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Overview of Explosives Countermeasures Programs Sandia National Laboratories

David Hannum

Sandia National Laboratories

(505) 844-6926

dwhannu@sandia.gov

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Outline

- Contraband Detection Technologies Department
  - Capabilities
- Describe a systems perspective on HE Countermeasures
- Describe Sandia's contributions in the HE area
  - Explosives Characteristics
  - Performance Validation
  - Explosives Defense Analysis Team
  - Support for the Homeland Security Community
    - Operation America training, local law enforcement
    - Disablement technologies
    - Explosives blast effects modeling and analysis
- Summary of Sandia's capabilities

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Capabilities

- **Sandia's capabilities include efforts to:**
  - **Develop system solutions for the most challenging problems in explosives detection**
  - **Consult with government agencies on how to create better explosives protection systems**
    - **Technology alone is not always the answer**
  - **Characterize explosives threats**
  - **Test and evaluate explosives detection systems for specific customers**
  - **Develop and design advanced prototypes for specialized applications**

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Sandia's Approach

- Readiness—Prepare well before a potential event
  - Explosives characterization—understand the nature of explosives
  - Plan before an event occurs
  - Use all options for defenses, including non-technical
- Develop and deploy advanced defenses to be aware of an event
  - Use planning information to design defenses
- Mitigation—Prevent or neutralize an event
  - If an IED is discovered, disable it or lessen its effects

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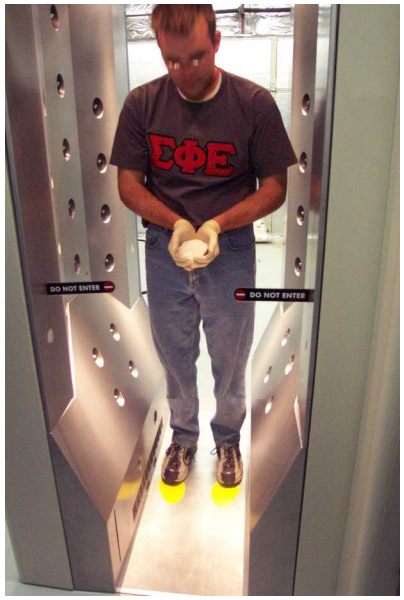
Characteristics of Explosives

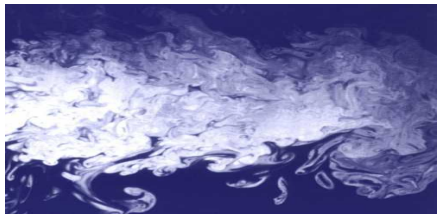


Testing Bulk Explosives in Portal

What is the nature of explosives in a real-world situation?

- Define the detection objective
- Perform modeling, experimentation, and theoretical studies
- Discover technology gaps
- Develop technology to meet the performance requirements
- Performed studies of homemade explosives and detection capabilities for DHS

Understand the physical and chemical properties before applying technology



Analyzing Dynamic Turbulent Flow to Understand Vapor Plumes

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Performance Validation of Technologies and Systems

- **Security**: Limits of detection, probability of detection, false positives (and negatives), and vulnerabilities
- **Operational**: Reliability, maintenance, lifecycle costs, training
- **Laboratory vs. field:** Controlled vs. "real" conditions
- Study: Factors that affect ability to detect vehicle bombs
  - Type of explosive, distance traveled, temperature, environmental factors
  - Explosive mass and type, sample location, and sampling method

How well does the technology work to solve the problem?

