

# THE ENGINEERING EDGE

EDGEWOOD CHEMICAL BIOLOGICAL CENTER

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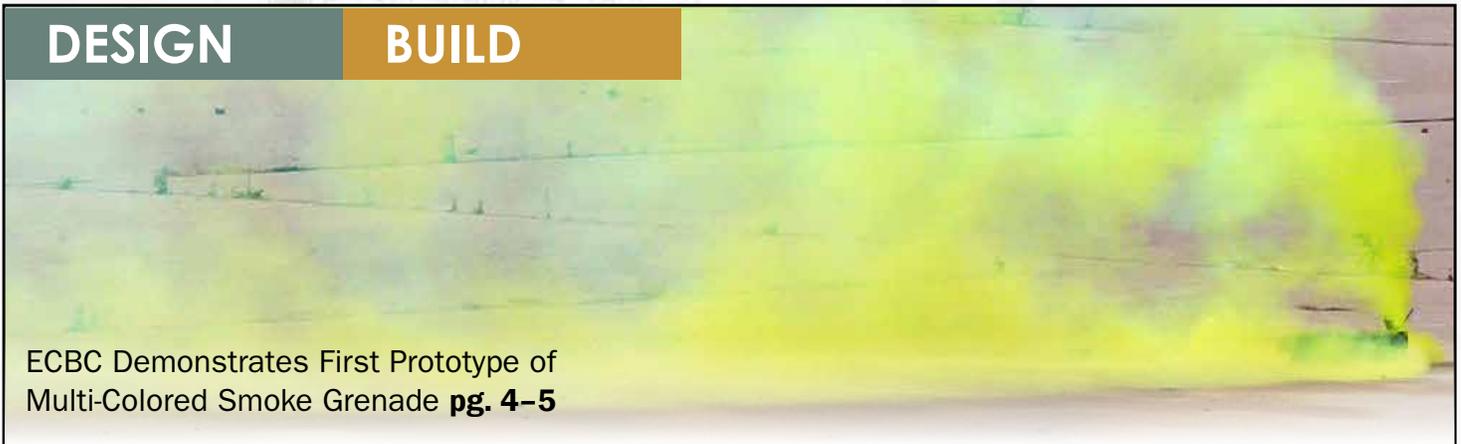
February 2015



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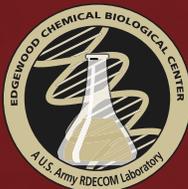
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This newsletter was published through the **Balanced Scorecard**.

For article suggestions, questions or comments please contact **Ed Bowen** at [edward.c.bowen8.civ@mail.mil](mailto:edward.c.bowen8.civ@mail.mil).



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## ECBC Engineers Awarded Patent for Novel Aerosol Dilution and Sampling System

**T**wo engineers from the ECBC Test Reliability and Evaluation Branch (TREB), Derek J. Mancinno (retired) and Myat S. Win, were recently awarded a patent by the United States Patent and Trademark Office for a new and useful invention.

The invention, called the “Dilution & Sampling System and Sampling & Counting System,” is a high flow rate, self-calibrating aerosol dilution device, and a sampling system for providing particulate samples to a particle counter which tests a variety of military and commercial air filter units.

When the current generation of particle counters measure aerosol concentrations above their operating range, the detectors can become saturated or exhibit undesirable nonlinear behavior. To overcome this obstacle, dilution techniques have been employed where the aerosol concentration is diluted by separating the flow path of an aerosol into a filtered path and a non-filtered path. It is often difficult to determine the dilution factor accurately, leading to inaccurate and disputed counts. Therefore, an improved dilution and sampling system that can be used in combination with modern particle counters, is highly desired. “This invention can be used for testing High-Efficiency Particulate Air (HEPA) filters by collecting samples up and downstream of the HEPA filter under test, and then comparing upstream and downstream sample counts,” said Win.

This critical test capability is applicable to a variety of military and commercial air filter units used in different joint military applications, such as enclosed cabins in Army tanks and shelters in Navy ships.

The patent application was first submitted to Army Contracting Command on APG, and then later forwarded to Frenkel & Associates in fall 2011. The patent was granted after it was determined that all requirements of law were met. Official credit was given to both inventors and the ECBC Engineering Directorate.

