JSTO in the News

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Saving our hides:
a kit for every occasion.

On location. CBRN systems are being adapted to go more places with the warfighter.

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DEFENSE THREAT REDUCTION AGENCY

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Front cover: Master-at-Arms practices detection training with her military working dog Aci. (U.S. Navy photo by Jacob Smith)

Inside cover: Air Force Staff Sgt., military working dog handler, screens military working dog Rogane, a German Shepherd who does single-purpose explosive detection, during Chemical, Biological, Radiological, or Nuclear decontamination training. (U.S. Army photo by Anaidy G. Claudio)

Back cover: U.S. Marine Cpl. shows a tethered reconnaissance Unmanned Aircraft Systems during Urban Advanced Naval Technology Exercises 2018 (ANTX18). (U.S. Marine Corps photo by Cutler Brice)

SAVING OUR HIDES:

A KIT FOR EVERY OCCASION

Military working dogs are critical warfighter assets due to their extensive training for search-and-rescue missions or detection of illicit or hazardous chemicals. These canines function as a force multiplier at the forefront of operations where the team may encounter a host of threats, such as exposure to a chemical warfare agent (CWA) or toxic industrial chemicals before the threat is identified. In these situations, canines can save warfighter lives; but, if contaminated, they can also risk contaminating their human handlers. To reduce the CWA contamination risk to military working dogs, the Defense Threat Reduction Agency's (DTRA) Chemical and Biological Technologies Department in its role as the Joint Science and Technology Office (JSTO) is investigating new methods and processes for their decontamination.

Fast decontamination is critical to military working dog survival. For immediate canine decontamination, current guidance recommends the use of existing human skin-based decontamination solutions, such as Reactive Skin Decontamination Lotion (RSDL), along with copious amounts of soap and water. RSDL is highly effective on human skin, but since the RSDL is a lotion optimized for human skin, it may not be the best option for dogs, such as when warfighters are downrange where there is not likely enough water to fully wash and rinse the dogs. As a result, DTRA-JSTO is developing an effective immediate decontamination kit specifically for military working dogs to rapidly remove contamination and reduce risk to both the dogs and their handlers.

Using canine skin and fur surrogates, DTRA-JSTO is developing a decontamination kit to rapidly remove contaminants from military working dogs and reduce risk for both the dogs and their handlers.

To do this, DTRA-JSTO is teaming with industry through Small Business Innovation Research grants to develop a decontamination kit specifically for military working dogs that is effective for a wide variety of CWAs and toxic industrial chemicals. Their goal is to develop a lightweight, versatile decontamination kit that can be carried by the military working dog or its handler. The materials in the kit would be tailored to remove and neutralize chemical contamination on military working dog skin and fur until handlers can perform a more thorough decontamination.

Prototype military working dog decontamination kits will be designed for use in an operational environment to reduce contamination levels on the dog by 90 percent within one hour. The kits will be usable by a single handler in personal protective equipment and effective even with limited external resources like soap and water. Kit design will focus on several of the major military working dog breeds, including the Belgian Malinois, German Shepherd, and Labrador Retriever. The kits will be modular to allow the warfighter to select the decontamination protocols and materials based on the type of contaminating CWA.

Several challenges remain for research and development of these kits. First, canine skin includes fur, foot pads, and other attributes that increase body region complexity as compared to human skin. Decontaminants must be effective on all these body regions. Second, the many working dog breeds used with the military and civilians have different fur characteristics, such as hair length, thickness, and undercoat depth, that may lead to various interactions between the agent and decontaminant. These fur characteristics determine if chemical warfare agents penetrate to skin or are instead wicked into the fur coat, becoming a potential residual hazard. Finally, any decontamination kit must be easily and rapidly applied, safe for humans, and have limited, acceptable side effects for both handler and canine, such as a neutralization reaction that warms the skin, not requiring further resources like soap and water. Handlers will likely decontaminate a motionless canine immediately upon exposure and may carry the military working dog to a thorough decontamination area, so the decontamination kit must reduce the potential for cross contamination to handlers.

