



# National Urban Security Technology Laboratory

Annual Report

Fiscal Year 2016



Homeland  
Security

Science and Technology











# **NATIONAL URBAN SECURITY TECHNOLOGY LABORATORY**

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## ► INTRODUCTION

In FY2016, the [National Urban Security Technology Laboratory \(NUSTL\)](#) celebrated 70 years in service through science. With locations in downtown New York City and the Chicago metropolitan area, NUSTL serves as an urban test bed that brings together the interests and initiatives of the federal community with the first responder community. The laboratory's mission activities in test and evaluation (T&E) and research and development (R&D) aim to help first responders prepare, protect and respond to homeland security threats.

Technological innovation is necessary to address challenges for the first responder community as well as homeland security threats. To answer to these challenges, NUSTL performs tests, evaluations and assessments of existing and emerging technologies through a full spectrum of laboratory and field testing services. NUSTL's scientists, engineers and program leads planned and executed T&E activities to inform acquisitions and operations, develop more effective technology deployments and integrate first responder operations.

T&E is just one part of the laboratory's mission that promotes the development and successful deployment of technologies and tools in the interest of national security. The laboratory also works to enhance first responder capabilities by partnering with stakeholders to develop viable solutions to radiological and nuclear threats. NUSTL's Radiological/Nuclear Response and Recovery (RNRR) Team strategically invests in R&D and technology innovations that can characterize and manage a radiological incident, save lives and minimize the impacts on communities through incident stabilization and radiological clean-up.

NUSTL's program and project accomplishments—detailed in this annual report—would not be possible if it were not for the hard work and dedication of its highly specialized staff.



## ▶ EXECUTIVE SUMMARY

As a federal laboratory organized within the U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T) First Responders Group (FRG), NUSTL is dedicated to advancing the research, development, test and evaluation of homeland security technologies and tools that prepare and protect our nation. This Fiscal Year (FY) 2016 Annual Report contains a summary of NUSTL's completed program and project milestones, collaboration and outreach, mission and services, laboratory operations, and organizational successes.

The laboratory fulfilled its mission by ensuring effectiveness, performance and suitability of technologies for operational deployment. NUSTL's notable achievements in T&E include:

- Functional testing of 1,079 units of radiation detection equipment;
- Operational field assessments, tests and evaluations of technologies such as the X-ray Scanning Rover, the Firefighter Accountability and Proximity System and Standoff Radiation Detectors;
- Provision of radiation sources and technical expertise to support 24 responder training and exercise events attended by more than 15 state and local agencies and
- 40 new technical reports and knowledge products authored and published by NUSTL to facilitate first responder technology acquisition and deployment decisions.

NUSTL also developed actionable tools and guidance to support local and state emergency managers, incident commanders and decision-makers during a radiological or nuclear emergency through its R&D. This report contains information on NUSTL's development of the Radiological Operations Support Specialist, a new National Incident Management System-type position, and the Science-based Response Planning Guidance for the First 100 Minutes of the Response to a Radiological Dispersal Device (RDD) Detonation, which offers recommendations on how local response agencies can be successful during the critical emergency phase of a response to confirm a radiological release, issue protective actions to the public, conduct lifesaving operations, and begin to measure and map areas of contamination.

These highlights among many other accomplishments from FY2016 are showcased in this annual report.



## ▶ HISTORY

### FROM THE MANHATTAN PROJECT TO HOMELAND SECURITY

NUSTL originated in 1942 during the Manhattan Project of World War II to support atomic energy activities for the nation's defense. Today, NUSTL serves as a trusted, federal resource to the homeland security community and state and local first responder agencies for the accelerated delivery and successful end-user deployment of technologies and systems.

### A 70 YEAR HISTORY OF SERVICE THROUGH SCIENCE

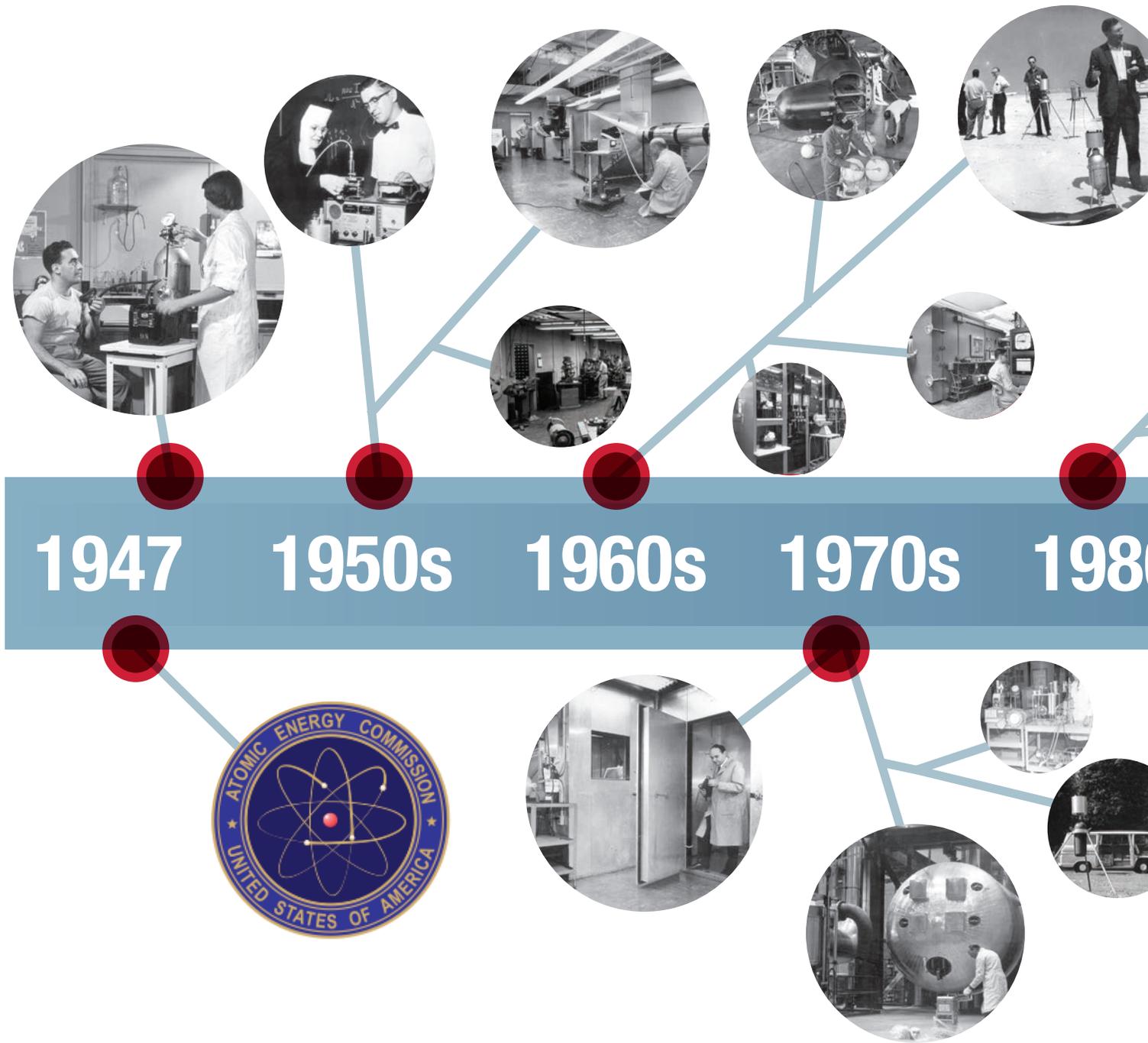
NUSTL has more than seven decades of rich history supporting national security needs since its establishment in 1947. These are some of the historic milestones that have shaped the laboratory today:

- **1947:** The laboratory was formed as the Medical Division under the Atomic Energy Commission (AEC) and later renamed to the Health and Safety Division; focusing on industrial hygiene, radiation protection and safety.
- **1953:** The laboratory became the Health and Safety Laboratory and shifted its focus to measurements and assessments of fallout from nuclear weapons tests.
- **1961:** The laboratory measured radon in mines to assess the health risks of miners.
- **1971:** The laboratory performed extensive radiation transport and dosimetry studies in and around nuclear facilities.
- **1974:** The AEC was abolished, and the laboratory became part of the Energy Research and Development Administration, which was absorbed by the newly created U.S. Department of Energy a few years later.

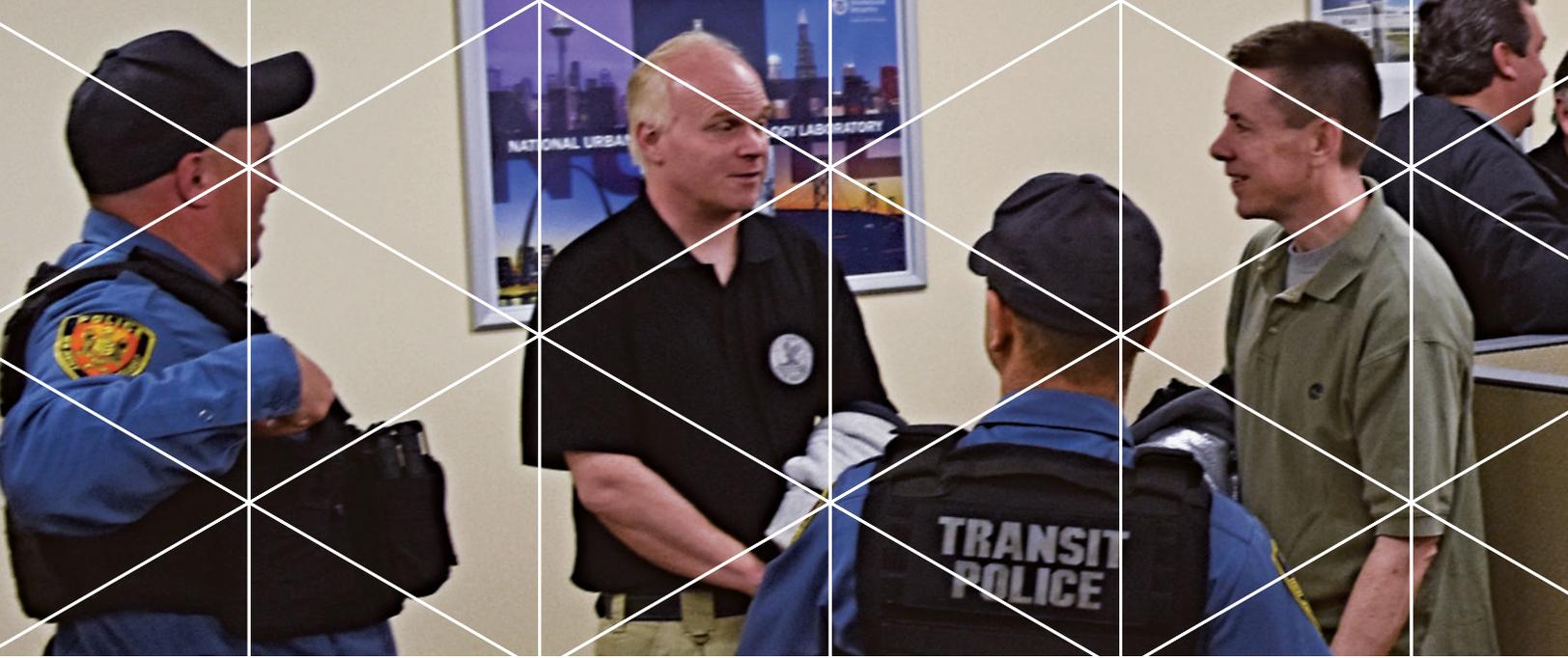


- **1977:** The laboratory became the Environmental Measurements Laboratory (EML) and supported environmental monitoring and sampling, fallout measurements, and decommissioning, decontamination and remediation efforts.
- **1989:** After the Three-Mile Island and Chernobyl accidents, the laboratory took immediate measurements to provide the ability to accurately and comprehensively reconstruct the environmental contamination that resulted from those incidents.
- **2003:** EML was transferred to DHS under the Homeland Security Act of 2002 and began supporting homeland security activities that prevent, protect against and respond to radiological and nuclear events through research, development, testing and evaluation.
- **2009:** The laboratory's name changed to NUSTL, and the mission was realigned to provide a test and evaluation capability for technologies and systems addressing a broad range of homeland security threats.

