DHS S&T Mission: Strengthen America’s security and resiliency by providing knowledge products and innovative technology solutions for the Homeland Security Enterprise (HSE)

- One of 10 DHS Components
  - Provides key technical & analytical capacity for DHS
  - Supports DHS, Component and HSE requirements with innovation
  - Operationally focused

- S&T statistics:
  - ~1.2% of DHS Budget
  - ~1,100 personnel
    - Federal, contractor, IPAs
    - Highly technical staff

- Six primary commodity areas
  - First responders, borders & maritime, cyber, chem-bio defense, explosives, resilience

- Highly collaborative
  - Components & HSE
  - State & Local
  - Interagency & International
  - Industry & Private sector

- Laboratories
  - 5 Internal Labs
    - Explosives, biodefense, chemical, urban environment
    - Adding new agricultural biodefense lab
  - Responsible for usage of DOE Labs & FFRDCs
## DHS Mission Guidance

### Complex & Dynamic Environment
- Globalization & Transportation
- Border Security & Immigration
- Violent Extremism
- Cyber Domain
- Nature of Innovation
- Natural Disasters

### More Threats, Less Resources

### Strategic Guidance (Examples)

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<td>Energy Sector Plan (2010)</td>
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<td>QHSR (Feb 2010)</td>
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### Quadrennial Homeland Security Review (QHSR) 2010

#### Threats
- Smaller Scale Terrorism
- Trafficking & Crime
- Pandemics, Accidents, Natural Hazards
- Violent Extremism
- High Consequence WMD

#### Core Missions
1. Preventing terrorism & enhancing security
2. Securing and managing our borders
3. Enforcing & administering immigration laws
4. Safeguarding and securing cyberspace
5. Ensuring resilience to disasters
Department of Homeland Security

Homeland Security Enterprise (HSE)

- Department of Homeland Security
- First Responders across U.S.
- Critical Infrastructure

... the 16 critical infrastructure sectors

The Department
- Organization: 22 to 1
- Personnel: DHS = ~230K; HSE = ~3.5M
- Culture of law enforcement
- Coordination vs. direction
Organization of DHS Science & Technology (S&T) Aligned with Mission

Under Secretary
Deputy Under Secretary

First Responders Group (FRG)
- Interoperability & Compatibility
- Technology Clearinghouse
- National Urban Security Technology Lab (NUSTL)

Homeland Security Advanced Research Projects Agency (HSARPA)
- Borders & Maritime
- Chemical/Biological
- Cyber Security
- Explosives
- Resilient Systems

Acquisition Support & Operations Analysis (ASOA)
- Research & Development Analysis & Assessment
  - Transportation Security Lab (TSL)
- Federally Funded Research & Development Centers Program Management Office
- Standards
- Test & Evaluation

Research & Development Partnerships (RDP)
- Interagency
- International
- National Labs
  - Plum Island (PIADC)
  - National Biodefense Analysis & Countermeasures Center (NBACC)
  - Chemical Security Analysis Center (CSAC)
  - National Bio & Agro-Defense Facility (NBAF)
- Public-Private Partnerships
- University Programs

S&T’s Value Added Proposition …
- **Operationally focused** … focused technology options & operational process enhancements
- **Innovative** … develop innovative, systems-based solutions to complex homeland security problems
- **Building partnerships** … technical depth and reach to leverage technology solutions from federal, state, local and tribal governments, universities, and the private sector - across the US and internationally

TSA, CBP, CIS, ICE, USSS, FEMA, USCG, NPPD, DNDO, OHA, First Responders
R&D programs benefit from stable funding profiles
- S&T's budget has not been stable
- From FY10 to FY12, S&T's discretionary R&D cut 57%
- S&T prioritized four key areas:
  - Aviation Security;
  - Bio-Threat;
  - Cyber Security;
  - and First Responders
In addition, FY12 included little funding for the following areas:
  - Border Security;
  - Infrastructure protection;
  - Chemical threat security;
  - Biometrics;
  - Advanced materials for explosive resiliency;
  - Natural disaster resiliency;
  - Hostile behavior detection; and
  - Violent extremism prediction
As a result of the budget cuts, the number of RD&I projects dropped from nearly 200 in FY10 to about 60 in FY12
Since FY12, S&T's budget has recovered to FY11 levels--an 86% increase in discretionary R&D
R&D projects up to about 100
This has opened S&T's R&D priorities to include Border Security and Infrastructure Protection
Approximately 50% of the total S&T budget is “must fund” and includes programs such as:

- Laboratory facilities maintenance and operations;
- Interagency and international cooperative programs;
- Bio and other risk assessments mandated in law or Executive Order;
- University Programs;
- R&D infrastructure such as testbeds and research databases;
- Federal employee salaries and benefits; and
- Working Capital Fund
Operational Focus

- Rio Grande Valley
- Secure Transit Corridor
- Rapid DNA
- Mobile Biometrics
- Multi-Band Radio
- Virtual USA
- Next Generation PPE
- FiRST
- Big Data
- DoD Tech Transfer
- SAFETY Act
- International programs
- Joint Interagency Exercises
- STORE
- Cyber Forensics
- National Bioforensics Analysis Center (NBFAC)

Leads to a Successful Program
S&T Operational Enhancements (STORE)

- Focus on near term, mission-critical issues
- Senior leadership direct involvement
- Collaborative partnership
- Joint staffing and joint accountability
- Innovative usable solutions in 24+ months

11 Technology & Knowledge Products
- Prioritized with USSS
- Understood Operational Context
- Technology Foraging
  - COTS/GOTS
  - Next Generation
  - New Capability
- Leveraged Other Investments (~$11M)
- Nat’l Labs, DoD, IN-Q-TEL, Industry
- Internal Collaboration

Inception

Execution

Transition

BUILD
S&T Lead w/Component

TAILOR & TRANSITION
Component Lead w/S&T

OWNERSHIP
Component Lead w/S&T as needed

Focus on what you can do in 2 years.
Innovation

Nature of Innovation: Both sides get to innovate … potential for individuals with state-like capabilities

Where should S&T be with investments?

