Human Factors Division

Sharla Rausch, Ph.D., Division Head
Department of Homeland Security (DHS)
Science and Technology (S&T) Directorate
Human Factors Division

From Science and Technology...Security and Trust
Human Factors Division Mission Statement

To apply the social and behavioral sciences to improve detection, analysis, and understanding of the threats posed by individuals, groups, and radical movements; to support the preparedness, response, and recovery of communities impacted by catastrophic events; and to advance national security by integrating human factors into homeland security technologies.

Human Factors Division Goals

1. Enhance the analytical capability of the Department to understand terrorist motivation, intent and behavior.

2. Improve screening by providing a science-based capability to identify deceptive and suspicious behavior.

3. Enhance the capability to control movement of individuals into and out of the United States and its critical assets through accurate, timely, and easy-to-use biometric identification and credentialing validation tools.

4. Enhance safety, effectiveness, and usability of technology by systematically incorporating user and public input.

5. Mitigate impacts of catastrophic events by delivering capabilities that incorporate social, psychological and economic aspects of community preparedness, response and recovery.

Know our enemies, understand ourselves; put the human in the equation.
HFD Thrust Areas

The DHS S&T Human Factors Division is comprised of two primary thrust areas, with programs under each:

• Social-Behavioral Threat Analysis
  – Precursors, Signatures, and Deterrence of Radicalization
  – Suspicious Behavior Detection
  – Community Preparedness, Response, and Recovery

• Human-System Research & Engineering
  – Personal Identification Systems
  – Technology Acceptance and Integration
  – Human-System Optimization
Infrastructure Geophysical Division

Christopher Doyle
Division Head
Infrastructure Geophysical Division
Science and Technology Directorate
Department of Homeland Security

“Putting First Responders First”
Mission:
• Increase the Nation’s preparedness for and response to natural and man-made threats through superior situational awareness, enhanced emergency responder capabilities, and critical infrastructure protection

Customers:
• DHS Office of Infrastructure Protection (OIP)
• DHS Federal Emergency Management Agency (FEMA)

End-users:
• First responders
• S/L/Fed emergency managers
• Private sector infrastructure owners and operators
Thrust Areas/Programs

Critical Infrastructure
- Protective Technologies
- Modeling, Simulation and Analysis
- Advanced Surveillance
- Rapid Response and Recovery

Preparedness and Response
- Incident Management Enterprise
- Integrated Modeling, Mapping and Simulation for Incident Planning and Response
- Personnel Monitoring and Tracking

Geophysical
- Resilience
- Natural Disaster Recovery
- SAFE
What We Need:

<table>
<thead>
<tr>
<th>Critical Infrastructure Protection</th>
<th>Incident Management</th>
<th>Geophysical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced surveillance</td>
<td>Insight into internal R&amp;D programs</td>
<td>Hurricane mitigation</td>
</tr>
<tr>
<td>Hardening technologies</td>
<td>Systems in harsh and difficult environments</td>
<td>Storm surge defeat</td>
</tr>
<tr>
<td>Automatic response/repair</td>
<td>Plug &amp; Play, interoperable, distributed modeling &amp; simulation</td>
<td>Long-term, sustainable solutions</td>
</tr>
<tr>
<td>Rapid reconstruction</td>
<td>Intelligent, easy to use, secure workflow IM engines</td>
<td>Early warning for all hazards</td>
</tr>
<tr>
<td>Insights for private industry technical directions</td>
<td>Innovative System integration framework/platform</td>
<td>Affordable protection</td>
</tr>
<tr>
<td>Critical Infrastructure Sector requirements</td>
<td>Integrated First Responder protection systems</td>
<td>Flood proofing</td>
</tr>
</tbody>
</table>
Explosives Division

Jim Tuttle
Explosives Division Head
Science and Technology Directorate
Department of Homeland Security

“Putting First Responders First”
Explosives Division

**Mission:** To develop technical capabilities to detect, interdict, mitigate, and respond to the effects of non-nuclear explosives terrorism and accidents.