# NUSTL: A 70+ Year History







## ▶ PARTNERING AND COLLABORATING WITH THE FIRST RESPONDER COMMUNITY



A word cloud comprised of more than 70 unique accolades used by customers to describe NUSTL staff members and capabilities.



### CUSTOMER SATISFACTION RESULTS

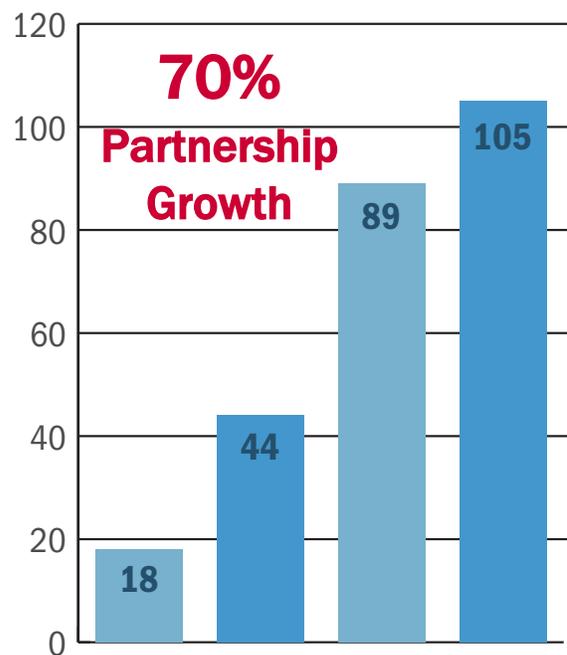
NUSTL fostered partnerships with first responder customers that enhanced the laboratory’s mission performance and resulted in greater customer satisfaction. NUSTL gathered written feedback and testimony from partners and customers that yielded an overwhelming number of positive accolades used to describe NUSTL’s products, services and staff interactions. The outstanding record of customer reviews received from first responders and federal, state and local entities of the Homeland Security Enterprise represents NUSTL’s superior level of customer satisfaction and quality performance.

### INCREASED PARTNERSHIPS AND NATIONAL REACH

NUSTL has engaged with 256 total organizations including government agencies, other national laboratories, public sector companies and universities. By combining the capabilities of our people and facility with those of our partners, NUSTL is able to provide a faster and more accurate response to customer needs, leverage more resources to fulfill its mission objectives and more effectively accomplish R&D and T&E activities at the laboratory.

NUSTL’s broad range of partnerships and collaborators are comprised of first responder key customers, project performers, stakeholders and government agency representatives from federal, state and local levels, who contribute to the laboratory’s products and services either through direct program or project participation, cooperative research or attendance at laboratory events such as meetings and technology assessments.

2016 PARTNERSHIPS



NUSTL’s 256 partners are grouped by organizational-type in this bar graph.

## WORKING COLLABORATIVELY FOR GREATER RESULTS

Throughout FY2016, the laboratory worked with 105 state and local, 89 federal, 18 academic and 44 private industry organizations. These numbers reflect a 66-percent increase in NUSTL's partnerships and collaborators from the previous calendar year. This increase fostered new ideas among staff members, led to the development of new partnership agreements and brought a breadth of experience to NUSTL's tests, evaluations, assessments and other R&D activities.

Developing a vast network of partnerships and alliances has also expanded NUSTL's national reach. NUSTL gained mutually beneficial relationships with organizations in 68 new cities and nine new states. The collaboration map, pictured below, shows the 116 cities located across 36 states where NUSTL currently has partnering organizations.

Collaborations in our strategic work brought 529 unique visitors from 16 domestic states and five countries to NUSTL for meetings, workshops, presentations, trainings and other laboratory-based events.

## NUSTL's Outreach

2013 – 2016



*Our collaboration data map illustrates the span of work NUSTL has accomplished with academia, government and private sector partners around the U.S.*



*NUSTL Deputy Director Alice Hong and staff members are photographed with the Indian Ministry of Home Affairs Joint Secretary and Police Commissioners from major Indian cities such as Delhi, Kolkata, Mumbai, Bengaluru and Chennai at NUSTL.*

## **GLOBAL SECURITY**

NUSTL contributes to the value DHS S&T places within its international partners and agreements for research collaborations among countries.

**Canada:** NUSTL tests GammaPix software technology to support the NYPD in their radiation detection efforts. GammaPix is a technology developed by Image Insight Incorporated, which allows video cameras to operate as radiation detectors. GammaPix employees from Canada worked with NUSTL scientists for software testing and troubleshooting.

**Germany:** NUSTL staff members met with Dr. Thorsten Wetzling from the Brandenburg Institute for Society and Security in Germany to discuss disaster resilience—specifically, integrated tools for response planning and scenario building and broadband communications systems for disaster-response.

**Singapore:** NUSTL hosted a delegation of Singaporean government representatives as part of a bilateral agreement between DHS S&T and Singapore. The delegation visited New York City to meet with various first responders and discuss mutual areas of interest, including screening technologies, biometrics and predictive data analytics.

**United Kingdom:** Representatives from CNIGuard, a manufacturer and distributor specializing in ruggedized sensor systems and security related products, visited NUSTL to provide staff with a technology briefing on their products.

**India:** NUSTL hosted members of the Indian Police Commissioners' Delegation for capability briefings that aligned our shared missions and responsibilities in the homeland security community. The delegation of government representatives visited from cities in India including Delhi, Kolkata, Mumbai, Bengaluru and Chennai.

# PARTNERING AND COLLABORATING WITH THE FIRST RESPONDER COMMUNITY

## WHO WE WORK WITH

NUSTL primarily works with the national first response community and components of the Homeland Security Enterprise. Seen below are many of the logos, seals and patches belonging to NUSTL's partners and collaborating organizations. These images include federal, state and local government agencies, as well as first responder organizations spanning across fire service, law enforcement, medical/health and emergency management discipline areas.



The below list outlines some of the private sector companies and academic institutions that NUSTL worked with throughout this fiscal year.

### PRIVATE SECTOR

- Abbey Services Incorporated
- American Academy of Health Physics
- Consolidated Edison Incorporated
- Health Physics Society
- Image Insight, Incorporated
- MSA Safety Incorporated
- National Property Management Association
- Thermo Fisher

### ACADEMIA

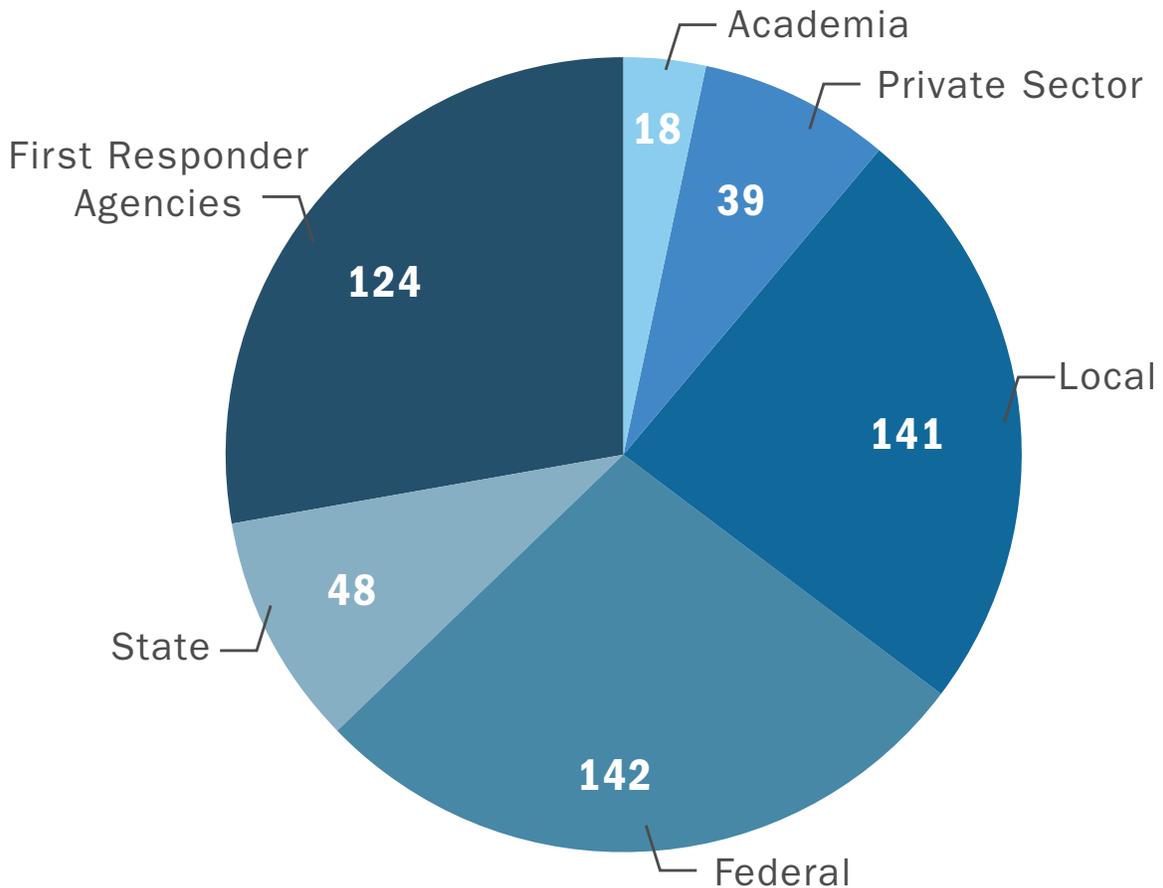
- Bergen County Academies
- Georgia Tech Research Institute
- Massachusetts Institute of Technology
- New York University
- Stevens Institute of Technology, Maritime Security Center
- Stony Brook University
- University of Colorado

## NEW YORK AREA SCIENCE AND TECHNOLOGY FORUMS

NUSTL manages and hosts [New York Area Science and Technology Forums \(NYAST\)](#) to promote the advancement and exchange of information in today's science and technology applications, with a special focus on first responders. Through the NYAST program, the laboratory conducted a series of three forums on emerging technologies from DHS S&T's [Next Generation First Responder \(NGFR\) Apex program](#), which works to develop cutting-edge solutions that can improve first responders' protection, safety, response time and decision-making. The series was followed by a later forum on the topic of countering violent extremism.

