DEVCOM

2021

YEAR IN REVIEW

The U.S. Army Combat Capabilities Development Command is the Army's organic team of scientists, engineers and analysts. This global team of teams works with scores of partners within the Army Futures Command and other Department of Defense organizations, the Defense Industrial Base as well as industry, small business, academic institutions, and other government agencies across the globe to enable the transition of cutting-edge and technologically relevant capabilities for the Future Soldier.

Through Soldier-Centered Design and Experimentation, DEVCOM's seven centers and the Army Research Laboratory explore early research, applied technology development and conduct life cycle engineering to drive the transition of knowledge, capabilities, and technology upgrades that enable persistent Army Modernization beyond 2035.

MESSAGE FROM THE COMMANDING GENERAL

The U.S. Army Combat Capabilities Development Command, or DEVCOM, team accelerated technology throughout 2021 to deliver next-generation Soldier capabilities and ensure overmatch for the Army — today and for our Nation's future. No matter the obstacles presented, DEVCOM continued work together to deliver, proving that it has no peers. Given the command's breadth and depth, scope, scale, talent and footprint, DEVCOM is truly a formation of uniquely talented people organized into one unique Command. As we reflect on our accomplishments this year, it is clear that these attributes and capabilities are critical to the success of Army modernization.

The Army has announced that it will put 24 of the capabilities that support its six modernization priorities in the hands of Soldiers — either as prototypes or fully fledged systems — by Fiscal Year 2023. The key to meeting that goal is the Army Futures Command's Soldier-Centered Design philosophy and DEVCOM scientists, engineers and analysts experimenting alongside Soldiers in the field. A component of our experimentation mission is participating in the Army's premier campaign of learning, Project Convergence. DEVCOM showcased 44 technologies during the Project Convergence 2021's largest annual exercise in November. The feedback from that exercise, as well as hundreds of other Soldier touchpoints, is instrumental to solving complex problems and delivering next-generation capabilities that will make Soldiers safer and more lethal.

DEVCOM's Future of Work effort also progressed from a study to a pilot in 2021. This new model, which encourages mission-domain based flexibilities for our workforce, has also introduced new collaboration opportunities across competencies, time zones and distributed operations that will help us continue to develop our team and empower greater integration of our efforts.

Edmond "Miles" Brown
MG, USA
Commanding

TECHNOLOGY DRIVEN.
WARFIGHTER FOCUSED.

TABLE OF CONTENTS

FOUNDATIONAL RESEARCH 2

SCIENCE AND TECHNOLOGY 4

LIFE CYCLE ENGINEERING 8

ANALYSIS 10

LEADERSHIP (FUTURE OF WORK AND COVID-19) 12

BUSINESS 14

FOUNDATIONAL RESEARCH

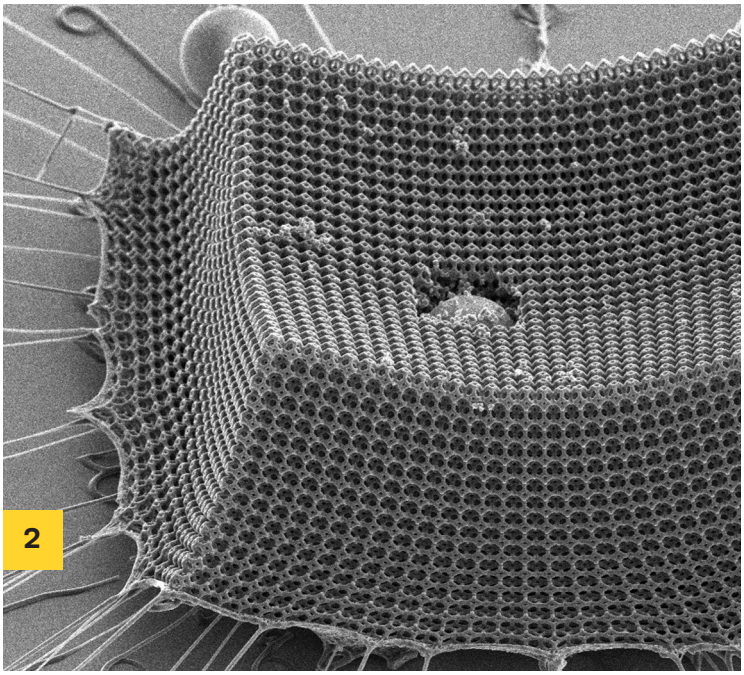
DISCOVERING SCIENTIFIC KNOWLEDGE FOR FUTURE CONCEPTS, TRANSITIONING KNOWLEDGE PRODUCTS AND DELIVERING CUTTING-EDGE TECHNOLOGY TO FURTHER INNOVATION. SOME EXAMPLES INCLUDE:

