Explosives Division Detection Research

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Homeland Security

University Network Summit:
Explosives Panels

- Explosives Detection Panel
  - Doug Bauer, S&T Explosives Division
  - Greg Dicinoski, Australian Centre for Research On Separation Science
  - Michael Silevitch, Northeastern University, Research Lead
  - Jimmie Oxley, University of Rhode Island, Education Lead

- Breakthrough Research in Explosives Panel
  - Doug Bauer, DHS/S&T/Explosives Division
  - Bill Rhodes, Sandia National Lab, NEXESS Center
  - Claude Roux, Director, Center for Forensic Science, Australia
  - Michael Silevitch, Northeastern University, Research Lead
  - Jimmie Oxley, University of Rhode Island, Education Lead

Detection Research:

On-Going Efforts

There is an ever expanding list of threats to detect and identify

- S&T is attempting to determine the detectability of priority threats identified during the Homemade Explosives (HME) Characterization effort. The effort is being coordinated with TSA to focus on several liquid HME threat groups

- Our ability to detect threats depends on providing characterization information to current vendors and National Laboratories to improve sensitivity and selectivity of existing equipment and also set future capabilities for new detection equipment.

Key research initiatives being undertaken by S&T include the Manhattan II Program for Next Generation Checked Baggage where we are trying to:

- Find the “best of the best” enabling technologies
- Un-bundle constituent activity in security screening of checked bags
- Match best detection technology with best image processing technology

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Detection Research Partners:

DOE National Labs

The DOE National Labs have assisted in transformative breakthroughs in explosives detection. Examples of these partnerships include:

- Cooperative effort with several DOE National Labs that build on previous Enabling Science workshops sponsored by S&T to identify basic research with promise for transformative breakthrough in explosives detection capability. All workshops conducted in Dec 05 – Jan 06.
- Lawrence Livermore (LLNL) hosted “Physics Approaches” workshop. Panel topic areas included laser spectroscopy, mass spectroscopy, GHz/THz imaging and spectroscopy, nuclear methods, solid-state devices, and HE signatures.
- Sandia (SNL) hosted “Nanoscience and nanotechnology” workshop. Panel topics areas included preconcentration and separation, detectors, nano/bio interface, and nanofabrication.
- Los Alamos (LANL) hosted “Alternate Signatures and Systems” workshop. Panel topic areas included remote detection of electronics, remote assessment of intent, and integration of data from orthogonal sensors.
- Oak Ridge (ORNL) hosted “Bioscience and Biotechnology” workshop. Panel topic areas included artificial nose technology, catalytic enzymes, bioreporters, immunoassay sensors, and insect sensors.
- Next step is to complete integrated “technology development roadmap” that will define key science efforts to achieve the research vision.

Detection Research:
Mobilizing the Academic Community

- We want to mobilize the academic community to help define the basic research priorities for explosives threats.

- We want to harness the knowledge in the academic community to help us answer the questions:
  - What is the threat we must be able to detect?
  - Can we detect those threats reliably and efficiently?
  - What is the damage potential for novel threats?
  - How do we validate modeling and simulation of explosives using Cheetah, Hydraulic codes, and finite element analysis of structures of interest, with carefully designed tests?
  - How do we prioritize and coordinate our research efforts to accomplish our objectives efficiently on the basis of solid science?

Explosives Detection Programs In S&T

Checkpoint Explosives Detection

- Working to develop technologies to screen passengers, carry-on and checked luggage, and cargo
- Increasing detection capability, including for liquid explosives
- Improving screening system throughput, capacity, reliability and effectiveness while minimizing false alarm rates, cost and labor
- Working to decrease passenger retention time while reducing intrusive searches of passengers

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Suicide and Vehicle Borne IEDs

- Developing new or improving existing technical capabilities to detect, defeat, and mitigate the effects of Suicide Bomber (SB) and Vehicle Borne (VB) IEDs for federal, state and local responders

- Technologies should assess, diagnose and render safe SB or VBIEDs
- Developing portable, non-obtrusive detection technologies with no chokepoints and decreased false alarm rates
- Integrated layered approach and a standardized/common display system

Trace Explosives Detection

Particles and Vapors

- Example of current detection basic research at TSL
- Developing enhanced methods to harvest, collect, transfer, characterize and quantify trace explosives particulate and vapor signatures.

- Technologies should be capable of sampling and analyzing both particulate and vapor sources at relevant threat signature levels.
- Developing compact, portable trace detection systems with increased sensitivity and throughput, and decreased false alarm rates.
- Developing trace detection systems with the capability to detect a broader range of threats than previous generations of detectors.

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