



# Providing Police Backup Through Science and Technology

October 2023

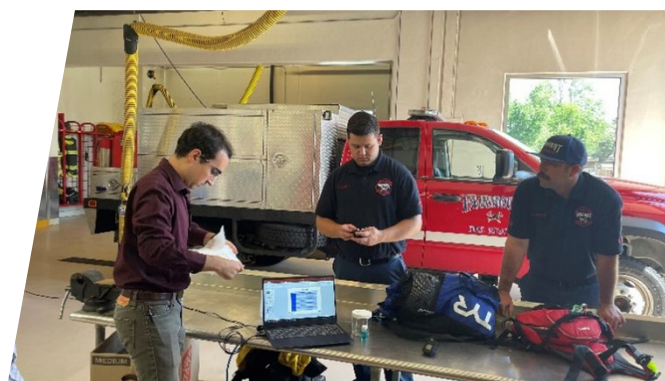


Science and  
Technology

The **Department of Homeland Security (DHS) Science and Technology Directorate (S&T)** works closely with first responders to improve their safety and effectiveness – lending expertise, conducting research and development, and funding innovation to ensure our nation’s public safety services are well-equipped to provide aid in times of crisis. Those efforts are guided by direct engagement with responders from across the country as well as invaluable insight gained through the **First Responder Resource Group**. Experienced firefighters, paramedics, police officers, emergency managers, and other public safety disciplines across our nation volunteer to help S&T focus on top-priority needs and assess that technology solutions meet those needs. Thus, the law enforcement community is naturally considered a key stakeholder and S&T is proud to serve the men and women sworn to protect all of us. The following is a select sampling of activities showcasing our work in support of law enforcement.

## PROTECTIVE GEAR

- /// The **Mission-Adaptive, Modular Law Enforcement Helmet** will provide concussive and ballistic protection, be mission-adaptive, lightweight, and wearable for an extended period of time. The solution, under development with Texas Tech University, will mitigate the risks of potentially violent situations.
- /// The **Multi-Spectrum Laser Detection System** will feature two laser light detector designs: an individual, wearable detector and a deployable standalone area detector to provide up to 360 degrees of coverage. The National Urban Security Technology Laboratory (NUSTL) is performing market survey analysis of the detectors, which will alert responders when a potentially dangerous laser light pointer is directed at them.
- /// **Wearable Smart Chemical Sensor Badges** will protect first responders by providing high sensitivity and selectivity to multiple toxic industrial chemicals at trace concentrations and triggering distinct alarms at set exposure limits. S&T is working with TDA Research, Inc. to develop the small, simple, inexpensive, and rugged devices.



TDA staff members provide an overview of the wearable chemical sensor badges. Photo: S&T

## SITUATIONAL AWARENESS

- ♥ The **Data Upload Mechanism** allows first responders to digitize, maintain, and access pre-incident floor plans from anywhere. Mappedin, Inc. delivers this flexible, cloud-based software solution for quickly assessing the layout of a building upon entry for rapid situational awareness.
- /// The **Detection of Presence of Life through Walls** technology will provide law enforcement with the ability to detect individuals through typical building walls and locate criminals and/or human trafficking and kidnapping victims. This capability will improve officer safety and provide them with critical information that potentially enables more tactical options.
- ♥ **Night Vision Technologies** support law enforcement operations with enhanced vision, sensing and awareness while operating in low or no light conditions. NUSTL conducted market research and hosted a focus group and assessment to test six commercially available night vision devices for operational use.

♥ In use/commercially available

/// in development/coming soon

### /// **Precision Outdoor and Indoor Navigation and Tracking for Emergency**

**Responders** is a palm-sized device for 3D position and orientation sensing in non-line-of-sight, indoor, underground, cave, tunnel, and outdoor environments. The focus of Phase II of development is on law enforcement, border security, wildland firefighting, and high-rise and industrial response applications.

/// The **Shooter Detection Systems Outdoor** system provides real-time alerting of detected gunshots, enabling responders to approach a gun-related incident more safely and with greater awareness. This portable system allows law enforcement to adjust coverage of gun-related incidents and shorten response times to provide better evidence and lead to greater apprehensions and convictions.

