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Good morning Chairman Johnson, Ranking Member Carper, and distinguished members of the committee. I thank you for this opportunity to testify today regarding the Department of Homeland Security (DHS) Science and Technology Directorate's (S&T) investments in support of border security.

S&T develops cutting-edge tools and technologies to prepare for and counter real-world threats. Whatever the scenario, whatever the threat, S&T's mission is to deliver effective and innovative insight, methods, and solutions for the critical needs of the Homeland Security Enterprise.

As the research and development arm of DHS, S&T does not procure or acquire products, off-the-shelf technologies, or services for the Department. Rather, S&T works with private industry, academia, government laboratories and other government partners to develop technical solutions for capability needs. By engaging with all key stakeholders early on during the development of solutions, we aim to create products that are useful for end users, including the DHS components and first responder community.

Under the leadership of Under Secretary Brothers, S&T has undertaken a number of initiatives across the Directorate to refine our strategic direction, ensure continuous understanding of operational challenges, and maximize our ability to identify, develop, and deliver force-multiplying solutions.

DHS Unity of Effort

Before talking in detail about the approach S&T is taking in technologies investment, I wanted to briefly touch upon a significant initiative DHS has kicked off recently that acts as a coalescing and supporting function for border security work across DHS. Secretary Johnson's Unity of Effort initiative has put in place new and strengthened management processes at DHS headquarters to enable more effective DHS component operations.

S&T actively participates in these efforts, which include a new DHS Joint Requirements Council and significantly strengthened budget and acquisition processes. Through these processes, S&T and other elements of the Department work together in a trusted, transparent fashion to better assess, budget for, acquire, and field fiscally sustainable technology in support of DHS border security efforts and the other primary DHS missions.

In addition, S&T was tasked last fall by the Deputy Secretary to explore the best ways to ensure knowledge of emerging technology and their potential application to DHS are incorporated into

the fabric of these management and decision-making processes. This exploration shaped our strategic vision and goals and is the new lens S&T is looking through to address DHS's many challenges.

S&T Visionary Goals and Strategic Plan

Over the past year, in collaboration with DHS Components, partners, and stakeholders, the S&T team has been working hard to develop visionary goals listed below that are well aligned with the 2014 Quadrennial Homeland Security Review, congressional guidance and Secretary Johnson's Unity of Effort initiative while providing a clear direction for S&T investments into the future:

- ***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 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 connections, 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 will be 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. Resilient communities struck by disasters will not only bounce back, but bounce forward.

To begin implementing these five visionary goals, S&T also recently completed the development of our 2015-2019 Strategic Plan. Published in April 2015, this new strategic plan lays out our strategic objectives, priorities, initiatives, and roadmaps. I will now discuss what S&T is specifically doing in the area of border security.

Border Security

Of the five S&T Visionary Goals discussed above, the following three are relevant to border security: ***Screening at Speed, Enable the Decision Maker,*** **and** ***Responder of the Future***. These goals require a common enabler – situational awareness – that is enabled by collection, integration, and analysis of large amounts of data from traditional and non-traditional sources. With new insights and actionable information, the results must then be shared in a timely manner with federal, state, local, and international partners to ***enable decision makers*** at various levels from the field to headquarters, to allow swift ***screening*** of people and goods with minimum disruption to the pace of life at our Ports of Entry, and arm our front line ***responders*** with proper knowledge to keep them safe and fully aware.

Technology is a powerful force multiplier to enhance border security and is a key strategy being pursued by DHS. For example, annual container shipments entering the United States are expected to grow at 4-5% per year for the foreseeable future; however, our DHS cargo security workforce is not expected to grow proportionally. In these circumstances, implementing force multiplying technologies to provide our workforce with timely and actionable information to focus screening and inspection activities on the highest risk cargo will be an effective way to cope with the increased volume while securing our border without impeding trade.