S&T Game Changers
- Advanced Manufacturing including 3D printing, Nanotechnology, Micromanufacturing
- Information and Communication Technology (ICT) and Data Proliferation
- Biological Sciences
- Weapons Technology and Robotics
- Energy
- Scientifically Informed, Technologically Based Decisions … then modeling, simulation

Looking out 2 terrain features …

Deliverables
- Technological Capabilities & Knowledge Products
- Acquisition Support & Operational Analysis
- Process Enhancements & Gain Efficiencies
- Understanding of Homeland Security Risks & Opportunities
S&T Partnerships

DOE National Labs

Federally Funded Research & Development Centers (FFRDCs)

International

DHS S&T Labs

- CSAC
- TSL
- NUSTL

- PIADC
- NBACC
- NBAF

DHS Centers of Excellence (COE) & Academic Institutions

Private Industry

- Large Integrators
- Medium & Small Business
- Industry Organizations
- Investment Community

Interagency

Current Portfolio, Missions, Requirements and Gaps

DHS/S&T Component
Building Partnerships for Technology Transition to Operational Use

**Tools**

- Cooperative R&D Agreements (CRADA)
- Long Range Broad Area Announcement (BAA)
- Small Business Innovation Research (SBIR)
- Safety Act
- Technology Foraging
- Systems Analysis
- Webinars

**Industry Collaboration**

1: Early

- S&T Priorities

   - Informs
     - LRBAA & White Papers
     - SBIR
     - Centers of Excellence

2: Mid

- S&T R&D

   - Industry Partner through CRADA

3: Late

- S&T R&D

4: As Needed

- S&T R&D

   - Transition to Industry

   - (Just In Time Transition??)

**Valley of Death**

- S&T Value Added Proposition
  - Operational Relevance ...
  - Innovation ....
  - Partnerships ...

**Examples**

- ARMOR
- FMD Vaccine
- CIRT
- RECX
Departmental Support ... Why S&T is Important to DHS!

S&T provides key technical & analytical capacity for DHS ...

- Scientific and Technical Arm of the Department (and the HSE)
- Coordinate R&D across DHS
- Definition of R&D for DHS
- Integrated Investment Lifecycle Model (IILCM)
- Export Control Policy
- Intellectual Property
- Quadrennial Homeland Security Review (QHSR)
- Joint Interagency Field Exercises (JIFX)
- Portfolio Reviews

- Test and Evaluation Oversight
- Treaty Compliance (and Other Compliance)
- Liaison with National Labs and S&T Labs
- International Bilats
- FFRDC interface
- SAFETY ACT
- University Programs
- Interagency
  - Biodefense
  - Research & Development Activities

What else? Are we appropriately organized for these missions?
National Bio and Agro-Defense Facility (NBAF) Update

NBAF -- a new state-of-the-art biosafety level 3 & 4 facility -- will enable the U.S. to conduct comprehensive research, develop vaccines and anti-virals, and provide enhanced diagnostic capabilities to protect our country from numerous foreign animal, emerging and zoonotic diseases.

To Be Located in Manhattan, KS

Current Status:

- Design is 100% complete -- has been peer reviewed by the scientific & international community.
- Mission Need Assessment was recently completed by the National Academy of Science and affirmed the nation’s need for the NBAF.
- Construction Manager is on board and preparing construction planning documents:
  - Site preparation completed in August 2012
  - Construction of the Central Utility Plant underway since early 2013
- Plum Island will be operational (with minimum investments) until the necessary accreditations are achieved by the NBAF.
- Current planning for full operational status is 2021.
Every 24 hours...

- 2M passengers pre-screened
- 1.8M passengers screened at 448 airports
- 200 inspections of air carriers & airport infrastructure
- 3.4M sq. miles patrolled on U.S. waterways
- 54 search & rescue cases
- $500k of counterfeit currency seized
- 3,200 citizens naturalized
- 109k identities verified for border crossing
- 31,800 containers screened at seaports

Examples

S&T: Biodefense
... signaling pathways of the human genome

CBP: National Targeting Center improvements

TSA: Real-time data fusion and analysis for improved detection

USCIS: Immigration systems consolidation

FEMA: Historical data analysis and predictive modeling

Non-proliferation Export Control

FEMA & First responder information for emergencies

Department of the Interior is responsible for developing the federal cloud
Superstorm Sandy & Resilience

- Largest Atlantic hurricane on record
  - At its peak, hurricane-force winds extended 175 miles (280km) from center
  - Tropical storm-force winds felt 520 miles (835km) away
- 24 states affected … entire U.S. eastern seaboard
  - 131 fatalities in U.S.
- Massive flooding from storm surge in New York City, New Jersey
  - $63 billion in estimated damage
  - 8.5 million without power at peak
    - ~1 million without power after one week

What are the lessons learned in the aftermath of Superstorm Sandy? What should we do to better prepare, prevent, mitigate, respond and recovery from future catastrophic events?
Event Security: Boston Lessons Learned

