Missile Defense Agency, tells us that agile sustainment across system life cycles, as well as developing and executing Army investments in future force capabilities, remain top AMCOM priorities moving forward. Not to be overlooked, process improvements in supply chain efficiency to support increases in materiel demand due to changes in operational tempo are also front and center at AMCOM. In lockstep with Army logistics, the Defense Logistics Agency (DLA) Strategic Materials Team is working to provide DoD with safe, secure, "environmentally sound" sources, in many cases, American made.

On the maritime front, this issue offers a look into U.S. Naval Supply Systems Command (NAVSUP) priorities as RADM Michelle Skubic, NAVSUP Commander, speaks to the latest in digital customer service and elevated technological capabilities to ensure supplies are there when and where needed. On the aviation side, we get insight into the Army's Future Vertical Lift (FVL) program and its "Eco-System" effort to ensure future air operations are not only more effective but more fuel efficient, a critical factor in modern long-range global combat.

Your comments and suggestions are welcome. Thank you for the continued readership!

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# CAPABILITIES TRANSFORMATION FORWARD

The U.S. Army's newest modernization enterprise, Army Futures Command or AFC, is tasked with taking myriad assets of invention and innovation, whether in government, industry or academia, and helping them to help DoD build a 21st century-ready force. No small feat.

By LTC Thomas "Bull" Holland, PhD., COL Dennis McGurk, PhD., Shawn M. Walsh, D.Eng



A paratrooper assigned to the 3rd Brigade Combat Team, 82nd Airborne Division launches a PUMA Unmanned Aerial Surveillance Vehicle during the recently concluded Network Integration Exercise. The Army Modernization Enterprise will embrace more Soldier feedback on product features early in the development process using Minimum Viable Product and open innovation approaches. (Photo by Sgt. Cody Parsons 3rd Brigade Combat Team, 82nd Airborne Division)

On July 1st 2018, U.S. Army Futures Command (AFC) was formally established. Senior Army leadership realized that its approach to Army modernization was fragmented and limited by an industrial-age model that inconsistently transformed requirements into relevant capability. Equally concerning was the Army's inability to exploit new and disruptive discoveries, inventions, and innovations from outside the Army – including new capabilities and expertise from universities, industry, and public-private partnerships. The Army had clear leadership in force design, training and doctrine, and sustainment of materiel in its existing U.S. Army Forces Command (FORSCOM), Training and Doctrine Command (TRADOC), and Army Materiel Command (AMC) units, but lacked a sharply focused organizational approach to



Dr. Shawn M. Walsh

identifying and prioritizing critical modernization efforts needed to ensure it was able to deliver the right solutions to the future force.

AFC was established to lead a continuous transformation of Army modernization. One of the primary goals of AFC is to ensure a unified approach to concepts, science and technology, requirements generation, production and delivery of new solutions to the future warfighter. This unity of effort applies to the organizational elements that compose AFC itself and synchronization with other Army organizations such as the Office of the Assistant Secretary of the Army for Acquisition, Logistics & Technology (ASA(ALT)), FORSCOM, TRADOC, AMC, and many others. Indeed, modernization is the responsibility of the whole



Army. AFC provides the framework for a transparent, highly integrated network of talent, infrastructure, and capabilities internal and external to AFC required to transform new concepts into validated requirements and reliable solutions.

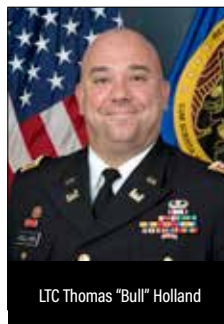
The Army must be more transparent to external public and private entities to maintain relevance. The ever-accelerating global pace and diversification of science and technology (S&T) investments makes it difficult to remain broadly relevant without connectivity to a larger external pool of talent, ideas, and technologies.

Historically, as part of a sizable organization like the Department of Defense (DoD), the Army and DoD in general had been able to lead significant and sustained investments in critical science and technology (S&T) areas. The goal was to transform raw discoveries into controlled effects that could provide a strategic and decisive advantage on the battlefield (e.g., overmatch). While the DoD still remains a major influence on 'big science', there is irrefutable evidence that its dominance in key S&T areas has been challenged by several factors. These include near-peer competitors aggressively investing in and exploiting S&T; the acceleration of S&T development in national and global public and private sectors; and fiscal realities and constraints that require prioritization of prudent investments by the DoD.

### Proactive S&T Development

It can be argued that part of the challenge the Army faces is not a lack of available innovation. Rather, it has been challenged in cohesively identifying, consuming, and reliably delivering new scientific and technological advances effectively. The Army is not simply trying to mature a new breakthrough or discovery to advance science; it is trying to ensure it provides its current and future force with superior capabilities enabled by such breakthroughs. While its mission to deploy, fight, and win decisively against any adversary is enduring, its underpinning S&T is a potent but perishable advantage. This advantage is challenged not only by increasingly aggressive near-peer competitors and complex operational domains, but also by lack of a unified approach to prioritizing and transforming new sources of invention and innovation into operationally superior capabilities.

Developing a strategic and effective means of consuming sources of innovation, and unifying these advances into new battlefield effects is critical to Army modernization. One possible model for more comprehensive integration of internal and external sources of new ideas is the "open innovation" approach as described by U.C. Berkeley Professor Henry Chesbrough. While other models could describe key elements of AFC's inputs and outputs to develop and deliver new capabilities and effects, the open innovation model has several attractive and intuitive features. Unlike a closed innovation model, which essentially draws on its own and often limited internal sources of innovation as inputs, the open innovation model embraces the consumption and fusion of the best ideas from both internal and external sources. Internal sources of innovation include AFC Combat Capability Development Command (CCDEVCOM) Army Research Laboratory and Centers. However, as shown in Figure 1, the open innovation model effectively provides an explicit means



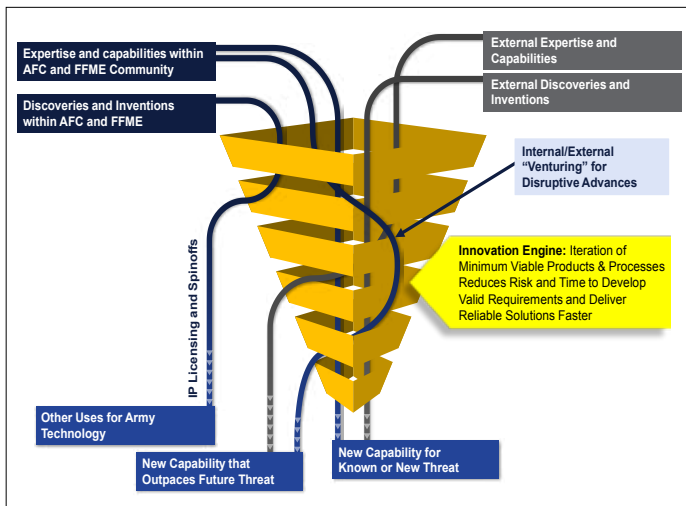
to identify external sources of innovation, including other government agencies, industry, academia, and public-private partnerships.

### Innovation Engine to Move Requirement to Capability

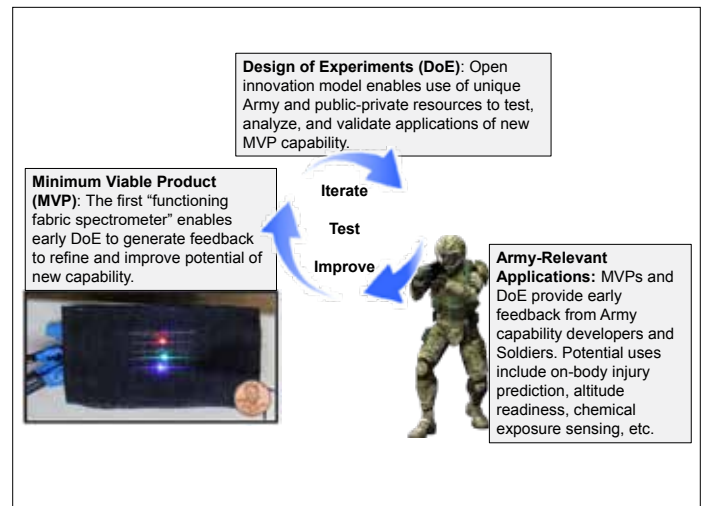
The AFC Combat Capability Development Command's Army Research Laboratory has embraced a more open approach to expand "the art of the possible" in emerging areas of science. An open innovation model provides one possible approach to harvesting new ideas and discoveries from other public and private entities. However, as emphasized in Figure 1 (following pg), an "innovation engine" is needed to fundamentally shift the means by which new sources of innovation are transformed into valid requirements and high impact capabilities. One example of a fundamental shift that AFC can influence in the Army's Materiel Development process is to implement an evidence-based requirements system that emphasizes the use of Minimum Viable Products (MVPs). Often mistakenly thought of as the 'good enough' end product, the MVP is actually a central tool in any innovative product development process. An MVP is anything (a sketch, a 'mock-up', an immature prototype, etc.) that allows a developer to test a hypothesis about the need for a product's features by engaging directly with product beneficiaries. As an example, when considering what information should be available in a Soldier-worn Heads Up Display (HUD), an initial MVP could be a screen shot of any potential battlefield with potential HUD icons superimposed on the screen shot. This MVP would not provide enough information to start "bending metal" and writing code. However, this type of MVP would provide evidence about what HUD icons different beneficiaries prefer and, just as importantly, which icons they do not prefer (e.g. a platoon leader will want different HUD icons than a sniper). Instead of spending years of development and millions of dollars in a formal Program of Record to build a functioning prototype to start receiving Soldier feedback on product features, early use of MVPs can rapidly generate hundreds of data points to support or reject product features while the requirement is being written. An MVP by itself is of limited value, but an MVP as part of an iterative and integrated Design of Experiments (DoE) approach to requirements and product development is a game-changing tool. Simply building a prototype to 'let Soldiers play with it' is marginally useful. By contrast, conducting an MVP experiment with a targeted user sample (e.g., Soldiers operating in extreme environments) can validate or challenge a specific hypothesis about a specific product feature. It is in this DoE context that innovators and entrepreneurs embrace a fail fast/learn fast culture. Fail fast does not mean increasing risk by rushing development so that leaders can decide whether or not to terminate programs sooner instead of later. Rather, fail fast means using the minimal time needed to create an MVP so that requirements developers can identify which proposed product features 'fail' their hypothesis tests in fast order. Identifying a new product feature failure early is an experimental success.