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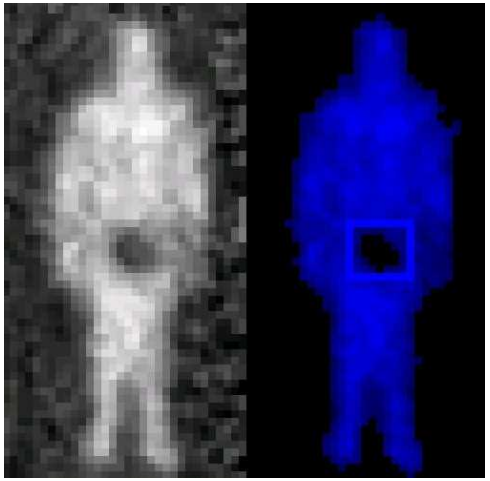
Suicide Bomber Detection: Lab and Field Testing

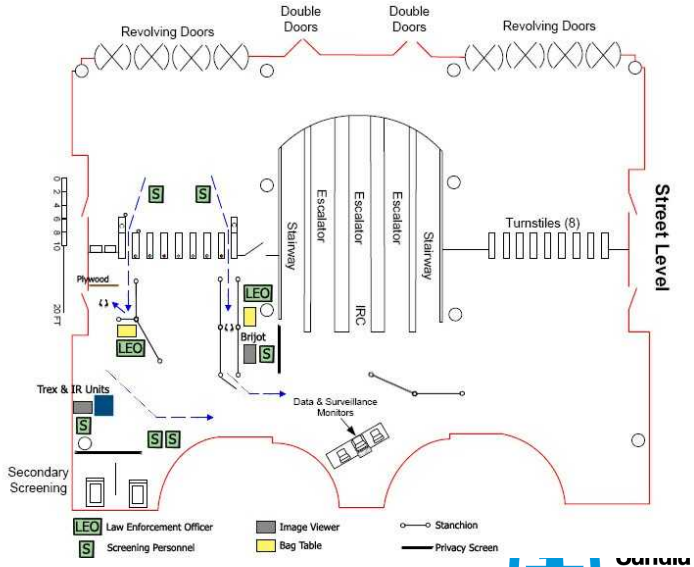
Vapor Wake Canine checking passengers

- IR, MMW and THz imagers; ticket vending machine embedded explosive trace detection; vapor wake canine
- Concealed bomb detection concepts of operation
- Lab testing with threat objects
- Field pilot at public transit authorities



Passive MMW Concealed Weapon Detection Technology

Trace Detection in Ticket Machine



Technical and applications evaluations of emerging technology

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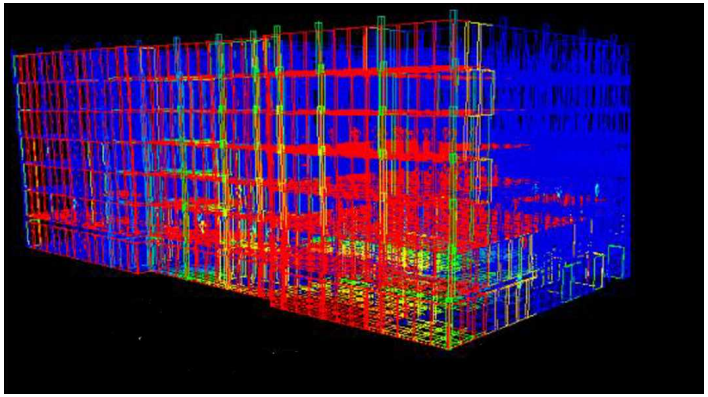
Protection Methodology:
Sandia's Explosive Defense Analysis Team (EDAT)

- Performs security evaluations of potential explosives threats at DOE sites
- Makes recommendations to improve explosives protection based on the results of evaluations
- Move protection concepts from compliance-driven ("Check the box") to performance-driven ("Does it do the job?")
  - Use strategies in addition to technology
    - Barriers to prevent vehicle proximity
    - Hardening to mitigate damage



Example:

Analyze the effects of a large vehicle bomb on the surrounding structures

Solve explosives defense problems for our customers

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Support for the HS Community

Connecting the developers to the users

- Consulting and training on appropriate applications of technology
  - Operation America—5-day workshop on advanced bomb-disablement technology for bomb squads
  - DoD 21st and 55th EOD squad for explosives detection and containment
  - UNWD base security upgrades
  - US Armed Forces in Europe
  - DOE National Labs
  - National Guard
  - South Texas Specialized Crimes and Narcotics Task Force