While it can be a long process, the Engineering workforce is encouraged to submit patent applications and to be constantly innovative in the work they do for the Army. “Innovation is just one way that ECBC continues to provide the best solutions for Warfighter and first responder needs,” said Win. ⚙️



Myat Win is a mechanical engineer who primarily works on system test, validation, design and integration of test equipment. Credit: ECBC Test Reliability and Evaluation Branch

## Ask a Tech Tip: Ice-Melt—Which Kind is Best?

**Mike Kauzlarich**, of the Pyrotechnics and Explosives Branch, reveals how the techniques and lessons learned in labs can help you solve your household problems. Submit a question to him at [usarmy.APG.ecbc.mbx.engineering-directorate@mail.mil](mailto:usarmy.APG.ecbc.mbx.engineering-directorate@mail.mil).

The weatherman says snow is coming! You rush to the store to buy milk, bread, toilet paper and Ice-Melt. But which Ice-Melt should you use? The days of rock salt as the only choice for melting snow and ice are over. Now there are several different Ice-Melts available: calcium chloride, calcium magnesium acetate, magnesium chloride, potassium chloride, sodium chloride (rock salt) and urea. Confused about the choices? Each one of these chemicals have advantages and disadvantages. Some are safe for use around pets, others are not; some damage concrete, and some not so much. Most of us just buy what is on sale and what is available at the hardware store. My advice: If you have pets or worry about damage to your concrete, please read the package label or do a web search to find the best Ice-Melt for you. Or, download this Ice-Melt comparison chart from Consumer Reports [http://www.consumerreports.org/content/dam/cro/news\\_articles/home\\_garden/CRO\\_home\\_IceMeltChart\\_2-14.pdf](http://www.consumerreports.org/content/dam/cro/news_articles/home_garden/CRO_home_IceMeltChart_2-14.pdf). ⚙️



# ECBC Engineering: A Critical National Asset



**W**ith a mission to provide unique infrastructure, engineering expertise and lifecycle services to solve chemical and biological defense challenges for the Warfighter and the homeland, the ECBC Engineering Directorate connects with customers and resources across the Army, government, allied nations, industry and academia to address their unique requirements and challenges in chemical and biological defense. The Directorate employs a workforce of more than 500 engineers, scientists, technicians and specialists who are knowledgeable and experienced in current and evolving technologies, and maintains state-of-the-art laboratories, test chambers and surety facilities on premises to support its work.

What makes the ECBC Engineering Directorate a critical national asset? "It's the combination of our capabilities, our people, and our commitment to our customers," said Bill Klein, Deputy Director of Engineering. "And especially our direct impact on the protection of our Warfighters and our country."

## Our Capabilities



Our engineering teams drive cutting edge technology—from research to engineering development, through production, fielding and sustainment. The Directorate's support ranges across the entire product lifecycle. We call this unique level of service "Design→Build→Test→Support."

## Our People

The people make the place: Our highly skilled engineers and certified acquisition professionals are dedicated to solving chem-bio defense challenges for the Warfighter and the homeland.

- **Syrian Chemical Weapons Team Honored with OSD Achievement Award**, [www.ecbc.army.mil/news](http://www.ecbc.army.mil/news)
- **ECBC Continues to be Award-Winning Workplace for Women**, [www.ecbc.army.mil/news](http://www.ecbc.army.mil/news)

## Commitment to Our Customers

With more than 500 personnel working to support the Joint Project Managers of the Joint Program Executive Office for Chemical and Biological Defense, as well as numerous other government agencies, the Engineering Directorate is the source of choice for chem-bio defense solutions for our customers.