### Embracing Public-Private Partnering

The Army has successfully used industry partnerships in critical areas to tap the unique talent and science needed to address a



**Figure 1:** Open Innovation Model: AFC and the Army's Future Force Modernization Enterprise (FFME) inclusive framework that provides a faster means to identify, consume, and integrate the best internal and external sources of discovery, invention, and innovation into desired Army capabilities. (U.S. Army)



**Figure 2:** Example of Minimum Viable Product development with a public-private partnership: exploring the potential of on-body sensing using advances in smart textile fabrication. (U.S. Army)

contemporary Army need. MVPs can be used to link Army and industry capabilities in the context of a much-needed product capability. The Combat Capability Development Command's Army Research Laboratory and Centers play a critical role in public-private partnerships (PPPs). For example, Figure 2 (following pg) illustrates an active PPP at the Defense Fabric Discovery Center (D-FDC) that

includes MIT Lincoln Laboratories, AFC CCDEVCOM Soldier Center at Natick, U.S. Army Research Institute of Environmental Medicine, and the Advanced Functional Fabrics of America (AFFOA). This partnership is exploring novel processes to create wearable fabrics which can detect and inform the Soldier of both physiological and external operating conditions during his or her mission. A flexible, lightweight

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approach to integrate and manufacture fabric-based sensors could enable better situation awareness, mobility, and survivability, as shown in earlier CCDEVCOM Army Research Laboratory work. Early MVP feedback from Soldiers can reveal issues in flexibility, comfort, durability, etc. that can be used to rapidly refine and improve utility of the technology.

Using MVPs in a DoE approach can be a key driver of the cultural change AFC must implement. There is currently no mandate for requirements documents to reference any evidence supporting the need for any product feature, and often a product's features rely on someone's personal opinion. In a system generating opinion-based product features, there is a risk that objective critiques of products and features inspire a defensive response from the product's creators and even their organizations. As part of its fundamental new organizational structure and processes, AFC is seeking instead to create tools that enable analytically driven and evidence-based decision-making. The goal is to allow the "best" solutions to emerge from cycles of iterative MVP development, data generation, and analysis. AFC further recognizes the rapid pace of national and global S&T advances suggests that the best Army solutions will rely on assessing and integrating new discoveries and emerging technologies from the public and private sector faster.

Another example of a successful PPP comes from the Army medical community. Mild traumatic brain injury (mTBI) was referred to as a signature wound of OIF/OEF and until recently the diagnosis relied exclusively on the Soldier reporting symptoms. Army-led

partnerships with industry brought together the complete and diverse set of expertise needed to accelerate the development of a new and effective blood-based biomarker (indicator) of an mTBI. This collaboration between the Walter Reed Army Institute of Research, Banyon Biomarkers and Abbott resulted in the first-ever blood test for mTBI to be approved by the FDA. At the root of highly effective PPP's is the driving goal to achieve mutually beneficial outcomes for all parties involved. In this context, AFC is an attractive partner for PPP's for several reasons. First, AFC is fundamentally revamping and renewing the Army's legacy of being both an early adopter and a leader of emerging science and technology - providing entrepreneurs/industry with more accessible opportunities to test out their new technologies for Army relevance. Second, AFC's new processes, early use of MVPs, and unity of effort are designed to put the right capability in the hands of Soldiers faster.

Finally, to demonstrate this renewed commitment to finding the best internal and external sources of discovery and invention, the AFC is the first Army command headquarters ever to be placed in Austin, TX - a representative U.S. hotbed of innovation and entrepreneurship. Collectively, AFC provides the transparency and unity of effort needed to connect its internal talent and capabilities earlier with universities, industry, and PPPs. The motivation is obvious and urgent: enable a new and fledgling crop of inventors and entrepreneurs to reinforce U.S. global competitiveness and co-create the Army's future force together. ■

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# DELIVERING A FUTURE NETWORK

Six months ago, the U.S. Army officially stood up its newest command aimed at finding, developing and experimenting with cutting edge technology to lead the service into the future. Now, the aptly named Army Futures Command (AFC) – armed with its Cross-Functional Teams (CFTs) – is outlining a plan to deliver these technologies, including tactical network capability, to Soldiers by 2028.

By Justin Eimers, U.S. Army Program Executive Office Command, Control, Communications-Tactical (PEO C3T)



Master Sgt. Charles Vaughn (middle, standing), Operations NCOIC for the Network Cross-Functional Team, helps members of the B Company, 1-508th Parachute Infantry Regiment troubleshoot components of the Integrated Tactical Network during a live-fire exercise at Camp Atterbury, Indiana. (Photo by Justin Eimers)

The U.S. Army's network is a critical enabler to the service's other modernization priorities and the Network Cross-Functional Team (CFT) is hard at work to meet the demands laid out by Commanding General John M. Murray, Army Futures Command.

"We intend to develop the technologies and solutions that will enable us to modernize the force quickly, effectively and cost-effectively, wherever and whenever they might be," Murray said at the Association of the United States Army's National Partner Luncheon last October. "We will harness advances in artificial intelligence and big data analysis to quickly process information and identify trends that will shape modernization efforts."

Over the next several years the Army will enhance its network with commercial solutions. This involves fielding common hardware and software to provide commanders better awareness while also



GEN John M. Murray

reducing the clutter in command posts; leveraging commercial satellite constellations to deliver global coverage to augment military capacity; fielding advanced data radios to help dismounted Soldiers share data and talk; and improving network security with a variety of network management and communications security solutions.

## Filling in Gaps

To deliver the tactical network of 2028 and achieve its Multi-Domain Operations future fighting concept, the Army will close critical gaps by fielding new capability sets – on a two-year basis – that build off of each other and are infused with commercial solutions informed by Soldier-led experimentation. The Army will begin fielding capability sets in fiscal year 2021 followed by increasing capability in

2023, 2025, and 2027. Capability experimentation and demonstration driven by the Network CFT, and direct feedback from operational units and Soldiers will inform the detailed network design of each successive capability set.

Maj. Gen. Pete Gallagher, director of the Network CFT, said this approach will ensure the Army accelerates at a rate at which it can steadily insert new technology solutions while enabling Soldiers with the best available capabilities.

"Inserting technology in two-year capability sets provides flexibility to augment and integrate IT capability as it emerges from industry," Gallagher said. "We will leverage Army and Defense science and technology, coupled with industry and academia's research and development. Advances in commercial off-the-shelf solutions in areas such as waveforms, cybersecurity, satellite constellations and artificial intelligence are core to the success of this phased approach."

The initial phase, Capability Set 21, will make leap-ahead improvements in several tactical network areas with specific focus on improving expeditionary capability while making the network simple and more intuitive. This phase will deliver smaller, lighter and faster communications systems, and Soldiers will find that the applications and network devices are easier to learn and use. The first iteration of the Integrated Tactical Network, or ITN, will be fielded to select Infantry Brigade Combat Teams (IBCTs), air-ground integration improvements will be made through the use of gateways, and initial fielding of the Command Post Computing Environment (CPCE) will enable a common operating environment, another pillar of Army network modernization.

## Partnering on Mission

The Network CFT is continuing to work in lockstep with the Program Executive Office for Command, Control, Communications-Tactical (PEO C3T) to develop and field these capabilities. The ITN, for example, has undergone several Developmental Operations (DevOps) iterations in which Soldiers are placed side-by-side with the developers to evaluate the technology and gather real-time, real-world feedback.

"In contrast to other Army programs, where somebody that we're not even interacting with decides what we need and pushes it down, the ability to work closely with the developers of the software and hardware has been great," said Capt. Matthew Risenmay, higher headquarters commander for the 1-508th Parachute Infantry Regiment (PIR), which is currently experimenting with initial ITN capabilities. "If you don't have contact with the people that are developing it, you run into problems and you have to deal with the problems for a long time." The 1-508th PIR employed the ITN for a sixth time during major battalion exercises at Camp Atterbury, Indiana last month.

Capability Set 23 will build upon advances in expeditionary capabilities to increase capacity and resiliency of the network while providing a more robust transport layer to support the requirements of the Army's other modernization priorities. Fielding of the ITN to additional formations – Armored and Stryker BCTs – will extend the distance and range of units, also increasing mobility for maneuver. Units at the tactical edge will have more agile computing environments thanks to access to a tactical cloud. Mesh networking and hardening of radios will decrease vulnerabilities and susceptibility to jamming.

Collaboration between the developers, acquisition professionals and Soldiers is key to infusing industry technology into the Army's network design. Through experimentation and DevOps, the Army will continue to leverage Soldier feedback and insert commercial solutions into its network in Capability Set 25 with a focus on automation and protection. Deployed units will have more robust cloud capability, network management and decision making tools will become more automated, and network security will be augmented by new waveforms.

"As we look five years down the road, we anticipate advanced cellular technology – such as 5G or an equivalent – will become accessible to formations to provide faster connectivity," said Maj. Brian Wong, Chief of Market Research for the Network CFT.

By fiscal year 2027, the Army's insertion of commercial technologies in two-year phases will be fully institutionalized. Wireless connectivity will be increasingly hardened and the service's network will have significant cyber improvements and protection. Automation capabilities inserted in earlier capability sets should have fully capable artificial intelligence baked in and will be machine learning enabled. Capability Set 27 will further advance non-traditional, spectrum-efficient waveforms while converging all warfighting function applications into a common operating environment.