1. The Army Research Laboratory (ARL) partnered with the Office of the Secretary of Defense Laboratory University Collaboration Initiative, which funded the project, along with Tufts University and the Naval Research Lab to develop an algorithm that enables robots to ask qualifying questions to Soldiers, increasing the robots' value as effective teammates.

2. The ARL researchers working with the Institute for Soldier Nanotechonologies at the Massachusetts Institute of Technology, California Institute of Technology, and ETH Zurich identified new ultralight structures called nanoarchitectured materials. These materials are stronger than Kevlar or steel, and could lead to lighter, stronger armor for personnel and equipment.

3. The ARL researchers are researching metallic alloys to develop lighter armored vehicles. The research included the relationships between the physical features of obstacles (e.g., size and shape) and the strength of the metallic alloy systems.

4. The ARL scientists developed a process to teach neural networks when to accurately say "I am sure," by reviewing uncertainty frameworks, categorizing sources of uncertainty in military information, and creating solutions to manage uncertainty.



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SCIENCE AND TECHNOLOGY

DELIVERING INTEGRATED CAPABILITIES THROUGH TRANSFORMATIONAL, MULTI-DISCIPLINARY EFFORTS AND BRINGING NEW TECHNOLOGICAL CAPABILITIES TO TODAY'S BATTLEFIELD. SOME EXAMPLES INCLUDE:

1. The Armaments Center (AC) tested and verified the system performance of the XM1299 Extended Range Cannon Artillery to ensure it met requirements to transition to the Product Manager, Self-Propelled Howitzer Systems.

2. The Chemical Biological Center (CBC) expanded and advanced its scientific talent to cement its identity as the DoD's preferred source for producing newly discovered, high-value chemicals and enhancing the functioning of those chemicals. This effort will decrease supply-chain disruptions, increase the U.S.'s self-sufficiency in its critical defense production needs, and support the global economy. It may also lead to putting bioproduction facilities near the front lines.

3. The CBC developed new standards for military-grade carbon used in gas masks and protective filters that will end U.S. reliance on a single source for carbon, help protect personnel, and provide a higher degree of confidence in the shelf life of such materials.

4. The Ground Vehicle Systems Center (GVSC) began testing light and medium Robotic Combat Vehicle prototype variants, featuring autonomous software that enables more flexibility for plugging in new software quickly. These prototypes are paired with the Mission Enabling Technology Demonstrator, an experimental system of vehicles developed to help Army leaders determine how best to integrate unmanned vehicles.

5. The GVSC plans to build the world's largest metal 3D printer, which will have the capability of printing large parts for military ground vehicles. The 3D metal printer is expected to be completed the end of summer 2022, and it will be installed at Rock

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Island Arsenal – Joint Manufacturing and Technology Center, which will be in charge of operations. This effort, called the Jointless Hull project, will greatly expand the Army's capability to make large parts that are typically required for ground vehicles. The machine, which uses metal additive manufacturing technology, will be able to print parts 30 feet long, 20 feet wide, and 12 feet high.

6. NATO accepted GVSC's Next Generation NATO Reference Mobility Model as a standard system. The NRMM is a tool that helps human or autonomous drivers predict a vehicle's capability over specified terrain conditions by providing information on how fast the vehicle will be able to move through the terrain.

7. The Soldier Center (SC) created or improved more than 3,000 recipes for dining facilities and shipboards across all branches of the military.

8. The SC, working in conjunction with academia and industry, has developed the Fragmentation Rapid Analysis Generator using Computed Tomography. FRAG-CT is a tool that can process data from a test range 200 times faster than the current method, which involves painstakingly collecting shrapnel and mapping explosions by hand. By collecting 3D images of fragments, the technology will aid in developing improved armor design.

9. The Aviation & Missile Center (AvMC) delivered two Terminal High Altitude Area Defense Radar Training Devices to the Fires Center of Excellence, which will extend Fort Sill's current Institutional Conduct of Fires Training Capability and replace the existing single, lower-fidelity system.

