THE ENGINEERING EDGE

EDGEWOOD CHEMICAL BIOLOGICAL CENTER
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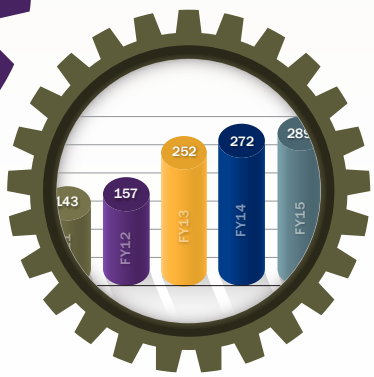
DESIGN • BUILD • TEST • SUPPORT

Supporting Customers with **Design, Build, Test** and **Support Solutions** to **Meet** the **Needs** of the **Chemical** and **Biological Defense Mission**



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For article suggestions, questions or comments, contact **Ed Bowen** at **edward.c.bowen8.civ@mail.mil.**

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Suzanne Milchling Bids Farewell to ECBC, Takes on New Role at AMSAA

Suzanne Milchling, former Director of Program Integration (DPI) at Edgewood Chemical Biological Center (ECBC), bid farewell to the Center at an open house on Aug. 6 in Berger Auditorium. The event featured presentations as employees wished her well for her new career opportunity as the Director of the Army Materiel Systems Analysis Activity (AMSAA). Prior to leaving ECBC, she served as the Acting Director of U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC) since March 2015. There, she led their strategic planning, business operations, surety, policy and support to current Warfighter and homeland defense operations.

Milchling's career at ECBC also included five years in the Engineering Directorate, where she served as the Associate Director of Joint and Interagency Activities and served on the Directorate's original core team that established the Balance Scorecard Strategy. She entered the Senior Executive Service in April 2011.

Suzanne Milchling and Engineering Directorate Deputy Director Bill Klein reflect on her career at ECBC during a farewell Open House at Berger Auditorium on Aug. 6.

Ask a Tech Tip: Storing Household Batteries

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

With the high cost of household batteries (such as D, C, AA and AAA), everyone tries as much as possible to extend their life and power. Many of us still store batteries in the refrigerator under the assumption that it extends the life of batteries in storage. It does not! Batteries should be stored at room temperature. When stored at room temperature, cylindrical alkaline batteries have a shelf life of 5–10 years and cylindrical carbon zinc 3–5 years. Lithium Cylindrical types can be stored from 10–15 years. Prolonged storage at extreme temperatures (either hot or cold) will shorten storage life.

DESIGN

Get in the Game: 3-D Software Prepares Warfighter for CBRNE Threats

Gaming Technologies Support Mission Readiness

Have you ever taken a training course, and then six months later, have to apply what you learned? Recalling that information is not always a simple task. The Advanced Design and Manufacturing (ADM) Division is designing 3-D software solutions to supplement more traditional training, and simulate real-life scenarios. The thought is that more experience-driven learning will help students retain knowledge better.

One example is an interactive training program that is being developed for the Joint Improvised-Threat Defeat Agency (JIDA). Joseph L. Williams, a computer scientist and Lead Software Developer for ADM's Conceptual Modeling and Animation Branch, said that the customer recognized the need for additional capabilities to supplement the already existing classroom training, and technical manuals.

The software serves as a refresher for how to use the equipment out in the field. "The program provides users with the steps they need to go through to operate the Husky Mounted Detection System (HDMS). It allows users to get practice with each of the different functions, become familiar with the various threat types, and then engage with the interactive training," explains Williams. The next iteration of the software, currently in development, will allow the vehicle to be controlled in a 3-D environment by the user.

ECBC's Military Deputy, COL Debra Daniels tries out the virtual reality head-mounted display. Photo Credit: Advanced Design and Manufacturing Division

In this example, the team used an industry standard 3-D real time engine to design and develop the product. The designers work off of static graphics to create a realistic virtual environment, and bring the end-user vision to life. The customer and their requirements inform the decision on what type of simulation software should be leveraged. "Being able to combine artists and programmers gives us a lot more potential than some organizations that just have computer scientists or engineers. This helps sell the product better," explains Williams.

