

**Testimony of Director Steven Wallen
Explosives Division
Homeland Security Advanced Research Projects Agency
Science and Technology Directorate
U.S. Department of Homeland Security**

**U.S. House of Representatives
Committee on Homeland Security
Transportation Security Subcommittee**

January 7, 2016

Good afternoon Chairman Katko, Ranking Member Rice, and distinguished members of the Subcommittee. Thank you for the opportunity to testify before you today on the Department of Homeland Security (DHS) Science and Technology Directorate's (S&T) work on transportation security technology. In this testimony, I will discuss S&T's approach to research and development (R&D) and how our partnerships with the Transportation Security Administration (TSA), the private sector, and universities are leading to new explosives detection and mitigation solutions.

S&T's mission is to deliver effective and innovative insight, methods, and solutions for the critical needs of the Homeland Security Enterprise (HSE). Many of the constraints that S&T and other federal R&D organizations face result, often indirectly, from processes and authorities suited to a previous era of relatively less competition for technical expertise and less emphasis on organizational agility and responsiveness to rapid change. The homeland security mission encompasses numerous complex threats that evolve quickly and strain operational capabilities running on traditional, multi-year development and acquisition cycles. Under Dr. Reginald Brothers' leadership as Under Secretary, S&T has focused the last two years on reshaping S&T's approach to R&D to overcome those constraints. That meant finding ways to mine sources of innovation like start-ups that may not traditionally work with government. To achieve this, we set up interdisciplinary teams working closely with field operators to accelerate translation of operational challenges into real, user-driven solutions. And that meant speeding up our internal processes to the maximum extent possible to ensure long-term relevance of solutions that become operational and enter widespread use.

To foster that approach to R&D, we have focused on five priorities:

- Develop visionary goals for the organization.
- Produce an actionable strategy.
- Foster an empowered workforce.
- Deliver force multiplying solutions to homeland security stakeholders.
- Energize a Homeland Security Industrial Base.

Visionary Goals

In the past, S&T had a very operational focus in helping to bridge capability gaps identified by Component partners and stakeholders. While S&T continues to work daily with Component

partners, first responders, and other stakeholders on immediate issues, the organization undertook an effort last year to create comprehensive, far-reaching visionary goals that look twenty or more years into the future. These visionary goals serve as our strategic direction and will ultimately improve DHS's capabilities and make our nation more secure.

- *Screening at Speed: Security that Matches the Pace of Life*
Noninvasive screening at speed will provide for comprehensive threat protection while adapting security to the pace of life rather than adapting life to security. Unobtrusive screening of people, baggage, or cargo will enable the seamless detection of threats while respecting privacy, with minimal impact to the pace of travel and speed of commerce.
- *A Trusted Cyber Future: Protecting Privacy, Commerce, and Community*
In a future of increasing cyber connectivity, underlying digital infrastructure will be self-detecting, self-protecting, and self-healing. Users will trust that information is protected, illegal use is deterred, and privacy is not compromised. Security will operate seamlessly in the background.
- *Enable the Decision Maker: Actionable Information at the Speed of Thought*
Predictive analytics, risk analysis, and modeling and simulation systems will enable critical and proactive decisions to be made based on the most relevant information, transforming data into actionable information. Even in the face of uncertain environments involving chemical, biological, radiological or nuclear incidents, accurate, credible, and context-based information will empower the aware decision maker to take instant actions to improve critical outcomes.
- *Responder of the Future: Protected, Connected, and Fully Aware*
The responder of the future is threat-adaptive and cross-functional. Armed with comprehensive physical protection, interoperable tools, and networked threat detection and mitigation capabilities, responders of the future will be better able to serve their communities.
- *Resilient Communities: Disaster-Proofing Society*
Critical Infrastructure of the future will be designed, built, and maintained to withstand naturally-occurring and man-made disasters. Decision makers will know when disaster is coming, anticipate the effects, and use already-in-place or rapidly-deployed countermeasures to shield communities from negative consequences.