- Importance of immediate care & evacuation by first responders and bystanders
- Planning & exercises critical to preparedness and response
- Keeping communication channels open during a crisis
- The use of social media during emergencies
- Balancing tightened security with free public movement and convenience during a high-attendance spectator event
- Managing the public’s personal and patient privacy while preventing or responding to emergencies
- Business continuity during and immediately following an emergency
Layered Security Solutions

OUTSIDE

- Recovery Transformer
- Baggage Screening

INSIDE

- Screening & Vetting
- Detect to Protect Bio Sensors
- Mobile Biometrics

Large Public Event

- Urban Blast Tool Simulation
- SAFETY Act

- ISIS
- Concrete Breach Tool
- FiRST Bomb App for First Responders

- Multi-Band Radio
- Backboard Cover
- Pipe Bomb End-Cap Remover
- Stadium Evacuation Modeling
IILCM Overview:

Process Flow Diagram

IILCM Overview:

Process Flow Diagram

- **Strategy**
  - Defining priorities and approaches for meeting mission goals and objectives
  - Department Strategy Council (DSC)
  - Department aspirations and missions
  - Mission priorities, goals, and objectives
  - Common definitions of mission success
  - Choice among alternative strategic approaches

- **Capabilities and Requirements**
  - Prioritizing capability improvements to meet mission objectives
  - Capabilities & Requirements Council (CRC)
  - Determine the prioritized list of cross-Department shared capability (gaps, duplications, overlaps)
  - Select cost-effective alternatives based on DOTMLPF R/G/S

- **Programming and Budgeting**
  - Portfolio allocation, affordability, and cross-portfolio trade space decisions
  - Program Review Board (PRB)
  - Investment options (i.e., RAPs)
  - Mission area capability gaps
  - Integrated and prioritized capability list

- **Major Investment Oversight**
  - Major acquisition and investment oversight
  - Investment Oversight Board(s) (IOB)
  - Program plans and performance
  - Resource allocations (i.e., RADs)

- **Execution**
  - Program decisions

**DECISIONS:**
- Allocate resources to programs of the Department in a time-phased manner within projected fiscal constraints
- QHSR Pilot in IILCM:
  - Cyber
  - Biodefense
  - Common Vetting
Cyber Security Operational Visualization (OV) Approach Example

- **Tier 1**: DHS Cyber Enterprise OV
- **Tier 2**: Operational Analysis Report
- **Tier 3**: Component OVs

**Data Transformation**

**Operational Data**

**Data Analysis**

**Data Fusion**

**Situational Awareness**

**Actionable Information**

**Education Influence and R&D Insertion**
Cybersecurity Pilot Capability Analysis

Strategic Input
- DSC Guidance
- PPDs/HSPPDs
- Emerging Threats

Portfolio Baseline

Develop Operational Context

1. Execute Liaison
2. Baseline Capabilities
3. Map Capabilities
4. Gap Analysis
5. Alternative Solutions

Collaboration Process
- Whiteboard sessions
- Domain/Technical SMEs
- Analytic Tools
- Collaborative Environment
- Archive

Capability Statements
- Measures of Effectiveness
- Description
- Score – (Risk, Cost, Maturity, Threats, etc.)
- Estimated Cost
- Open Actions
- Supporting Documentation

Timeline of sequencing & dependencies

Terms of Reference

Recommended Analysis of Alternatives

Capability Roadmap

Prioritized List of Gaps

Complexity

Provides the Program Review Board with data driven analysis to support investment allocations

Content Example
- Capability Statements
- Measures of Effectiveness
- Description
- Score – (Risk, Cost, Maturity, Threats, etc.)
- Estimated Cost
- Open Actions
- Supporting Documentation

Terms of Reference

Recommended Analysis of Alternatives

Capability Roadmap

Prioritized List of Gaps

Complexity

Provides the Program Review Board with data driven analysis to support investment allocations
R&D Definition

DHS Research and Development Under Scrutiny -- September 2013

There are 35 cases of overlapping research-and-development programs totaling about $66 million at the Department of Homeland Security, the Government Accountability Office has found.

There is a lack of visibility on who is working on what projects across the 22 agencies, Dave Maurer, GAO director of homeland security and justice issues, testified on Capitol Hill.

In many cases, one agency was working on similar studies without necessarily being informed of the other’s research, he said. (MORE>>>)

http://www.nationaldefensemagazine.org/archive/2013/September/Pages/DHSResearchandDevelopmentUnderScrutiny.aspx

☐ Develop definition of R&D … based on the GAO and DoD definitions

☐ For use in dialogue with Components – will also be used to drive portfolio development and reviews for the Components

☐ Intended to respond to the Congressional and Departmental leadership requests for R&D framework

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<tr>
<th>Basic Research</th>
<th>Applied Research</th>
<th>Technology Development</th>
<th>Technology Demonstration</th>
<th>System Development</th>
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<td>TRL 2</td>
<td>TRL 3</td>
<td>TRL 4</td>
<td>TRL 5</td>
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<tr>
<td>Basic Principles Observed/Reported</td>
<td>Technology Concept/application formulated</td>
<td>Critical Function or Characteristic proof of concept</td>
<td>Validation in lab Environment</td>
<td>Validation in Relevant Environment</td>
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<td>System Prototypes in relevant environment</td>
<td>System Prototypes in operational environment</td>
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S&T Portfolio Review Analysis

Goals of the Portfolio Reviews are to:

- Improve the quality of the portfolio
- Rationally manage the resources of S&T
- Increase partner alignment and ensure that technologies & knowledge products transition to operational use