**Design:** Design products to protect the Warfighter and First Responders.

- **Design on the Fly: How ECBC Engineers Adapted Cape Ray for the Unknown**, [www.ecbc.army.mil/news](http://www.ecbc.army.mil/news)
- **ECBC Engineers Put 54,000 Projectiles Back into Inventory for Army and Marine Corps**, [www.ecbc.army.mil/news](http://www.ecbc.army.mil/news)

**Build:** Take design to the next level via rapid-prototyping and manufacturing.

- **ECBC Demonstrates First Prototype of Multi-Colored Smoke Grenade**, read on pg. 4-5
- **ECBC Builds Additive Manufacturing Partnerships through NMAMIA Consortium**, [www.ecbc.army.mil/news](http://www.ecbc.army.mil/news)

- **ECBC Provides Fabrication and Integration Expertise for Milestone Capability for Jordanian Armed Forces**, [www.ecbc.army.mil/news](http://www.ecbc.army.mil/news)
- **ECBC's ATD Branch: The Bridge Between Science & Technology and Acquisition**, [www.ecbc.army.mil/news](http://www.ecbc.army.mil/news)

## Service to the Warfighter and the Homeland

The Engineering Directorate combines its historical knowledge, modern technical capabilities, state-of-the-art equipment and laboratories, and dedicated expert workforce to serve the ultimate customers—the Warfighters and people of the United States.

- **ECBC Engineering and JPM-NBC CA Support Navy's Innovative Missile Defense System**, [www.ecbc.army.mil/news](http://www.ecbc.army.mil/news)
- **ECBC Tests SNIFFER Chemical Detector for MTA's Baltimore Transit System**, [www.ecbc.army.mil/news](http://www.ecbc.army.mil/news)

**Test:** Use expertise and infrastructure to test products in surety and non-surety environments.

- **TREB Engineers Played Key Role in Containment System Used to Transport Americans with Ebola Back to U.S.**, read on pg. 6
- **ECBC Engineering Test Facilities Offer Unique Options for Surety and Non-Surety Testing**, [www.ecbc.army.mil/news](http://www.ecbc.army.mil/news)

**Support:** Support products and services that meet customer needs for the duration of the mission.

- **Platform Manager for Ground Mobile Platform CBRN Survivability: Linking the Directorate with Customers**, read on pg. 7
- **ECBC Engineers Evaluate Warfighter Feedback to Improve RASR Detection System Technology**, [www.ecbc.army.mil/news](http://www.ecbc.army.mil/news)



Learn more about the ECBC Engineering Directorate's capabilities and expertise at [www.ecbc.army.mil](http://www.ecbc.army.mil).

## ECBC Demonstrates First Prototype of Multi-Colored Smoke Grenade



The Selectable Color Single Canister Smoke Hand Grenade would allow Soldiers to carry one smoke grenade that can produce up to seven different colors used for signaling. *Credit: ECBC Pyrotechnics and Explosives Branch*

**E**ngineers from the U.S. Army Edgewood Chemical and Biological Center (ECBC) have tested the first prototype of a multi-colored smoke grenade designed to “lighten the load” for Soldiers in the field. The prototype, called the “Selectable Color Single Canister Smoke Hand Grenade,” would allow Soldiers to carry one smoke grenade that can produce up to seven different colors used for signaling.

An important communications tool for the modern Warfighter, the current M18 grenade contains just one color of smoke (red, yellow, green or violet) per grenade. Since each color serves a distinct purpose for signal-calling, Soldiers are often required to carry most or all colors at all times, adding a physical burden that could affect their speed and agility. Having one, multi-colored smoke grenade would decrease that burden while still providing the technology that Soldiers require in the field.

“Tomorrow’s Army is expected to be smaller in size, but greater in capability,” said project lead Amee La Bonte, an engineer with ECBC’s Pyrotechnics and Explosives Branch. “The Future Soldier will need to be a component in a lighter weight, more lethal, more survivable force. Having multi-purpose communications gear like this grenade will add to that capability without increasing a Soldier’s load.”

This technology works by giving Soldiers the ability to select the desired color via innovative combinations of fuels, oxidizers, coolants and colored dyes. The prototype’s current design is vertical with three dye compartments, each filled with a primary color: red, yellow and blue. The top part of the grenade has two dials. When the user twists one dial, one dye color is produced; if they twist two dials, two colors are produced together to make one new color. For example, if a Soldier needed to use orange smoke, he would twist the dials for the red and yellow dyes, creating the orange-colored smoke. Yellow and blue dyes will make green smoke and red and blue make violet smoke. When all three dyes are released at the same time, the grenade produces a nearly black smoke – the seventh color – providing a highly concentrated screen or signal.

“Each color dye is thermodynamically distinct in composition and handles the heat and gas differently,” explained Joseph Domanico, ECBC Senior Engineer for Pyrotechnics and Explosives and Ammunition Control Officer.