In the future, industry and government researchers will explore the materials, test methods, and procedures needed to develop novel military working dog decontamination kits. For example, some data suggests that the longer, thicker hairs of a dog's coat may provide a level of protection by preventing liquid CWAs from

Military working dog Oopey, a Belgian Malinois who does patrol work and explosive detection, wears protective gear and sits with her handler and members of the 637th Chemical Company. (U.S. Army photo)

penetrating the coat and contacting the skin. However, the best way to immediately remove the contamination from long fur remains a key question. Researchers will not use live canines for actual CWA or simulant testing. Instead, in a laboratory, they will test neutralization of the CWAs and simulants on different skin and fur type surrogates to develop complementary application processes, such as wiping, blotting, or other techniques, and how much decontaminant to use, etc. Researchers will, however, use military working dogs along with their handlers in personal protective equipment to develop safe processes and procedures to implement a future immediate decontamination kit.

These collaborative efforts between industry and Department of Defense (DoD) laboratories will generate data that are critical for the design of new decontamination methods and equipment options for military working dogs beyond the use of RSDL. This data will also show researchers how different military working dog breeds are affected by CWAs and the parts of their bodies that are most vulnerable. Ultimately, this research is part of a larger personnel decontamination effort within the DoD to reduce risk and improve decontamination options for the warfighter's four-legged team members on the front lines. ●

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ON LOCATION

CBRN systems are being adapted to go more places with the warfighter.

American forces and our allies face potential but real symmetric and asymmetric Chemical, Biological, Radiological, and Nuclear (CBRN) threats during forward deployed operations. As such, it is vital to possess capabilities to protect, mitigate, and understand these threats to facilitate effective decision-making so that the force can continue operations within a hazardous environment.

An effective defense, especially in foreign or "forward deployed" and harsh or "austere" locations, requires a CBRN integrated early warning technology platform that is light, lean, and adaptable to different objectives. The Air Force Emergency Management community calls one such "system of systems"—a collection of tools—the Austere Environment Reconnaissance and Surveillance (AERS) platform. Having this system be faster, lighter, more maneuverable, and capable of

AERS platform UTV with CBRN-mounted sensor and communications equipment. The lighter, leaner personnel and equipment package is contained all on the one vehicle. (U.S. Air Force photo by Steve Gaboriault)

holding myriad, effective detection tools to analyze and combat CBRN threats while enabling real-time data communications displayed on tablets in a common operating picture gives the warfighter a significant edge over the current capability.

The Defense Threat Reduction Agency's Chemical and Biological Technologies Department in its role as the Joint Science and Technology Office in coordination with the Defense Threat Reduction Agency's Nuclear Technologies Department recently conducted the United States Air Force (USAF) CBRN Reconnaissance and Surveillance Field Demonstration at Marine Corps Base Quantico.

This Advanced Technology Demonstration (ATD) is part of the Integrated Early Warning campaign to develop advanced threat detection, understanding, and communication of CBRN defense capabilities. Like previous demonstrations for multi-service applications, such as the Perceptive Dragon series of exercises, this ATD showcased USAF Emergency Management personnel using remote chemical and radiological sensors along with handheld and wearable sensors, all integrated into a common architecture on the AERS platform Utility Task Vehicle (UTV). Much of this collection of tools can be used for all types of CBRN threats.

Remote chemical and radiological sensors along with handheld and wearable sensors all integrated into a common architecture on an AERS platform "system of systems" enable a **real-time operating picture**.

The ongoing adverse impacts of the coronavirus pandemic inspired an innovative alternative to the standard live ATD event with large crowds. For the two-week event, a small, controlled group of Air Force participants and key support personnel trained with and then operated the developmental technologies and were recorded in extensive video footage that will be distributed to key stakeholders to help shape future development.