NUSTL's NYAST membership grew to surpass 500 members comprised of first responders, emergency response professionals, federal, state and local homeland security officials, as well as academia and private sector groups. The four quarterly forums conducted this fiscal year attracted attendance from 104 NYAST members representing 45 unique organizations including Consolidated Edison, Customs and Border Protection, FDNY, NYPD, Stevens Institute of Technology and the U.S. Environmental Protection Agency (EPA).

## NUSTL REACHES **512** TOTAL NYAST MEMBERS



## PARTNERING AND COLLABORATING WITH THE FIRST RESPONDER COMMUNITY



### NYAST 36: OCT 23, 2015

*Fully Aware—Making Informed Decisions that Save Lives*

Audience members were introduced to situational awareness and the technologies that can assist first responders in making the most informed decisions. Advances in awareness technologies included indoor tracking, heads-up displays and the [Assistant for Understanding Data Through Reasoning Extraction and Synthesis \(AUDREY\)](#), a human-like reasoning program for automated big data analytics.

### NYAST 37: MAR 9, 2016

*Protected—Defending Against Life-Threatening Hazards*



Prototypes of protected technologies, including the [Burn Saver Thermal Sensor](#), [Improved Structure Firefighting Glove](#), [Physiological Monitoring Sensors](#) and [Wireless Physiological and Environmental Monitoring \(WiPEM\)](#), were shared by the NGFR and Responder-Technologies programs to show how they can improve first responders' safety and protect them from the hazards they face every day.



### NYAST 38: JUNE 21, 2016

*Connected—Having a Lifeline When It's Needed Most*

Representatives from Balfour Technologies presented the [Machine-to-Machine \(M2M\)](#), an Internet-of-Things architecture focusing on network connectivity to improve the ability of wired and wireless technologies. This was followed by discussions on the communications systems crucial for responders during emergencies. The National Aeronautics and Space Administration demonstrated the AUDREY's integration with the [Android Tactical Awareness Kit](#) to show how the technologies create a fully interoperable system.

### NYAST 39: MAR 9, 2016

*Countering Violent Extremism*



The National Consortium for the Study of Terrorism and Responses to Terrorism led an interactive demonstration of the [Terrorism and Extremist Violence in the United States \(TEVUS\) Portal](#) with end users from the audience. TEVUS integrates characteristics of terrorism and extremist crime, including perpetrator and geospatial information.

## ▼ Teaming with First Responder Resource Group Members

The [First Responder Resource Group \(FRRG\)](#) is an all-volunteer working group that helps DHS S&T's First Responders Group focus on the top-priority needs of responders across the nation. FRRG Member Captain Dan Dooley of the NYPD's Manhattan South Narcotics, VICE and Gang Squads is responsible for criminal investigations into narcotics, prostitution, gambling, human trafficking and gang crime south of Central Park. The NUSTL team invited Captain Dooley to the lab for collaboration meetings. He said he was amazed by the lab's capabilities and the projects NUSTL has in the pipeline. To him, first responders are lucky to have labs such as NUSTL staffed with dedicated professionals. Visit the [FRG Responder Spotlight: Dan Dooley](#) to learn more.



*NUSTL's Sprint participants from left to right: Matt Monetti, Abby Hooper, Shmuel Link and Andy Chen during a PIONEER trip to each of the five DHS Laboratories and S&T Headquarters.*

Through the DHS S&T's [Partnering for Innovation and Operational Needs through Embedding for Effective Relationships \(PIONEER\)](#) program, NUSTL hosted groups of representatives from the DHS S&T Chemical Security Analysis Center, Transportation Security Laboratory and S&T Headquarters at Vermont Avenue for several Sprint visits throughout the year. Staff members provided laboratory tours and briefed the visitors on NUSTL's programs and projects to help broaden awareness of the capabilities and operations across the Science and Technology Directorate.



## ▶ TESTING AND EVALUATION

### COUNTER-UNMANNED AERIAL SYSTEMS TESTING AND EVALUATION SUPPORT

NUSTL formed a Counter-Unmanned Aerial Systems (C-UAS) Testing and Evaluation Team to support the DHS S&T Program Executive Office (PEO) for Unmanned Aerial Systems (UAS). The team participated in numerous test events to support data collection efforts and observe the evaluation criteria, logistics, operations and systems for future inclusion in projects and C-UAS test activities at NUSTL.

Test and evaluation events included:

- Boston Police Department's Full Scale Complex Operating Environment Training Exercise
- Rapid Equipping Force Desert Chance III Community of Interest Event
- Demonstration of Skywall 100
- Science and Technology Systems Adaptive Red Team Systems C-UAS Field Experiment 2-16 Community of Interest Days
- Black Dart Exercise on C-UAS
- MITRE Challenge for C-UAS

In addition, NUSTL's C-UAS T&E Team participated in various site visits with interagency partners. Using pre-existing site selection requirements, the team surveyed the following UAS/C-UAS test sites to evaluate their potential to serve as a test range:

- Cameron County Airport in Port Isabel, Texas
- Charles R. Johnson Airport in Port Mansfield, Texas
- Chase Field Facilities in Beeville, Texas



- Chase Field Airport in Beeville, Texas
- Disaster City, a facility near College Station, Texas
- Riverside, a facility near College Station, Texas
- U.S. Department of Defense, Eglin Airforce Base in Eglin, Florida
- U.S. Army's Armament Research Development and Engineering Center, Picatinny Arsenal, New Jersey

Staff attendance at these events expanded NUSTL's role as the lead C-UAS Test Agent to the DHS PEO UAS. NUSTL will lead [Technical Assessment for Counter Unmanned Aerial Systems Technologies in Cities \(TACTIC\) 2017](#), which is a two-part technical assessment of C-UAS technologies. Part one, in summer 2017, will allow C-UAS technology developers to test their equipment and make modifications to account for conditions at the assessment site. The second part, being planned for late fall 2017, will be a scored assessment to evaluate the C-UAS technology and its ability to detect, track and identify different small-UAS under varying conditions and use-cases.

NUSTL's TACTIC planning and C-UAS T&E project-work is conducted in close coordination with the DHS PEO UAS and in collaboration with DHS T&E performers including the Stevens Institute of Technology, Homeland Security Systems Engineering and Development Institute operated by the MITRE Corporation, the Aerospace Corporation and the Massachusetts Institute of Technology Lincoln Laboratory.

## PERFORMANCE TESTING AND EVALUATION AT NUSTL

The [Performance Test and Evaluation at NUSTL \(PTEN\)](#) program supports the national need to detect and protect against radiological and nuclear threats by conducting functional tests of law enforcement radiation detection equipment before they are used by responders in the field. PTEN ensures that equipment supplied to first responders works as designed and that all supporting materials are delivered. As a result of PTEN, first responders have increased confidence in their equipment because they know each unit has been independently tested.



*PTEN technical staff members Andy Chen and John Kada conduct conformance checks on RadEye PRD units.*

PTEN was developed by NUSTL and is made possible in part by a Memorandum of Understanding with the NYPD, which states all radiation detection equipment purchased through the Domestic Nuclear Detection Office (DNDO) Securing the Cities (STC) program be tested by NUSTL. STC is a cooperative federal, state and local program, which seeks to design and implement architecture for coordinated and integrated detection and interdiction of illicit radiological materials that may be used as weapons.

PTEN was expanded to include testing equipment beyond STC, including other first responder agencies and equipment deployed within the New York City metropolitan area purchased under non-STC funding. In addition to testing and evaluation, PTEN provides:

- Technical guidance and support to responders for radiological detection devices
- Warehousing and logistical expertise to facilitate deployment of equipment

Over 17,500 pieces of first responder equipment have been tested since the program's inception in 2009. In FY2016, NUSTL received, tested and deployed 1,079 pieces of equipment for eight different first responder agencies.

The equipment included:

- 12 Backpack Detectors
- 5 Personal Digital Assistants
- 1,034 PRDs and
- 28 Radioisotope Identifiers (RIIDs)



Images of the radiation detection equipment tested at NUSTL from left to right: Backpack Detector, GF 10-EX PRDs, RadEye PRDs and RIIDs.

Through the STC program, NUSTL tests equipment for many of the tri-state area first responder organizations including the following:

- Department of Environmental Protection Police Department
- FDNY
- Metropolitan Transportation Authority Police Department
- Nassau County Police Department
- New York State Division of Homeland Security and Emergency Services
- NYPD
- Port Authority of NY and NJ Police Department
- Rockland County Police Department
- Suffolk County Police Department

NUSTL has received favorable comments from responder organizations about the PTEN program:

*“My overall experience was positive, and I would recommend NUSTL’s Performance Test and Evaluation program to fellow first responders.” – NYPD*

*“As the NYPD’s primary testing facility for CBRNE equipment, NUSTL is head and shoulders one of the most professional organization’s I have dealt with.” – NYPD*

*“Having NUSTL conduct initial testing has been a tremendous help. Generally speaking I am confident to issue out equipment directly that has been checked by NUSTL.” – New York State Department of Environmental Conservation Police*

*“NUSTL is a wonderful partner to work with in the very important mission of quality training to our first responder community...all operations went smoothly and any problems were dealt with promptly.” – Suffolk County Police Department*

*NUSTL's work for FDNY was well received. The FDNY's Battalion Chief for Hazmat Operations said of NUSTL's work, "NUSTL has done an outstanding job for the FDNY. The FDNY and I thank you."*

In FY2016, NUSTL completed a project aimed at testing previously used and excessed equipment for DNDO. Over several years, PTEN tested 1,354 PRDs and 155 RIIDs that were previously deployed by the USCG. The goal of the testing was to provide a subset of units that could be deployed to state and local first responders to allow them to plan future radiation detection/protection programs. Of the units tested, roughly 30 percent of the PRDs and 40 percent of the RIIDs were redeployed. The remaining units were returned to the respective vendors for decommission due to the age of the equipment.

Additionally, PTEN initiated a new project working directly with FDNY to support their use of electronic dosimetry equipment as a part of their personnel protection program. This support is a follow-on to a 2014 effort by NUSTL to design and implement a test of equipment that FDNY was considering for purchase. Through direct interaction with the FDNY's Hazmat Battalion, a set of checks was developed for these electronic dosimeters at the one- and two-year marks of service. During this fiscal year, PTEN tested 811 electronic dosimeters for FDNY.

### RADIOLOGICAL EMERGENCY MANAGEMENT SYSTEM QUALITY ASSURANCE

The [Radiological Emergency Management System \(REMS\)](#), a network of gamma radiation sensors, provides real-time, city-wide data for response and recovery from a radiological or nuclear event. REMS was designed at NUSTL and field-tested over the course of five years. Through a cooperative research and development agreement, the REMS concept and design was commercialized, enabling NYPD and other first responder agencies, to purchase the system in the commercial marketplace. NYPD implemented the commercialized system, and REMS is now fully operational in outdoor locations throughout the New York City metropolitan area.



*NUSTL Engineer Brian Albert (left) presents the REMS to New York Representative Daniel M. Donovan (middle) and the former Under Secretary for Science and Technology Dr. Reginald Brothers (right).*

NUSTL continued to provide its REMS quality assurance support to the NYPD. Engineer Brian Albert observed the temporary rooftop installation of the RadHalo by the NYPD. The RadHalo is an improved version of the REMS, which is installed at dozens of locations throughout New York City. The RadHalo resolves issues uncovered by NUSTL's quality assurance tests, technical support and calibration of REMS.