Plan is to assist the Components in conducting R&D portfolio reviews (as appropriate) ...
Science & Technology’s Resource Allocation Strategy (STRAS) – Component Perspective

Work with Component to validate:
- Current Component/HSE efforts
- Assist in developing requirements
- Mission, priorities and gaps
- S&T investment in the correct solutions

Gain Component Head & USST Support
- Agree upon Mutual Goals
- Agree upon Co-Ownership
- Commit organizations to solution development and transition

GO / NO GO DECISION

Sign Formal Strategy
- Document understanding
- Document expectations
- Document approach

Current Portfolio

DHS/S&T

Component

Portfolio Review

First Responders Group (FRRG)

Homeland Security Advanced Research Projects Agency (HSARPA)

Acquisition Support & Operations Analysis (ASOA)

Research & Development Partnerships (RDP)

First Responders Resources Group (FRRG)

HSARPA R&D Strategies

T&E TSL Ops Acq Spt

Labs Universities

Systems Engineering

Technology Foraging

Systems Analysis

Operational Context

- Interagency
- International
- PPP
- Universities

Coordination (DUS’ Office)
... Internal focus on S&T R&D activities is essential for understanding how strategies translate to resources which in turn translate to achieving stated (and measurable) objectives

S&T Strategic Planning Guidance

(Examples)

4. We will fully fund area X at 100% of requirements
5. Labs will be funded at ______
6. The priorities for biodefense funding will be ______

Cost, Schedule, Performance

Employing Earned Value Management System (EVMS) characteristics

Technology Roadmaps

Objectives to be achieved through S&T’s R&D efforts
Science & Technology’s Resource Allocation Strategy (STRAS)

Update:
- Will use HSSTAC on 4-5 December and FEMA meeting on 16 December to prototype
- All groups are developing their presentations
Agricultural Screening Tools: Will provide tools needed to rapidly: (1) detect and respond to Foreign Animal Disease (FAD) outbreak; (2) cargo inspections at ports of entry

Outcomes/payoffs
- Trusted tools and assays:
  - For use during outbreak to handle anticipated sample surge
  - Reduced sample transport logistics
  - Swifter answers to allow continuity of business for industries
  - Reduced impact to export and quicker return to trade status
  - Eventual adoption into pre-event surveillance activities

Transition
- USDA APHIS National Veterinary Services Laboratory
  - Dossier via National Animal Health Laboratory Network Methods Technical Working Group (NAHLN MTWG)
- Livestock Industry's (Dairy, Pork)
Agricultural Screening Tools Roadmap

Tools to support planning and response, drive requirements for countermeasures development and inform post outbreak response activities by creating scalable (local to national) simulation and modeling tools to analyze potential responses and control options to minimize FAD spread.

Enhanced Passive Surveillance (EPS) includes diagnostic tests, surveillance tools and data integration procedures to identify infected animals prior to overt symptoms and improve our ability to detect diseases that threaten the U.S. agricultural critical infrastructure.

High throughput diagnostics (DX) allow more rapid confirmation of disease status and increased sample processing capabilities enhancing our ability to contain outbreaks.

Vaccines (VX) to rapidly prevent disease in healthy animals prevents disease spread among healthy herd, maintaining business continuity.

Vaccines (VX) to rapidly prevent disease in healthy animals prevents disease spread among healthy herd, maintaining business continuity w/in U.S.

Diagnostics (DX) to distinguish vaccinated from infected animals may allow more rapid return to trade status, enhancing business continuity and minimizing economic impact.

Livestock Decontamination, Disposal and Depopulation (3D): New methodologies and decision support tools for depopulation, disposal and decontamination that facilitate rapid response and prevent disease spread in a manner that minimizes waste, environmental impact and negative public perception.
Operational Context Chart (As Is -- To Be)

**As Is**

- **NAHLN**
- **FMD**

**Farm/Pen**

- **Quarantine Affected Location(s)**

- **Visual Detection (~21 days)**

- **Analyse at PIADC (~1-3 days)**

- **Confirm?**

- **No**

- **Stop ALL Movement Nationally**

- **Depopulate (All? / Sick?) Animals (TBD scope)**

- **NAHLN Surveillance (Regional & Nationwide Scope)**

- **Clear?**

- **Yes**

- **Re-Start Movement (Nat/Inter TBD)**

**To Be**

- **NAHLN**

- **AST Detection (~7 days)**

- **AST Early Detection (State Vets)**

- **FMD**

- **Analyse at PIADC (~1-3 days)**

- **Confirm?**

- **No**

- **Stop Animal Movement Nationally**

- **Depopulate Sick Animals (regional)**

- **NAHLN Surveillance (National but with Focused Scope)**

- **Clear?**

- **Yes**

- **Move Healthy Animals Domestic**

- **Move Healthy Animals International**

**Timeframes**

- **0 days**
- **21 days**
- **25 days**
- **2-4 months**
- **6-9 months**
- **1-2 years?**

**Questions**

- Clear?
- Yes
- No
Conclusions
(& Recurring Tensions in R&D)

- Infrastructure versus R&D
- Doing more with less
- Balancing needs of Department, State and Local, Components, national missions
- Nature of innovation
- Becoming too conservative in the portfolio
- Transitioning technologies, capabilities and knowledge products

S&T’s Value Added Proposition ...
- Operationally focused ... focused technology options & operational process enhancements
- Innovative ... develop innovative, systems-based solutions to complex homeland security problems
- Building partnerships ... technical depth and reach to leverage technology solutions from federal, state, local and tribal governments, universities, and the private sector - across the US and internationally
S&T Themes and Priorities