## Moving Forward

According to Gallagher, the capabilities laid out in each phase of this approach will position the Army to advance the other modernization priorities and deliver a future network enabling Soldiers to fight and win.

"Our Army is implementing these modernization efforts through capability sets to drive towards a less-complex tactical network in 2028 that utilizes the full benefits of existing technology and ensures Soldiers of today and future generations continue to be the most lethal fighting force in the world." ■

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# SUSTAINING LETHAL RELEVANCE

The U.S. Army faces similar challenges in sustaining electronics, communication and support equipment for Army weapon systems that are maintained for decades. Many of these weapon systems are past their original designed life expectancy with no set plans to decommission, which presents the Army with both financial and readiness challenges.

By Alissa T. (Rese) Stevens, Obsolescence Service Lead, U.S. Army Materiel Command



A CH-47 Chinook helicopter prepares to lift an armored High Mobility Multipurpose Wheeled Vehicle after Soldiers from the 123rd Brigade Support Battalion, 3rd Brigade Combat Team, 1st Armored Division, completed hookup procedures at Camp Humphreys, Republic of Korea. Sling load operations test Soldiers' ability to move equipment from location to location. (U.S. Army photo by Pfc. Edwin Petzke, 20th Public Affairs Detachment)

It feels like technology is progressing faster than ever – and it is. As soon as a new technology is debuted to the public, developers are already working on the next new thing or upgrade. It can be seen in the consumer world, from cell phones to televisions to personal vehicles. A decade ago, smartphones as we know them by today's standards, didn't exist. The car stereo has been replaced with an overall media display unit with other capabilities, like a navigation system, car maintenance status and automated safety service.

While car manufacturers would prefer buyers to replace their vehicles every three years, most consumers typically hold them for at least six years. Elements of the car, such as components inside the media display, will become obsolete within these three to six years. If one of these obsolete electronic components fails, the car owner has several options to consider before determining the best path forward. Can the car continue to be used without the display unit? Do aftermarket suppliers have any residual stock? Can a new model be installed in the car? Should the entire car be upgraded? As a consumer, the car owner explores and weighs each option to determine the best solution.



Alissa T. (Rese) Stevens

## Overcoming Parts Unavailability

Where the consumer can probably operate their vehicle without the failed unit or can look to replace the vehicle in total, the Army does not have that option. If the system is down, mission readiness is affected and lives can be lost. The Army needs to overcome the challenges of maintaining system readiness on legacy weapon systems due to the availability of parts.

Per Army Regulation 700-90, the Army Industrial Base Process, Army Materiel Command (AMC) is responsible for managing Diminishing Manufacturing Sources and Materiel Shortages (DMSMS). Likewise, obsolescence is a component of providing materiel and sustainable readiness for the Army.

There are two primary options for addressing the obsolescence issues of aging weapon systems: reactive and proactive. Reactively addressing obsolescence issues as they occur comes with a hefty price tag and a risk to system operational readiness. For example, in 2008 when The National Aeronautics and Space Administration (NASA) attempted to restore images taken from lunar orbiters, it found that the components needed to read the magnetic tapes had been discontinued in the 1970s and it would be prohibitively expensive to manufacture



them. Thankfully, NASA was able to find the components needed, and the restored photos are preserved for history. But we cannot rely on chance and hope for critical weapon systems. By reactively managing obsolescence, issues are generally not found until a part or component is needed and a procurement request has been issued. By this point, the obsolescence issue can affect readiness and/or require an unbudgeted cost to mitigate the issue.

On the other hand, proactively managing obsolescence involves monitoring the parts and components used to produce, maintain and repair a system down to the lowest possible level. Proactive obsolescence management does incur a cost to the Army; however, it also provides time for the weapon system's design authority to develop, budget, and implement the most efficient and cost-effective mitigation prior to the obsolescence issue affecting weapon system readiness.

## Targeting Process to Identify Deficiency

To address the impact of obsolescence in Army weapon systems, AMC initiated an enterprise-wide Obsolescence Best Practices Integrated Product Team (IPT) in 2014 to identify the most effective and efficient methods to reduce costs on common commercial tools, reduce costs of mitigating obsolete parts, maintain system readiness, and increase obsolescence process efficiencies through knowledge management. With the emergence of Army Futures Command (AFC) in 2018, that effort is now a collaboration between AMC and AFC.

During the IPT review of multiple tools and available processes, AMC decided to adopt 10 Obsolescence Best Practices, which ultimately leverages the Combat Capabilities Development Command (CCDC) Aviation & Missile Center Obsolescence Engineering Branch's methodology.

Army Program Management Offices (PMOs) and Life Cycle Management Commands (LCMCs) utilizing the Combat Capabilities Development Command (CCDC) Aviation & Missile Center (formerly the Aviation and Missile Research, Development and Engineering Center until its move to AFC in February 2019), obsolescence management services have avoided spending significant additional and unbudgeted costs to the Army by implementing a proactive obsolescence management program.

In addition, these PMOs have also been able to reduce backorders due to obsolescence to less than 1% of total backorders. By leveraging common commercial tools across AMC and AFC, and by using CCDC Aviation & Missile Center-developed methodology, the Army is able to reduce the overall cost of obsolescence while also improving readiness across the enterprise. There are four core aspects to the AMC proactive obsolescence management strategy. First, AMC has reduced the overall cost of commercial obsolescence tool subscriptions by submitting a single contract action for each of the tools, as opposed to separate contract actions from each command.

Second, utilizing the centralized Multifunctional Obsolescence Resolution Environment (MORE) database improves efficiency and effectiveness across the enterprise. MORE is a government-owned database used to house obsolescence parts research and mitigations for weapon systems.

The term "parts" includes everything from microelectronics to electromechanical Commercial off-the-Shelf (COTS) items. Many of the hundreds of thousands of parts in the MORE database are used on multiple Army and Department of Defense (DoD) weapon systems. Since the parts research is completed once and dispersed to each affected weapon system within MORE, the manpower required to research the

hundreds of thousands of parts is reduced. Efficiency is also gained by internal controls to automate as much research as possible and by using standardized research processes for research that cannot be automated. An additional benefit of MORE is the cross-platform visibility feature, which allows users to see if a specific part utilized on their weapon system is used on other weapon systems. This provides opportunities for PMOs to potentially leverage previous obsolescence resolutions or collaborate on future obsolescence resolutions.

The third aspect is continuing the AMC Obsolescence Best Practices IPT. No two Army programs are the same; they are in different phases of the life cycle, utilize different types of contracts, have different levels/types of repair, and a variety of mission requirements. Therefore, the obsolescence program manager has to tailor the obsolescence management strategy to the needs of the individual weapon system.

The AMC Obsolescence Best Practices IPT provides the opportunity to share successes, struggles, and facilitates open discussions on how to continuously improve program management for individual weapon systems based on insight from other experienced obsolescence managers. The open communication also allows for continuous improvement for new ideas and methodologies for research, database management, and program management.

Fourth, and finally, is communication and collaboration with the government and industrial workforce across AMC and DoD. The most effective and efficient obsolescence management teams include representatives from multiple organizations within AMC, the PMO, and industry. Within each weapon system the necessary representatives vary, but most include multiple individuals from the LCMC, PMO, prime and subcontractors and/or Army depots, and any other stakeholders based on their specific responsibilities to maintain the weapon system.

The LCMCs are responsible for fielding and sustaining Army weapon systems. The PMO is the single point of accountability for accomplishing program objectives for total life-cycle systems management, and the prime contractors, subcontractors, and/or Army depots are responsible for various aspects of the weapon system's production and/or sustainment.

To ensure the best mitigation at the lowest cost to the government is selected, these representatives need to understand what obsolescence is, why it is important and what can be done to manage it across the weapon system's life cycle. With that thorough understanding, these individuals are able to assess the risk of obsolescence impacts in a timely manner and implement the most cost-effective mitigations.

## Proactive Life Cycle Management

AMC is also an active participant in the DoD obsolescence working group. Participation in the DoD working group allows for Army input into DoD-wide obsolescence management discussions and decisions. This, in turn, provides AMC and AFC the opportunity to leverage obsolescence management experiences and processes from across the entire DoD.

The AMC obsolescence management strategy is designed to identify and mitigate obsolescence issues before the weapon system is impacted while allowing for time to budget affordable mitigations. In turn, this increases the affordability and capability to sustain the Army weapon systems throughout their life cycles.

In virtue of the fast-paced nature of advancing technology, obsolescence will always be a factor in the ability to affordably maintain weapon systems. Through steadfast collaboration and efficient and effective obsolescence management processes, the Army is capable of maintaining its position as the best fighting force in the world. ■



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# JLTV UPDATE: FIELD DELIVERIES RAMP UP

By Program Executive Office, Combat Support & Combat Service Support



JLTVs lined up along the tank trail at Ft Stewart, GA for driver training. (U.S. Army)

Army modernization is rolling forward, as the first Joint Light Tactical Vehicles (JLTVs) arrive in the field.

In January 2019, 1st Brigade Combat Team, 3rd Infantry Division, accepted the first of its anticipated 350 JLTVs from the Joint Program Office, Joint Light Tactical Vehicles (JPO JLTV). Soldiers at Fort Stewart have been busy taking part in new equipment training for both operators and maintainers, giving them first-hand experience with the latest in tactical vehicle technology.

"We are very excited to get these trucks into the hands of our Soldiers," said Col. Mike Adams, 1st Armored Brigade Combat Team commander. "It's an honor to be chosen as the first unit to receive such an improved capability, and I look forward to getting it into our formations."

The deliveries to Fort Stewart represent a significant modernization success for the Army and Marine Corps, as continues on-schedule and on-budget toward replacing many venerable High Mobility Multipurpose Wheeled Vehicles (HMMWV). In doing so, the JLTV will close an existing capability gap in Army and USMC light tactical wheeled vehicle fleets, while providing improvements in the balance of payload capacity, mobility performance, and protection, along with enhanced maintainability, reliability, and network connectivity.