Albert demonstrated REMS during the DHS S&T First Responder Technology Hill Day. This event provided an opportunity for DHS S&T FRG to showcase its cutting-edge technology solutions to members of Congress through a series of hands on demonstrations. Hill Day showcased technologies currently being developed and successfully transitioned to first responders.

Albert was accompanied by NUSTL's first responder partners, Radiation Safety Officer Andy Karam, NYPD, and Joseph Brandine, Metropolitan Transportation Authority, who supported discussions on NUSTL's deployment of REMS throughout New York City including Grand Central Terminal. Hill Day was sponsored by New York Representative Dan Donovan, Chairman of the Homeland Security Committee- Subcommittee on Emergency Preparedness, Response and Communications and was conducted at the Rayburn House Office Building in Washington, D.C.

## SYSTEM ASSESSMENT AND VALIDATION FOR EMERGENCY RESPONDERS

NUSTL's [System Assessment and Validation for Emergency Responders \(SAVER\)](#) program conducts impartial, practitioner-relevant, operationally oriented assessments and validations of emergency response equipment and systems. SAVER develops knowledge products that enable decision-makers and responders to better select, procure, use and maintain emergency response equipment. These knowledge products are shared nationally with the responder community through the SAVER section of the DHS S&T website, [www.dhs.gov/science-and-technology/SAVER](http://www.dhs.gov/science-and-technology/SAVER), and provide a life- and cost-saving asset to DHS, as well as to federal, state and local responders.

In FY2016, NUSTL published 29 SAVER reports, including two application notes, six technotes, nine market survey reports, eight highlights and four assessment reports. Additionally, three SAVER-on-Demand projects were initiated, and one was completed. SAVER-on-Demand projects originate from direct requests made by emergency response organizations for the evaluation of specific technologies or equipment. The published reports are listed below and posted to the [S&T website](#).

- [4G Mobile Broadband Routers Highlight](#)
- [4G Mobile Broadband Routers TechNote](#)
- [Ballistic-Resistant Body Armor for Women TechNote](#)
- [Chemical, Biological, Radiological, and Nuclear \(CBRN\) Air-Purifying Respirators Highlight](#)
- [Digital Forensics Tools TechNote](#)
- [Enhanced Law Enforcement Uniforms Market Survey Report](#)
- [Explosive Trace Detectors TechNote](#)
- [GIS Disaster Event Models with Population Data in Response TechNote](#)
- [Handheld Multi-Gas Detectors Application Note](#)
- [Handheld Multi-Gas Detectors Highlight](#)
- [Handheld Multi-Gas Meters Assessment Report](#)



- [Handheld Multi-Gas Meters Highlight](#)
- [Handheld Multi-Gas Meters Market Survey Report](#)
- [Handheld Radiation Survey Meters Market Survey Report](#)
- [Handheld Thermal Imagers Application Note](#)
- [Hearing Protection with Integrated Radio Communications Assessment Report](#)
- [Hearing Protection with Integrated Radio Communications Highlight](#)
- [Hearing Protection with Integrated Radio Communications Market Survey Report](#)
- [Individual Officer Trauma Kits Highlight](#)
- [Individual Officer Trauma Kits Market Survey Report](#)
- [Passive Infrared Systems for Remote Chemical Detection Assessment Report](#)
- [Passive Infrared Systems for Remote Chemical Detection Market Survey Report](#)
- [Portable Infrared Spectroscopy Chemical Detectors Assessment Report](#)
- [Portable Infrared Spectroscopy Chemical Detectors Highlight](#)
- [Radiation Dosimeters for Response and Recovery Market Survey Report](#)
- [Satellite Mobile Phones Market Survey Report](#)
- [Text Mining and Analysis Market Survey Report](#)
- [Thermal Imagers Highlight](#)
- [Throwable Robots TechNote](#)

NUSTL conducted four SAVER assessments, which involved 28 emergency responder participants from 19 states: Arizona, California, Florida, Georgia, Illinois, Massachusetts, Maryland, Michigan, New Mexico, New Jersey, Nevada, New York, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, Washington and Wisconsin. These assessments provided comparative analyses of the equipment tested by the first responders, including individual evaluation category and criteria scores as well as overall scores. The assessments focused on the following technology areas:

- Fourier Transform Infrared Chemical Detectors
- Handheld Multi-Gas Meters
- Hearing Protection with Integrated Radio Communications
- Standoff Infrared Gas Detectors

Focus groups comprised of first responders are conducted prior to SAVER assessments and are used to establish evaluation criteria for the equipment, develop test scenarios and select the products to be assessed. NUSTL conducted six focus groups, which included 48 emergency responder participants from 13 states: Arizona, California, Illinois, Maryland, New Jersey, New Mexico, New York, Pennsylvania, South Carolina, Tennessee, Virginia, Washington and Wisconsin. These focus groups were concentrated on the following technology areas:

- Handheld Multi-Gas Detectors
- Handheld Radionuclide Identification Devices
- Passive Infrared Systems for Remote Chemical Detection
- Hearing Protection with Integrated Radio Communications
- Portable Radiation Portal Monitors
- CBRN Air-Purifying Respirators



*Director Adam Hutter speaks to Port Authority Police Officer James Griglio at the SAVER RID Focus Group.*



*Evaluators assessed the clarity of radio communications while a 9-mm pistol was fired during the Hearing Protection with Integrated Radio Communications SAVER Assessment.*

## RESPONDER-TECHNOLOGIES TESTING AND EVALUATION SUPPORT

NUSTL supports [FRG's First Responder Technologies \(R-Tech\)](#) division by planning and managing the testing of first responder technologies in operational and laboratory settings. NUSTL assesses the capabilities and operational suitability of R-Tech-funded solutions to assist in the quick transition of these technologies to the commercial market.

NUSTL conducted three operational field assessments for R-Tech including the Firefighter Accountability and Proximity system, X-Ray Scanning Rover and Lost Person Locator software. NUSTL also facilitated a focus group on a base garment concept uniform.

The [Firefighter Accountability and Proximity \(FFAP\) Operational Field Assessment \(OFA\)](#) was led by Test Engineer Bhargav Patel and conducted in Butler, Pennsylvania. Designed by TRX Systems, Incorporated, the FFAP technology helps to locate downed firefighters and improve situational awareness among team members during structural firefighting operations. Several test scenarios were conducted to familiarize evaluators with the FFAP device and help them determine how to incorporate the device during structural fires and lost person recovery scenarios. Nine members of the Herman County Volunteer Fire Company and one member of the Rocky Grove Volunteer Fire Department participated in the test scenarios and provided their feedback during the OFA. Employees from MSA Safety Incorporated and the technology developer, TRX Systems Incorporated, also attended the event. The feedback provided by the evaluators during the OFA will be used to further assess the prototype's ability to quickly understand the status and location of firefighters on the scene of an incident.



*NUSTL Test Engineer Bhargav Patel (far right) conducting an outdoor test scenario alongside participating firefighters from Herman County and Rocky Grove Volunteer fire departments.*



*The FFAP is placed on display during the OFA.*

The [X-Ray Scanning Rover \(XSR\) OFA](#) was led by Physicist Gladys Klemic and Engineer Cecilia Murtagh. The XSR is a robotic tool used for the rapid scanning of large numbers of unattended parcels. The technology has been developed for use during incidents such as a terrorist attack, active shooter event or public evacuation, where bomb squads are called to investigate suspicious items for possible explosives. Initially, the XSR was developed through R-Tech in a custom-built robotic platform to demonstrate its capability. After a successful demonstration, S&T awarded a contract to conduct a feasibility study to determine the final design and build an XSR prototype for transition into the commercial market.

The XSR OFA took place at the United States Pentagon Emergency Response Center in Arlington, Virginia, where evaluators assessed and provided feedback on the suitability and operations of the XSR.

During the OFA, Klemic and Murtagh led various experiments, simulating both outdoor and indoor operational scenarios, to assess the XSR's usability by law enforcement during field operations.

First responders and representatives from Customs and Border Protection, Michigan State Police, NYPD's Bomb Squad, Pentagon Force Protection Agency, Transportation Security Administration and a bomb squad for Montgomery County, Maryland, participated in the event.

A [Lost Person Locator OFA](#) was led by Test Engineer Bhargav Patel and Program Manager Brian Warner. The Lost Person Locator is a suite of search and rescue initial response tools. The OFA focused on the FINDER software for the Lost Person Locator. Participants operated the software in parallel to the Deschutes County Sheriff's Office annual search and rescue exercise in Bend, Oregon. NUSTL trained some of the participating search and rescue volunteers and first responders in preparation for the mock scenarios that were incorporated at the annual exercise. The OFA assisted in determining whether the technology will gain operational acceptance within the first responder community.

Lastly, Test Engineer Bhargav Patel facilitated an R-Tech focus group at the Montgomery County Fire Department in Silver Spring, Maryland to assess a base garment concept uniform developed by Luna Innovations Incorporated, aimed to help meet the needs of multi-agency first responders. Six Montgomery County Fire and Rescue Service firefighters tested two styles of shirts and two styles of pants to narrow down concepts for further development. Representatives from North Carolina State University and the United Kingdom Home Office also attended.



*During the XSR OFA, the evaluators scanned packages of various sizes, materials and contents placed in different configurations and on level and inclined ground with asphalt and grass surfaces.*



*Participating first responders conduct a search and rescue scenario to evaluate the Lost Person Locator and FINDER software at NUSTL's SAVER Assessment.*



*Evaluators assess a range of criteria including usability and comfort while wearing the base garment uniform.*

### RESPONDER TRAINING AND EXERCISE SUPPORT

NUSTL established its [Responder Training and Exercise \(RTE\)](#) program in 2009 to support the DND0's STC. STC aims to prevent radiological or nuclear attacks on high-risk urban areas by helping local and state responder agencies to detect and interdict illicit radioactive and nuclear material. In support of STC, NUSTL's RTE program assists first responder agencies in the New York City metropolitan area with their radiation detection training sessions and exercises by providing licensed radiation sources, training materials and technical support.



*NUSTL Engineer Brian Albert provides source handling support during Nassau County Police Department's personal radiation detector training class.*

NUSTL's RTE Team, led by Radiation Safety Officer Carl Schopfer and staff members Engineer Brian Albert, Operations Analyst Andy Chen, Engineer Norman Chiu, Program Manager Ethel Davis, Chemist Karin Decker, Support Contractor Kris Dooley, Physicist Paul Goldhagen, Test Engineer Shmuel Link, Test Manager Matt Monetti, Property Manager Robert Stocco, Electronics Engineer William Van Steveninck and Program Manager Brian Warner supported 24 training events for more than 450 first responders at 15 state and local agencies. The RTE Team also provided several facility tours throughout the year to share their work and technical expertise.

This included four Suffolk County Police Department (SCPD) Personal Radiation Detector Training courses at the SCPD Training Academy in Brentwood, New York, which focused on the use of person-worn radiation detector devices. Participants came from SCPD as well as the Suffolk County Sheriff's Office, Stony Brook University Police Department, East Hampton Town Police Department, Southampton Police Department and Hempstead Police Department.

NUSTL also provided radiation sources and technical support to the Federal Bureau of Investigation (FBI) Stabilization Program Exercise at John F. Kennedy International Airport in Jamaica, New York. During the exercise, experts from the FBI New York Stabilization Unit trained special operations teams from the Port Authority of New York and New Jersey Police Department and the FBI on their Concept of Operations in responding to an Improvised Nuclear Device.