One of the nicest benefits to the customer is that this type of technology can be used anywhere, making it easier to conduct effective training, in a shorter timeframe and in multiple settings. The training software can be sent overseas if needed, it can be taken out to the field, or it can be used in a classroom setting.

Keeping up with Industry

The ADM team is also exploring the use of virtual reality capabilities, which is the latest craze in the film, education and gaming industries, and is already being used for some military training. Instead of using a computer screen or tablet as your display, users wear a head mounted display that translates into a virtual reality. This provides a higher level of user immersion than a standard screen and has been primarily designed to integrate into real time 3-D environments.

One way this technology is being designed is with a 360 degree video capability that, when fully developed, makes the user feel as though they are actually in a different environment. This could be used for product support or mission rehearsal to increase the level of chem-bio readiness.

"We have provided virtual reality demos to a number of potential customers," said Jeff Warwick, Branch Chief for Conceptual Modeling and Animation. "We like to keep abreast of the newest technology so when a customer wants something, we are familiar with it. When people think of the military, they think cutting edge. We always strive to stay current – make sure technology is fresh, new, and exciting."

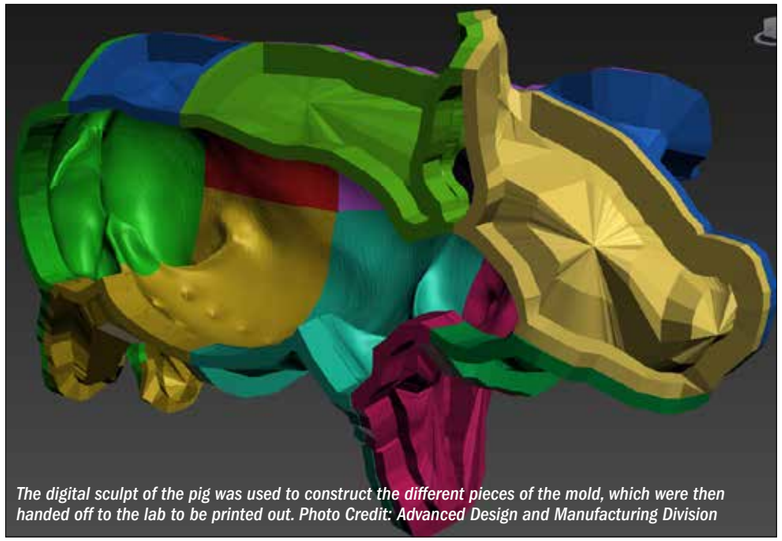
HDMS training from the student's perspective helps with operation of the HDMS. Photo Credit: Advanced Design and Manufacturing Division

BUILD

Model Pig: Making Upgrades to Training Props

Imagine walking through an open field scattered with livestock when one of them starts foaming at the mouth, and a foul odor permeates the air, as a result of a CBRNE incident.

A team of ECBC designers and engineers worked together to design and build a pig that could enable more realistic training scenarios—like the one described above—in the future. The lifelike pig model was designed as a CBRNE training prop for the Field Assistant in Science and Technology (FAST) Center. Still under evaluation, this unique concept was to create a livestock prop that could be used during training exercises, and simulate reactions an animal might have if it came in contact with a chemical agent.



The digital sculpt of the pig was used to construct the different pieces of the mold, which were then handed off to the lab to be printed out. Photo Credit: Advanced Design and Manufacturing Division

The customer wanted a prop that could appeal to more senses than just sight. Jeff Warwick, Branch Chief for Conceptual Modeling and Animation, describes the customer need as "a massive upgrade to the current training prop, which didn't look like a specific animal and didn't smell, feel or sound like one either. They wanted something that could be used as a visual precursor for incidents. Dead livestock that smell funny or make funny noises are things that Soldiers need to recognize in the field. They wanted the pig to foam at the mouth."

The ECBC group was approached by the customer with their request and, within 24 hours, the team designed and built a small-scale mockup of the dying pig. They used this proof-of-concept mockup to take to their initial meeting with the customer. "The fact that we were able to build a mockup with such short notice to take to the first meeting really sold the capability to the customer," explained Rick Moore, Chief of the Rapid Technologies and Inspection Branch. The branch supports product development, model making, additive manufacturing and 3-D printing as part of ECBC's Advanced Design and Manufacturing capability.