These goals will serve as our strategic direction and will ultimately improve DHS's capabilities and make our nation more secure. S&T will continue to provide operational support and help stakeholders nationwide meet near-term requirements while, with the Visionary Goals as a guide, also facilitating longer-term R&D opportunities with public and private sector communities.

Force-Multiplying Solutions

The Apex Program

Grounded in our Visionary Goals and working in mission areas that cut across our DHS Component partners, S&T launched six new Apex projects including one in direct partnership with TSA. These ambitious programs – which are based on vetted, long-term requirements of DHS operational Components – look strategically at the Nation's security and address future challenges while continuing to support today's operational needs. It is worth noting that in order

to create the new Apex projects, we reduced the overall number of programs at S&T to have fewer, but more impactful, projects. New Apex project areas include the following: biothreat awareness, aviation screening, next-generation cyber infrastructure, flood awareness, next-generation first responder, and border situational awareness. In addition to existing Apex projects with U.S. Customs and Border Protection on passenger screening (the Apex Air Entry/Exit Re-Engineering Program) and U.S. Immigration and Customs Enforcement (ICE) on data analytics (the Apex Border Enforcement Analytics Program), Apex projects represent some of the highest-profile and most promising projects in the Directorate.

Engines

S&T's Apex program is supported by a new category of projects called Apex Technology Engine Teams (Engines) that provide expertise in focused topic areas, enable cross-cutting R&D, and benefit S&T's entire portfolio including our work with TSA. Engines represent a novel approach in S&T for realizing S&T's Visionary Goals and powering innovation. The first wave of Engines includes the following:

- Data Analytics
- Situational Awareness and Decision Support
- Communications and Networking
- Behavioral Economics and Social Sciences
- Identity and Access Management
- Modeling and Simulation

Our Engines harness subject matter expertise and capabilities across the Department and leverage technological, scientific, industrial, and academic communities to provide continuous support in areas of need common to multiple, and sometimes all, DHS Component agencies. S&T's Engines identify and share subject matter expertise, technical solutions and tools, best practices, lessons learned, and reusable products and solutions on behalf of Apex and other S&T projects. Collaboration to leverage knowledge from the DHS enterprise and external stakeholders are core components of the Engine approach.

In less than a year, the Engines model has already begun to take root. As one example, the Data Analytics Engine works with nearly every operational Component in DHS. It recently won an award for work with the Federal Emergency Management Agency on the U.S. Fire Administration's National Fire Incident Records System and has a highly successful program underway with ICE's Homeland Security Investigations. Additionally, the Data Analytics Engine continues to support customer projects such as TSA's third-party pre-screening by providing technical evaluation of analytics software.

Integrated Product Teams

Science and technology are near-universally acknowledged as critical elements to future operational success. By prioritizing solutions that substantially multiply the effects of manpower and other existing assets, Components and customers are more likely to recognize S&T's value and integrate a jointly-developed R&D portfolio into their procurement cycles and, ultimately, their operations. In the last year, we have made significant strides in this area including, most significantly, re-establishing the Department's Integrated Product Teams (IPT) as part of the Secretary's April 2014 Unity of Effort initiative.

In August, the Secretary directed S&T to reinstitute these cross-departmental IPTs for the purpose of identifying technological capability gaps and coordinating R&D to close those gaps across the mission areas of the Department. The overall effort is led by S&T, but the individual IPTs are led by senior representatives from the operational Components with representation from the Joint Requirements Council (JRC) and support from S&T.

One of the first five topic areas for IPTs is Aviation Security and is chaired by TSA. The remaining four topic areas are Biological Threats, Counterterrorism, Border Security, and Cyber Security. S&T will also continue its ongoing IPT supporting our Nation's first responders through the First Responders Resource Group, and the IPT will create additional sub-IPTs to address key issues such as resilience. Going forward, the IPTs will be one mechanism by which the Department identifies and coordinates its R&D efforts to align DHS's priority missions.