NUSTL supported the NYPD Harbor Unit during multi-agency chokepoint exercises, which helps keep the New York Harbor-area maritime responder partners up-to-date in choke point tactics and radiation detection operations on harbor waters.

NUSTL provided radioactive sources, equipment and technical staff for these exercises, which took place at the Verrazano and Throgs Neck Bridges, with vessels participating from the NYPD Harbor Unit, USCG, Nassau County Police Department, NYPD Counterterrorism Unit, New Jersey State Police, DHS and the New York Department of Environmental Conservation.

For its support in the chokepoint exercises, NUSTL received a letter of appreciation from NYPD Harbor Unit Executive Officer, Captain Anthony Russo, on behalf of the NYPD Harbor Unit and members of the Securing the Cities Maritime Subcommittee. The letter thanked the NUSTL team and Radiation Source Officer Carl Schopfer for providing source materials and expertise during their maritime chokepoint exercises, which are critical to the security of New York City. NUSTL's provision of radioactive sources allowed members of each agency to test the capabilities of their equipment and personnel in realistic scenarios.

Since 2009, NUSTL has supported training and exercises for more than 1,800 state and local first responders. To ensure the best services are provided to first responder partners, the RTE team regularly trains on all applicable standards and regulations.



*NUSTL's source support includes maintaining a set of radioactive sources as well as a specialized work force that can be deployed to support first responder training and exercise events. NUSTL provides radioactive sources and equipment as seen above, to provide first responders a better understanding of the physical principles involved in radiation detection.*



*NYPD Harbor Unit vessel is pictured during a choke point exercise conducted on harbor waters.*

*“On behalf of the New York City Police Department, the Harbor Unit, and members of the Securing the Cities Maritime Subcommittee, I would like to thank you for your support by providing us with the availability of source materials and the expertise of Carl Schopfer and his team. The maritime chokepoints that your teams were present for are critical to the security of New York City. Making actual radioactive sources available for realistic scenarios allow members of each agency present to test the capabilities of their equipment and personnel. Carl and his assistants were highly attentive to our needs and requirements. They were willing to help in any way possible. In addition to safeguarding the source materials, they were eager to answer any related questions and made helpful suggestions when and where appropriate. Their knowledge, input and enthusiasm were most helpful. We appreciate your substantial commitment to advancing our mission of keeping New York City safe and secure. We hope that you can continue this ongoing commitment.”*

*— Executive Officer NYPD Harbor Unit*

### URBAN OPERATIONAL EXPERIMENTATION

NUSTL published eight [Urban Operational Experimentation \(OpEx\)](#) Reports, assessing the technologies that were tested during the DHS S&T Urban OpEx event. This three-day event took place throughout the New York City metropolitan area and brought together first responders and product developers to experiment with emerging technologies in urban operational conditions.

Urban OpEx was supported by the New York City Emergency Management, Port Authority of New York and New Jersey, FDNY, as well as the FRRG. First responder feedback was collected during the experimentation scenarios and utilized to develop and publish the following Experimentation Reports:

[Knight Robot](#): An unmanned ground vehicle developed for explosives detection and removal applications. This device is equipped with surveillance and manipulator arms that can be operated remotely at a distance of up to 600 meters from its operator. During Urban OpEx, the KnightRobot was configured with the HAZPROBE, a tool to drill into and view the interior of confined spaces.

[X-Ray Scanning Rover](#): A custom robot with a fold-out arm that can X-ray packages of any length in a single scan while the operator remotely controls the unit. The design is geared toward rapid inspection of multiple bags left behind due to an evacuation or emergency.

[BioFlash-E](#): A biological identifier that collects and analyzes atmospheric aerosol samples for a suite of biological pathogens. BioFlash-E can be used for biological monitoring at fixed locations and can be configured to be transported, set up and operated by a single person.

[RepKnight](#): An open-source data platform that performs real-time monitoring and analysis of social media for keywords, trends and sentiment using a web-based browser.

[Internet of Things Networks for First Responders](#): A low-power, handheld, prototype transmitter-receiver technology. This technology is capable of sending and receiving signals through challenging environments, such as reinforced concrete buildings, using a unique multipath technique.

[Tridion-9](#): A portable gas chromatography/mass spectrometry system that can analyze volatiles and semi-volatiles for chemical warfare agents and other substances to determine what is present at an emergency incident.

[FIDO B2](#): A networked, bio-active clarifier bio-aerosol detector that alarms when an airborne bio-threat is detected. The technology is intended to bridge a technology gap in situational awareness by enhancing the ability to detect, monitor and analyze passive and active threats and hazards at incident scenes in real time.

[Situational Heads Up Display](#): A micro liquid crystal display that presents data without requiring end users to look outside of their view point. The technology is intended to increase situational awareness through an integrated global positioning system that provides position and direction information.

An [OpEx video reel](#) is published on the DHS S&T Microsite to showcase the Urban OpEx technologies.



## NEUTRON BENCHMARKING

To aid scientists and engineers designing and deploying systems to detect nuclear threats, NUSTL Physicist Paul Goldhagen collaborated with scientists at the Los Alamos National Laboratory and the University of Delaware to understand variations in the neutron background. The collaboration has developed detailed calculations of background neutrons on a global matrix of locations. NUSTL has measured the intensity and energy distribution of cosmogenic neutrons on airplanes, ships and land, and continues to analyze the measurements to benchmark, correct and verify the calculations. While doing so, Goldhagen discovered previously unreported effects of temperature on the detection sensitivity of polyethylene-moderated neutron detectors, the most common type of large neutron detector used for homeland security applications.

NUSTL hosted “Principles of Neutron Detection for Interdiction of Nuclear Threats,” a presentation on neutron detection for first responders. The presentation was conducted by Dr. Paul Goldhagen in cooperation with the New York City Department of Health and Mental Hygiene. Goldhagen provided a live demonstration of neutron detection principles and challenges to more than 40 audience members from the first responder community, government agencies, private sector and academia partners, representing approximately 20 organizations. The presentation explained what neutrons are, why they are important to homeland security, where they come from, how they are detected, what “moderation” is and why it is important and how neutrons differ from gamma rays.



## ► RESEARCH AND DEVELOPMENT

### RADIOLOGICAL/NUCLEAR RESPONSE AND RECOVERY RESEARCH & DEVELOPMENT

NUSTL's [Radiological/Nuclear Response and Recovery \(RNRR\) Research & Development \(R&D\)](#) program continued to support state and local responders to prepare for radiological and nuclear emergencies. To accomplish this, NUSTL executed and commissioned a variety of projects with the federal interagency, national laboratories and other partners. The RNRR R&D program aims to meet the following goals:

- Increase capability at all levels of government to manage and characterize complex and catastrophic radiological and nuclear incidents
- Improve responder ability to save lives during the initial response operations of a radiological incident
- Minimize impact to community and economy through improved methods of incident stabilization, radiological clean up and recovery.

The RNRR R&D program advanced two flagship projects that contributed to the achievement of those goals:

- Increase Local Capability to Manage Radiological Incidents—Piloting Science-Based Radiological Dispersal Device (RDD) Guidance
- Supporting Local Responders with Radiological Expertise



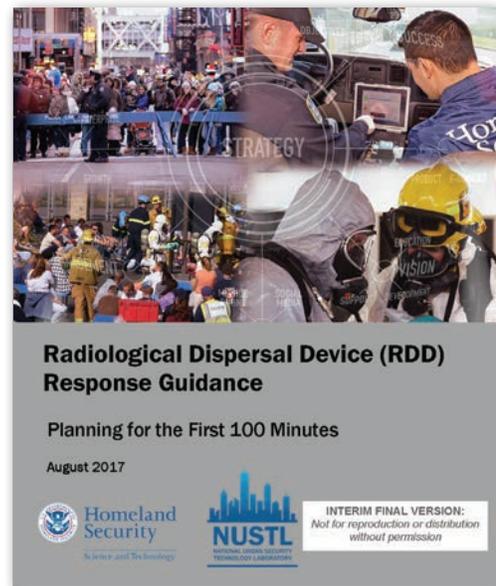
## INCREASING LOCAL CAPABILITIES TO MANAGE RADIOLOGICAL INCIDENTS

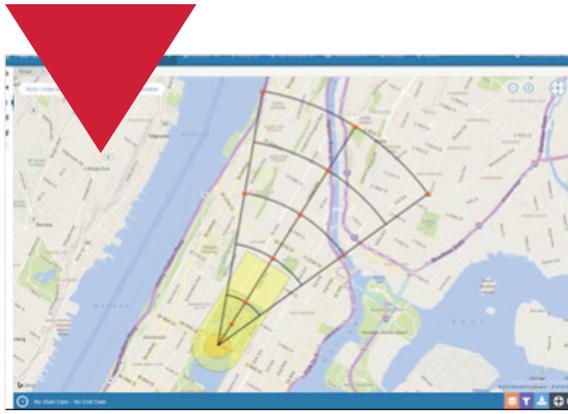
The RNRR Team led a pilot program to gather feedback on a NUSTL and U.S. Department of Energy (DOE)-developed planning tool, called the Radiological Dispersal Device (RDD) Response Guidance; [Planning for the First 100 Minutes](#). The pilot program included the following jurisdictions: New York, New York; Philadelphia, Pennsylvania; Fort Collins, Colorado and the state of New Mexico and was conducted to better understand how science and research can assist U.S. cities developing response protocols to an RDD detonation in their jurisdictions.

The local response planning agencies that participated in the pilot process learned from the scientific expertise of the DOE and used the operationally-focused guidance to expand on existing, or develop new, concepts of operations, roles and responsibilities and resource needs.

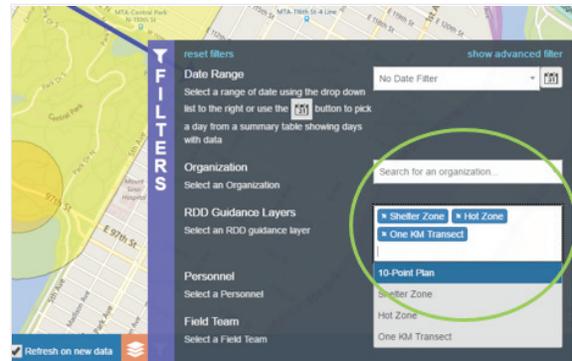
The information and feedback provided by pilot participants were used by NUSTL to clarify concepts and requirements and validate or adjust the operational recommendations included in the guidance.

As part of the pilot process participants were also introduced, and in some instances, trained on the RadResponder tool, fostering a key partnership between DHS S&T and the Federal Emergency Management Agency (FEMA) on radiological data collection. RadResponder is a web application developed jointly by FEMA, DOE and the U.S. Environmental Protection Agency (EPA) that helps emergency managers and incident commanders visualize radiological contamination in real time by providing a platform for collecting and mapping on-the-ground radiological measurements from responders in the field. In conjunction with the pilot process, NUSTL and DOE worked with the RadResponder team to integrate key elements of the guidance, including protective action zones and radiological survey strategies, into the user interface to support local responders in operationalizing the scientific recommendations.





A RadResponder screen showing the 10-point monitoring survey points overlaying a map image of a radiological incident. This feature is one example of the guidance tools jointly developed by NUSTL and selected for integration in FEMA's RadResponder system.



A 10-Point Monitoring Plan layer can be added into RadResponder to allow first responders to visualize the suggested points for monitoring on a map.