The team brushed a layer of silicone into the mold to capture the skin detail so it would look and feel like real skin. Photo Credit: Advanced Design and Manufacturing Division

The cross-functional team worked together to meet all of these requests for the pig using a technique called organic modeling, which is a fairly new capability within the Army. The development process started with designing a 3-D virtual model of a dying pig. "We used the same process, materials and techniques of how they would make a prop for a Hollywood movie. We even consulted with mold makers at the Smithsonian —to ensure we were taking the right approach and creating something to seem as real as possible," said Jason Gitlin, Lead Artist.

After the design was completed, they used their 3-D printing capability to create the mold. "Since this was a full-size model, we had to print in 15 sections using Stereolithography (SLA), a process that uses ultraviolet (UV) curing resin. Each section was bolted together to create the full mold," explained Moore. They filled the mold with a layer of silicone skin and expanding foam to help finalize the outside shape of the pig.

Mechanical and electrical engineers worked on the inside of the pig, developing the special effects to really bring the pig "to life." This included implementing a device to generate sound, pumps for the foaming mouth, and tubes to emit an odor.

"This really was a true team effort that included artists, modelers, electrical and mechanical engineers and the logistics team, who helped ship the final prototype to Germany where the customer has it in the field for testing and is receiving feedback," said Moore. "What happens next is up to the customer. If they have a desire to make more, with different modifications, the team is ready. We are hoping they will come back to us with more animal requests."

The final pig model is ready to be shipped to the customer. Photo Credit: Advanced Design and Manufacturing Division

TEST

Designing Future Capabilities for All Phases of Matter

Industry Partners Test Next Generation Chemical Detector Prototypes

Preparing for a future yet to be imagined requires a scientific approach focused on designing research that is persistent in experimentation. The U.S. Army ECBC is working with 10 industry partners, lending its laboratories and subject matter experts, to test prototypes for the Next Generation Chemical Detector (NGCD).

ECBC provides contractors with the laboratory space and engineering controls to advance prototypes of several NGCD detectors. Photo Credit: ECBC and JPM-NBC CA

"The government labs here at ECBC conduct this kind of chemical agent testing for traditional warfare agents and advanced threats," said Jeff Hofmann, Deputy Product Director for Sensors. "What's unique is allowing contractors to come in and choose the chemical warfare agents they want to focus their testing on in order to develop their agent library, test the integrity of their systems, and conduct sensitivity type analyses. They're able to maximize the time they spend in our labs and collect quality data to advance their technology."

The NGCD program is a long-term acquisition that is managed by the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD) to field four new chemical detection capabilities to the Warfighter. Until then, ECBC employees matrixed to JPEO's Joint Project Manager for Nuclear, Biological and Chemical Contamination Avoidance (JPM-NBC CA) are testing some of the latest detection equipment and software algorithms in industry.

"Even though this is a long-term program, there are multiple phases built in that allow industry to conduct multiple rounds of testing to ensure their technologies are on par, or surpass what's available on the commercial market," Hofmann said. "If, at any point, a company has developed something that works better than what we're already testing, we have the ability to incorporate that into the next phase of the program. There is great potential to advance these technologies through new and existing partnerships. Our ultimate goal is to get the most efficient, accurate and state-of-the-art technology in the hands of the Warfighter."

According to Hofmann, a comprehensive program to develop a detection capability for all phases of matter has never been done before. The NGCD will eventually be fielded to all services of the U.S. military in locations all around the world, including shipboard operations.

Technology Maturation and Risk Reduction (TMRR)

Continuously testing technology not only spurs its development more quickly, it also reduces the risk of manufacturing the capabilities prematurely. Beginning in the first quarter of FY15, ECBC conducted breadboard testing, an engineering term used for simple, stripped down prototypes, that were developed by the contractors so they could collect the data necessary to build a detection algorithm for its software.

"That algorithm is a critical piece of the detection software," said Aaron Young, the Test Support Lead for the NGCD team. "They are able to collect spectra from various agents of interest and write a program that looks for certain features within that data to signify the presence of an agent."