## Beyond Initial Evaluation

The JLTV program entered its Low Rate Initial Production (LRIP) phase in August 2015 with an award to Oshkosh Defense. Since the award, Army and Marine Corps leaders conducted numerous manufacturing assessments, developmental tests, and a Multi-service Operational Test & Evaluation event in 2018 that allowed the services to gain critical feedback from Soldiers and Marines.

### Some primary features of the JLTV:

- Protection similar to the original Mine Resistant Ambush-Protected (MRAP) All-Terrain Vehicle (M-ATV) and substantially greater than the High Mobility Multipurpose Wheeled Vehicle (HMMWV) but in a lighter and more transportable package than M-ATV
- M-ATV-like protected payload capacity
- Connectivity as the first vehicle purpose-built for battlefield networks
- Improved reliability, fuel efficiency, and maintainability
- Transportability by CH-47, CH-53, and inside amphibious transports
- Sustainability designed into the system with integrated driver's smart display unit and vehicle health management systems

## Full Capability Through Partnering

Yet even before production began, the JLTV program set out to improve acquisition processes—and outcomes—with a focus on stable requirements, mature technologies, and maximizing the capability available under an affordability cap. The program actively leveraged consistent industry competition for three different phases. It also worked harnessed the value of teamwork both across the armed services and the many communities involved in science and technology, requirements, resourcing, testing, and program management.

"The JLTV program exemplifies the benefit of strong ties between the warfighter and acquisition communities," said Dr. Bruce Jette, Assistant Secretary of the Army for Acquisition, Logistics, and Technology. "With continuous feedback from the user, our program office is able to reach the right balance of technological advancements that will provide vastly improved capability, survivability, networking power, and maneuverability."

## Further Deliveries on Schedule

The ongoing deliveries at Fort Stewart keep the program right on schedule, following a recent Army Systems Acquisition Review Council to move forward with fielding JLTVs to the 1st Armored Brigade Combat Team, 3rd Infantry Division.

More deliveries are slated across each service in 2019. The Army currently anticipates purchasing 49,099 vehicles, and the Marine Corps more than 9,000 spread across two variants and four mission package configurations: General Purpose, Close Combat Weapons Carrier, Heavy Guns Carrier, and Utility vehicle. ■

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# AMCOM: NEXT-LEVEL LIFE CYCLE MANAGEMENT

The U.S. Army Aviation and Missile Command (AMCOM) continues to improve sustainment and readiness initiatives through advanced materiel supply chain processes.

By Lisa M. Hunter, Army Aviation and Missile Command



Soldiers from Delta Company, 3rd Battalion, 187th Infantry Regiment, 3rd Brigade Combat Team, 101st Airborne Division (Air Assault), fire the TOW missile system during a live fire at Fort Campbell, KY. (U.S. Army Photo by Capt. Justin Wright)

For the past three years, while serving as the Commander of the U.S. Army Aviation and Missile Command (AMCOM), Maj. Gen. Doug Gabram made it his personal mission to increase Army aviation and missile readiness. Daily checks on Army-wide Aviation and Missile readiness rates, checking on the status of industry supply chain parts on hand, production redundancy and leading others to airworthiness solutions that maximized readiness are but a few of the myriad tasks Gabram carried out.

Gabram relinquished command last month after three years at the helm to become the Director For Test, U.S. Missile Defense Agency, but the processes and programs he built improved sustainment and Army readiness.

"We have to be ready to fight tonight," Gabram was fond of saying. "And to do that, our aircraft and our missile systems have to be fully mission capable." An aircraft or missile system that needs a part to make it fully mission capable is dependent on the supply chain to deliver that part. Building supply chain depth – and the resulting Army readiness it brings – is the legacy Gabram left behind when he relinquished command, February 14, 2019.



## Full-Mission Global Support

AMCOM develops and delivers readiness to Soldiers and joint warfighters around the globe. AMCOM and the units under its operational control ensure that Army Aviation and Missile capabilities – which support nearly every Army operation across the globe – are available to meet the combatant commander's requirements, wherever and whenever needed.

In terms of Army commands, AMCOM is a relatively young organization stood up in July 1997, merging the Army's missile and aviation life-cycle management commands. The organization grew in 1998 when AMCOM assumed operational control of Corpus Christi Army Depot and Letterkenny Army Depot. Then, in 2003, AMCOM assumed operational control of all aviation logistics management functions at Fort Rucker, Alabama. The Aviation Center Logistics Command was formally activated on Aug. 5, 2004 to provide quality aviation sustainment, logistics and materiel in support of the U.S. Army Training and Doctrine Command training mission at Fort Rucker; Fort Bliss, Texas; Fort Benning, Georgia; Fort Huachuca, Arizona; and Fort Sill, Oklahoma.



In 2005, AMCOM joined with PEO Aviation and PEO Missiles and Space to form the Aviation and Missile Life Cycle Management Command, the first life-cycle management command, which provides integrated engineering, logistics and contracting support to more than 90 major support systems.

Gabram assumed command Feb. 18, 2016. Under his watch, AMCOM established several processes that represented a departure from just-in-time maintenance logistics the Army had defaulted to over the past 15 years: The first-ever AMCOM Campaign Plan, identifying the need and solutions for building supply chain depth; and engaging with industry partners to eliminate single points of failure and increase production, just to name a few.

One of the first initiatives was to develop a comprehensive command plan, a framework to ensure capabilities are aligned with the required outputs to the Army. AMCOM's Campaign Plan, developed in the spring of 2017, weaves the critical core competencies into effective, output-driven lines of effort. These lines of effort serve as a roadmap to enable readiness, support the future force and provide trained, resilient and ready employees who are focused on delivering key outputs for the Army.

"We are focusing on near-term priorities and requirements, but keeping in mind that we are supporting an ever-evolving Army," Gabram said. "AMCOM will ensure that our time, money, workload and initiatives are focused on operational outcomes."

The campaign plan laid out AMCOM's four main lines of effort. The first, "Sustainable and Materiel Readiness," supports the Chief of Staff of the Army, Gen. Mark Milley's, top priority, readiness. "We will always be ready to fight today, and we will always prepare to fight tomorrow," Milley wrote in his initial message to the Army, in September 2015.

"This LOE is focused on our strategic, operational and tactical sustainment goals," Gabram explained. "It includes initiatives such as optimizing the supply chain, optimizing depot performance and divestment of excess materiel."

The second LOE, "Future Force," addresses agile sustainment across the system life-cycle, as well as developing and executing Army investments in future force capabilities. The relationship and information sharing between AMCOM, PEO Aviation and the Future Vertical Lift Cross Functional Team (FVL CFT) is just one example of how AMCOM, as a life-cycle management command, is coordinating with other units to ensure future aviation platforms are sustainable.

The third LOE is the "Human Dimension." "We are only as effective as each individual member of our workforce," Gabram said. "We are investing in developing and retaining a workforce of excellence, an adaptable team of professionals." The command is comprised of more than 7,800 civilian and military employees. The majority are stationed at Redstone Arsenal, but AMCOM has employees stationed across the globe. The command worked hand-in-hand with the civilian career managers and military leaders to develop and implement several development programs to help employees grow professionally. "Our goal is to build flexible and adaptive leaders and multi-skilled Soldiers and civilians," Gabram said.

The fourth LOE is "Resource Management." "Everything revolves around our resources," Gabram said. "The command always did a good job of presenting the quantitative money requirements, but we weren't doing a good job of outlining the quantitative requirements. We weren't answering the 'Why.'" AMCOM shaped the internal organizations, financial resources and priorities so that we had the right outcomes at the right time and the right cost for our Warfighters. The command now is able to show a direct correlation between AMCOM's outputs and operational impacts.



An AH-64 Apache attack helicopter assigned to 2nd Squadron, 6th Cavalry Regiment, 25th Combat Aviation Brigade, 25th Infantry Division, flies during gunnery qualification on Schofield Barracks, HI. The AH-64D/E Apache helicopter is a twin engine, tandem seat, aerial weapons platform capable of performing attack, movement to contact, reconnaissance, and security operations. (U.S. Army photo by 1st Lt. Ryan DeBooy)

## Renewed Focus on Logistics

The AMCOM team also took a hard look at every aspect of sustainment, specifically strategic depth in the supply chain.

"We are planning for a near-peer engagement and we have to think about how do we get to strategic depth [in our supply chain] so we can take that punch," he said.

Gabram often spoke of the "Art of the Probable." The term refers to making progress and moving on rather than being driven to complete immobility by the desire to be perfect. It turned out to be an effective approach in sustaining materiel readiness and, more specifically, working toward strategic depth in the supply chain.

To better deliver readiness and improve materiel availability to Soldiers on current Aviation and Missile platforms, AMCOM developed a systematic approach in order to meet future requirements.

"We are not just chasing parts anymore. We are building processes and partnerships to achieve strategic depth," Gabram said. "We have developed an action plan for each task."

The AMCOM leadership planned and holds regular meetings with the original equipment manufacturers to ensure that industry members are using quality, speed and accuracy in delivering parts to the Army.

Gabram also looked inside his formation for solutions, one of which was empowering the more than 190 AMCOM Logistics Assistance Representatives (LARs) who support Army units around the world. These representatives are subject matter experts on various pieces of Army equipment who work in motor pools, hangars, maintenance shops and offices across the Army, including combat zones. At the unit-level, commanders and Soldiers count on LARs to help produce readiness, identify problems and assist with maintenance resolutions. LARs give commanders the technical guidance to identify, report and resolve logistics issues that could have an adverse effect on logistics readiness. That support includes supply availability, maintenance, transportation, personnel systems and doctrinal issues, among others. AMCOM's LARS provided reachback that increased readiness at the AMCOM Logistics Center and saved the Army millions of dollars.