RadResponder is a free resource for the first responder community on radiological/nuclear preparedness and looking ahead to future years, a likely home to many of the tools and resources developed by the RNRR R&D program.

## PILOTING ACTION-ORIENTED TOOLS AND GUIDANCE

The Fort Collins pilot was a great example of NUSTL's success working with first responders. Using the guidance, jointly developed with the DOE's Brookhaven National Laboratory (BNL) and Sandia National Laboratories, the pilot process consisted of three full-day sessions spread across approximately three months to introduce the research and science that form the basis of the guidance and to delve into complex planning matters that an RDD would pose to a locality. Collaboratively, the RNRR team, along with representatives from the state of Colorado, city of Fort Collins and DOE planned and refined response protocols tailored for the city of Fort Collins.

Approximately 50 first responders, state agency representatives and federal partners participated in each of the sessions to discuss key response elements such as initial recognition, notifications and measuring and mapping radiological data. Fort Collins also established a working group focused on public messaging and communications to ensure a clear and cohesive message on protective actions can be delivered across the response agencies quickly.

During the last session of the pilot, the Fort Collins Office of Emergency Management presented a draft of the local response protocol and led a facilitated discussion with pilot participants to understand next steps and opportunities for improvement and advancement in this planning area.



*A photo of the participants during the Conference for Radiation Control Program Director's Annual Meeting. NUSTL's Orly Amir is pictured fourth from the left in the back row.*

## **SUPPORTING LOCAL RESPONDERS WITH RADIOLOGICAL EXPERTISE**

NUSTL funded and managed the development of a FEMA-led course to train the first Radiological Operations Support Specialist (ROSS) candidates. A ROSS, once transitioned to FEMA's National Incident Management System suite of typed positions, will provide trained and certified radiation expertise to support emergency managers, incident commanders and local decision-makers during a radiological or nuclear emergency.

The Conference of Radiation Control Program Directors (CRCPD) physically hosted the first course in Linthicum, Maryland. There were 16 students in attendance from various state and local agencies, academia and private sector companies, including the Connecticut Department of Energy and Environmental Protection, Arizona Radiation Regulatory Authority, Iowa Department of Public Health and the University of Michigan.

The need for a ROSS during a radiological or nuclear incident is clear. Emergency managers, incident commanders and other local and state response personnel require an understanding of the nuances of radiological health and safety to protect the public and responders during the emergency response and contamination containment and decontamination strategies in the later phases of the response. These on-scene radiation specialists can provide this specific expertise to local responders, augmenting and supporting the radiological expertise that may already exist.

During the pilot course, students participated in lectures and interactive learning activities to hone their ability to communicate technical information effectively, interpret modeling and briefing products and understand key references and documents. Instructors led drills and exercises to reinforce how the ROSS will employ these tools during an emergency response. The ROSS Steering Committee, which includes representatives from NUSTL, FEMA, DOE and CRCPD, as well as subject matter experts with backgrounds in radiological response, federal integration, and training, evaluated the pilot course to support the integration into the FEMA course catalog in future years.

### CONTINUING MEANINGFUL FIRST RESPONDER FOCUSED RADIOLOGICAL/NUCLEAR R&D

The RNRR Team initiated four new projects focused on fulfilling operational capabilities for first responders in radiological/nuclear response. The program continued working on previous fiscal year work, and also wrapped up several projects during FY2016.

#### NEW R&D MISSION-WORK:

**Research on how radar systems can track plume clouds for incident characterization:** Oak Ridge National Laboratory, along with FEMA and the Defense Threat Reduction Agency, are collaborating to understand how existing radar systems can be used to characterize radiological incidents, influence modeling and support decision-making.

**Leveraging Municipal Equipment to Manage Radiological Contamination:** The EPA's National Homeland Security Research Center, in collaboration with Argonne National Laboratory, is researching how public works equipment, such as street sweepers, garbage trucks and snow plows that local cities own and operate, can be used for contamination containment and gross decontamination. Additionally, this work will expand the EPA's Waste Estimate Support Tool (WEST) to better meet the needs of the first responder community in estimating waste from a radiological response for planning purposes.

**Development of ROSS Tools and Products:** The DOE National Nuclear Security Administration is leveraging its network of national laboratories and subject matter experts to fill ROSS capability needs and gaps. This will include expanding a ROSS toolkit, improving the ROSS five-day training course, and additional job aids and incident support materials.

**Assessment of International Radiological/Nuclear Tools for Use by First Responders:** BNL is investigating the tools and products developed by the International Atomic Energy Agency to determine how they could be used by first responders in the United States.



## COMPLETED R&D PROJECTS:

NUSTL completed several projects in FY2016. The outcomes of these efforts have been transitioned to first responder customers and federal components as described below. Follow-on work continues at NUSTL and will result in new FY2017 R&D investments.

**Gross Decontamination and Waste Management Technology:** NUSTL partnered with the EPA to develop a first responder field tool providing guidance on techniques, procedures and the use of common/available equipment to reduce and control contamination following a radiological incident; minimizing exposure hazards to responders and citizens.

**Research on Improving IND Decision Making through Virtual Training Skill Transfer:** NUSTL supported the Massachusetts Institute of Technology Lincoln Laboratory in cataloging emergency decision making requirements during an Improvised Nuclear Device (IND) incident, and understanding what skills can be directly transferred from virtual training/video games into real world performance.

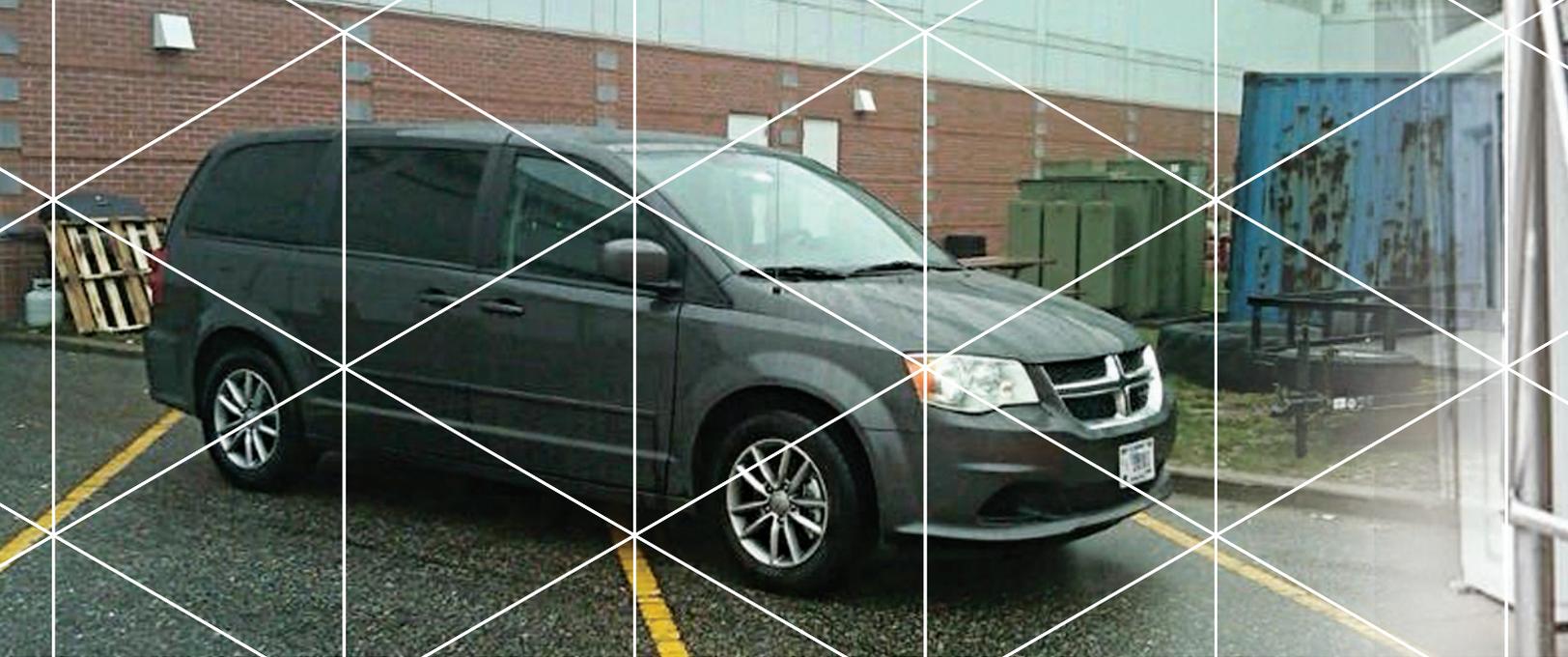
**Local Radiation Planning Job Aid and Support to First Responders:** NUSTL partnered with the National Nuclear Security Administration to author a print and online handbook for state and local ROSS candidates detailing key guidance and field operational job tools, including specific forms to assist the ROSS in ensuring radiological protection and safety is integrated into the incident command system planning process. This project also included meeting the technical requirements of moving the Turbo Federal Radiological Monitoring and Assessment Center (FRMAC) tool into the cloud.

**State and Local Support to Radiological/Nuclear Emergency Planning and Response Procedures:** NUSTL worked with LLNL to improve the fidelity of modeling algorithms currently used for prediction of dispersion in various environments and developing technical requirements and recommendations for a rapid consequence assessment and decision support tool.



*DHS S&T NUSTL and EPA worked on contamination containment, waste staging and municipal equipment studies and experiments to mitigate radiation hazards and ensure communities have technologies for disaster response.*





## ▶ LABORATORY OPERATIONS

### INFORMATION TECHNOLOGY

NUSTL upgraded various aspects of Information Technology (IT) equipment to ensure its [collaboration facility](#) remains state-of-the-art. Within the Grand Central Conference Room, NUSTL's largest, a new digital audio/video system was installed to improve the overall sound by reducing the acoustic interferences that existed with the analog system. This new system provides higher resolution and can be integrated with future technology upgrades. A 65-inch display screen was also installed into the Highline Conference Room, which enhances presentation display capabilities. To continue improving technology infrastructure, NUSTL replaced network switches, printers and Homeland Security data network equipment to increase connectivity speed, maintain government standards and safeguard information.

### PERSONAL PROPERTY AND FLEET MANAGEMENT

NUSTL continued its efforts in property management and environmental sustainability by donating, selling and recycling excess property, valued at more than \$20,000. NUSTL continued its efforts of maintaining our vehicle fleet, as well as facilitating property related audits and meetings as highlighted below.

#### DONATED AND SOLD PROPERTY

- Radiation detectors (7) were transferred to the Office of Naval Research in Washington, D.C.
- Sinclair Technologies 138-225 MHz Antenna was transferred to the Federal Emergency Management Agency in Maynard, Maryland.
- Motorola Walkie Talkie Base Station was transferred to DHS Immigration and Customs Enforcement in Daytona Beach, Florida.
- Liquid nitrogen dewar was sold to iCream Café in Frisco, Texas.



### RECYCLED PROPERTY

- 770 pounds of excess electronic waste during NUSTL's Earth Day initiatives.
- A total of 1,000 pounds of metal, electronic waste and paper from NUSTL's warehouse.

### AUDITS

NUSTL's Property Manager conducted and facilitated annual personal property audits of technology equipment at the laboratory that resulted in 100 percent compliance in accordance with DHS S&T Asset and Logistics Management Branch requirements.