Contractors returned at the end of June with modified prototypes that were smaller and lighter in form, and updated with the rudimentary algorithm. This next phase, called brassboard testing, includes three phases: two technical tests customized for contractor-specific agents of interest, and one blind test where the ECBC and JPM selects the chemicals and conditions, but they will be unknown to the contractors. The blind test will be standard for all 10 contractors.

"What we are looking to create for the Warfighter doesn't exist yet in the commercial sector, so having the chance to collaborate with industry through this kind of development program is incredibly beneficial to both sides: we're able to provide the subject matter expertise to advance their systems, and they're able to design new technologies that meet our requirements," Young said.

The NGCD program is currently developing four capability development documents. Right now, ECBC is working with industry partners to test and develop NGCD 1-3, with plans to start NGCD 4 in fiscal year 2018. Below are details of all four individual NGCD components, which are meant to stand alone as independent capabilities:

1. **Detector Alarm: portable air monitor designed to detect vapors and aerosols in the field**
2. **Survey Detector: portable surface scanner designed to detect liquids and solids in the field**
3. **Sample Analysis Detector: stationary laboratory unit with deployable hand-held device designed to collect samples of all phases of matter in the field and return to lab unit for accurate analysis**
4. **Individual Detector: small, lightweight wearable device designed to detect vapors and aerosols, including low exposure limits and oxygen deficiency levels**

Having a diverse set of contractors allows the ECBC and JPM to observe what works well among the different technologies, as well as what some of the performance limitations are. This kind of research up front helps the ECBC and JPM make smarter decisions about where it invests in further development before the engineering and manufacturing development phase of acquisition, said Young. Not to mention, these industry insights are also coupled with Warfighter input.

"Warfighter input is always important," Young said. "Near the end of the TMRR phase, Soldiers will conduct an early operational assessment and take the systems out in the field to use on missions. We'll get feedback from them through interviews and surveys, which will inform the design for improved capability."

SUPPORT

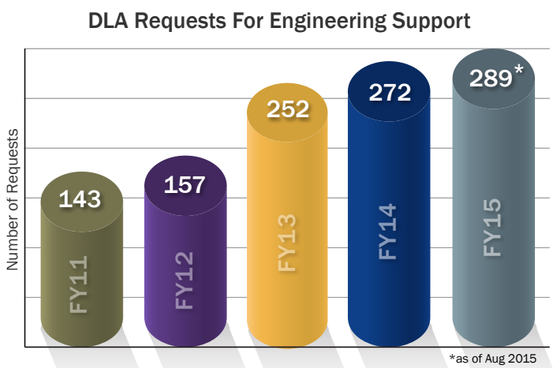
ECBC Improves Procurement Process for DLA Items

Engineering Requirements and Quality Assurance Standards Simplified for Technical Data Packages

Some things just don't translate, despite being written in black and white. Technical data packages are one of those things and, in the CBRNE defense arena, the terms and language used throughout the procurement process must be comprehensively and clearly stated by subject matter experts, and easily understood by all who are involved, especially the potential producers.

In this case, ECBC's Sustainment Engineering Division and Product Quality Management Branch located in Rock Island, Ill., worked hand-in-hand with the Defense Logistics Agency (DLA) to simplify how the engineering requirements and quality assurance measures of various items used for chemical and biological defense are incorporated into technical data packages. The data packages ECBC provides are then used in contracts that allow DLA to buy the items for supplying the field with needed replacement parts, with the ultimate goal of providing Warfighters with the most technically capable products that meet cost and delivery requirements.

According to Joe Gardner, ECBC Quality Assurance Specialist, the procurement process for DLA is different from the process used for the Department of Army. "DLA tends to buy based on demand so they're buying smaller quantities more often, whereas the Army tends to use longer-term contracts that allow for indefinite quantity amounts to be purchased," Gardner said. "Because we're a U.S. Army organization, all of our technical data packages were geared toward the Army contracting process, and we learned that providing information in the same format wasn't effectively addressing DLA's needs."



The increase in engineering support requests from DLA initiated the need to review work processes for providing technical requirements to DLA.