"Looking back, as a field commander at multiple levels during many deployments, I never worried about parts. They were always there. I didn't truly understand what was behind the supply chain. Now I do. I'm always asking: 'Do we have the right parts in depth on the shelf to sustain ourselves in a near-peer conflict?'"

"For more than 15 years, we've been operating on a just-in-time basis. We must have depth and predictability in our supply chain to anticipate our Soldiers' needs in a large-scale combat operation. A combat environment against a near-peer competitor will be much different than today's conditions and it might occur at the same time we are conducting our current operations. To strengthen our position, we have identified key readiness drivers for every one of our aircraft platforms and missile systems."

AMCOM Logistics Center personnel identified the top readiness drivers for all of AMCOM's Aviation and Missile platforms, and defined sufficient stock on hand. A readiness driver is a critical repair part that will deadline a system and is essential for equipment operation. AMCOM defines sufficient stock to be three times the average monthly demand with no backorders over 30 days. Identifying and stocking the readiness drivers are a means of prioritizing how to go after the goal of supply availability. Identifying the top 10 readiness drivers was a major initiative toward building supply availability.

### Looking Ahead

These are just some of the initiatives that Gabram spearheaded during his three years as commander. The AMCOM team continues to ensure Aviation and Air Defense Artillery units are not only prepared for the current and future combat operations, but are configured appropriately to be sustained for the duration. The Army must have a robust supply chain that can endure and respond to a complex,

rapidly evolving, strategic landscape. As Gabram often pointed out, "a combat environment against a near-peer competitor will likely be characterized by surging supply chain demands, interrupted lines of communication and extended expeditionary operations." Supply chain depth enables AMCOM to anticipate and quickly respond to surges in materiel demand due to spikes in operating tempo.

The AMCOM team represents the major spoke of the Aviation and Missile enterprise. AMCOM has continued to support Soldiers every day through its two depots, field maintenance sites, calibration support elements, installation maintenance activities, security assistance, training center support and much more.

Great organizations adapt and fight the enemy, not the plan. AMCOM, in coordination with the Aviation and Missile Enterprises and industry partners, has made great strides in improving readiness. AMCOM is shaping the fight and setting conditions to remain flexible and successful. Those efforts are changing the way AMCOM sustains readiness.

"As the Chief of Staff of the Army makes a ready and modern Army his top priority. AMCOM will provide that readiness," Gabram said "I have a great sense of satisfaction in seeing the programs we built here at AMCOM," Gabram said. "The Command has and continues to posture itself for the future, enabling readiness to meet the emerging global requirements of the joint force. The world-class logistics and sustainment AMCOM provides was not built overnight. It was built through the hard work and dedication of the entire AMCOM team."

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By Anita Olsen, INVISIO Communications



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INVISIO Communications Inc is proud to support the U.S. Army's Tactical Communication and Protective System (TCAPS) program as well as the Security Force Assistance Brigades (SFABs) with advanced hearing protection and improved situational awareness. INVISIO also services various U.S. Special Forces components with customized systems to meet their demanding requirements with radio and intercom integration capabilities. Many other Defense Departments, Federal agencies, and law enforcement departments utilize INVISIO products. The organization is continuously growing and is comprised of operational subject matter experts – veterans with various military and law enforcement backgrounds. We work closely with radio manufacturers and industry partners to provide seamless system integration. "We firmly believe in the importance of new equipment training; ensuring our warfighters are properly fitted and knowledgeable of their equipment," emphasized INVISIO CEO Ray Clarke. "INVISIO recognizes how hearing protection and hearing enhancement are critical in all tactical environments; training and combat. It is imperative that we continually strive to reduce the hearing loss experienced by our veterans." ■

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## FUTURE VERTICAL LIFT “ECO-SYSTEM”: MODERN-BATTLE READY

The U.S. Army's Future Vertical Lift (FVL) program will provide a family of vertical lift platforms that deliver next-generation capabilities and address aviation capability gaps against future peer and near-peer adversaries. All that in a survivable and lethal package.

By Lt. Col. Eddy J. Lee, Deputy Chief of Operations, Future Vertical Lift Cross-Functional Team, Army Futures Command



The Future Vertical Lift Cross-Functional Team is currently focused on four efforts: Future Attack Reconnaissance Aircraft Capability Set 1, Future Long-Range Assault Aircraft Capability Set 3, Modular Open System Architecture, and Future Unmanned Aircraft System. Cross-cutting these efforts are the qualities of survivability, lethality, sustainability, and mission command. (U.S. Army)

Non-permissive environments characterized by expanded adversarial areas of influence made possible by longer range, more precise detection, tracking, and engagement systems, high levels of competition within the cyber and information domains, and the emergence of highly sophisticated manned and unmanned systems trolling the battlefield evoke an image of future warfare that significantly raises alarm due to added battlefield complexity and a corresponding need for modernization. Ultimately, warfare is already complex as it is, dealing with future complexity is the challenge.

The impetus to search for that next pre-paradigmatic advancement in warfare to add to our body of knowledge as a ground force and overall military is alive and well within Army Futures Command (AFC) and its Cross-Functional Teams (CFTs). This is evident through on-going efforts to develop Multi-Domain Operations concepts and innovative material solutions to address the challenges of tomorrow's battlefield. AFC leads the Army's future force modernization enterprise. The Command assesses and integrates the future operational environment, emerging threats, and technologies to develop and deliver concepts, requirements, future force designs, and material solutions to address the U.S. Army's modernization needs.

The Army initiated a realignment of modernization responsibilities in October 2017. This involved the establishment of a pilot program consisting of eight CFTs, one of which is the Future Vertical Lift Cross-

Functional Team (FVL CFT). CFTs are now in full swing developing warfighting requirements, informed by experimentation and technical demonstrations, through teaming and rapid feedback from within Government, Academia, and Industry.

### Lines of Effort

The FVL CFT is currently focused on four efforts: Future Attack Reconnaissance Aircraft Capability Set 1, Future Long-Range Assault Aircraft Capability Set 3, Modular Open System Architecture, and Future Unmanned Aircraft System. Cross-cutting these efforts are the qualities of survivability, lethality, sustainability, and mission command.

Future Attack Reconnaissance Aircraft Capability Set 1 is a light-weight and small scout aircraft which the U.S. Army will employ for the purpose of reconnaissance, security, and offensive operations against peer or near-peer competitors in contested and adverse conditions, including difficult terrain and dense urban environments. This aircraft will provide a marked increase in speed, range, survivability, lethality, and sustainability over current and past U.S. Army rotorcraft due to a “clean-sheet” design and recent advances in technology.

Future Long-Range Assault Aircraft Capability Set 3 is the next-generation assault and medical evacuation aircraft that integrates



new technology, materials, and designs to increase speed, range, and payload. Both the Future Attack Reconnaissance Aircraft and the Future Long Range Assault Aircraft will provide the reach necessary to rapidly employ much-needed aviation capability to forward areas from positions of relative sanctuary.

FVL platforms will integrate a common “Digital Backbone” across multiple platforms to provide rapid integration of advancing technologies to reduce the time it takes to field and employ cutting-edge capabilities. Development of a modular open system architecture for FVL platforms will enable us to outpace future adversaries.

Future unmanned aircraft systems are the next family of unmanned aircraft systems optimized for denied, degraded, and contested environments. Future unmanned aircraft systems include advanced unmanned aircraft systems, Air-launched effects, and future munitions. Air-launched effects consist of an air or ground launched quiver of effects which include advanced sensing, kinetic, non-kinetic, or electronic warfare capability to detect, identify, locate, report, share, decoy, disrupt, or destroy in support of aviation maneuver. Future munitions consist of longer-range precision-guided munitions for the purpose of providing aviation formations with maximum stand-off against high pay-off and high value targets. These systems are focused on enhancing survivability, lethality, and advanced teaming within the Future Vertical Lift “Eco-System.”

## The “Eco-System”

The Future Vertical Lift “Eco-System” presents cutting-edge implications for future aviation employment and quite possibly maneuver warfare itself. The theoretical underpinning of the Future Vertical Lift “Eco-System” resides in army aviation advanced teaming concepts. Advanced Teaming is the coordinated effort of multiple manned systems, unmanned systems, and battlefield effects to accomplish the full range of multi-domain tactical and operational missions within denied, degraded, and contested environments with enhanced and distributed situational awareness, improved survivability, and greater lethality. Longer range, faster, and more capable Future Vertical Lift platforms such as the Future Attack Reconnaissance Aircraft, teamed with a network of multiple heterogeneous agents such as advanced unmanned aircraft systems, air-launched effects, and/or future munitions will form the basis of the Future Vertical Lift “Eco-System” capable of operating on exterior lines, quickly massing, penetrating denied, degraded, and contested environments, and rapidly exploiting a salient created in the enemy’s defense.

Manned-unmanned teaming (MUM-T) is highly useful for warfighters but is a concept that must evolve. No military force has as much experience fighting manned and unmanned platforms in tandem than the U.S. Army. MUM-T pairs a manned aircraft such as an AH-64 Apache with an unmanned, remotely controlled aircraft such as a RQ-7 Shadow. Levels of interoperability to manned crew-stations within the AH-64 Apache include everything from Video Down-Link feed from the Shadow to control of the actual Shadow sensor to control of the Shadow itself. This capability provides unique tactical advantages for commanders by enhancing key attributes required to conduct tactical enabling and offensive operations. Key attributes include surprise, protection, extended station-time, and making initial contact with the enemy with the smallest force possible. However, MUM-T, with its one-to-one correlation between manned and unmanned systems, or in the example previously

mentioned, one-to-one correlation between a single AH-64 Apache and a single RQ-7 Shadow, limits an Aviation formation’s capability to mass its unmanned platforms and expand its areas of influence. A single unmanned aircraft can only influence so much.