Airmen demonstrated chemical and radiological sensors mounted on a Nibbler drone—a small Unmanned Aerial Vehicle (UAV), an Unmanned Ground Vehicle, and the AERS platform vehicle while using handheld sensors and wearing Physiological Status Monitors with a Heads Up Display in realistic and operationally relevant scenarios. The integrated sensors provided real-time data sharing and data display that significantly improved timeliness

A small UAV with mounted chemical sensors was operated to conduct remote recon to detect chemical vapors. (U.S. Air Force photo by Pierce Jennings)

and accuracy in gathering detection and identification data compared to current procedures. The traditional USAF CBRN capability package is called a "Whisky Lima" that includes 22 to 32 airmen with materials and equipment that weigh about 6,600 pounds. The smaller AERS platform capability requires only four airmen and weighs about 2,300 pounds—a significant reduction in required manpower and a 65 percent decrease in weight. The two mostly differ in that the Whisky Lima is a main operating base capability while the AERS is for a forward deployed, austere environment. C-130 transports and Osprey V-22 vertical-takeoff-and-landing aircraft can easily move the AERS platform capability to these areas.

At the tactical team level, this technology can:

1. Inform whether the team can safely access a location for interrogation using modeling to see where contamination clouds or regions are and how to best approach the hazardous area;
2. Help determine what types of capabilities need to be deployed to best understand the hazards in that environment;
3. Show which areas are of concern and which are not; and
4. Pinpoint the hazards, freeing up other areas for maneuver and operations.

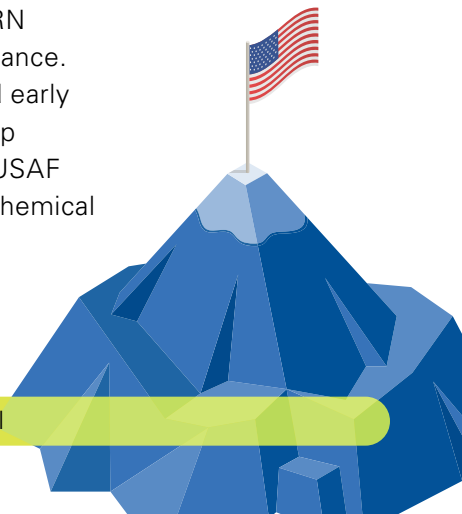
At higher levels in the chain of command, this technology can be used to make operational decisions such as:

1. How to restore combat power once the hazards in that environment are known;
2. What type of protective posture personnel need to use to safely mitigate the risk; and
3. How to minimize the risk to the warfighter while maximizing the team's ability to complete the primary mission.

Ultimately, the ATD demonstrated the AERS could enable timely, well-informed decision-making to maintain mission effectiveness in a contaminated environment and reduce casualties. The airmen also identified some areas where tweaking the capabilities could improve the operational use of the AERS platform:

1. Use lighter but still strong materials to reduce weight while maintaining performance;
2. Adjust the locations of some of the system's hardware to accommodate individual protective ensemble gear; and
3. Improve the usability of the system's capabilities on handheld devices by optimizing the graphical user interface.

Through their participation and feedback during the demonstration, the airmen validated the utility of the AERS platform's capabilities. These integrated technologies successfully demonstrated the possibility of providing a versatile and transportable chemical and radiological detection and analysis capability that significantly improves upon current means of CBRN reconnaissance and surveillance. Ultimately, these integrated early warning capabilities will help provide the foundation for USAF know-how to meet future chemical and radiological threats on tomorrow's battlefield. ●



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INTRODUCING
THE DTRA-JSTO eBOOK

The official eBook of the Defense Threat Reduction Agency's (DTRA) Chemical and Biological Technologies Department in its role as the Joint Science and Technology Office (JSTO)

This eBook publication outlines the mission, strategy, and capabilities of DTRA-JSTO. By navigating the eBook, scientists, researchers, military personnel, and others will learn about the Chemical and Biological Defense Program (CBDP) and DTRA-JSTO's role in supporting disruptive scientific and technical advancements to protect the warfighter and the nation.

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Within the Defense Threat Reduction Agency's Research and Development Directorate resides the Chemical and Biological Technologies Department that serves as the Joint Science and Technology Office. This publication highlights the department's advancements in protecting warfighters and citizens from chemical and biological threats through the innovative application of science and technology. DTRA.mil