This required an entire redesign of ECBC's work process. Over several months, ECBC personnel met with their DLA counterparts in Columbus, Philadelphia and Richmond to workshop current language around technical specifications, and collectively determine the components necessary for quality assurance and performance requirements.

"We went through every element of quality assurance input, examined it together and determined if it was needed. If it wasn't, we eliminated it. We developed a new DLA contracting form and simplified the language to match DLA's items, which generally aren't nearly as complex as Army items," Gardner said. "We had to consider the service-specific and commodity-specific clauses typically used, as well as the DLA-specific clauses that were absolutely needed."

Implementing the Process, Monitoring for Improvement

Now that a streamlined process between ECBC and DLA is in place, the next step is to set up a control phase that monitors and evaluates the lifecycle, including post-contract award support. Since ECBC controls the configuration of the parts, including the materials used to produce it, the form, fit and function of the item cannot change without prior approval from ECBC. This enables the Center to govern the process from a systems perspective, employing technical expertise to support customers that may only be concerned about an individual part. The reality, however, is that a minor change in one area can significantly impact a critical piece in another area.

Maureen Jacobs is an ECBC Engineer responsible for providing technical requirements to customers like DLA, as well as supporting general configuration management control procedures. It is her job to ensure the proper protocols are in place that allow ECBC to vet any changes and grant approval prior to a product change from the manufacturer.

"That's the piece that we're working on now," Jacobs said. "We have to make sure the language is established in the contract so that there is a clear avenue that needs to be taken in the event of a design change. The last thing we want is to leave ourselves vulnerable to changes we aren't aware of. Knowing how each part works in conjunction with the system it was designed for is incredibly beneficial, and all of this communication with DLA has helped us demonstrate that niche expertise."

Everything from product shelf life to the protective finish that makes items resistant to chemical and biological agents are considered key requirements for different products, and it all goes into building a quality technical data package.

"The original impression was that our technical data packages were complicated because we provided significantly more information to DLA than the other services provided to DLA," said Nancy Lyford, ECBC's lead coordinator for DLA work. "Now we have a more sensible, yet judicious process, which is especially important in chemical and biological defense where you need to ensure the integrity of a procured part, otherwise you're risking the life of the end-user if you don't. And ultimately, the winner in all of this is the Warfighter."

When Questions Arise, CBRN-IRC Has the Answers

What is the CBRN-IRC?

Our challenge in the 21st century is to defend our nation against the unknown, the unexpected and the unseen. We must protect our Warfighters, support our allies, and defend our cities against weapons of mass destruction (WMD). The Department of Defense (DoD) is working vigorously to rapidly deploy state-of-the-art equipment to deter, detect, and if necessary, deal with the consequences of a WMD attack.

In 2007, the JPEO-CBD saw a need for a single entry point for all requests for information related to the chemical, biological, radiological and nuclear (CBRN) defense program. In partnership with ECBC, it established the Chemical Biological Radiological Nuclear Information Resource Center (CBRN-IRC). The CBRN-IRC provides military services, government employees, homeland defense personnel and first responders an around-the-clock interface for current, relevant and accurate CBRN information.

The CBRN-IRC is operated by a team of subject-matter experts (SMEs) located at ECBC's Rock Island site. The team often coordinates with other SMEs and external agencies as needed to make sure inquiries are thoroughly addressed. The team also works hand-in-hand with the U.S. Army TACOM logistics and item management teams and CBRN commodity engineers, scientists, equipment technicians, and test experts.

"The CBRN-IRC has taken an active role in dealing with the recent Ebola and Anthrax world situations. The IRC serves as the central repository for questions and requests for information regarding exposure to Ebola and Anthrax and worked hand in hand with subject-matter experts to ensure that the resolutions provided to our customers contain the most accurate and up-to-date information available."
- Kevin Lee,
Site Director, ECBC- Rock Island