From an operational standpoint, DHS continues to deploy resources to enhance situational awareness of a broad border encompassing 328 ports of entry, 7,500 miles of land border, and 95,000 miles of shoreline against a multitude of ever-changing threats. Technology, insofar as it is a force multiplier, enables decision makers to better evaluate the flow of goods and people across our borders in order to determine when and where to utilize interdiction assets. With a risk-based approach to border security that integrates technology and analytics, operators will free up resources by avoiding costs associated with false alarms or inaccurate targeting information. Technology and knowledge products do not replace boots on the ground; rather they are an essential complement and critical to performing operational missions in a targeted, more efficient, more effective manner.

Situational Awareness – The Key Enabler to Effective Border Security

Considering both S&T visionary goals and today's operational needs, we believe that the biggest return on S&T investment can be gained by providing an enterprise capability to provide situational awareness across the Homeland Security Enterprise (HSE), enabling both tactical response and strategic risk-based resource allocation.

Our strategy to provide superior situational awareness to the decision makers in the HSE includes:

- Integrating and federating existing stove-piped sensor and non-sensor data sources from federal, state, local, tribal, and international law enforcement partners and sharing that data within the HSE;
- Developing and integrating of decision support tools and analytics to allow the HSE to translate the available data into actionable information and intelligence;

- Providing the capability to share the actionable information and intelligence with HSE partners; and
- Developing new sensors and sensor systems to fill the gaps. Currently, situational awareness can be significantly improved along our maritime and terrestrial borders. A substantial portion of S&T's current border security research and development portfolio is dedicated to identifying, developing, and operationally evaluating gap filling technologies. Some of these technologies include tripwires, radars, cameras, seismic and acoustic sensors that are discussed later in this testimony.

Providing Superior Situational Awareness in all Border Environments

S&T envisions a Border and Coastal Information System (BACIS) that (1) provides wide access to existing federal, state, local, tribal, and international data sources, (2) makes available decision support tools to translate the available data into actionable information and intelligence, and (3) enables sharing of the actionable information and intelligence with HSE partners.

The BACIS concept addresses the three unique border environments -- land borders, coastal and maritime borders, and at the ports of entry -- using common data tools and architectures. Some of this work is already underway.

- Land Borders – S&T initiated the Border Situational Awareness Apex program in FY15 to develop BACIS capabilities along the terrestrial borders. Apex programs are S&T's multi-year, cross-cutting, multi-disciplinary efforts aimed at solving problems of strategic operational importance to the Department. The Border Situational Awareness Apex program will enable the Homeland Security Enterprise to achieve increased border situational awareness leading to more effective border incursion detection, interdictions, and deterrence. Specifically, the increased situational awareness will result in:
    - Improved measurement of illegal border activity to understand current state and impacts from additional resources or other actions taken to improve security;
    - Improved assessment of risks by identifying current threats along with emerging patterns and trends; and
    - Improved alignment of resources to risk for current and future operations on both a tactical and strategic level.

- Coastal and Maritime Borders – S&T's Integrated Maritime Domain Enterprise (IMDE) and Coastal Surveillance System (CSS) projects are developing BACIS capabilities in the coastal and maritime environment. S&T is currently piloting IMDE/CSS at CBP's Air & Marine Operation Center (AMOC) in Riverside, California, obtaining customer/user feedback. IMDE/CSS integrates and federates existing federal, state, local, tribal, territorial, and foreign surveillance infrastructure and assets to detect, track, identify, and interdict maritime threats. Once completed, this new capability will improve the maritime domain awareness of DHS components in the coastal regions of the nation, resulting in increased small vessel interdiction efficiency and effectiveness. AMOC operators enthusiastically have embraced IMDE/CSS, while still a pilot, to assist in not only finding more bad actors but also allowing DHS to save money by pursuing threats more efficiently.

- Ports Of Entry - S&T's Apex Air Entry/Exit Reengineering (AEER) program is currently partnering with CBP to identify and evaluate processes and technologies (including biometrics) to efficiently inspect and examine travelers entering/leaving the U.S. In FY17 S&T plans to initiate the integration of Apex AEER and other Port of Entry security data into the BACIS information sharing environment.

Utilization of common data standards, tools, and architectures will allow us to efficiently develop BACIS capabilities in the three environments in parallel and ultimately allow their integration into a single enterprise capability as each is ready for deployment.