**Themes**

- Value Added Proposition …
  - Operationally Focused, Innovative, Building Partnerships
- S&T as the analytical and scientific core of DHS …
  - Place to go with the hard problems
- S&T increases the effectiveness and efficiency of the Department
- Trusted technical advisors
- Need stable funding

**Priorities**

- Our priority is improving operational effectiveness and efficiency in the following mission areas ….
  - First Responders
  - Borders & Maritime
  - Chemical/Biological
  - Cyber Security
  - Explosives
  - Resilient Systems
Research & development to produce compelling and affordable technologies and capabilities for homeland security
Broad Range of Customers and Stakeholders

Responders Emergency Management

DHS components (CBP, TSA, USSS, FEMA, USCG, ICE, CIS, OHA, NPPD)

Federal Interagency (FBI, EPA, HHS, USDA, DoD, FPS, GSA)
Cultural Shift at HSARPA

- Enhance the level of innovation in the portfolio
- Stimulate strategic new starts / new directions
- Improve planning & execution
- Create and enhance internal & external collaboration opportunities
- Establish mechanisms to avoid failed transitions

Realign portfolio to strike a better balance between near term lower risk technologies and longer term, high-risk/high-payoff technologies
Spurring Innovation and Transition

- More innovation, but still applied research

- Transition to a project based culture with well defined success metrics and completion points

- Encourage more opportunities for new ideas and competition through greater number of new starts and BAAs

- Increase the cycling of new ideas; attrition can be a good thing

- Become “best-in-class” at technology foraging – find and use opportunities when they are available
HSARPA Funding

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<th>Year</th>
<th>Funding</th>
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<td>FY 2014</td>
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- Near Term Transition Focus
- Rebalancing Investment Portfolio
HSARPA Technical Divisions

- **Borders and Maritime Security Division (BMD)** - Prevent contraband, criminals and terrorists from entering the United States while permitting the lawful flow of commerce and visitors.

- **Chemical/Biological Defense Division (CBD)** – Detect and protect against, respond to, and recover from potential biological or chemical events.

- **Cyber Security Division (CSD)** - Create a safe, secure and resilient cyber environment.

- **Explosives Division (EXD)** - Detect, prevent and mitigate explosives attacks against people and infrastructure.

- **Resilient Systems Division (RSD)** - Identify and analyze threats, enhance societal resilience, and integrate human capabilities in technology development. Strengthen situational awareness, emergency response capabilities, and critical infrastructure protection.
Border and Maritime Security

- **Mission:**
  Develop, integrate and evaluate technologies to detect, track and classify threats crossing air/land/water borders in between ports of entry.

- **Research Areas:**
  - Buried tripwires
  - Mobile surveillance systems
  - Tunnel detection and monitoring
  - Air-based sensor technologies
  - Maritime security of surface and underwater contraband threats
Next-generation sensors/scanners/analytic/ communication tools and alternate power schemes/sources for:
  - Surveillance in extreme environments (terrain, weather, maritime)
  - Change detection
  - Mobility
  - Automation
  - Dark targets (ex: ultra lights, submersibles)

Fusion/integration of air, land, maritime, cargo sensors & data streams across agencies / components at local, regional, and national levels

Fusion of hard data (sensors), soft data (HUMINT, open text…), context (policies, cultural understanding), and forensics (learned data)

Real-time info sharing/distribution to users at various entitlement levels (field, Op center, HQ, local, state…)
BMD Future Focus Cargo and 
Supply Chain Security

- Improved data/algorithms for CBP targeting systems being used to identify high-risk cargo
- Improved automatic target recognition for detection of explosives and contraband
- Advanced scanning methods for non-containerized cargo (ULD, bulk, break bulk…)
- Integrated sensors/combined portals
- Improved tools/methods/algorithms/databases to validate cargo and enforce trade compliance and detect invasive species
- Improved positive identification of land/maritime cargo (containerized, palletized, parcel, bulk/break-bulk, Ro-Ro, air, etc.) and detection of unauthorized access for land/rail/maritime
- Reliable and secure global communications and tracking of containers.
- Improved ability to quickly configure resources in response to supply chain disruptions
Chemical and Biological Defense

- **Mission:**
  Protect the Nation’s population and infrastructure against chemical, biological and agricultural threats and disasters.

- **Research Areas:**
  - Comprehensive understanding of chem-bio threats
  - Pre-event assessment, discovery, and interdiction capabilities
  - Warning, notification, and timely analysis capabilities
  - Recovery tools & processes
  - Attribution of attacks
  - Medical countermeasures against foreign animal diseases
CBD Thrust Areas

- Traditional Bio/chem
  -- High priority known threats to human and animal populations

- X-Bio/chem
  -- Address unknown and emergent threats

- Urban
  -- Bio/chem planning, surveillance, and response for mass transit, buildings, etc.
CBD Crosscutting Areas of Emphasis

- System level approaches to chemical and biodefense
- Bioinformatics - Integration of new data streams and analysis techniques to improve timeliness and accuracy of detection, identification, response, and forensics
- Surveillance and diagnostics - leveraging commercial technologies to enable low cost, widely available diagnostic and surveillance tools and networks
- Vaccines – Broad spectrum animal vaccines
Cyber Security

- **Mission:**
  
  Secure cyber systems and networks that are resilient to cyber threats. Protect users, infrastructure, and the Internet.