## Automation Critical to Future Warfare

The Future Vertical Lift “Eco-System” moves beyond the limitations of one-to-one correlation offered by MUM-T and exploits a one-to-many correlation offered by advanced teaming. The revolutionary nature of the Future Vertical Lift “Eco-System” resides in a game-changing capability offered by connecting a Future Attack Reconnaissance Aircraft to a heterogeneous network of multiple remotely controlled or automated unmanned platforms. The development of this capability is unprecedented and has particular application to our emerging Multi-Domain Operations concepts and doctrine. A permutation of the Future Vertical Lift “Eco-System,” in line with our Air-Ground Operations tradition, which offers even greater capability in the future is a networked formation of manned and unmanned air and ground vehicles connected to fully autonomous unmanned air and ground platforms. The tactical and operational advantages offered by employing the Future Vertical Lift “Eco-System” include all the advantages of MUM-T plus the capability to rapidly synchronize and converge what would otherwise be the activities of disparate unmanned platforms, to include electro-optical/infrared reconnaissance and Electronic Warfare activities, into a singular effort aimed at penetrating a contested area, testing the enemy’s defenses, and establishing conditions to exploit an enemy seam or gap all while enhancing a tactical commander’s ability to dictate the terms of human contact with the enemy. The Future Vertical Lift “Eco-System” consisting of the Future Attack Reconnaissance aircraft, advanced unmanned aircraft systems, air-launched effects, and future munition is the Reconnaissance-in-Force formation of the future will provide aviation formations, in support of ground maneuver elements, the capability to rapidly task organize, or coalesce and splinter, in order to adapt to and operate effectively within what we consider today as the highly dynamic and ultra-competitive battlefield of tomorrow.

## Integration within a Proven Force

FVL CFTs, other CFTs, the HQDA G-2 Intelligence, Surveillance, and Reconnaissance Task Force, and the Army Futures Command Artificial Intelligence Task Force and are working in concert with other branches of the military, government partners, academia, and industry to materialize this innovative approach to army aviation employment and maneuver warfare. Many historians argue that we never got it right and that we will never get it right preparing for the next war. Conversely, preparing for warfare, modernizing, and enhancing combat readiness are military virtues with far-reaching effects. Efforts to prepare, modernize, and train will bear fruit on other battlefields. For example, training and modernizing for combat operations in the Fulda Gap manifested itself in combat operations during Desert Storm when we were able to liberate Kuwait in only 100 hours. We may never get it exactly right preparing for the next immediate war but, at least within the mind of every warfare practitioner, preparation takes us favorably into the future regardless of who our adversaries are. The Future Vertical Lift “Eco-System” will undoubtedly take us into the future and prepare us for the complexities of future battle. ■

## SUSTAINING MISSION SUCCESS THROUGH THE LAST TACTICAL MILE

*Rear Adm. Michelle C. Skubic became Commander, U.S. Naval Supply Systems Command (NAVSUP) and 48th Chief of Supply Corps on July 13, 2018. Her operational assignments include: division officer in readiness and services billets, aboard USS Acadia (AD 42), which included deployment for Operations Desert Shield and Desert Storm; supply officer aboard Precommissioning Unit (PCU) McFaul (DDG 74), built in Pascagoula, MS; and supply officer aboard PCU George H. W. Bush (CVN 77), built in Newport News, VA, which was commissioned to the fleet in January 2009. Additionally, she completed a tour forward-deployed as commander, Defense Logistics Agency Support Team in Kuwait, where her team, in concert with other DLA activities, supported U. S. Central Command, U. S. Army Central, and other DoD organizations.*

*Rear Adm. Skubic's shore assignments include: services officer and carrier readiness officer at Commander, Naval Air Force, U.S. Pacific Fleet, San Diego; combined bachelor quarters officer and aviation support division officer, Naval Air Station Sigonella, Sicily; deputy department head for program contracts, Naval Air Systems Command at Patuxent River, MD; deputy force supply officer, Commander, Naval Surface Forces, San Diego; director of supplier operations, DLA Aviation, Richmond, VA; commanding officer, Naval Supply Systems Command (NAVSUP) Fleet Logistics Center Norfolk, VA; chief of staff, NAVSUP, Mechanicsburg, PA; director, Logistics, Fleet Supply and Ordnance, U.S. Pacific Fleet, Joint Base Pearl Harbor-Hickam, HI; and commander, DLA Land and Maritime, Columbus, OH.*



**RADM Michelle C. Skubic**

Commander  
Naval Supply Systems Command  
Chief of Supply Corps

*Armor & Mobility spoke with RADM Michelle Skubic, Commander, U.S. Naval Supply Systems Command (NAVSUP), regarding current efforts to bridge gaps associated with timely re-supply of Fleet operations supporting response on a global scale.*

**A&M: Could you give us a look at today's NAVSUP mission and why it is so vital to present day Fleet operations?**

**RADM Skubic:** Naval Supply Systems Command (NAVSUP) is a critical logistics and sustainment enabler for our Navy and Joint warfighters. We are a 22,500-member strong organization made up of active-duty and reserve officer and enlisted personnel, civil servants, and contractors who provide supplies, services, and quality-of-life support to the Navy and Joint warfighter. NAVSUP Headquarters is an Echelon II command located in Mechanicsburg, PA, and oversees a global enterprise of 11 subordinate commands. NAVSUP Weapon Systems Support (WSS) is primarily responsible for Supply Chain Management of weapon systems repair parts. Our eight NAVSUP Fleet Logistics Centers (FLC) are NAVSUP's "Face to the Fleet," globally-positioned to provide customer support to our operational forces. NAVSUP Business

Systems Center (BSC) provides business solutions through information technology/information management. Finally, Navy Exchange Services Command (NEXCOM) is our quality-of-life provider, managing 300 retail locations worldwide, over 180 ships' stores, 39 Navy Lodges, the Navy's Uniform Program Office and the Navy Clothing and Textile Research Facility.

Our officers and enlisted personnel stand shoulder-to-shoulder with the warfighters, serving on and deploying with operational units and ensuring their unique maritime, aviation, and expeditionary requirements are understood and met. These deployed personnel are sustained by the broader NAVSUP family through material tracking/expediting/delivery, and support for contracting, Logistics Information Technology (LogIT), postal services, food service, quality-of-life services, and associated policies.

NAVSUP's global reach helps us provide the vital and sometimes most difficult "last tactical mile" support to our deployed units. NAVSUP commands are positioned across the country and around the world to ensure our units have weapon systems that are fully mission capable. We are a geographically-dispersed organization; co-located with customers and stakeholders, and aligned with numbered fleets



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and regional commanders. We also have the unique capability to translate and integrate Navy requirements across many different organizations within the Department of Defense to ensure our warfighters have what they need to successfully complete their assigned missions.

**A&M: Although the NAVSUP reform initiative had been started before you assumed command, could you explain the reasons for it and its goals? What are your plans to continue those reform efforts?**

**RADM Skubic:** NAVSUP launched its reform program in April 2017 to improve business processes in response to the Secretary of Defense's call to action to increase readiness and lethality. The strategic and operational environments are changing, and NAVSUP must also change to continue to meet the fleet's needs in two ways: (1) increasing customer demands require us to increase our capabilities to meet them, and (2) NAVSUP services need to adapt to advances in digital customer service and elevated technological capabilities. NAVSUP is reforming to enhance our unique capabilities, which, in turn, allow us to be better positioned to support our customer as the Navy's leader for supply chain management.

Starting with a customer focus, our planners interviewed and surveyed our customers across all levels to understand their concerns, pain points, and how to improve partnering. We used this initial input to develop our reform focus areas.

The reform program is structured around five core pillars focused on essential areas for change, plus four key enablers that span the core pillars to support and drive change throughout NAVSUP. The five core pillars are: (1) Responsive Contracting, designed to increase the speed and productivity of acquisition; (2) Forecasting, focused on enhancing predictions and use of forecasts to improve the speed and reliability of weapon systems spares support; (3) Customer Presence, redefining how we partner with our customers; (4) Strategic Supplier Management, increasing long-term arrangements and relationships with suppliers to improve supplier performance and collaboration; and (5) Integrated Logistics, focusing on the end-to-end supply chain visibility and enhanced last tactical mile support. There are four key enablers supporting these pillars; they are (1) Digital Accelerator, providing new digital tools and improving data insight; (2) Enabling New Era Workforce, enhancing the workforce to support and sustain reform efforts; (3) Audit, providing transparent and consistent processes and results; and (4) Driving Reform, communicating and facilitating the change.

NAVSUP's reform program will improve our support to customers and increase readiness and responsiveness. As we continue on our 18-month timeline, we have launched new initiatives under each of our core pillars to improve performance, and hold ourselves accountable to targets.

As we enter into the fourth quarter of reform, we are continuing the momentum by expanding our Customer Presence pilot to improve communications and transparency with our customers, increasing efforts focused on supplier engagement, and supporting cross-functional teaming across the enterprise to support the end-to-end supply chain process.

**A&M: Are there any examples of goals or significant milestones the command has recently reached?**

**RADM Skubic:** After the first months of NAVSUP's reform program, the effort is showing significant value and results. In contracting, initial efforts focused on implementing a cross-functional pod structure to

speed the requirements definition process to get material on contract for repair faster. The pods, as designed, quickly elevate roadblocks to speed solutions to the customer.

The Digital Accelerator team developed a minimum viable product (MVP) technology solution in just a month to support cross-functional teams of contract specialists, planners, and equipment specialists. This new application allows pod members to complete a digital purchase request checklist to ensure a 'clean' requirement is passed to buyers to start the process of getting material on contract. Application updates are in process and continue to be rolled out to support additional functionality.

A Strategic Supplier Management team, focused on readiness recovery, is using a new operating cadence and tools within the F/A-18 Integrated Weapon System Team (IWST) to reduce the number of items degrading fleet readiness. Planners own the process, engage suppliers and hold them accountable for improving their performance. The efforts have resulted in an eight-month improvement of 'get-well' dates for the F/A-18 servo cylinder, a component holding down 28 aircraft.