♥ The **Team Awareness Kit** is a government off-the-shelf mobile phone application that provides a common operating picture, enhancing situational awareness across disciplines and jurisdictions during a response. The app is available for both Android and Apple devices.

♥ The **QuickRoute** mobile application recognizes the conditions and constraints emergency vehicle operators face and helps them to respond efficiently while navigating to an incident. The app, which is available for download, addresses more challenges than a typical GPS application, including narrow lanes, inclement weather, downed power lines, and other hazards. A recently enhanced version, QuickRoute Emergency Command Center, incorporates a dispatch function.

/// The **Urban Security Initiative** is a portfolio of collaborative projects with the City of New York to help protect high-density urban areas and transit systems from chemical and biological threats. S&T and a coalition of partners, including the Metropolitan Transportation Authority, are developing enhanced mitigation strategies, and testing and evaluating various biosensor technologies to provide early warning for public transit.



*The SDS Outdoor gunshot detection technology is quickly installed for field assessment. Photo: S&T*

## ON-THE-JOB TECH

/// The **3D X-ray** is a user-friendly, portable, durable, prototype imaging tool that uses a combination of both 2D and 3D computed tomography imaging capabilities to detect the presence of explosive devices and related components quickly and accurately in backpack-sized containers or bags—without needing to open them.

♥ **Body-Worn Cameras with Automatic Activation** were assessed and a focus group was conducted by NUSTL based on criteria determined by law enforcement professionals from across the country to obtain hands-on feedback that will help agencies make operational and procurement decisions.

♥ **Chemical Agents Reactions Database (CARD)** is a centralized location of chemical information for threat materials developed by S&T's Chemical Security Analysis Center (CSAC). If police find an illicit drug or warfare agent, they can search the CARD to see what chemicals can be used to make it, enabling them to obtain further evidence against a suspect.



*Two evaluators using the Motorola V300 body cameras during an unholstering and room clearing scenario. Photo: NUSTL*

- ♥ The [Electronic Recovery and Access to Data \(ERAD\) Prepaid Card Reader](#) is a wireless, handheld device used to check the balance of any suspicious cards with a magnetic strip to see if money is hidden on it. The ERAD Prepaid Card Reader has helped local, state, federal, and international law enforcement agencies seize tens of millions in fraudulent funds.
- /// The [Less Lethal Options for Crowd Environments](#) program is developing an aerial drone equipped with a Large Range Acoustic Device and a microphone to enable two-way communications. This drone will enable responders to provide instructions to large crowds or conduct two-way communications with specific individuals in multiple law enforcement use cases.
- ♥ The [Research and Prototyping for Tactical Operations \(RAPTOR\)](#) program enhances the safety, efficiency, and effectiveness of our nation's Special Weapons and Tactics (SWAT) officers through evaluation of existing and emerging technologies. RAPTOR is the only federal program specifically focused on meeting SWAT teams' needs.
- ♥ The [Response and Defeat Operations Support \(REDOPS\)](#) program supports public safety bomb technicians by providing a collaborative structure for the research, development, testing and evaluation of new technologies to defeat improvised explosive devices. REDOPS serves as a force multiplier, identifying prototype innovations at the local level and bringing a certified and standardized version to responders nationwide.
- /// The [Safe Handling and Collection of Electronics \(SHAKE\) mobile application](#) allows U.S. Customs and Border Protection (CBP) agents to quickly and easily access information in the field about how to deal with intercepted drones that could be carrying illicit drugs or contain unlawful surveillance equipment.
- ♥ The [Soft Target Security Program](#) deploys enhanced detection methods, protective physical barriers, and more to ensure large public gatherings are as safe as possible. The [Special Event Planning Tools](#) decision-support software suite, which enables users to assess potential event vulnerabilities and subsequent civilian consequences, is just one example of soft target security.