“Since they are all different formulations, they are really seven different grenades. To have all of these color possibilities make available to our Warfighters in a single

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**– Amee La Bonte, Engineer, ECBC  
Pyrotechnics and Explosives Branch**

grenade – that has never been done before, and would revolutionize how the Army uses colored smoke in theater.”

Tests of the most recent prototype were conducted July 9, 2014, at Aberdeen Proving Ground, Md. The test was completed using aluminum hardware and a standard grenade fuse to prove the concept. The smoke produced by the first prototype provided approximately 75 percent of the smoke from a standard M18 colored smoke grenade and revealed some areas of improvement before the design can be finalized.

The ECBC team has been working on the project with \$25,000 in seed money that had been awarded through the Section 219 funding program, which encourages Army scientists and engineers to bring their innovative ideas to fruition to benefit their customers, the Warfighter and the nation. Section 219 funding comes from the National Defense Authorization Act of 2009, which allowed military and government research laboratories to tax customers up to 3 percent of all revenue sources as an indirect fee that helps finance the overall cost of a given project. The funds are used for technology development, supporting the transition of technology developed in laboratories, workforce development and minor construction for laboratory capabilities enhancement.

With limited funding, the team has been challenged to design a prototype with maximum efficiency and minimum waste. The dyes used for the prototypes were ones remaining after ECBC’s successful experiments with lower-toxicity formulas

for four colors for the M18 smoke grenade. These dyes have been evaluated in the past and continue to be examined to provide the lowest levels of potential toxicity in the colored smoke clouds.

To continue development of the project, ECBC will have the tasks of ensuring that the majority of the dyes vaporize without being destroyed during dissemination while exposed to the required hot gas stream, as well as resolve other challenges in the actual chemical formulations to be used in the grenades. The U.S. Army Armament Research, Development and Engineering Center (ARDEC) will refine ECBC’s initial design, evaluate plastic and other materials for use in building the actual dissemination grenade, and cooperatively work with ECBC to ensure that the grenade will function under all weather and combat conditions.

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**– Joseph Domanico, ECBC Senior Engineer  
for Pyrotechnics and Explosives and  
Ammunition Control Officer**

“Even after the first successful demonstration of the prototype, much work needs to be completed before this device is ready to be placed into the hands of a Soldier,” explained Domanico. “Our team is committed to the project and to the value of the capability it brings to the Army and our Warfighters.” 



CNN recently featured ECBC’s work on modernizing the Army’s smoke grenades. Watch the video at <http://www.cnn.com/>

## TREB Engineers Played Key Role in Containment System Used to Transport Americans with Ebola Back to U.S.



The Aeromedical Biological Containment System (ABCS) was tested by TREB and used to transport two Americans infected with Ebola from Africa to the U.S. for life-saving treatment.  
*Credit: ECBC Test Reliability and Evaluation Branch*



TREB engineers David S. King II and Kenneth Eng conduct the HEPA filter housing pressure decay test.  
*Credit: ECBC Test Reliability and Evaluation Branch*

**A**t the request of President Barack Obama, the Army has led the U.S. military response to the Ebola crisis in West Africa by constructing facilities to treat Ebola patients and providing logistics, engineering and medical skills to help contain the epidemic that gained worldwide attention in summer 2014.

But back in 2010, engineers from ECBC's Test, Reliability & Evaluation Branch (TREB) did not anticipate that a system that they worked on would be used years later to transport American aide workers infected with Ebola from Africa to the U.S. for life-saving treatment.

### What is the ABCS?

The Aeromedical Biological Containment System (ABCS) is designed to isolate an infected person during transport by aircraft without endangering the flight crew. It operates at a negative pressure relative to the aircraft, and all air in and out of the ABCS is filtered. The tent-like system includes a patient compartment (PC) that accommodates one patient, healthcare personnel and medical equipment, with an anteroom that allows entry and exit for medical personnel. Clean air is supplied to the patient compartment through the use of a high-efficiency particulate air (HEPA) filtration system under negative pressure compared to the crew compartment. The air exiting the PC is filtered with a HEPA filtration system as it exits the plane.