Operation America Training

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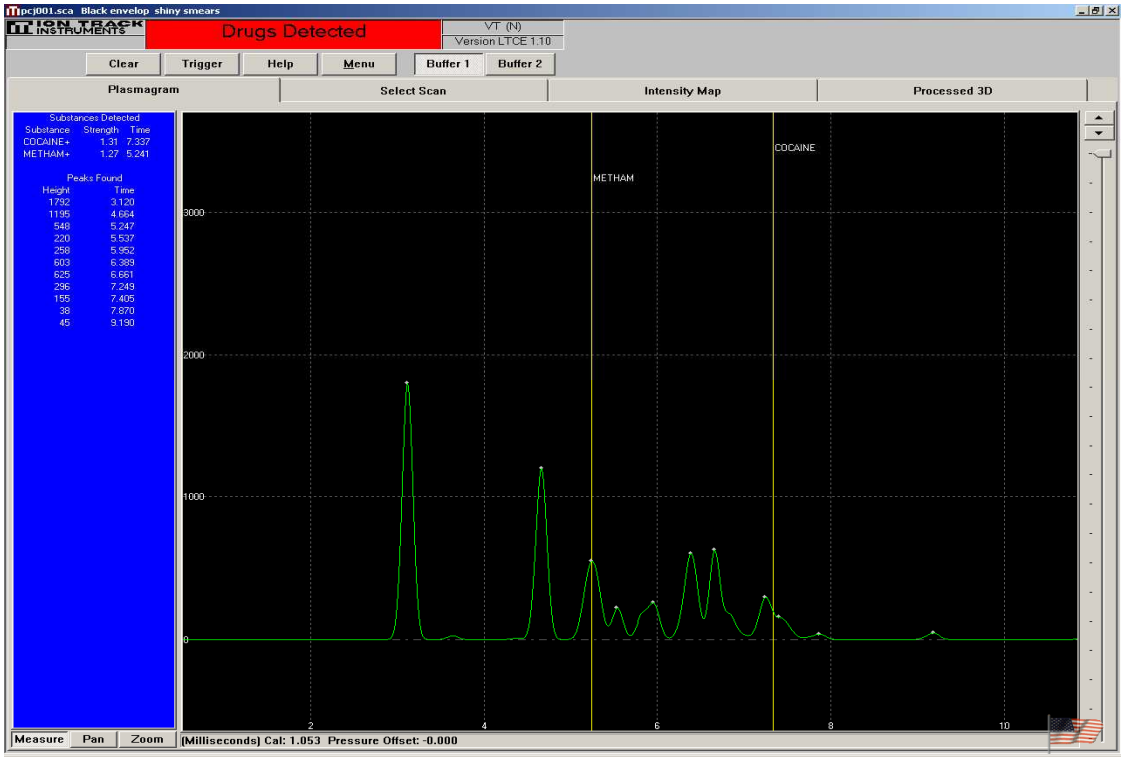
Pima County, AZ, Jail Mail Room Drug Detection Project

- Conducted site evaluation and supplied drug detection equipment
- Conducted drug contamination testing of mail room and incoming mail
- Performed laboratory calibration testing of drug detection systems

Tests with a Hound and VaporTracer Found Meth, Marijuana, Heroin, and Cocaine on Mail to Inmates



The Hound System Helps Texas Police Identify Drugs

- South Texas Specialized Crimes and Narcotics Task Force field tested a Hound system with a commercial detector.
  - During a routine traffic stop, officers discovered large quantities of liquid and powder substances. The Hound revealed methamphetamines.
    - Seconds vs. days for lab tests
  - Test of a minor's driver's license revealed cocaine, leading to his entrance into a drug rehab center.