Acquisition support in the Department

S&T's Office of Test and Evaluation oversees test and evaluation (T&E) for DHS major acquisitions including at TSA, ensuring homeland security technologies are reliable, interoperable and effective. S&T provides test and evaluation oversight for the Department's major acquisition programs housed by the DHS Components. In this capacity, S&T develops DHS-wide T&E policies and procedures, acts as principal advisor on operational T&E to the Office of the Secretary and the Component heads, and manages a T&E Center of Excellence to support the Department. As an independent T&E organization within DHS, the objective is to help every program plan and execute robust T&E throughout the acquisition lifecycle, bringing credible assessments to all acquisition decisions.

For pre-acquisition requirements development, S&T has also been an active participant in the Department-wide JRC, a part of the Secretary's Unity of Effort Initiative. The JRC identifies common capability needs and challenges across DHS Components and will work as an essential input into S&T's own R&D process. In addition to JRC membership, S&T currently provides the JRC's primary analytic resources. As such, S&T is helping develop and refine JRC analysis, methodology, and process in addition to partnering with topic-specific teams to conduct capabilities-based assessments. Working under the direction of the JRC Chair and with the other JRC stakeholders, S&T will establish a lasting and functional framework for the Department's requirements process.

Homeland Security Industrial Base

In many cases, DHS – more than many federal agencies such as the Department of Defense – is dependent on commercially-available, off-the-shelf products to achieve its mission. As a result, partnership with industry, specifically in product development, is essential. R&D projects can yield isolated, one-off solutions, but a truly successful portfolio must strategically shape the shelf by inserting homeland security applications, if not as primary use cases or applications, at least as considerations during companies' product development cycles. If successful, that approach results in numerous products on the shelf that operators may use.

S&T has enjoyed considerable success expanding and refining outreach to industry including in the area of explosives detection and mitigation. We continue to host industry days to inform and

educate the private sector on our direction and available opportunities for partnership, including one last June dedicated to checkpoints and S&T's screening-focused Apex project. We published a new S&T Strategic Plan and overhauled S&T's website to be more informative and transparent to potential private sector partners. Additionally, we launched innovative accelerator and prize competition platforms to reach innovators and communities that may have never heard from or worked with government before. S&T expanded our Silicon Valley presence with a pilot program that aims to maintain constant, face-to-face contact with venture capital and start-up communities outside the Beltway, including in the Silicon Valley area. By combining these efforts with willing partners within the Department, including in the Management Directorate and Office of General Counsel, we are beginning to see real interest in private sector participation in a Homeland Security Industrial Base.

R&D and T&E in Explosives Detection and Mitigation

S&T's Explosives Division is devoted to protecting citizens and our country's infrastructure against the devastating effects of explosives by seeking innovative approaches in detection and countermeasures. Through our work with operational partners like TSA and with industry, S&T delivers concepts, science, technologies, and systems that increase the HSE's ability to detect explosives and mitigate the effects of an explosive blast. The Explosives Division's portfolio is divided into three operational areas:

- Aviation Solutions, developing cost-effective systems for screening air cargo, checked baggage, carried items, and people at checkpoints that will improve detection capabilities, reduce false alarm rates, and improve the overall customer experience.
- Intermodal Solutions and Facilities Protection, developing technologies capable of screening in high-throughput areas where traditional checkpoints are neither effective nor efficient and enhancing tools to improve current canine and trace detection screening methods.
- Foundational Science, determining explosives and blast phenomenology that makes applied R&D possible, including the study of explosive material characteristics relevant to discrimination and detection and the assessment of blast effects on aircraft and infrastructure.

In addition to the broader approaches and capabilities in S&T described above, below are descriptions of a number of elements that are specifically contributing to the success of the explosives R&D portfolio.

Partnership with TSA

Through the Aviation Security IPT, S&T is implementing a formal process for identifying, validating, and prioritizing technological capability gaps to help guide future R&D investments within DHS S&T. The Aviation Security IPT includes five Sub-IPTs: Checkpoint, Checked Baggage, Emerging Threats, Air Cargo, and System Architecture and Integration. Although the primary IPT is chaired by TSA, the Sub-IPTs are jointly chaired by TSA and DHS S&T and include members from other organizations such as Customs and Border Protection, the U.S. Secret Service, the Federal Protective Service, and the Federal Bureau of Investigation. The Aviation Security IPT charter was signed on October 15, 2015, and the results of the capability

gaps evaluation, program crosswalk, and R&D plan are currently being combined and prioritized by a cross-component body of senior leaders, known as the S&T Research Council.

