



Homeland  
Security

Science and Technology

WELCOME TO DHS @ CES

# THE ROAD TO REOPENING

Recovery through Research



In the race to get the country back on track in the current COVID-19 era, the Department of Homeland Security Science and Technology Directorate (S&T) is leading a whole-of-government approach to build public-private innovation teams that incentivize and lower the risk for industry to co-invest in solutions to address nationwide problems and build resilience capacity.

Our CES '21 theme, “The Road to Reopening: Recovery through Research,” answers the call about what is needed from a governmental R&D organization to improve security, restore public confidence and keep our front-line workforce safe and protected. S&T is at CES to enhance relationships with the innovation community and help the tech community get more connected to federal government-led R&D COVID-response initiatives.

By working across public and private sectors, S&T is identifying and advancing R&D solutions that have the potential for scaling across numerous communities in the areas of public transit, wastewater surveillance, drone operations, airport security, and COVID-19 threat characterization and assessment. This week and beyond, we look forward to continuing these crucial conversations, which directly impact the nation’s public health, national security, economic recovery and smart cities future.

For more information, please visit our **CES Resource Hub** on the S&T website for additional information on S&T’s whole-of-government R&D investments that are helping to save lives.

“TO ACCELERATE A SAFE AND SECURE RECOVERY, DHS SEEKS TO BETTER UNDERSTAND HOW BREAKTHROUGH TECHNOLOGIES CAN BE USED TO BOLSTER THE SECURITY AND RESILIENCE OF HOMELAND SECURITY MISSION OPERATIONS.”

**CATHERINE CROSS**  
DHS S&T

## SARS-CoV-2 Detection in the Wastewater

S&T researchers are working to develop standards development teams to help communities nationwide detect the SARS-Cov-2 virus in wastewater. This approach called Wastewater-Based Epidemiology (WBE) provides real-time monitoring capabilities to predict the potential spread of COVID-19. WBE makes it possible to detect the virus in wastewater 4 to 10 days before people start to show symptoms of exposure to COVID-19. This is key because with COVID-19, people may be contagious before they exhibit any symptoms. Using data science, technology, and infrastructure, WBE serves as an early warning system by mining sewage samples for clues about public health.

Through WBE, COVID-19 can be monitored in target populations, including university and correctional facilities, at an early stage, enabling state and local governments to better understand the severity and location of the virus and then direct resources and communications.

Going forward, WBE will play an important role for gathering health data to direct testing and vaccine distributions. S&T is working with whole-of-government partners, including Louisville, KY and the National Institute of Standards and Technology to develop standards teams, to improve the effectiveness of WBE in the COVID-era and beyond.



**“IN COLLABORATION WITH PUBLIC AND PRIVATE PARTNERS, S&T IS DEVELOPING STANDARDS TEAMS FOR WBE DATA COLLECTION AND ANALYSIS, WHICH WILL ENHANCE PUBLIC HEALTH SECURITY.”**

**PHIL MATTSON**  
DHS S&T

## Safeguarding the Nation's Public Transit

S&T is partnering with federal and state agencies to leverage new science and technology, modeling and data analytics to better assess the risk of COVID-19 aerosols in buses, subway train and passenger rail cars. Providing safe public transportation is vital to economic recovery by making it possible for the workforce to return to the office and in bringing our cities back to life.



With a goal of safe and resilient public transit systems, S&T's collaboration with the Metropolitan Transportation Authority (MTA) in New York City, Massachusetts Institute of Technology Lincoln Laboratory and the U.S. Department of Energy Argonne National Laboratory, is studying how air moves through trains and buses. This research is tracking the route of particles expelled from riders by breathing, coughing and sneezing under a variety of conditions – including: wearing a mask vs. no mask, windows and doors open vs. closed, and heating/air conditioning (HVAC) system settings and filter type.

Science-based data will enable NYC-MTA to mitigate airborne virus transmission while protecting passenger health and safety. This initiative will also help improve protections for the transit workforce – the brave men and women who face risk on the job but continue to show up every day to keep our country going. S&T's whole-of-government R&D models are helping communities build resilience and make informed decisions to keep citizens safe on the road to reopening our economy.

**“WHOLE-OF-GOVERNMENT R&D INITIATIVES TARGETED AT IMPROVING PUBLIC HEALTH SECURITY AND MITIGATING THE RISK OF COVID-19 REPRESENT UNPRECEDENTED COORDINATION BETWEEN STATE AND FEDERAL GOVERNMENTS.”**

**DON BANSLEBEN**  
DHS S&T

## Integrating Drones in the Airspace

The future of drones and the advancement of new applications in areas of healthcare, security and commerce, call for the safe integration of drones into the national airspace. The development of an unmanned aircraft system (UAS) traffic management (UTM) system for low-altitude airspace is needed to unleash innovation and enhance security for our country.