New Sensors and Sensor Systems to Fill the Gaps

As mentioned earlier, we need to improve situational awareness capability along our maritime and terrestrial borders. A substantial portion of our border security R&D portfolio consists of projects to enhance capabilities and provide new data/information sources for BACIS. The following represent a sampling of the capabilities being developed:

- *Ground Based Technologies* pursues technologies to provide new or improved border surveillance capabilities including radars, imagers, unattended ground sensors, tripwires, and related communication/power technologies;

- *Tunnel Detection and Surveillance* provides CBP and ICE capabilities to locate clandestine tunnels and the forensic analysis tools to support investigations and prosecutions;

- *Air Based Technologies* identifies, tests, and evaluates small Unmanned Aircraft System (SUAS) technology for possible use in border and maritime security and public safety missions;

- *Small Dark Aircraft* develops inexpensive, man portable, flexible, wide area sensors/sensor systems to detect and accurately track small aircraft, ultralights, and gyrocopters to enable their interdiction;

- *Cargo and Conveyance Security* develops technologies for collecting additional cargo data and invests in analysis methods necessary to translate new and existing cargo data into actionable information which in turn improves targeting, which raises the probability of detection of illicit or hazardous materials and expedites delivery of legitimate cargo;

- *Cargo Forensics* provides CBP with the enhanced capability to detect and investigate illegal activity through the forensic analysis of material collected from suspicious cargo/packages enabling enhanced trade compliance enforcement;

- *Land/Sea Cargo Scanning* develops software and hardware upgrades for CBP's legacy cargo scanning units, infusing state-of-the-art technology resulting in (1) improved performance, including reduced operator workload, increased contraband detections,

reduced false alarms, resulting in improved throughput, (2) increased reliability, and (3) reduced operation and maintenance costs; and

- *People Screening* supports CBP-led efforts to deploy a cost-effective biometric air exit capability and expands efforts to introduce improvements in CBP air entry inspection based process and technologies in support of the President's National Travel and Tourism Strategy.

Technology as Interim Operational Capability for the Border Workforce

S&T-developed technology is providing interim operational capabilities that DHS Components are putting to use to secure our borders. There are numerous operational prototypes/pilots across the land, maritime, and port of entry domains. Examples include the operational testing of a buried tripwire system along the U.S. border in Arizona and a tunnel activity monitoring system undergoing operational assessment in a border city in Texas. On the northern border, there is a Canada-U.S. Sensor Sharing pilot and a prototype system to detect and track small dark aircraft. Our IMDE/CSS pilot is providing maritime domain awareness of the waters off of Southern California, and there are plans to expand the system to portions of the Chesapeake Bay, Puget Sound, and the Great Lakes by the end of the fiscal year. In operational use at the Laredo, Texas Port of Entry is a prototype Aviation Scanner that non-intrusively images the internal voids (fuselage, empennage, wings, etc.) of General Aviation (GA) and small commercial aircraft for contraband thereby eliminating the costly and time consuming need to remove aircraft panels. S&T is partnering with industry in piloting commercial off-the-shelf electronic security devices to secure and track deliveries (packages, cargoes) between federal facilities in the National Capital Region. The devices detect unauthorized door openings, off-route deviations, and excessive delays along delivery routes and could be utilized to provide security for cargo in the global supply chain. DHS's utilization of these technologies will enable decision makers to leverage a risk-based approach to border security that integrates technology and analytics. This will free up operator resources by avoiding costs associated with false alarms or inaccurate targeting information.

Technology is an essential ingredient to enhance our capabilities on the border. However, only when knowledge of emerging technology and its specific application to address DHS capability gaps is used to inform full life-cycle budget and acquisition assessments will DHS make both effective and efficient decisions to get the right capabilities, at the right time, on budget to DHS operators in the field. We are not there yet in S&T or the Department whole, but we are making essential improvements to better secure our borders and conduct our other homeland security missions.

I thank the committee for giving me the opportunity to testify on this very important subject.