### FLEET MANAGEMENT

NUSTL replaced its 2009 Dodge Caravan with a 2016 Dodge Caravan to comply with the General Services Administration Fleet Management Service Center procedure for leased vehicles.

### SECURITY

NUSTL Administration Division Director Alfred Crescenzi, who also serves as the laboratory's security manager, presented a proposal to the Facility Security Committee (FSC) for the installation of a security booth outside of NUSTL's loading dock bay doors to house an armed security officer. The FSC members agreed to fund the cost of the booth and security guard surveillance, 24 hours a day, seven days a week. NUSTL purchased and installed HID Global's Personal Identity Verification (PIV)-card readers. A key feature of the dual interface readers is to provide a backup when a card's contactless antenna is not functional.

### QUALITY MANAGEMENT

NUSTL's Quality Management System (QMS) was developed to ensure NUSTL's products and services are of the highest quality and are delivered to its customers in a timely manner. The QMS includes laboratory-wide policies, standard operating procedures, work instructions and other documentation, which NUSTL developed to effectively manage its business processes and to consistently deliver high quality products and services to its first responder customers.

The QMS holds all NUSTL personnel responsible and accountable for performing their assigned tasks safely and in accordance with documented processes and procedures. Staff members are responsible for continually assessing and recommending improvements to work processes, with the goal of achieving a rising standard of quality in all programs. In developing a QMS, NUSTL leadership is committed to ensuring adequate resources are in place to achieve program goals and performance objectives; establishing and implementing management control systems to achieve quality in its products in a planned and systematic manner; and instilling the achievement of project goals is only made possible through each employee's personal commitment to quality.

In FY2016, NUSTL received a near flawless audit score from a QMS pre-audit conducted by Mabbett & Associates, Inc., and Loch Harbour Group, Inc. The pre-audit analyzed NUSTL's QMS against the International Standards Organization (ISO) 9001:2015 QMS Standard. NUSTL met 176 out of the 182 total requirements, resulting in a conformance score of 96.7 percent. The audit findings also included four non-conformities that NUSTL has already begun addressing. The auditors advised NUSTL to move forward and seek formal ISO 9001:2015 QMS certification. NUSTL has begun this process and is planning to have the certification audit conducted in FY2017.

### SAFETY, HEALTH AND ENVIRONMENTAL MANAGEMENT SYSTEM

NUSTL's [Safety, Health and Environmental Management System \(SHEMS\)](#) was developed to aid in the management of environmental and safety related activities in accordance with federal, state and local regulations. Administration Division Director Alfred Crescenzi, who serves as the SHEMS Coordinator, developed, implemented and mandated the S&T's SHEMS at NUSTL. Crescenzi presented outcomes, status and progress made by the SHEMS at the annual SHEMS Management Review (SMR). At the conclusion of the presentation, the NUSTL director stated that NUSTL's SHEMS continues to be suitable, adequate and effective for its intended purposes.

In preparation of the annual SHEMS Second-Party Audit, Support Contractor Kris Dooley, Program Analyst Theresa Campo-Bradford and Chemist John Kada conducted an internal audit of the SHEMS program. The purpose of the audit was to determine the facility's knowledge and awareness of SHEMS and its compliance with applicable federal, state and local Environmental, Safety and Health (ESH) laws and regulations; evaluate conformance to applicable internal policies and procedures including appropriate DHS directives and assess the design and effectiveness of specific management systems that have been created to help NUSTL's regulatory obligations. The internal audit team concluded that there were no instances of non-conformance and identified two opportunities for improvement that could enhance the SHEMS program. This included updating agendas and minutes from the Cross Functional Team to include action items and to conduct SMRs within three months of the completion of the SHEMS Second-Party Audit.

Following the internal audit, Crescenzi conducted a SHEMS Awareness training session to prepare staff members for the SHEMS Second-Party Audit. Crescenzi also held an additional training session for Operational Management Program (OMP) leads. OMPs are a management tool used to document tasks, responsibilities and operational details implemented to achieve objectives and targets to mitigate or remove significant environmental aspects and worker health and safety risks. During the training session, Crescenzi reviewed specific responsibilities related to the significant aspects and hazards identified in their respective OMPs.

The annual second-party SHEMS Audit and Radiation Safety Assessment was conducted by Mabbett & Associates, Incorporated. During the audit, NUSTL staff members were interviewed for awareness and compliance with the SHEMS program, ESH policies and practices, as well as OMP content and applicability to NUSTL operations. Additionally, the auditors assessed NUSTL's Radiation Safety program and compliance with the Nuclear Regulatory Commission Materials License.

### SAFETY PERFORMANCE METRICS

- No OSHA recordable injuries/illnesses
- No recordable injuries and illness or environmental releases associated with the decontamination and decommission of NUSTL's previously used 5<sup>th</sup> floor space
- No lost time injuries
- No hazardous releases to the environment

### NUSTL STAFF MEMBERS PARTICIPATED IN VARIOUS SHEMS-RELATED TRAINING ACTIVITIES INCLUDING:

- Cardiopulmonary Resuscitation, First Aid and Automated External Defibrillator training conducted by the American Red Cross
- Medical Counter Measures Point of Dispensing (MCM POD) activation exercise during a planned Anthrax MCM POD. The intent of the exercise was to increase the knowledge base, efficiency and effectiveness of NUSTL's MCM POD Team in emergency situations. Additionally, NUSTL hosted the first MCM Working Group for the Office of National Laboratories, which included a tabletop Anthrax exercise.
- DHS Mission Sustainability Energy Training at the National Renewable Energy Laboratory (NREL) in Golden, Colorado. The DHS-sponsored course taught how to implement energy changes. Discussions topics included incorporating sustainability into lease and build agreements, statement of works for energy projects, renewable project development and finance, greenhouse gas reduction and reporting from fleet vehicles such as hybrids and electric vehicles. All discussions were applicable to meet the Executive Order 13693, Planning for Federal Sustainability in the Next Decade.



NUSTL staff from left to right: Abby Hooper, Matt Monetti, Steve Vargas, Rochelle Cave, Andy Chen, Christian Madera and Orly Amir learn chest compressions during the CPR training.



Training participants for the MCM POD at NUSTL.



Alfred Crescenzi and DHS colleagues visit a solar panel rooftop during the Mission Sustainability Energy Training at the NREL.



## ► ORGANIZATIONAL SUCCESSES

Each year, the DHS S&T Under Secretary honors individuals and teams from across S&T components whose hard work and exemplary accomplishments have personified the very best of the Department. At the 2016 DHS S&T Under Secretary's Award Ceremony, Program Manager Ethel Davis received a Program Management Award for her outstanding accomplishments and management of the Performance Test and Evaluation program at NUSTL. Additionally, Test Manager Matt Monetti and Test Engineer Bhargav Patel received Outstanding Collaboration Awards for their respective roles in the DHS S&T Next Generation First Responder program and the DHS S&T Employee Council Team.

NUSTL's Urban Operational Experimentation team was also presented with a Building Partnerships Award for hosting a unique and collaborative experience with new technology for first responders. The NUSTL team included Program Analyst Theresa Campo-Bradford, Support Contractor Geoff Buteau, Division Director Alfred Crescenzi, Program Manager Ethel Davis, Chemist Karin Decker, Support Contractor Kris Dooley, Purchasing Agent Frances Di Pasqua, Physicist Paul Goldhagen, Support Contractor Abby Hooper, Chemist John Kada, Physicist Gladys Klemic, Support Contractor Christian Madera, Information Technology Manager Jenny May, Test Manager Matt Monetti, Engineer Cecilia Murtagh, Test Engineer Bhargav Patel, Division Director Larry Ruth and Support Contractor Steve Vargas.



*From left to right: Ethel Davis, Matt Monetti, Alfred Crescenzi, former DHS S&T Deputy Under Secretary Dr. Robert Griffin, former DHS S&T Under Secretary Dr. Reginald Brothers, Steve Vargas, Geoff Buteau and Abby Hooper.*

## AWARDS AND ACKNOWLEDGMENTS

In Celebration of Women’s History Month, the DHS Office of Corporate Communications conducted a “We Are STEM” campaign with selected women from the Science and Technology Directorate that inspire innovation through science, technology, engineering and math fields. NUSTL Performance Test and Evaluation Program Manager Ethel Davis, Chemist Karin Decker, Physicist Gladys Klemic and Engineer Cecilia Murtagh were recognized in the campaign for their years of experience and influence in their STEM fields.

Physical Scientist Sam Lee received a Division Goal Buster award from the New York City Combined Federal Campaign (CFC) at their annual awards ceremony. As the CFC Loaned Executive for Division 3, which includes DHS and U.S. Department of Defense agencies located in New York City, Lee surpassed the fundraising goal of \$388,150 set by the Local Federal Coordinating Committee by raising \$453,961.

Program Analyst Orly Amir was selected for DHS S&T’s March Employee Spotlight. The spotlight feature detailed her significant role in radiological/nuclear response planning and outlined her personal interests. About working at NUSTL, Amir stated, *“What I like most about working here at NUSTL is that we have all these smart scientists and engineers working to provide technical information, guidance and expertise to first responders. These responders are working day in and day out to keep our communities safe, healthy and vibrant. If we (as a lab, or as a broader agency) can provide them with information and tools that are usable and accessible in planning or that operationally make it easier to do their jobs – that is what keeps me going and where I find value.”*

Support Contractor Christian Madera traveled to Ecuador to aid victims in recovery efforts following a 7.8-magnitude earthquake that resulted in more than 500 casualties and left thousands injured. Madera volunteered alongside members of the local police in Manta, Ecuador, to help disseminate food, mattresses and clothing to approximately 400 earthquake survivors. Madera also traveled to Guayaquil, Ecuador, where he volunteered at that distributed approximately five tons of supplies, water, clothing, food and other non-perishable items.



NUSTL’s women of the STEM workforce hold their campaign signs with personal quotes to share their experiences within their respective fields. Not pictured: Physicist Gladys Klemic.



Sam Lee holds his award for his fundraising achievement.

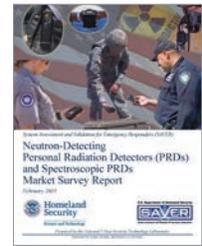


Orly Amir was selected for S&T’s employee spotlight of the month.



Christian Madera is pictured in the middle of two fellow volunteers providing relief to victims in Ecuador.

Physicist Paul Goldhagen and Support Contractor Kris Dooley were honored at DHS S&T's First Plain Language Awards Ceremony. Both were announced as category winners of the plain language contest and recognized for developing clearly written products. Dooley received an award for writing NUSTL's Internal Audits Standard Operating Procedure (SOP) that defines the responsibilities and requirements for planning and conducting internal audits, reporting results and maintaining audit records. Goldhagen received an award for the [Neutron-Detecting Personal Radiation Detectors \(PRDs\) and Spectroscopic PRDs Market Survey Report](#).



Physicist Gladys Klemic was elected for a six-year term to the National Council on Radiation Protection and Measurements (NCRP). NCRP's mission supports radiation protection by providing independent scientific analysis and recommendations representing the consensus of leading scientists. Klemic was elected as a council member based on her exemplary contributions and scientific expertise.