## TRAINING TOOLS

- ♥ The [Advanced Open/Obstructed Test Proctor Course for Evaluating Drone Capabilities and Remote Pilot Proficiency](#) was developed in conjunction with the National Institute of Standards and Technology. The training ensures competent drone piloting for law enforcement operations including search and rescue and counter improvised explosive device. The test methods are easily replicable, and the assessment standards have been used internationally.
- ♥ The Explosives Detection Canine Program launched an interactive training guideline for [Person-Borne Explosives Detection \(PBED\)](#) in collaboration with the Johns Hopkins University-Applied Physics Laboratory. The comprehensive, HTML-based tool incorporates extensive experience and lessons learned, delivering detailed descriptions of training techniques, video clips, and tips on evaluating canines for potential PBED detection capabilities.
- /// The [Firearms Coaching/Video Analysis Tools](#) is a software system for firearms instructors at the Federal Law Enforcement Training Centers (FLETC) to analyze, coach, and provide immediate feedback to inexperienced students. By using video to capture shooting errors, the instructor can quickly show the trainee problem areas and document progress. S&T's Tech Scouting team recently researched existing and emerging technologies that could provide a secure, internal system for multiple users and devices and will perform a live, hands-on demonstration. For additional information on this and other efforts, contact [first.responder@hq.dhs.gov](mailto:first.responder@hq.dhs.gov).

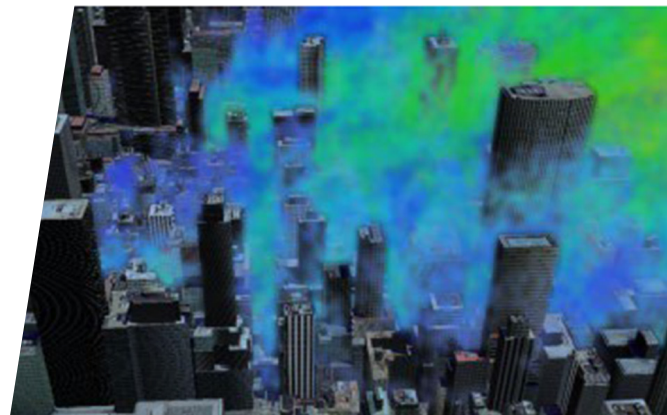


*A drone operator is observed during testing by a test proctor at the Maryland State Police Training Academy. Photo: S&T*

- ♥ The [Regional Explosive Detection Dog Initiative \(REDDI\)](#) program provides regionally based training events for detection canine teams in the law enforcement community. The events include classroom instruction and exercises demonstrating common issues for the participating canine handlers. The performance of more than 500 canine teams has been evaluated through the REDDI program with the goal of improving effectiveness and efficiency.
- ♥ NUSTL operates a [Responder Training and Exercise \(RTE\)](#) program to help responders train and use radiation detection equipment by providing radioactive samples, equipment, and technical expertise for trainings and exercises. The RTE program serves as a resource for agencies developing radioactive response protocols.

## REFERENCE MATERIALS

- ♥ [CSAC](#) has worked with fusion centers and the U.S. Drug Enforcement Administration's High Intensity Drug Trafficking Area program to provide technical information for law enforcement use in battling illicit opioids. This includes interferences to proposed testing devices and chemistry considerations for illicit drugs.
- ♥ [Synthetic Opioids Detection](#) was the focus of research by S&T and the Pacific Northwest National Laboratory to assess field detection equipment in the presence of fentanyl, fentanyl-related compounds, other drugs, and cutting agents. Participating vendors have obtained new reference spectra to enhance their products' marketability and end users of the equipment can contact the manufacturer for free system updates with the expanded libraries.
- ♥ The [Homeland Explosive Consequence Assessment Tool](#) is a desktop application developed by CSAC for planners to rapidly analyze 'what-if' scenarios when preparing to protect a major event such as human health consequences from an explosion, the current medial ability to respond, and various mitigation strategies.
- ♥ S&T's [Master Question List for Synthetic Opioids](#) serves as an information resource for response personnel who might encounter these substances in the field. This document provides information on synthetic opioid topics such as: exposure limits, personal protective equipment, personnel decontamination, medical countermeasures, and more.
- ♥ The [New York Area Science and Technology \(NYAST\) Forum](#) is a consortium of federal, state, and local government organizations, first responders, academia, and private sector groups that regularly meet to promote and discuss advances in science and technology applications. NYAST is managed and hosted by NUSTL.
- ♥ The [Probabilistic Analysis for National Threats, Hazards, and Risks](#) program provides decision support to first responder communities through its annual production of the Chemical, Biological, Radiological, and Nuclear (CBRN) Strategic Risk Assessment. State, local, tribal, and territorial partners leverage the results of the assessment to help inform concept of operations and to allow the community to best prepare for, respond to, and recover from CBRN attacks.
- ♥ [Project Responder 6](#) is a coordinated effort across first responder disciplines to identify and validate common needs. The study identified six distinct factors that may have an impact on responders' current operating environment: human behavior, technology advancement, environment, infrastructure, COVID-19, and protest/civil unrest.
- ♥ The [Radiological/Nuclear Response and Recovery Research and Development](#) program managed by NUSTL develops tools, modeling, and guidance to help state, local, tribal and territorial public safety agencies initiate a response in the first minutes, hours, and days following a radiological and nuclear incident and support their longer-term recovery needs.