10. The AvMC, in conjunction with the Long Range Precision Fires Cross Functional Team, demonstrated a proof of concept for an Autonomous Multi-Domain Launcher on a High Mobility Artillery Rocket System. The demonstration showcased the AML's lethality potential in anti-access/area denial Multi-Domain Operations.

11. The Command, Control, Communication, Computers, Cyber, Intelligence, Surveillance and Reconnaissance Center's (C5ISR) Combined Joint Systems Integration Laboratory (CJSIL) achieved Full Operational Capability in mid-March 2021. The CJSIL connects Army and Joint Service labs in a single, virtual, operationally realistic tactical network environment, enabling greater collaboration on technology solutions that will enable dominance for Warfighters during Multi-Domain Operations.

LIFE CYCLE ENGINEERING

APPLYING EXPERTISE AND CAPABILITIES TO ENABLE THE RAPID DEVELOPMENT, TRANSITION, INTEGRATION AND SUSTAINMENT OF TECHNOLOGICAL CAPABILITIES ACROSS A PROGRAM'S LIFE CYCLE. SOME EXAMPLES INCLUDE:

1. The AC worked through challenges presented by the COVID-19 pandemic to continue to safely provide mission critical life cycle engineering in support of Army modernization priorities and production and sustainment readiness. Many of these critical activities required hands-on, on-site work that could not be performed remotely. Examples include: prototyping the Extended Range Cannon Artillery, and limited production of M1158, 7.2mm ammunition.

2. The AvMC-led Aviation and Missile Life Cycle Management Command Value Engineering program saved or avoided costs totaling $155 million in FY21, or 132% of the organization's $117M goal. More importantly, the 83 completed projects provided a multitude of both direct and indirect benefits to Soldiers such as obsolescence mitigation, reliability improvements, technology upgrades, reduced administrative burden and timely deliveries. This makes the 24th consecutive year that AMCOM has surpassed its assigned VE monetary goal.

3. The AvMC achieved 1,048 airworthiness releases, which are changes or additions that are evaluated before the aircraft is deemed airworthy, and 20 material releases, which are final checks that ensure requirements are met.

4. The AvMC overhauled six UH-60V helicopters with upgraded digital glass cockpits, certified Global Positioning System receivers, area navigation databases and advanced flight planning and mission capabilities. The team worked with the UH-60 program office to deliver the helicopters to Fort Indiantown Gap, Pa., where the first unit equipped, the Eastern Army National Guard, was trained on how to use them.

5. The AvMC wrote and tested the tactical software for the Longbow L7A missile and provided the information and data analysis to Army aviation stakeholders to get final approval from Aviation and Missile Life Cycle Management Command for fielding the upgraded capability on the MQ-1C Gray Eagle platform. This project updated a weapon system currently in the Army inventory with a new platform and mission set for counter-UAS and littoral operations. The AvMC also developed the training material and will train Soldiers on the new weapon system's capability in the field.

ANALYSIS

DRAWING QUALITATIVE AND QUANTITATIVE INSIGHTS AND PREDICTING OUTCOMES FROM DATA TO ADVANCE LETHALITY, SURVIVABILITY AND EFFECTIVENESS FOR INTEGRATED CAPABILITIES. SOME EXAMPLES INCLUDE:

1. DEVCOM showcased 44 technologies during PC 21, including 25 used in direct support of one of the experimental use-case scenarios. DEVCOM personnel conducted excursions with 15 technologies during the use-case experiments, four demonstrations separate from the use cases, and operated an on-site additive manufacturing capability.

2. The DEVCOM Analysis Center (DAC) assessed data from nearly 100 Soldiers at Soldier touch points to evaluate advanced helmet-mounted displays, pilot-cueing simulations, cognitive workload and decision making proficiency, and warfighting design concepts. The feedback from these Soldier-Centered Design exercises will help refine the capabilities that will drive the Army's six modernization priorities.

3. The AC successfully showcased these capabilities during PC 21: Fires Synchronization to Optimize Responses in Multi-Domain Operations, ERCA Rate-of-Fire, Advanced Lethality and Accuracy System for Medium Caliber, and Rapid Fabrication via Advanced Manufacturing on the Battlefield.