*Gladys Klemic was elected as a council member to the NCRP, providing independent scientific analysis and recommendations representing the consensus of leading scientists.*

NUSTL and the United States Coast Guard (USCG) Research and Development Center (RDC) dedicated personnel for short term details through the DHS S&T Partnering for Innovation & Operational Needs through Embedding for Effective Relationships (PIONEER) program. These arrangements enabled NUSTL and the USCG to rotate technical expertise across mutual test and evaluation projects to leverage staff and facility resources. NUSTL Test Engineer Shmuel Link was detailed to USCG's test events, while USCG RDC Lieutenant Keely Higbie and Lieutenant Joseph DiRenzo supported NUSTL's project work related to C-UAS test and evaluation.

NUSTL hosted three summer interns sponsored through the DHS S&T Office of University Programs for students majoring in homeland security related science, technology, engineering and math (STEM) disciplines.

Scott Fishkin was mentored by Program Analyst Orly Amir during his project to assess the existing public information from websites and publications on protective actions for radiological/nuclear device detonations and events at nuclear power plants.

Regina Zbarskaya was mentored by Program Manager Ethel Davis during her PTEN software application project. Zbarskaya successfully designed and built a database-driven user application to ensure test data integrity, and to streamline testing of electronic dosimeters deployed and used by the New York City Fire Department.

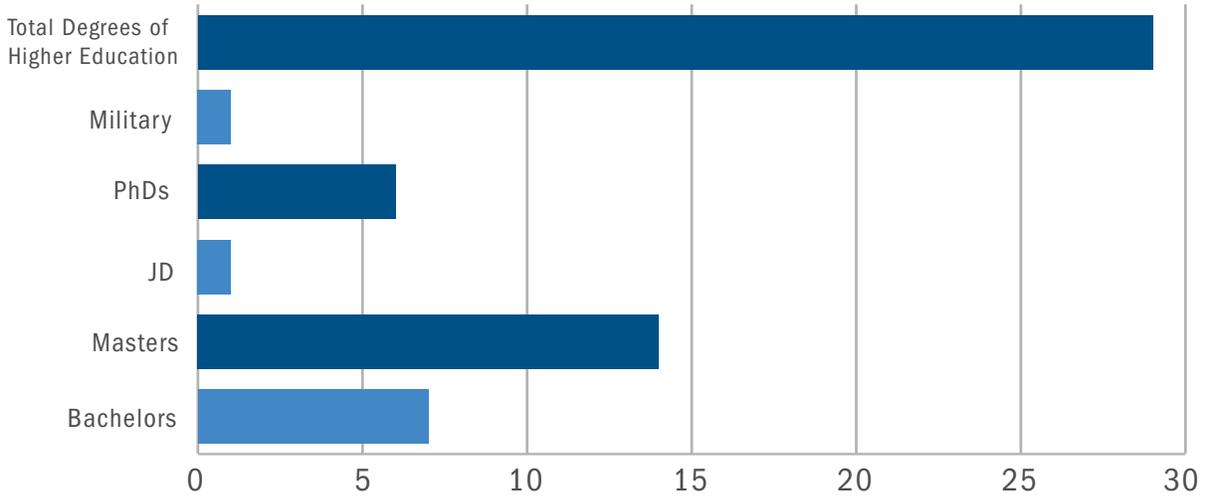


*From left to right: Student mentor Ethel Davis, STEM intern Regina Zbarskaya, NUSTL Director Adam Hutter, STEM intern Grant Schumock, and student mentors Shmuel Link and Gladys Klemic. Additional STEM intern not pictured include Scott Fishkin.*

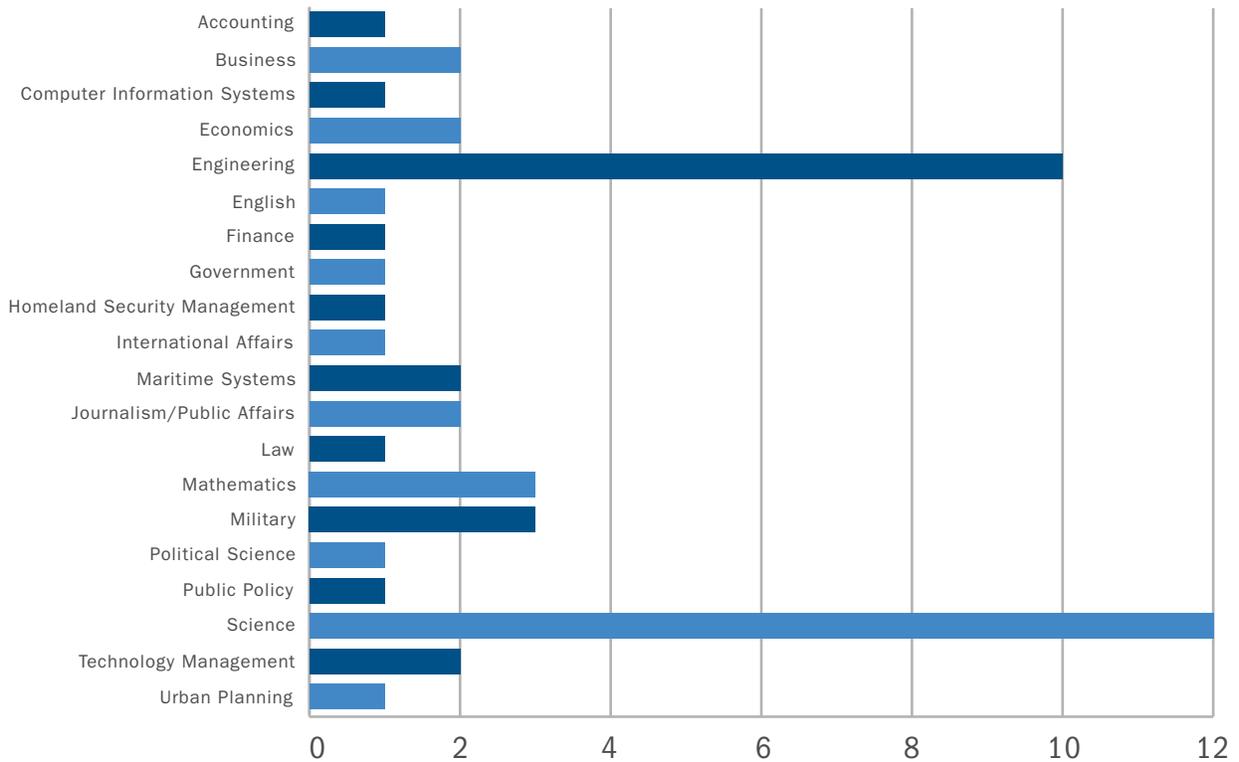
Grant Schumock was jointly mentored by Physicist Gladys Klemic, Health Physicist Carl Schopfer and Test Engineer Shmuel Link during his project on optimizing radiation contamination screening at community reception centers (CRC). Schumock developed custom data acquisition software for a pedestrian radiation portal detector, tested CRC optimization codes to minimize resource allocation and maximize throughput, designed hardware for angular positioning and conducted laboratory testing that verified that the experimental infrastructure is working to ensure success in completing the project.

## STAFF MEMBER FAST FACTS

### HIGHEST LEVEL OF ACADEMIC DEGREE ACHIEVED



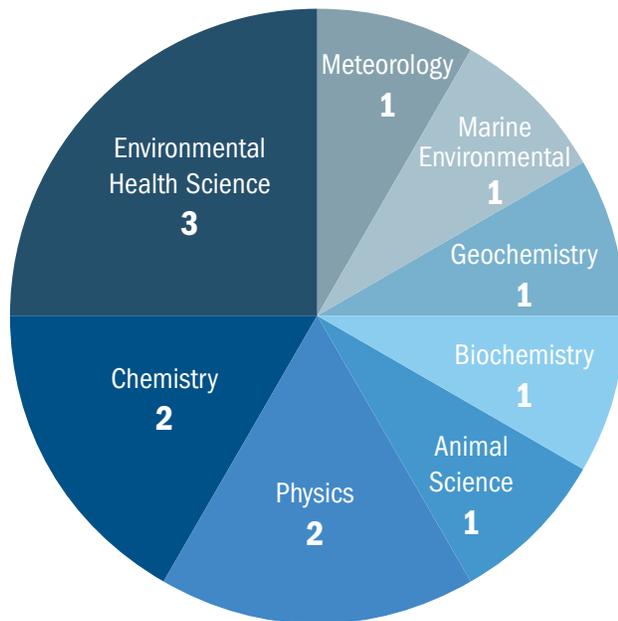
### EDUCATIONAL BACKGROUNDS



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## SCIENCE FOCUS AREAS

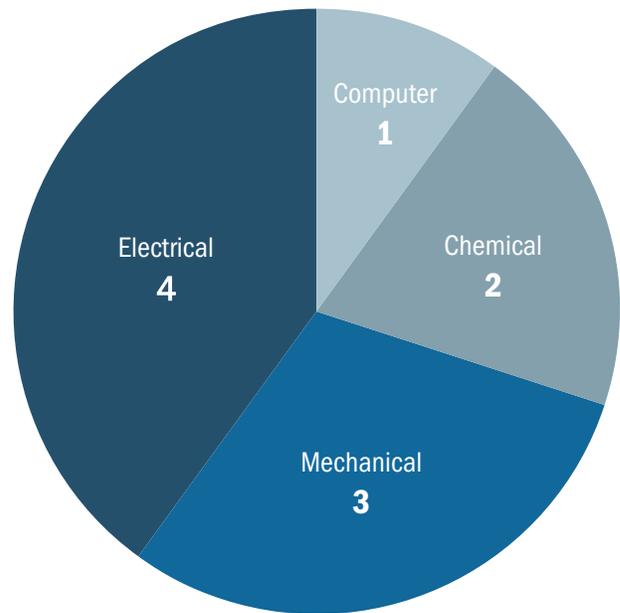
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## ENGINEERING FOCUS AREAS

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*NUSTL staff members are photographed with the NYPD's tour guide at the main entrance of the training academy.*

NUSTL visited the New York City Police Department (NYPD) Training Academy for a tour of their new, 730,000-square-foot state-of-the-art training facility located in College Point, New York. Staff members observed various training exercises throughout the tour and gained a greater understanding and appreciation for NYPD's training programs, and the tools and resources that foster their mission. The tour reinforced the dedication of the NYPD workforce, which serves as an inspiration to NUSTL's mission and support of the men and women who put their lives on the line to keep our community safe.



## ▶ LOOK AHEAD

Looking ahead, NUSTL expects FY2017 to be another successful and impactful year as requests for NUSTL's testing and evaluation expertise, services and products continue to increase. DHS components, S&T offices and the national first responder community have a high demand for NUSTL's honest and objective assessments of emerging and commercially available technologies that can help guide their investment and acquisition decisions.

Test events already planned for FY2017 include NUSTL's second annual Urban Operational Experimentation, the S&T 2017 Technical Assessment for Counter Unmanned Aerial Systems Technologies in Cities, the Electronic Jamming Exercise Demonstration at Idaho National Laboratory and the Next Generation First Responder Apex program's Spiral 2 demonstration event.

In addition to these and other test events, NUSTL's RNRR R&D Team will continue their work on existing and new projects to support state and local responders prepare for radiological and nuclear emergencies. They will also finalize and publish the RDD Detonation Response Planning Guidance.



*NUSTL staff members wear blue for National Slavery and Human Trafficking Prevention Month.*





To learn more about NUSTL, visit: <https://www.dhs.gov/science-and-technology/national-urban-security-technology-laboratory>,  
or contact us at [NUSTL@hq.dhs.gov](mailto:NUSTL@hq.dhs.gov).