*A computer simulation shows the spread of radioactive material in an urban setting Photo: S&T*

- ♥ The [System Assessment and Validation for Emergency Responders \(SAVER\)](#) program develops reference materials that help emergency response agencies make informed procurement decisions. SAVER has conducted more than 100 assessments on everything from tactical body armor and ballistic helmets to search and rescue robots and has published over 1000 knowledge products covering 700 different commercially available technologies.
- ♥ S&T's [Technology Clearinghouse](#) is a searchable repository of research and development findings and information about innovative technology solutions to inform procurement, policy, and research and development decisions.

## TESTING AND EVALUATION

- ♥ S&T is supporting [Counter-Unmanned Aircraft Systems \(UAS\)](#) research, testing, training and evaluation across multiple DHS missions and components to mitigate unlawful use of UAS. Several tests have already been successfully executed and more are planned in coordination with the U.S. Coast Guard, U.S. Secret Service, Federal Protective Service, and CBP. NUSTL has developed related resources for local law enforcement including a [Technology Guide](#) and [Questions to Ask When Researching C-UAS](#).
- ♥ [FirstNet's Push-to-Talk application](#) is a standards-based, mission-critical push-to-talk app that S&T field tested in collaboration with multiple federal partners over the course of a month in 2021 to see how it performed in real-world emergency scenarios. The app allows voice, video, and data communications with high priority and low delays with the press of a button.
- ♥ The latest [First Responder Electronic Jamming Exercise \(JamX\)](#) took place in April 2022. The event assessed the impact of illegal jamming (blocking) on public safety communications systems and mission response. Participants identified gaps in training, and evaluated tactics and technologies to help better identify, locate, and mitigate the impact of jamming.
- ♥ [Methods for De-escalation of Conflict in Law Enforcement Encounters](#) was the focus of research conducted by FLETC and Arizona State University through their Center for Acceleration Operational Efficiency. The study used a systematic evaluation of escalation, related factors, and the extent to which force usage may be considered appropriate. Bodycam and dashcam video were analyzed for 540 on-duty encounters to provide the framework for this analysis.
- ▤ NUSTL recently released a request for information for [Pedestrian Weapons Screening Systems for Use at Large Gatherings or Mass Transit Centers](#) to understand commercially available products that meet the needs of law enforcement and emergency response agencies. Advanced screening technologies capable of detecting covert weapons without impeding pedestrians' flow are required to secure venues and events where large crowds gather. Technologies identified will be included in a market survey conducted by NUSTL.
- ♥ [Urban Operational Experimentation \(OpEx\) 2022](#) evaluated new and emerging technology solutions in realistic, urban settings throughout the New York Metropolitan area. The lineup of technologies featured assessments of unmanned aircraft systems, deployable robotics, handheld sensors, artificial intelligence-enabled gun detection, incident management and situational awareness platforms, and deployable communications.



*The JamX 22 counter-jamming event was held at White Sands Missile Range in New Mexico. Photo: S&T*



# Science and Technology

To learn more about S&T's support to law enforcement, please visit our website:



<https://www.dhs.gov/science-and-technology/first-responders-capability>

And follow @DHSSCITECH for the latest updates