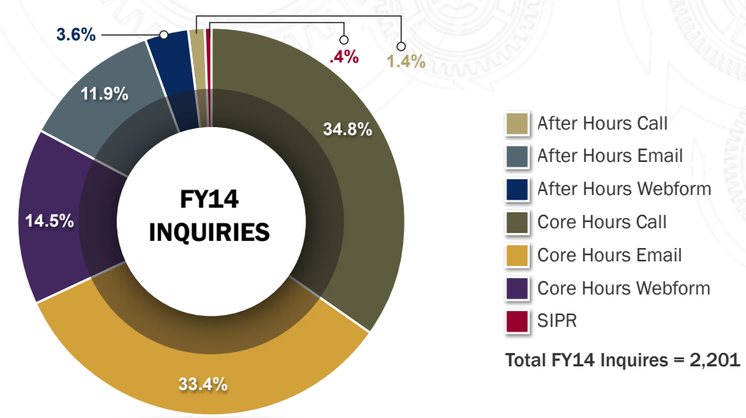
Inquiries range from training questions to technical skills and knowledge needed to utilize equipment and procedures developed to identify and analyze a CBRN threat, provide protection in a CBRN environment, decontamination procedures initiated after an exposure to CBRN threats, and the care of CBRN casualties.

The CBRN-IRC provides valuable feedback to the JPEO-CBD JPMs, the DoD's focal point for the research, development, acquisition, fielding and lifecycle support of CBRN defense equipment, medical countermeasures, force protection and WMD elimination. This information allows them to seamlessly integrate internal and external communication to provide responsive, relevant and reliable CBRN information in support of the Warfighter's real-time mission and the JPM's responsibilities for total lifecycle systems management. Additionally, the CBRN-IRC gathers information from field users and provides reports that may be used by material developers and logisticians for product and customer support improvements.

How Does it Work?

A CBRN threat or emergency can happen at any time—the CBRN-IRC stands ready to deliver information that helps the CBRN users prepare for, or recover from, such events in a timely manner. The CBRN-IRC can receive both classified and unclassified customer inquiries. Communication platforms include phone and email via Non-Secure Internet Protocol Router Network (NIPRNET) and Secure Internet Protocol Router Network (SIPRNET). Contact information is also posted on numerous websites. Customers may contact the IRC directly or the Joint Acquisition CBRN Knowledge System (JACKS), which is the portal host of the CBRN-IRC.

The CBRN-IRC strives for the quickest turnaround time possible for every inquiry. Requests receive a response within 24 hours whenever possible. When an inquiry requires additional time for coordination and research to provide the answer, the CBRN-IRC staff diligently follows up to ensure that actions are taken in a timely manner in accordance with standards set by the International Organization for Standardization.



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How to Keep a Customer

Delivering good customer service is the best way to ensure you keep a relationship with your customers, and increase the likelihood of retaining their business. Too often we hear of experiences where customer needs aren't met and the relationship suffers. However, customers can also be turned off by an attitude of indifference, so it is important to make a conscious effort to always be at the top of our game when working with our customers. Here are five tips we should remember to encourage our customers continue to stay in business with us.

1. **Acknowledge the customer.** Give credit where credit is due and acknowledge the input of your customer, no matter how miniscule their contribution may seem. Many of our customers provide the financial backing to support our research; without them we would not exist. Make sure you acknowledge your customer when briefing your research, on presentation material, and on deliverables you prepare. This makes the customer feel as if they are part of the team; which they are. If we fail to acknowledge our customers, they may take their business elsewhere.

2. **Care about the customer.** There's an expression that is attributed to John Maxwell that says, "People don't care how much you know until they know how much you care." If there is one important part of customer service, it is that you care – and the customer knows it. Empathy builds the relationship, and true caring and concern for the customer trumps all.

3. **Listen to the customer.** Customers want to be heard, and equally as important, understood. Avoid a Moment of Misery with a customer by ensuring communication lines remain open throughout the project, and you are easily accessible and readily available. Customers should enjoy doing business with you, and one way to do that is making sure you listen and understand their needs.

4. **Respond to the customer.** It is so frustrating to leave a message on the phone, send an email or a Tweet, and get no response. A bad customer service situation gets worse when the company doesn't respond to the complaint or problem.

5. **Appreciate the customer.** A fundamental need of most, if not all people is to feel appreciated. Customers want to be appreciated for sending their scarce resources to your place of business. So, let your customers know you appreciate them by providing the best service possible.

(This article is inspired by, and uses content from Shep Hyken's Customer Service Blog, posted on Jan. 20, 2014.)