**Customers:**
- Transportation Security Administration
- National Protection & Program Directorate
- US Secret Service
- Customs and Border Protection
- US Coast Guard
- Federal, state and local first responders
Division Organization

Managed by the DHS Science and Technology Directorate, the Explosives Division delivers on its mission through five thrust areas.
Explosives Prevention: Representative Technology Needs

• Standoff detection on persons (portable solutions)
• Screen People at checkpoints for explosives and weapons
• System solution for detection in baggage (checked & carried)
• Screen Air Cargo for Explosives
• Capability to detect VBIED / large threat mass (container, trailer, ship, vessel, car, rail)
• Capability to detect homemade or novel explosives
•Capability to assess, render safe, and neutralize explosive threats
• Optimize canine explosive detection capability
Explosives Breakout Sessions

Wednesday

- Breakout 17: Explosives Division: Counter-IED Program and the First Responder: Response and Render Safe (2pm)

- Breakout 24: Response/Render Safe—Developing Future Requirements for the First Responder (3pm)
Chemical Biological Division

S. Elizabeth George, Ph.D.
Chemical Biological Division Head
Science and Technology Directorate
Department of Homeland Security

“Putting First Responders First”
Mission: to increase the Nation’s preparedness against chemical and biological threats through improved threat awareness, advanced surveillance and detection, and protective countermeasures.

Key 5 year deliverables:
- Integrated CBRN risk assessments
- Anticipation of future & unconventional threats
- Chemical infrastructure risk assessment
- Fully automated Gen 3 BioWatch
- Integrated CBRN facility protection
- National lead for operational biological and chemical forensics
- Decision tools and veterinary countermeasures for Foreign Animal Diseases (FADs)

IPT Co-Chairs: OHA, IP
DHS Drivers: OHA, IP, I&A, CBP, NPPD, PLCY, DNDO, Interagency Gaps
End-Users: HSC, HHS, FBI, USDA, IC, EPA, local public health, critical facilities

Current BioWatch collects air samples & analyzes them in LRN lab
Where Do Our Requirements Come From?

Directly from a Capstone Integrated Product Team (IPT)
- Co-chaired by DHS Office of Health Affairs (OHA) and DHS Infrastructure Protection (IP)
- Membership from other DHS operational arms
- Identified 50+ Capability Gaps in first IPT process (FY07)

And they in-turn, base their requirements on
- Homeland Security Presidential Directives – 10, 7, 9, 18
- Congressional legislation & guidance
- National planning & implementation guidance – NIPP, NRP, NIMS, and the National Planning Scenarios
- Risk, vulnerability and mitigation studies
- Private, local, state inputs
ChemBio Division:
3 Thrust Areas and 9 Major Programs

The overall structure reflects our HSPD-9, HSPD-10 and HSPD-18 responsibilities

<table>
<thead>
<tr>
<th>Thrust Area</th>
<th>Program</th>
<th>Major Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio</td>
<td>Systems Studies</td>
<td>System tradeoffs e.g. Gen 3 BioWatch; policy net assessments</td>
</tr>
<tr>
<td></td>
<td>Threat Awareness</td>
<td>Risk assessments; lab studies to close key gaps</td>
</tr>
<tr>
<td></td>
<td>Surveillance and Detection</td>
<td>Detection systems for air, food; supporting assays</td>
</tr>
<tr>
<td></td>
<td>R&amp;D</td>
<td></td>
</tr>
<tr>
<td>Forensics</td>
<td></td>
<td>Enhance and operate the National Bioforensics Analysis Center (NBFAC)</td>
</tr>
<tr>
<td>Response and Restoration</td>
<td>System approaches for recovering from bio attack</td>
<td></td>
</tr>
<tr>
<td>Ag</td>
<td>Foreign Animal Diseases</td>
<td>Modeling, vaccines &amp; diagnostics for FAD; JADO</td>
</tr>
<tr>
<td>Chem</td>
<td>Analysis</td>
<td>Chemical threat characterization and risk assessment; Develop and validate forensic analysis tools to enable attribution</td>
</tr>
<tr>
<td></td>
<td>Detection</td>
<td>Chemical detection systems for facility monitoring and first responders</td>
</tr>
<tr>
<td></td>
<td>Response and Recovery</td>
<td>Decontamination tools and systems approaches for chemical decontamination</td>
</tr>
</tbody>
</table>
Biological Detection Paradigms and Timeline