In the Forecasting pillar, planners were empowered with a streamlined planner override policy that standardizes the process for overriding system data, resulting in more accurate forecasts for 300 components. Another effort identified cycle time nodes that were missing from the Navy Enterprise Resource Planning (ERP) financial system, and added this additional repair time, which will result in more timely repair actions and increased fill rates.

**A&M: Sustaining the fleet and providing supply support services for the Navy is undoubtedly an enormous task. What particular challenges does NAVSUP face in carrying out that mission?**

**RADM Skubic:** One of our biggest challenges is supporting weapon systems that are in service over many decades, sometimes well beyond their originally intended life span, while also making sure the industrial base is able to support our needs. NAVSUP is the lead supply support provider in Navy's Title 10 mission to man, train and equip. Sustaining the fleet by providing supply support in the most efficient and effective way is what our nation demands of us. Because NAVSUP does not own the supply chain from end-to-end, we work hand in hand with our partners, such as DLA and others, to solve complex sustainment challenges. Navy Supply Corps officers interspersed throughout Navy and Joint commands provide a network of supply support experts who play a vital role as they integrate the supply chain.

Our ability to effectively partner and develop sustainment solutions with DLA enables the Navy's success. I've been fortunate to serve within the DLA enterprise on two occasions, at DLA Aviation in Richmond, VA, and in command at DLA Land & Maritime in Columbus, OH, and will always encourage our Supply Corps officers to seek similar assignments.

The largest life-cycle costs of a new weapon system are in the sustainment period. Making the correct logistics investments earlier in the acquisition process can save millions of dollars in the future as a system's sustainment period can last as long as 30-40 years. NAVSUP works with partners and stakeholders, like NAVSEA and NAVAIR, to help design the support for our platforms and weapon systems, not just support the design. This is why it is vital for NAVSUP team members to be involved early on in the logistics planning efforts and ensure proper future logistics and sustainment support. This is a



critical factor in providing warfighters the parts they need at an affordable cost, especially when they will need them for decades to come.

We also need to ensure our support strategies are able to adapt to evolving technologies. As we move toward a future where additive manufacturing (3D printing) capabilities can produce military specification (MILSPEC) grade components, we need to have reliable access to technical data to take advantage of this emerging technology's potential to enhance supply chains. New technologies have the potential to unlock incredible ways to support our warfighters faster and more efficiently. We must aggressively explore these opportunities and work to adapt them to enhance Navy logistics and sustainment support and, ultimately, improve readiness and lethality.

**A&M: As the Commander, NAVSUP and Chief of Supply Corps, do you have any special goals you would personally like to see accomplished in the command and the corps?**

**RADM Skubic:** The NAVSUP enterprise has a global reach to deliver the materials warfighters require for their aircraft, ships, and submarines and their associated weapon systems to fight tonight and sustain tomorrow. Combined with the Supply Corps, NAVSUP has a substantial opportunity to strengthen every corner of the Navy. My goal at NAVSUP is to challenge everyone to have an operational and enterprise mindset. It is particularly important that we have this mindset since NAVSUP Headquarters assumed responsibilities closer to the fleet with the disestablishment of NAVSUP's Global Logistics Support (GLS) Command. We need to be more operationally focused as we work arm in arm with the Fleet Logistics Centers and the teams that support the warfighter each and every day. The more our capabilities are understood by everyone across the NAVSUP enterprise and Navy, the better we will be able to support the warfighter.

Another of our goals for the Supply Corps is for junior officers to fully understand where they fit into the larger picture of Navy and Joint force logistics. One of the ways we will accomplish this goal is by developing a course for Lieutenant Commanders that focuses on force development, the optimized fleet response plan, acquisition, the integrated supply system, ethics and strategic thinking. We are currently working with Center for Service Support (CSS) to develop the course that the Navy Supply Corps School (NSCS) will deliver to our officers. Topics that blend technical issues with broad leadership principles are critical in developing future Supply Corps leaders.

**A&M: Any final thoughts?**

**RADM Skubic:** My focus will always be to ensure our supply community efficiently and effectively does its part to support fleet readiness and lethality, while remaining postured to sustain the fight. Enhancing fleet readiness, continuing NAVSUP's reform efforts, improving our auditability, and taking care of our people are my priorities as we execute the mission.

We share the Navy's sense of urgency, and the risk of inaction is great. What we do today and tomorrow will impact the Navy for decades to come. We are boldly challenging ourselves and reforming to increase the speed of delivery. We are uniquely poised to improve the readiness and lethality of our Navy and Joint forces, and we are adapting to become better, more data-informed, managers of risk.

Auditability is important as it directly supports our readiness by exposing risks and challenging our current operating assumptions. Inventory accuracy is at the heart of what we do as supply chain man-

agers, and the Navy is looking to us to solve these challenges ... and we will. Audit provides transparency and assurance that we are using the taxpayer's dollars appropriately and efficiently. Reform and audit will complement one another as we improve our business processes.

Our most remarkable asset remains our people, and we must challenge and take care of our Navy supply teams around the globe with the right culture, right training, and right focus. We rely on our supervisors to proactively develop our future enterprise leaders. Together, we will manage a culture of integrity and trust, allowing fearless conversations both about organization and employee performance, and embracing innovation. Our people do outstanding work every day in support of the Navy and our warfighters, and we must recognize and celebrate their accomplishments.

NAVSUP has a long history of solving complex, logistical problems, and we will continue to step forward as the trusted agent to those counting on us to not only succeed, but excel. We will always be ready to serve, ready to sustain the fight, and "Ready for Sea."

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# SM-3: ADAPTING TO THE EVOLVING THREAT

Raytheon Company's evolving 65 plus-year-old Standard Missile-3 is bigger, more capable, and most importantly, more versatile to address intelligent threats.

By Dr. Mitch Stevison, Vice President, Raytheon Strategic and Naval Systems

Ballistic missile threats continue to advance, and in the same way, the Standard Missile-3 is evolving with the help of innovative engineering. A “crawl, walk, run” development approach that builds on proven systems has created an unparalleled ballistic missile killer. It destroys short-to-intermediate range ballistic missiles in space by colliding with its target – like hitting a bullet with a bullet. The SM-3 is the only missile in existence today that can be launched from a ship at sea or from land, offering extraordinary versatility to the warfighter.

## Threat-Targeted Evolution

Over the years, the SM-3 has flexed its muscle in dozens of flight tests from both land and sea, which are designed to test



the full capacity of the missile in real-life scenarios. The latest variant – the SM-3 IIA – has larger rocket motors and a bigger, more capable kinetic warhead that permits rapid engagement of threats. Complementary to its earlier variants, the SM-3 IIA's enhanced

range allows it to travel further, protect larger regions, and reach velocities much faster than the speed of sound. The SM-3 IIA will join its earlier variants on U.S. Navy and Allied ships and in European land-based sites.

A series of significant testing marked a banner year for SM-3 in 2018, particularly for the IIA. The variant completed its second and third successful intercepts last year, in addition to demonstrating the first intercept from a land-based launch and the first intercept of a sophisticated intermediate-range ballistic missile target. It also accomplished its first intercept using tracking data from remote sensors, known as “engage on remote.” Raytheon's missile defense solutions continue to expand the defended area by protecting against increasingly sophisticated threats with the use of remote sensors like the AN/TPY-2 radar.

The newest variant works in concert with the SM-3 IB to provide a layered missile defense shield against ballistic missile attacks. The SM-3 IB also made waves in 2018 when Japan tested it for the first time, intercepting a target off the coast of Kauai. The test marked a significant milestone in missile defense cooperation between Japan and the United States.

The evolution of the SM-3 family, and others that Raytheon produces, is intentional. The rapid development of technologies is only able to occur when you have a robust base of engineering, production, and testing expertise to build upon – a more than 60-year legacy makes a solid base.

Few missiles are started from scratch. Over the years, we've taken the best components of the best systems to create versatile powerhouses like the SM-3. The program has leveraged lessons learned during years of testing and stacked up more than 30 intercepts in space. ■



A Raytheon Company SM-3 Block IIA missile completed its third successful intercept of a ballistic missile target in December, 2018. The test marked the variant's first intercept from land, the first intercept of an IRBM, and the first “engage on remote.”

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# DLA STRATEGIC MATERIALS: PROMOTING HOME-GROWN RESUPPLY

Since just before World War II, the U.S. has acquired and stored critical metals, minerals and agricultural supplies to reduce the nation's dependence on foreign sources in national emergencies. To supply those materials, the Defense Logistics Agency Strategic Materials Team provides safe, secure and environmentally sound sources, working with DLA's Information Operations Research and Development Team.

By Dianne Ryder, Defense Logistics Agency



Tinker Air Force Base, OK, sends its excess used engine parts to DLA Strategic Materials at Hammond Depot, Hammond, IN, through the Strategic Materials Recovery and Recycling Program. Super alloys are then stripped from the parts. By recycling parts, the government doesn't have to invest in new materials, saving the taxpayer millions of dollars. (Photo by Nutan Chada, DLA)

"The U.S. National Defense stockpile and R&D fall under the Strategic and Critical Materials Stockpiling Act," said Brian Gabriel, Chief, DLA Strategic Materials Planning Branch. "Essentially, we are [the Department of Defense's] agency for looking at raw material supply chains during conflicts." There are potential vulnerabilities in the supply chain, and his team understands the risks of relying heavily on foreign manufacturers for raw materials.

"There are about 200 materials on the strategic materials 'watch list,'" noted Gabriel.

"The old saying is, we go from A-Z — aluminum to zinc. When we do our primary analysis, which runs in a two-year cycle,

we're running about 100 materials through our economic analysis — which is a lot of materials for our small teams to cover. There are recycling and reclaiming authorities for strategic and critical materials that allow DLA Strategic Materials to work with domestic industry to qualify substitutes," he said.