S&T's Explosives Division regularly interacts with various offices in TSA and often works closely with TSA's Office of Security Capabilities. The organizations share information on goals, requirements, and current and proposed projects. Both organizations frequently offer to hold joint meetings with vendors to evaluate the status of projects, discuss new technology, or discuss proposals. The organizations are evaluating the means by which to use proposals submitted to the other organization's Broad Agency Announcements to expedite the procurement process.

Aviation Checkpoint Screening at Speed Apex project

Our Aviation Checkpoint Screening at Speed Apex project is developing next-generation, leap ahead screening hardware with potential to substantially improve the security and passenger experience at checkpoints. The Screening at Speed Apex specifically focuses on developing the technologies and framework that is compatible with TSA's vision for an Aviation Checkpoint of the Future while at the same time enhancing TSA's ability to reliably detect smaller and evolving threats and to distinguish potential homemade explosive (HME) threats from items commonly carried by passengers. S&T envisions a future where TSA screeners are able to spend less time on complicated images and more time observing and assisting passengers and resolving alarms. The technology being developed as part of the Screening at Speed Apex will strengthen security and lead to expedited passenger and baggage screening.

Transportation Security Laboratory (TSL)

Located in Atlantic City, New Jersey, TSL is one of S&T's five labs and is dedicated to advancing detection technology from conception to deployment through applied research, test and evaluation, assessment, certification and qualification testing. TSL's Independent Test and Evaluation group provides certification and qualification tests. Additionally, they create laboratory assessments that provide DHS Components, including TSA, with critical information about equipment and its ability to detect explosives and other contraband. TSL also provides system developers and manufacturers with a range of explosive test articles to help them develop software to locate explosive threats artfully concealed on passengers or in their luggage. With a specialized campus; a highly-experienced staff including physicists, chemists, engineers, and mathematicians; and numerous cooperative research and development agreements with industry and academia, TSL is a national asset for transportation security.

DHS Tyndall Reactive Materials Group (TRMG)

Another important DHS S&T asset which supports the work of TSA and furthers aviation security is the TRMG. The TRMG is an explosives data collection facility located at Tyndall Air Force Base in Panama City, Florida, which collects and maintains data on explosive materials using specialized facilities and equipment under the oversight of DHS S&T. One of the key ways in which the TRMG supports DHS S&T and TSA programs is by collecting large amounts of data on HME materials. TRMG personnel work to meet the needs of the Electronic Baggage Screening Program (EBSP) and the Passenger Screening Program (PSP), by providing vendors with information and a test platform for algorithm development to detect new threats. Their work is designed to keep pace with the dynamic and expanding requirements and threats at

transportation screening portals and to maintain the capacity to conduct testing on systems and technologies to detect improvised explosives.

Center of Excellence for Awareness and Localization of Explosives-Related Threats (ALERT)

Led by Northeastern University in Boston, Massachusetts, ALERT is one of S&T's ten university-based Centers of Excellence (COE) and is dedicated to transformational research, technology, and educational development surrounding explosives-related threats. The COE network is an extended consortium of hundreds of universities conducting groundbreaking research to address homeland security challenges. S&T's COEs work closely with the homeland security community to develop customer-driven, innovative tools and technologies to solve real-world challenges. ALERT's researchers bring strengths in designing advanced sensors; detecting weakly defined targets from a standoff distance; signal processing and sensor integration; characterizing explosives; understanding improvised explosive device (IED) detonator signatures; shock physics; and material science.

Path Forward

S&T brings to bear a range of capabilities and expertise in support of TSA and the explosives detection and mitigation portfolio. Through the Aviation Security IPT and routine formal and informal interactions, we are investing with TSA and our stakeholders in both evolutionary and revolutionary improvements. I thank you for the opportunity to testify before the Committee today, and welcome your questions and the opportunity to further discuss our work.