4. The AvMC partnered with industry through PEO Aviation's Program Manager, Future Attack Reconnaissance Aircraft, to integrate the Modular Effects Launcher onto a UH-60 Black Hawk. MEL is a compact and lightweight system optimized for the FARA. It features a Modular Open Systems Approach and mixed load-outs for mission flexibility. The technology was demonstrated at the Project Convergence 21 exercise.

5. The C5ISR Center's Rainmaker stitches together a variety of information sources and unique data formats, ranging from modern sensor arrays to legacy systems designed for specific functions, such as Intel and Operations. During PC 21, the Army integrated Rainmaker with other Army network and mission command capabilities to support mission scenarios in competition, crisis and conflict.

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LEADERSHIP (FUTURE OF WORK AND COVID-19)

SOME EXAMPLES INCLUDE:

1. DEVCOM's Talent Management Strategy set the foundation for strategic talent management efforts designed to acquire, develop, and retain a superior workforce. In addition to this foundational strategy, which was signed in 2020, the COVID-19 pandemic provided an opportunity for changing the way DEVCOM not only acquires, but engages, manages, develops and retains an agile and diverse workforce, through development of DEVCOM's Future of Work effort. DEVCOM recently moved into the pilot phase of its Future of Work model.

2. The DEVCOM Talent Management team designed a number of initiatives to empower and engage a hybrid workforce to create a new Workforce Wellbeing program. The program combines resiliency, wellness and skill development to foster a culture of caring, employee engagement and personal growth.

3. The CBC partnered with the University of Pennsylvania in research that led to the discovery that dogs can detect a COVID-positive person days before most rapid tests. Scientists at CBC hope to use this canine capability aboard large ships, in training environments and at events where large groups of people gather.

4. The SC, CBC, and Defense Threat Reduction Agency collaborated with North Carolina State University to improve the protection, comfort and reusability of face masks.

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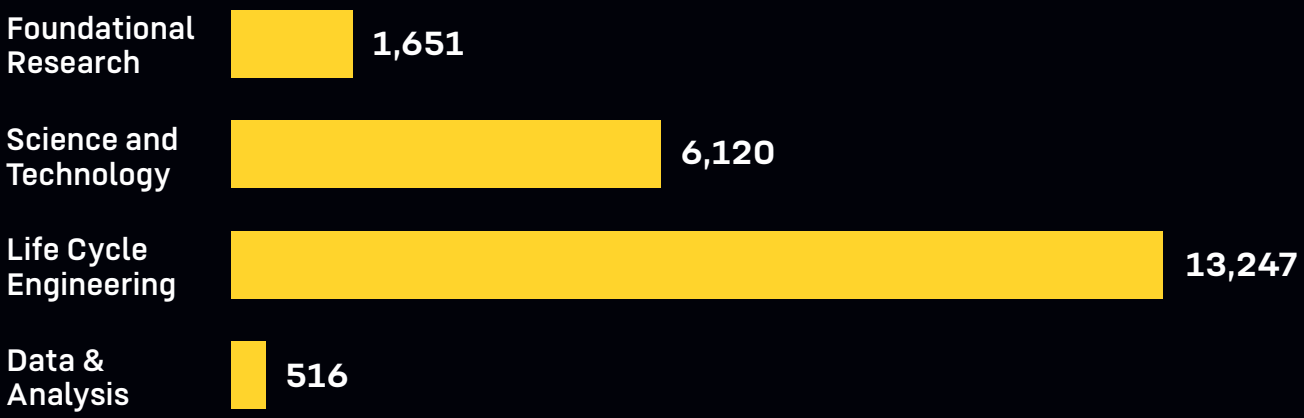
DEVCOM has one of the largest and most diverse concentrations of technical talent in the world, with scientists, engineers and analysts working across more than 60 disciplines and competency areas, all supported by a cadre of leaders and business experts.

DEVCOM TALENT BY DOMAIN* TOTAL: 21,534



*Totals vary by current mission and do not reflect permanent positions

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BUSINESS

DEVCOM supports **more than 75 DoD customers.**

DEVCOM provides **over 75 percent** of the science, engineering, and analytics services to the Army. Its customers include:

15 Program Executive Offices

11 AMC Life Cycle Management Commands

29 DoD agencies

26 Other Army organizations

The Army derives benefits including support to its Modernization Priorities through DEVCOM customer projects.

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