- **Research Areas:**
  
  - Ensure infrastructure and the Internet are secure and less vulnerable to malicious and natural events
  
  - Develop protocols essential to trustworthy cyber systems
  
  - Provide safe cyber arenas to enable research on discovery, testing, and analysis of tools, technologies and software
  
  - Provide R&D activities for users to attract next generation cyber security warriors, provide tools cyber criminal and terrorist investigations
Cyber Security Thrust Areas

- CNCI and Federal R&D Plan Programs
  - Executing R&D programs with support from WH, OMB, OSTP

- Trustworthy Cyber Infrastructure
  - Working with the global Internet and critical infrastructure communities to secure cyberspace

- Research Infrastructure to Support Cybersecurity
  - Supporting national-level research with necessary R&D infrastructure

- Network and System Security
  - Technologies for next-generation networks and systems

- Law Enforcement R&D Needs
  - Capabilities to support F/S/L law enforcement requirements

- Cybersecurity Education
  - Leading National and DHS cybersecurity education initiatives, including Cyber Skills Task Force (CSTF)
Explosives

Mission:

Develop technical capabilities to detect, respond, defeat, and mitigate non-nuclear explosives terrorism.

Research Areas:

- Secure passenger and cargo safety at airports and checkpoints
- Protect national infrastructure and treasures from explosive threats
- Protect people and facilities in high volume, fast-paced environments such as trains and subways
- Support first responders and TSA, US Secret Service, and Customs and Border Protection agents
Aviation Security Technology Development Plans

Current Individual Technologies

Primary Screening

AIT:

Secondary Screening

x-ray:

ETD:

DT&E: New Certified/Qualified Systems

GEN 1 Ckpt System

Networked Adaptive Detectors with Demo of RBS Capability

Flat Panel AIT/Shoe Screener

Enhanced HME Detection

High-Res ETD

Other Investment Areas: Bottled Liquid Scanners, Video Analytics, Explosives Threat Characterization, Canines, …

FY13 FY14 FY15-17 FY18-20

GEN 2 Ckpt System

Networked Adaptive Security Systems with Enhanced RBS

Walk-through AIT/Shoe Screener

Optically controlled x-ray systems

Automated Sampling
EXD Program Vision

<2 year goals:
- Enhanced HME detection capability in fielded systems and establish broad-based HME detection capability enhancements with low false alarm rate
- Demonstration of low cost, high throughput personnel screening solutions
- Alignment of EXD RDT&E 5 yr plans with ETD, x-ray and AIT DHS acquisition plans

5 year goals:
- High throughput (250+ pph) checkpoint screening with minimal divestiture for aviation and facilities security
- Demonstrated risk-based security systems to maximize efficiency for checkpoint screening operations
- Realized 30% reduction in security system false alarm labor costs

10 year goals:
- Fully integrated, risk-based checkpoint screening for aviation and facilities security
- Demonstrated walk through (400+ pph) screening without divestiture for all operational environments
Mission:
Rapidly develop and deliver innovative solutions that enhance the resilience of individuals, communities, and systems by enabling the whole community to prevent and protect against threats, mitigate hazards, effectively respond to disasters, and expedite recovery.

Research Areas:
- Adaptive risk mitigation
- Agile disaster management
- Resilient infrastructure
- Effective training, education, and performance
- PPD-8 & PPD-21
### Adaptive Risk Mitigation
- Environment for analyzing alternative scenarios, impacts of cascading effects, and cost/benefit implications of various responses in near real-time
- Scalable Integration of Geodispersed Monitoring Assets (SIGMA), e.g., pictures, video, analytics, etc., to accelerate forensics and rapidly respond to evolving risks
- Countering Violent Extremism (CVE) repository for appropriate personnel at all levels of government to understand/mitigate violent extremism

### Agile Disaster Management
- **Predictive Analytics Toolbox** for national/regional response coordination centers and state/local EOCs, enabling users to understand cascading effects and make decisions faster/better (real time)
- **Secured, cloud-based access to imagery** for ongoing disaster tagged with source, time, and location, etc., to expedite recovery operations
- **Unified Supply Chain/Logistics System** to manage / distribute critical supplies (hours)

### Resilient Infrastructure
- **Agile Energy System**: Self-healing new distribution grid architectures and devices to enable rapid restoration and increased resilience to multiple threats. Interoperability among micro-grids to support restoration of services.
- Critical infrastructure integration of **Built-in Resilience**: inexpensive sensor webs broadcast health/warning information to mitigate catastrophes
- Securing of critical infrastructure key sectors (power, water, transportation, etc.) through deployment of **Cyber-Physical System solutions**
S&T Apex Programs

Collaboration between S&T and components to solve problems of strategic operational importance and deliver technology solutions that are integrated into homeland security operations.