- **Detect to Protect**
  - Detect the Attack Prior to Contamination of Infrastructure
  - **FBADS**
    - Food Biological Agent Detection Sensor

- **Detect to Warn**
  - Move People Out of Harm’s Way to Provide Timely Response and Protection Measures
  - **IBADs**
    - Instantaneous Biological Agent Detection System
  - **RABIS**
    - Rapid Automated Biological Identification System

- **Detect to Treat**
  - Supply the Appropriate First Aid and Treatment
  - **BAND**
    - Bioagent Autonomous Networked Detectors
  - **LBADs**
    - Low-Cost Bio-Aerosol Detection Systems

Revised January 8 2008
Successful Transition of Major Programs to Customers

Gen 1, 2 BioWatch

PROTECT: Chemical Detection System

Rapidly Deployable Chem Detection System (RDCDS)

1st phase of mobile chem lab (PHILIS) to EPA
Early Detection to Mitigate Consequences

**Gen 1 BioWatch (FY03):**
- Operating in > 30 cities
- Detect in 12-36hrs
- Over 3M assays without a false positive

**Gen 2 BioWatch enhancements (FY05-07)**
- 4x increase in collectors in top 10 threat cities
- Critical transportation hubs and special events

**Gen 3 BioWatch (FY09-12)**
- Fully autonomous, analyzes at same site it collects – 3 to 6 times daily
- Cover a major portion of US population
- Detect a smaller attack than Gen 1
- Per unit operational cost < 25% of current system
PROTECT: Chemical Early Warning System

- Demonstration completed 2003
- This program has transitioned and is an allowable expenditure under the Transit Security Grants Program
- Closed Circuit Television Camera (CCTV)
- Fiber Optic Link
- External Fireman Jacks
- Deployed in US transit systems

Monitor screen view

Concourse Level

Pedway (Underground)

Operations Control Center (OCC)
Rapidly Deployable Chemical Detection System

Airborne Segment

Ground Segment

Stand-off Detection capability:
- Chemical vapor
- 3 minute presumptive identification by interpreter
- 40 minute confirmed identification by interpreter
- Plume mapping

Point Detection capability:
- Chemical vapor and aerosols
- 2 minutes identification of CW agents by interpreter
- 2 minutes identification of TICs by interpreter

Interpreted results communicated to incident commander

Deployed in support of Special Security Events
In Summary

S&T Chem-Bio efforts are part of a national strategy as reflected through the requirements of the DHS operational offices.

We have already made a difference with first generation systems, e.g.

- Bio risk assessments to help prioritize national investments
- Developed and transitioned to operation bio and chem detection systems (BioWatch, BWIC, PROTECT, RDCDS, PHILIS)
- Operational forensic capabilities
- Improved protocols and tools for protecting transportation facilities

We are currently developing the next generation tools & systems to meet DHS and National requirements

S&T-ChemBio@dhs.gov
Borders & Maritime Security

Captain David Newton, USCG
Borders & Maritime Security Division Head
Science and Technology Directorate
Department of Homeland Security

“Putting First Responders First”
Borders and Maritime Security Division

Mission Statement:
Develop and Transition Capabilities that Improve the Security of our Nation’s Borders without Impeding the Flow of Commerce and Travelers

Stop Bad Things and Bad People from Entering the Country

AND

In the Maritime- Protect the Public, the Environment, and U.S. Economic and Security Interests

Borders are all land and maritime borders including U.S. ports-of-entry, vast stretches of remote terrain and inland waterways

Customers:
Customs and Border Protection (CBP), United States Coast Guard (USCG), Immigration and Customs Enforcement (ICE), Transportation Security Administration (TSA), and Citizenship and Immigration Services (CIS)
Representative Technology Needs

Border Security

- Improved ballistic protection via personal protective equipment
- Improve detection, tracking, and identification of all threats along the terrestrial and maritime border
- Non-lethal compliance measures for vehicles, vessels, or aircraft allowing for safe interdiction by law enforcement personnel