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Explosive Device Disablement

- **Sandia developed the *Percussion-Actuated Nonelectric (PAN®) Disrupter***
  - **Non-destructive—saves forensic evidence**
  - **Sandia team disabled the booby traps in the Unabomber cabin**
  - **Massachusetts State Police officer trained at** Operation America **used a Mini-PAN® disrupter in the Shoe Bomber case**

Unabomber Cabin

PAN & MiniPAN punch holes in the bomb, killing the circuit and disabling active bomb components

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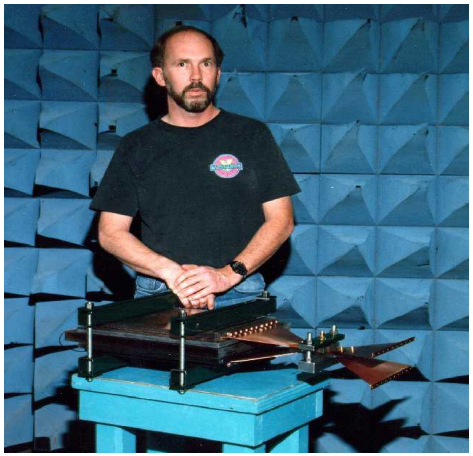
Disablement Technologies and Reachback

- Sandia leads the HE Home Team for Nuclear Emergency Support Team (NEST)
  - Develop and maintain rapidly deployable equipment and personnel for a worldwide response to nuclear and radiological terrorist incidents
  - Supports field in response to real threats
  - Develops and evaluates equipment for field use
- Advanced RF jamming to disable remote controlled devices



Jamming equipment

NEST focuses on rapid deployment and response

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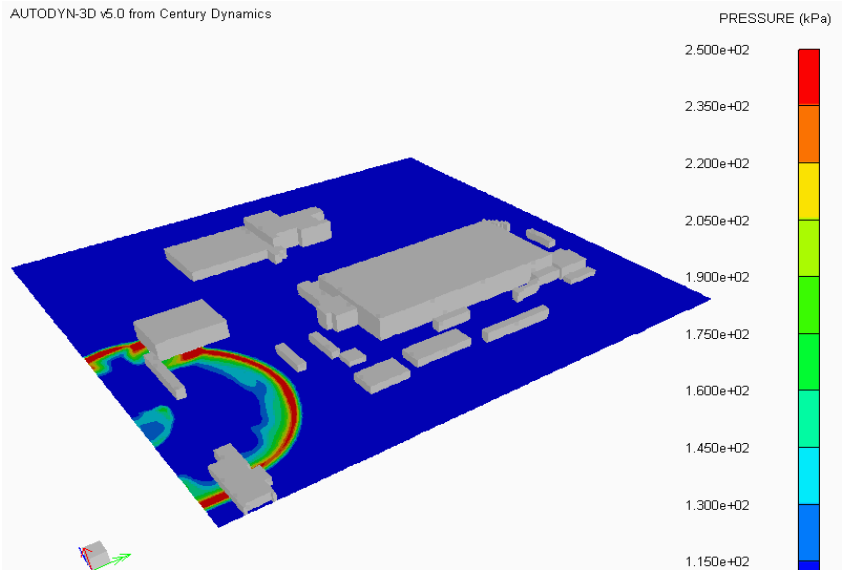
Explosives Blast Effects Modeling and Analyses

Unique Strengths:

- Explosives vulnerability analysis
- Explosive events through testing
- Fast turnaround, high-fidelity information during crises
- Focus on blast mitigation and consequence reduction
- State-of-the-art computing



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HE Countermeasures Core Capabilities

- Key Strengths:
  - Protection Methodology
  - Detection Systems
  - Disablement Systems
  - Blast Effects Modeling
  - Blast Mitigation/Containment
  - Training/Consulting
  - Performance Validation
  - Field Testing
  - Standards Definition
- Staff dedicated to the National Security Mission
  - Over 200 personnel specializing in HE efforts (teaming with other labs, universities, and industry when needed)

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