APEX Entry/Exit Re-Engineering

**Air Entry**
- Minimize processing time for travelers entering the United States at U.S. airports

**Air Exit**
- Implement an agile and cost-effective biometric exit capability

**Goal:** Biometrically verify the foreign national who entered the United States is the same foreign national who exited the United States

Border Enforcement Analytics Program (BEAP)

**Goal:** Deliver data driven business models to support ICE Homeland Security Investigations
Summary

- HSARPA offers great opportunities
  - An important mission
  - Money to invest
  - Staff that is empowered
  - A willingness to adapt
  - An opportunity to make a difference

- You can help
  - Bring us great ideas
  - Write compelling proposals
  - Put your best people on our projects
  - Work with us to commercialize & sustain our products
  - Help us find the talent that we need to enable & sustain success
DHS Science and Technology Mission

To strengthen America’s security and resilience by providing knowledge products and innovative technology solutions to the Homeland Security Enterprise
DHS S&T Goals

1. Rapidly develop and deliver knowledge, analyses, and innovative solutions that advance the mission of the Department

2. Leverage technical expertise to assist DHS components’ efforts to establish operational requirements and select and acquire needed technologies

3. Strengthen the Homeland Security Enterprise and first responders’ capabilities to protect the homeland and respond to disasters

4. Conduct, catalyze, and survey scientific discoveries and inventions relevant to existing and emerging homeland security challenges

5. Foster a culture of innovation and learning, in S&T and across DHS, that addresses challenges with scientific, analytic, and technical rigor
Strengthen the Homeland Security Enterprise and first responders’ capabilities to protect the homeland and respond to disasters

Objectives

- Better understand first responders’ needs and requirements, including those related to border protection and transportation security
- Create high-impact technologies and knowledge products, such as standards and protocols, that facilitate the safety, effectiveness, and ease with which first responders conduct their work
- Advance the operability and interoperability of public safety communications equipment
- Increase first responders’ access to information about best practices and product performance standards
Mission: Strengthen responders’ ability to protect the homeland

Guiding Principles:
- Our collaborations save lives
- The operational needs of first responders drive our projects
- We build on existing investments
- We support easy-to-use solutions
- We transition technologies to operations

Providing solutions that save lives
FRG’s Strategic Focus Areas

Communications
Data Gathering/Sharing
Responder Safety & Effectiveness
Radiological/Nuclear Response & Recovery
First Responders Group (FRG)

OIC
Office for Interoperability and Compatibility
Technical solutions to public safety communication challenges

NUSTL
National Urban Security Technology Laboratory
Testing, evaluation, analysis, technical assistance; leads Radiological/Nuclear Response and Recovery effort

IA
Information Applications
Technologies that access critical incident information wherever and whenever needed.

CORE
Communications, Outreach, and Responder Engagement
Links FRG to practitioners; identifies responder requirements; informs stakeholders about FRG projects

R-Tech
Responder Technologies
Manages technology development; disseminates information on products and services; facilitates innovation
## FY13 Budget Allocation

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### FRG Budget

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FY13 FRG Budget by Project Type

- **T&E**: $4,596,818 (12%)
- **Outreach**: $4,213,893 (11%)
- **Study**: $2,854,177 (7%)
- **Standards**: $2,119,991 (6%)
- **Project**: $24,858,566 (64%)
FY13 Project Funding by Priority Areas

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<th>Priority Area</th>
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<td>T&amp;E</td>
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<td>Study</td>
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Note: Total funding for FRG "Projects" equals $24.9M
FRG Technologies in an Incident Cycle

Mitigation

Preparedness

Response

Recovery

COMMUNICATIONS

COMMUNICATIONS MODELING

IP VIDEO ENCODER

LOW LIGHT SURVEILLANCE CAMERA

VIRTUAL TRAINING

VIRTUAL TRAINING

TURTLE MIC

VIRTUAL TRAINING

VIRTUAL TRAINING

VIRTUAL USA®

NEXT GENERATION PPE

DECONTAMINATION

SCBA

WIRELESS PATIENT MONITORING

Prevention
How FRG Identifies Responder Needs

Project Responder

- Systematic effort to identify gaps between current emergency response capabilities and capabilities required to respond to catastrophic incidents

- Collaboration among DHS S&T, Federal Emergency Management Agency (FEMA), and state and local response agencies

- Over 250 responders from spectrum of agencies and non-traditional partners have participated in three phases since 2001
How FRG Generates Requirements

FRG’s First Responder Resource Group (FRRG)

- More than 120 fire service, law enforcement, EMS, emergency management, communications, and medical practitioners from across the country
- Several national associations represented
- Based on Project Responder priorities and their own experience and expertise, develop Operational Requirements Documents (ORDs) that specify what technologies and knowledge products must do to fill capability gaps
- ORDs incorporated in FRG Broad Agency Announcement
FRRG Membership

Regional Representation
- Northeast: 23%
- Southeast: 32%
- Midwest: 11%
- Southwest: 18%
- West: 16%

Level of Government
- Local: 45%
- State: 18%
- Tribal: 20%
- Federal: 15%
- Association: 2%

Disciplines of Non-Federal Members
- Fire: 31%
- Law Enforcement: 25%
- Medical: 20%
- Emergency Management: 15%
- Other: 9%

Stakeholders Identify Requirements
- Local: 71%
Are Face-to-Face Meetings Necessary?

- In 2013, FRG participated in 22 webinars with 1,655 participants, saving $442K in travel expenses
- FRRG using webinars and teleconferencing more, to reduce costs, but efficiency suffers
- In April 2013 feedback about preferred meeting formats, FRRG members commented:
  
  “I don’t believe you can properly debate an issue without visual contact.”

  “Some [projects] can be done via con-call or telecon; however, others require F2F so brainstorming can take place or specific details can be worked on.”