Maritime Security

- Wide-area surveillance from the coast to beyond the horizon; port and inland waterways region - detect, ID, and track
- Data fusion and automated tools for command center operations
- Vessel compliance through non-lethal compliance methods

Cargo Security

- Enhanced screening and examination by non-intrusive inspection
- Increased information fusion, anomaly detection, Automatic Target Recognition capability
- Detect and identify WMD materials and contraband
Border Watch

Border/Maritime Technologies

Border Detection Grid

Sensor/Data Fusion, and Decision Aids

BorderNet

Secure Border Initiative (SBI) Systems Engineering and Modeling & Simulation

Border Officer Tools and Safety
Cargo and Conveyance Security

Container Security Device

Advanced Container Security Device (ACSD)

Marine Asset Tag Tracking System (MATTSS)

Secure Carton

Advanced Screening and Targeting (ASAT)

Hybrid Composite Container

Supply Chain Security Architecture
Command, Control and Interoperability

Mission
Through a practitioner-driven approach, CCI creates and deploys information resources to enable seamless and secure interactions among homeland security stakeholders.

• A practitioner-driven approach is defined as a process where the needs of end-users drive the creation of information resources.
• Information resources include standards, frameworks, tools, and technologies.
• Enabling seamless and secure interactions means enhancing the ability to communicate, share, visualize, analyze, and protect information.
• Stakeholders include all local, state, tribal, Federal, international, and private entities engaged in homeland security.

Vision
Stakeholders have comprehensive, real-time, and relevant information to create and maintain a secure and safe Nation.
CCI Division Organization

Managed by the Department of Homeland Security’s (DHS) Science and Technology Directorate, the Command, Control and Interoperability (CCI) Division delivers on its mission through five thrust areas.
Cyber Security

- Secures the Nation’s critical infrastructure, and coordinates efforts to improve the security of the existing cyber infrastructure.

- Focuses on priorities established in the President’s National Strategy to Secure Cyberspace, as well as needs identified by external stakeholders with emphasis on critical infrastructure.

- Addresses cyber security requirements from internal Department customers in support of DHS operational missions in critical infrastructure protection.

* Distributed Denial-of Service
Reconnaissance, Surveillance, and Investigative Technologies

- Develops and evaluates individual sensor technologies, fusion of multiple sensors, and examination of new sensor technologies

- Develops integrated technology platforms to collect, share, and disseminate information

- Develops advanced investigative and crime scene forensic tools

- Supports the technical rationale for policies and privacy issues associated with these applications

- Initiates R&D activities with intelligence and defense organizations
Communication, Interoperability and Compatibility

• Works to strengthen interoperable wireless communications, improve effective information sharing, and develop tools to enhance overall coordination and planning at all levels of government

• Coordinates with primary customers, including DHS Protection and Programs Directorate, Federal Emergency Management Agency, Department of Justice, National Communications System, U.S. Coast Guard, Secret Service, Immigration and Customs Enforcement, Customs and Border Protection, and Transportation Security Administration

• Directs initiatives to end users, including more than 60,000 emergency response agencies nationwide, state homeland security officials, and policy makers at the local, tribal, state, and Federal levels
Knowledge Management Tools

• Provides knowledge management capabilities to reduce the risk of terrorist attacks and to prepare for and respond to natural and man-made disasters

• Develops tools and methods to handle massive amounts of information that are widely dispersed in a great variety of forms

• Works collaboratively to complement efforts in the intelligence, law enforcement, and homeland security communities
Basic/Futures Research

- Information and intelligence systems research
- Comprehensive, timely threat awareness
- Accurate consequence analysis
- Effective risk management approach to homeland security

Visual Analytics and Physics-Based Simulation: Visually based mathematical methods and computational algorithms for discovering, comprehending, and manipulating diverse data, and applying the resulting knowledge to anticipate terrorist incidents and/or catastrophic events

Data-Intensive Computing, Privacy, and Forensics: Software algorithms and hardware architectures for extracting and managing data, assessing threats and consequences, ensuring information privacy, securing the cyber infrastructure, and ensuring telecommunications interoperability