Gabriel explained these are new authorities granted in recent National Defense Authorization Acts, specifically in a 2017 bill. "On programs where we see a supply chain risk from our analysis team, we don't necessarily see stockpiling as the ideal solution right now. We've been working with R&D to do more novel risk mitigation programs."

## Domestic Solutions

One of the team's biggest challenges is gaining dominance over foreign manufacturing of rare-earth materials.

"One thing that comes up constantly is the issue with rare-earth elements — the rare-earth market itself is heavily dominated by [foreign nations that] have good mineral endowments," Gabriel said. "We can create some domestic production or get some alternative to those ... materials into the DoD supply chains that adds to the robustness or resiliency of those supply chains."

It's a high-visibility area because of the interest in materials where there is a known foreign reliance issue, he said. "There's a big push within the executive branch as a whole to try to make the U.S. more self-sufficient," Gabriel added. "We've had to participate on two executive orders — one related to the overall defense industrial base, another specifically on critical minerals for all the government agencies to collaborate on. Federal officials are also seeking solutions before the issue becomes big enough to hurt U.S. jobs."

"They're looking for policy changes that will [reduce foreign reliance] in the long term. But resolving these overall economic large market issues takes a lot of time," he said. "These things move in cycles, [but] there's been a lot of movement in the rare-earth market and new technologies. I think the market is looking better for that particular material for domestic production in the next couple of years."

DLA's carbon-fiber project has been particularly successful. Carbon fibers are used in satellite applications, and in the past, foreign manufacturers who produced technically advanced carbon fibers held the monopoly on those materials. "While DLA doesn't have the resources or the mandate to set up its own factories, the agency can and has set up smaller-scale projects like carbon fiber production," said Matt Hutchens, DLA's R&D program manager. "We started



Workers excavate a site at Urban Mining Company's facility for manufacturing neodymium/iron/boron magnets in San Marcos, TX. (Photo courtesy of Urban Mining Company)

[the project] because there was a supply risk with foreign, ultra-high-modulus carbon fibers used on satellite structures," he said. "There was a domestic product that became available and the folks that build the satellite structures needed to qualify it at a materials level."

The fibers produced by the domestic companies looked comparable to or even better than the foreign fiber, Gabriel said. "After the domestic

company fully qualified the materials, it was able to create designs based on the domestic fibers."

## Collaboration and Innovation

One goal in partnering with R&D is to set up a program that will spark domestic recycling capabilities for rare-earth elements. "Instead of mining them, which is difficult in the U.S., we can use waste streams," said Gabriel. A waste stream is the complete flow of waste from domestic or industrial areas to final disposal. Recycling lessens the content of a waste stream as it moves down the line.

Vaibhav Jain, a DLA Strategic Materials materials engineer, talked about other difficulties with mining. "To start a new mine, especially in the U.S., is so expensive," he said. "The whole process takes 10-15 years." Jain explained that it's easier to work from existing mines already in production. "One of the contracts we have found is [with] Rio Tinto — they have a copper smelting process in Utah," he said. Smelting is the process of extracting metals from their ore by heating and melting. "When they recover copper from the ore, they have a lot of waste stream that goes out that's of no use. Rio Tinto has put in the initial work and found a good amount of rhenium, which is an important critical material for DLA, used in high-octane fuel, super alloys and weapons systems," Jain said. Recovering materials from the waste stream is expensive, but it's something Rio Tinto has done successfully with DLA's help, Jain added. "If they could optimize the process and improve their circuit, they would be able to recover extra material from the waste stream that's already there because of the copper-smelting process," he said.

Recovery and domestic production of materials greatly reduce the amount DLA needs to maintain in the stockpile. "Primarily, we look at foreign sources and single points of failure in the supply chain, and we come up with what we call the stockpile requirements," Gabriel said. To determine how much new material needs to be produced, his team does an economic analysis. "All these efforts have also created more competition in the rhenium market and increased domestic sources of supply for jet engines," Gabriel said. "It's a better solution overall for us and for industry partners to do that domestic production," he said. Stockpiling still works in some cases because there are materials DLA will always need to stock. But by collaborating with R&D, DLA Strategic Materials is setting up unique programs that extend how DLA and DoD approach sustainment of critical materials beyond stockpiling. Using creative problem-solving skills we can stand up capabilities and new ideas, he added.

Jain agreed. "If you solve a problem of production by something that already exists, the problem is solved for the next several years or next several decades," he noted. Magnets and magnet alloys are important to DLA's mission as well. But the U.S. had few domestic companies to manufacture the rare-earth supplies permanent magnets are made from. DLA is working with Urban Mining Company (UMC) in Austin, Texas, to solve this. "We need magnets for regular work as well as for specialized weapons systems applications and precision-guided bombs," Jain noted. "They are critical to the weapons systems in DoD. UMC finds magnets at the end of life-cycle from hard drives, phones and MRI machines, and using a proprietary process, the company makes new magnets it says are better than the original product," he noted.

Using recovered waste, UMC takes a neodymium magnet, the most widely used type of rare-earth magnet, and inserts it directly into its own magnet-recycling process. In 2014, DLA's main focus for



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High-purity stabilized ceramic powders are produced by a chemical synthesis method. The powders yield a rare-earth-based ceramic thermal barrier coating made from yttria-stabilized zirconia, which DLA uses to achieve heat resistance and thermal control in jet engines and in the space program. (Photo courtesy of Xylon Technical Ceramics)



Eric Deal of DLA Strategic Materials checks out a lens from Anniston Army Depot, AL. Germanium will be extracted from the lens and stockpiled until needed. (Photo by Nutan Chada, DLA)

the program was stockpiling materials. "Now, we're using other risk-mitigation approaches — stockpiling, recycling, working with domestic industries to build up technologies for domestic production, qualifying these domestic materials — the whole toolbox itself is much larger for the stockpile program and for DLA," Gabriel said. "DLA R&D has been a big part of that in expanding the toolbox."

## Recycling Versus Recovery

Federal agencies and facilities are directed to implement acquisition programs aimed at encouraging new technologies and building markets for environmentally preferable and recycled products. While recovery occurs in the waste stream, recycling refers to the reuse or regeneration from an end-of-life-cycle product.

DLA's R&D mission differs from that of DLA Strategic Materials because the latter is viewing the risks "of a whole gamut of materials," while R&D focuses more on inventory control and acquisition processes. But they work together when there's a potential R&D processing solution, said Hutchens. "We've done some small business innovation research on the rare-earth recycling, but we're [looking] at some other areas to do that as well where we can recycle products that are foreign sourced, essentially. Where DLA Strategic Materials sees a risk, a need or maybe even just a significant cost reduction that we can achieve, we'll talk to them and see what their requirements are."

On Oct. 1, 2017, the R&D group became part of DLA Information Operations. Now, in addition to investing in anti-counterfeiting efforts, Hutchens said another fairly new project involves working with DLA Distribution to expand the use of lithium-ion batteries in forklifts. "We're looking at what sort of modernization could we do in the distribution warehouses — utilizing robotics, robotic stackers and improving data management," he said. Jain said DLA is also exploring the recycling process for lithium-ion batteries. "We're always looking for ways to recycle what the current feedstock is. Lithium-ion has lithium, cobalt and a small amount of rare-earths," he said. "But sometimes we have limitations on how much feedstock we can get."

Hutchens said DLA R&D has been participating in a robust Battery Network (BATTNET) program since 2010. The program reduces life-cycle costs and logistics requirements by reducing the size and weight of personal and vehicle batteries and extending their run time. The team is also working on new designs to reduce environmental hazards. Batteries

referred to as wet, or flooded lead-acid, are no longer used. "Some of the military's batteries have been merged over to the new technology, which is the absorbent glass material — it's more of either a gel or harder substance inside instead of a liquid acid," he said. "It performs better, it has much better vibration resistance, you don't have to replace acid and so you're getting rid of all that maintenance activity out in the field." Two types of batteries that no longer have any commercial use, 2HN and 4HN, are used for turret power on the Bradley Fighting Vehicle.

"We found a company that would do the research and development to give us a new advanced battery that will outperform [the old batteries] but will have the same fit and function," Hutchens said. "The old ones will go away or be disposed of, and once the new ones are qualified, we'll just buy them off of a new [National Stock Number]."

"The new battery replaces about 120 pounds of electronic equipment," Hutchens said. "We think it'll save about \$8 million of procurement a year, when you look at all the components this battery replaced."

## Future Technologies

In addition to BATTNET, DLA R&D uses diverse manufacturing methods to innovate in the discrete-parts support of fielded weapons systems and is investigating other technologies. These initiatives include casting and forging and additive manufacturing, or 3D printing.

"Every day they're looking at more parts that they prefer to use this process for," Hutchens said. "We're actually going back and working with the services for legacy parts within the supply system."

Another necessary innovation is microcircuit emulation, because of the hard-to-find older microcircuits DLA still uses. "We are spending about \$10 million a year to advance the production capability as microcircuits [become] more obsolete," he said. "It saves billions of dollars — that's actually one of our bigger manufacturing technology programs."

Finally, DLA's Energy Readiness Program is used to qualify alternative fuels, such as biofuel, Hutchens said. "Sometimes suppliers add large doses of antioxidant to the fuel to mask unstable characteristics of the fuel," he explained. However, DLA R&D developed methods to identify high levels of antioxidants and assess the underlying quality of the fuel. Testing is necessary to determine how alternative fuels such as biofuels will perform in comparison to traditional jet fuels. ■



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**APR 3 - 4**

**Military IoT and Sensors Summit**  
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**MDEX**  
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**APR 10 - 11**

**Border Security & Intelligence Summit**  
Alexandria, VA  
[Bordersecuritysummit.dsigroup.org](http://Bordersecuritysummit.dsigroup.org)

**APR 9 - 12**

**ISC West/Unmanned Safety & Security**  
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**Future Ground Combat Vehicles**  
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