S&T is working with NASA, Department of Defense, the Federal Aviation Administration and others to develop an automated UTM, which will safely and securely integrate Unmanned Aircraft Systems (UAS) into national airspace systems (NAS), regardless of where those operators reside and where those flights take place.

In ways we could only imagine a couple years ago, UTM systems will enable DHS to more effectively identify the good and bad drones in the sky, those piloted by humans or machine. By leveraging best practices from the aviation community, UTM will establish airspace flight corridors, geo-fencing, route planning, terrain avoidance guidance, and weather alerts, among other capabilities. With UTM, drone delivery of goods and services is coming one day, but if it's not safe and secure, this vision will not become reality anytime soon. S&T is following the science and building whole-of-government innovation teams to prepare the country and stay at the front of breakthrough advances and future R&D curves.



**“WHEN YOU CONSIDER METRICS OF  
“TIME, RISK, AND ABILITY,” UTM  
WILL BE A GAME CHANGER FOR DHS  
DRONE OPERATIONS, INCLUDING THE  
DELIVERY OF MEDICAL SUPPLIES  
AND RESPONDING TO “9-1-1” CALLS  
OF HAZARDOUS MATERIALS, BOMB  
THREATS, SUSPICIOUS PACKAGES,  
AND LOCATING  
LOST PERSONS.”**

**TIMOTHY BENNETT**  
DHS S&T

## Securing the Future of Travel

DHS recognizes how important travel is to our global economy and quality of life. S&T's Biometric research is evaluating how technologies can reliably verify the identities of travelers who are wearing face masks. This research is a great example of how we are innovating the growing demands for "speed and security" in operational settings. Investing in new capabilities and improvements for securely verifying peoples' identities without requiring the removal of protective equipment, e.g., masks, will not only reduce the risk for both members of the public and frontline security personnel -- it will also help our communities reopen and recover.

This timely research applies to other sectors updating workforce policies for 2021 and various public-private organizations that are charged with keeping citizens safe and protected.

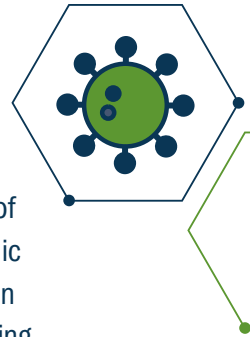
S&T is constantly refining its research agenda by asking: are we on the right path for developing future-proof capabilities that better prepare the country for the next crisis and lower risks to the public and frontline workforce? S&T's biometric initiatives are making it easier for industry innovators to work with government and for DHS to leverage technological advances that accelerate the delivery of solutions.



**“S&T’S BIOMETRIC RESEARCH SUPPORTS MULTIPLE DHS MISSIONS AND OUR INTERAGENCY AND INTERNATIONAL PARTNERS WHO SHARE COMMON CHALLENGES AND SEEK TO LEVERAGE THE SPEED OF PRIVATE SECTOR INNOVATION.”**

**ARUN VEMURY**  
DHS S&T

## Following the Science During the Pandemic



When a once-in-a-lifetime public health crisis sweeps the globe, how do you know what you don't know? Answer: you follow the science. S&T's Probabilistic Analysis for National Threats Hazards and Risks (PANTHR) program is building a database of timely knowledge—the weekly Master Question List—to shape the nation's pandemic response. Collating data on how SARS-CoV-2 is transmitted, how long the virus can live in the air and on surfaces, or which PPE is best to use has led to groundbreaking steps in our fight against COVID-19.

The laboratory studies and applied research led by PANTHR, the Hazard Awareness & Characterization Technology Center, and the National Biodefense Analysis and Countermeasures Center have produced novel insights about the virus' environmental stability and transmission, as well as actionable information for surface decontamination. The research has been adapted into interactive calculators to determine the half-life of the virus in aerosols and on surfaces, as well as methods for using common household technologies to disinfect N95 masks. These tools can arm decision-makers with additional critical tools to keep our communities and citizens safer.

With the deployment of vaccinations underway, we are starting to see light at the end of the dark tunnel, but there is still a way to go to get our nation, economy, and lives back to “normal.” S&T continues to work alongside academia, labs, and industry to deliver scientific solutions to the biggest crisis of our lifetime.

**“THIS IS A SCARY, CHALLENGING TIME. WE OWE IT TO THE ESSENTIAL WORKERS, THE OVERWHELMED PARENTS, THE UNEMPLOYED, AND MOST OF ALL, THOSE WHO HAVE FALLEN PREY TO THIS INSIDIOUS DISEASE TO DO ALL THAT WE CAN TO BE RESPONSIBLE MEMBERS OF OUR COMMUNITIES.”**

**DR. LLOYD HOUGH  
DHS S&T**

# S&T @ CES 2021

For more information, please visit the  
**S&T CES Resource Hub.**

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