The Centers for Disease Control and Prevention (CDC) charters the use of the specialized aircraft through Phoenix Air Group, Inc., for the transport of patients afflicted with potentially infectious diseases. The enclosure provides safe transport of the patient; relieves the flight crew from wearing cumbersome individual protective equipment while operating the plane; and provides easy decontamination of the airplane after the patient is transported. The system was used in August 2014 to transport two American aid workers who had contracted Ebola in Liberia to a hospital in Atlanta where they were treated.

### How did TREB Support the System?

ECBC began working on the system in 2007, along with the Centers for Disease Control and Prevention, the Joint Project Manager for Collective Protection, and the Natick Soldier Research, Development and Engineering Center. Since the delivery of the first ABCS to ECBC in March 2008, TREB played a vital role in the development of the system with its capability to test each component for proper function. TREB worked closely with the ABCS Program Manager at the Naval Surface Warfare Center (NSWC) to find solutions and guide the contractor, Production Products Manufacturing, in the redesign of each prototype component.

"Because of our good working relationship on past projects with the customer, and our innovative approach to engineering and testing, NSWC came to us with this very unique project," said Ken Eng, a mechanical engineer and project lead with TREB.

TREB conducted the component function testing to verify that the ABCS met performance criteria before going into the operational testing phase. During the testing, when the system did not meet the performance criteria TREB provided recommended corrective actions to repair the issue.

"The ABCS filter housing unit was a major cause of concern for us," Eng stated. "The first versions were very flimsy, until they were ruggedized to prevent contamination from escaping, while withstanding aircraft-imposed shock and vibration."

In addition to performing filter tests, TREB ensured the entry/exit airlocks, airlock purge rates, strength of the frame, airflow rate, and the operational pressure all met their design specifications. TREB also ensured the ABCS liner and seams had no leaks.

Through much iteration, the ABCS finally met its functional criteria in early 2010. "It was immensely gratifying to see the photos of the isolation chamber in the news," said David S. King II, an engineering technician with TREB who was directly involved with the project. "To think that a project that we worked on was used to save these Americans' lives drives home how important our mission truly is to our country."

TREB looks forward to partnering with other government organizations and contributing its expertise in testing to unique projects like the ABCS in the future.

"It was great to see the ABCS that we helped develop made a difference in this historic event," added Eng. "All those hours working on this project were worth it." 

# Platform Manager for Ground Mobile Platform CBRN Survivability: Linking the Directorate with Customers

As one of its core competencies—and as a value-add to its customers—the ECBC Engineering Directorate maintains a core group of trained acquisition professionals who support the Joint Executive Program Office for Chemical and Biological Defense (JPEO-CBD) with its current and future technical, and programmatic needs through matrixed support to its Project Managers.

Matrixed employees make up approximately one-third of the Engineering Directorate's workforce, and play a valuable role as subject-matter experts in chemical and biological defense engineering, science, technology, logistics and program management. Most are imbedded with their customer teams and provide an indispensable link back to the Engineering Directorate and its design, build, test and support capabilities.

One example of that valuable link is that of the Platform Manager for Ground Mobile Platform CBRN Survivability (PM-GMPCS), a job recently transitioned to Chris Ritchey of the Engineering Directorate. In this role, Ritchey is matrixed to the Joint Project Manager for Protection (JPM-P) and directly supports the JPM-P's Major Defense Acquisition Program (MDAP) Trail Boss initiative.

In October 2009, the JPEO-CBD established the MDAP Trail Boss to leverage JPEO-CBD expertise and product portfolios to provide non-chembio defense programs with CBRN survivability and force protection capabilities. Operated by the JPM-P, the MDAP Trail Boss acts as the primary interface within the JPEO-CBD and its JPMs, by providing tailored CBRN information and services at any point in MDAP's acquisition lifecycle. Benefits to the Warfighter include integrated CBR and toxic industrial chemical protection capabilities with minimal logistical and operational impacts to the existing platform.

"There is a synergy between the JPEO-CBD and the MDAP programs—a push-pull relationship for developing future capabilities," said Ritchey. "The JPEO-CBD can integrate current products into the systems and platforms, but platform requirements also drive future capabilities. The MDAP Trail Boss facilitates the research, development and testing of new CBRN Survivability capabilities to meet the requirements of the MDAP programs."

