

# DHS Science and Technology Directorate

## Detect to Protect Bio-Aerosol Detection Systems

### Defending against biological threats

Our national infrastructure is vulnerable to biological attacks on major facilities such as large office buildings, subways, stadiums and airports. A biological substance dispersed through a facility's air handling system or in an enclosed area could quickly spread before the attack is recognized and an appropriate response is activated. The Department of Homeland Security Science and Technology Directorate (S&T) launched the Detect-to-Protect (D2P) Bio-Aerosol Detection program to combat these threats. Through the program, S&T developed and is testing bio-aerosol sensors that can identify and confirm the release of biological agents within minutes. S&T aims to deploy these sensors to improve facility security, protect individuals from exposure to biological threats and support the Department's mission to secure America.

### Expanding detection capabilities at minimal cost

To ensure comprehensive threat coverage, S&T developed a suite of complementary sensors that address two crucial areas:

- **Trigger Sensors.** These sensors are able to rapidly determine if an aerosol is *biological* in origin. Available at a low cost, these early-warning sensors will initiate "low regret" alarms that launch initial defensive measures, such as activating a nearby confirmation sensor or change air flows to minimize the spread of a potential contaminant.
- **Confirmation Sensors.** These sensors autonomously collect and process air samples when initiated by a trigger alert. Within 15 minutes, confirmation sensors can determine if a substance is a *biological threat*. Considered extremely high confidence detection technologies, these sensors provide first responders with a basis for initiating "high regret" alarms for building evacuation and public health response.

This multi-tiered detection approach reduces the number of samples that need to be processed. In turn, this will lower the overall cost of ownership and prevent excessive false alarms.

Recognizing that the system architecture in buildings can widely differ, S&T designed these sensor systems to be extremely adaptable. The goal was to create a system of sensors that can be rapidly integrated into buildings and structures across the nation. For optimal coverage, the sen-

sors should be distributed at various sites throughout a facility to protect individuals from exposure and reduce the contamination of critical infrastructure.



The Anaheim Convention Center is an example of a complex building that could be well served by a "detect-to-protect" system of networked bio-aerosol sensors.

### Testing prototype sensors in real-world environments

Initially prototype sensors were independently verified at a government-standardized testbed. S&T is now testing the prototypes in relevant operational environments such as airports, subway systems and convention centers. In FY 2013, S&T conducted extensive tests in Boston's subway system to evaluate the performance of the sensors in real-world environments.

These tests afforded S&T an opportunity to socialize the technology with potential user communities. S&T is working with federal, state and local first responders, transportation hub managers and private sector leaders responsible for protecting facilities against attack to further demonstrate the prototype system. Also, S&T has hosted public forums to discuss the tests as well as the technology.

Before the sensors can be transitioned to the commercial market, S&T must demonstrate several technical metrics, including rapid sensing in cluttered backgrounds and threat coverage for at least 20 biological agents. Through further testing, S&T plans to demonstrate the sensors' performance and develop concepts of operations for their use in the field.



**Homeland  
Security**

Science and Technology

To learn more about the Detect-to-Protect Bio-Aerosol Detection program, contact [SandTChembio@hq.dhs.gov](mailto:SandTChembio@hq.dhs.gov).