## The MDAP Trail Boss facilitates the research, development and testing of new CBRN survivability capabilities to meet the requirements of the MDAPs.

As the PM-GMPCS, Ritchey is responsible for providing tailored CBRN survivability information and support to the ground mobile platform MDAPs. "The support can range from answering basic questions with regard to CBRN equipment, all the way to developing a unique piece of CBRN equipment," explains Ritchey. Typical duties include providing CBRN input to requirements, requests for proposal, test and evaluation, and other related MDAP documents; serving on source selection boards, as a contract technical monitor, and/or evaluating contractor proposed CBRN survivability designs; briefing MDAPs on CBRN survivability solutions offered by the JPEO-CBD; preparing status reports, briefing packages, information papers and CBRN assessments; providing CBRN equipment technical information to the MDAPs and/or their contractors; and assisting in the development of CBRN related concepts of operations.

To date, the MDAP Trail Boss initiative has supported and/or worked with more than



The Stryker family of vehicles is one of many programs supported by the MDAP Trail Boss initiative. *Credit: General Dynamics Land Systems*

30 MDAPs, and is currently supporting 15 programs in development. Current programs include the Abrams Main Battle Tank and Stryker Family of Vehicles programs, and the effort to mount and integrate the Joint Chemical Agent Detector on their platforms, with plans to provide the same type of support to the Joint Armored Bridge in the next year. Ritchey is also coordinating support between the JPEO-CBD and two newer ground mobile platform MDAPs—the Armored Multi-Purpose Vehicle and the Joint Light Tactical Vehicle—to meet engineering, manufacturing and development phase and low-rate initial production CBRN survivability equipment requirements. In addition, PM-GMPCS is providing support to the Next Generation Close Combat Vehicle Study, a one-year effort to explore close combat vehicle technology and system options for the U.S. Army Training and Doctrine Command for the far-term (2028–2048) timeframe.

The JPEO-CBD, JPM-P, and Engineering Directorate all reap valuable benefits from Ritchey's role. "An important part of my job is to make connections between the Engineering Directorate and the customer," said Ritchey. "I work closely with the customer to recommend the best solution, while maintaining situational awareness of all of the Engineering capabilities that would be useful for those customers. Knowing the capabilities well will help me facilitate those conversations and drive business to the Directorate." 

## AWARD

# ECBC Engineer Receives Black Engineer of the Year Award for Technical Management of Raman Spectroscopy Integration

**E**CBC Engineering's Doretha Green was honored for Outstanding Technical Contribution in Government at the 29th annual Black Engineer of the Year Awards Gala, held on Feb. 7 in Washington, D.C.

Green, an industrial engineer and technical manager in the Advanced Technology Demonstration Branch, has more than 20 years of experience in engineering, testing, management and contracting in chemical and biological defense. She was nominated for her work to advance the application of Raman spectrometry to manned and unmanned reconnaissance for detecting and identifying hazardous chemicals and chemical warfare agents.

Green managed the demonstration of a Raman-based detection system onto a military vehicle for detection on the move for chemical reconnaissance operations. In a



Doretha Green's award was presented by Gen. Dennis Via, Commander of Army Materiel Command. Credit: RDECOM Public Affairs

follow-on effort, she demonstrated updated Raman spectrometry detection and identification systems as a handheld device, and integrated on an unmanned ground vehicle. Green's technical management of both programs demonstrated the

utility of Raman detection technology in military operations.

"This award is a great honor made possible by all the people who worked with me on this project," she said. ⚙️

## LEADERSHIP

# ECBC Engineering Director Inducted into Senior Executive Service

**O**n Monday, Feb. 2, Michael S. Abaie was inducted into the Senior Executive Service at a ceremony held at Aberdeen Proving Ground, Md. He was sworn in by ECBC Director Dr. Joseph L. Corriveau.

Abaie was recently appointed as Director of Engineering for the U.S. Army Edgewood Chemical Biological Center. Prior to joining ECBC, Abaie held leadership roles within the Joint Chemical



and Biological Defense Program and Joint Program Executive Office for Chemical and Biological Defense. For the full story, go to [www.ecbc.army.mil/news](http://www.ecbc.army.mil/news). ⚙️



Credit: RDECOM Public Affairs