  “While costs are a factor–face to face meetings are the most effective and productive engagements for us.”
How FRG Generates Requirements

Input also solicited from recognized emergency response and preparedness authorities
Requirements Considered for PPE

**Stakeholders Identify Requirements**

- Government
- Materials Developers
- Standards Developers
- First Responders
- Vendors
- Academia

**Focus Areas**

- Protection
- Garments
- Gloves
- Ballistic
- Warning Devices
- Durability
- Respiratory Apparatus
- Location Tracking
- Thermal
- Comfort
- Comm Devices
- Stabbing/Penetration
- Versatility
- Boots
- Chem/Bio

**Threats**

- Chem/Bio
- Ballistic
- Stabbing/Penetration
- Comm Devices
- Thermal
- Comfort
- Location Tracking

**Capabilities**

- Protection
- Garments
- Gloves
- Ballistic
- Warning Devices
- Durability
- Respiratory Apparatus
- Location Tracking
- Thermal
- Comfort
- Comm Devices
- Stabbing/Penetration
- Versatility
- Boots
- Chem/Bio

Class 2 Bauer Multi-Threat Suit
Determining Which Projects to Undertake

1. What are we trying to do? What problem are we trying to solve?

2. How is it done today, and what are the limitations of current practice?

3. What is our new approach, and why do we think it will be successful?

4. If we are successful, what difference will it make?

5. How long will it take, what will it cost, and what are the milestones?

Questions posed by George Heilmeier, former DARPA Director, at the start of every project.
FRG Technology Flow

**FRG Priority Areas**

- FR Safety & Effectiveness
- Data Sharing
- Communications

**Tech Foraging**

**Available Technology**

**Technology Development/Adaption**

- Partnerships
  - Intra-agency
  - Inter-agency
  - International
  - Private Sector
  - Academia

**Project Responder 3**

- Towards the First Responder of the Future

**First Responders Group**

- Operational Requirements Documents (ORDs)

**ORDs developed in coordination with first responder community**

**Solution Development Process**

- Transition Solutions into Use
- Manage and Complete Projects
- Select and Approve Projects

**FEMA's AEL**

**SAVER**

**U.S. Department of Homeland Security**

**ORDs developed in coordination with first responder community**
Technology Foraging

Tech Foraging

- Identifies existing and emerging technologies that might fill first responder requirements
- Evaluates identified technologies against operational requirements
- Assesses whether technologies can be leveraged for first responders, avoiding duplication and saving taxpayers money
- Establishes collaboration opportunities with DoD and other partners
- Facilitates transfer of technologies through field demonstrations
- Informs first responders about available and emerging technologies
Technology Foraging Overview

**Systems Analysis**

- Nodal analysis to …
  - Better understand the environment
  - Identify questions for analysis
  - Identify requirements
  - Identify gaps

**Technology Foraging**

- Process of Learning
  - Foraging Questions

**Outputs**

- “System” Definition
- Situational Awareness
- Speed of Execution
- Strategic Partnerships
- Portfolio Refinement
- Resource Management
- Data
- Points of Contact
- New Questions
Multi-Band Radio (MBR)

**Problem**  Agencies cannot communicate with one another during emergencies, because their equipment uses different radio bands

**Solution**  Multi-Band Radio, a mobile radio capable of operating across disparate radio bands
Multi-Band Radio (MBR)

Need identified directly by first responders

Requirements Gathering (SAFECOM ERC; FRRG)

Requirements determined by practitioners

Technology Foraging

Similarly, a DoD effort identified

Nationwide pilots conducted to test and evaluate MBR

Operational Pilots

DoD investment of ~$6B leveraged

Leveraging DoD Resources

Developed knowledge products to share lessons learned
Multi-Band Radio (MBR)

Operational Successes
- 13 successful pilots, including Kentucky Derby
- Last two Super Bowls
- 2013 Presidential Inauguration
- 2013 State of the Union Address

Market Impact
- On FEMA Approved Equipment List; qualifies for FEMA grants
- Market competition (Motorola, Harris, Thales)
- New market in MBR accessories
- Procurements by states, cities, U.S. Marine Corps, Department of Interior, U.S. Capitol Police

Giving first responders new communications capability, while preserving U.S. engineering and manufacturing jobs
First Responder Support Tools (FiRST) Application

**Problem**  Responders need information tool to help them isolate bomb and hazardous material threats, evacuate affected areas, and coordinate their efforts

**Solution**  Easy-to-use application for smartphones and laptops that shows safe standoff distances, nearby areas of concern (e.g., schools, hospitals), and suggested roadblock locations

**Status**
- Available on iTunes and Google Play
- Requires minimal training
- Listed on Responder Knowledge Base Authorized Equipment List; qualifies for grant funding
- More than 5,000 users
- Additional information at [www.ara.com](http://www.ara.com)
Problem  Wildland firefighters suffer more heat stress injuries than burn injuries, due in part to bulky, heavy, uncomfortable protective garments

Solution  Turnout gear using innovative materials that increase radiant protection and breathability, and reduce weight

S&T’s Approach
- Leverage $1.7M from DoD, USDA, and FEMA grant
- FRG invests $330K
- Provide 1,200+ prototype garment systems to US Forest Service and State of California for trials
Next Steps

- Project Responder 3c/4
- Futures Initiative
- Flexible approach to address emerging communications
- Shift from SOA construction to capacity building for information sharing
- Rad/Nuc Response and Recovery Roadmap
- Social Media
- Convergence
Challenges

- Rebalance portfolio

- Fighting the good fight: working with first responders within federal regulations

- Doing more with less
  - Reduced budgets (federal, local, and state)
  - Less travel funding
  - Internal requirements
    - E.g., meeting/conference approval process
HSSTAC -- ASOA 101

Ms. Debra Durham
Director, ASOA
Science & Technology Directorate

December 5, 2013
S&T’s Value Added Proposition …

- **Operationally focused** … focused technology options & operational process enhancements
- **Innovative** … innovative, systems-based solutions to complex homeland security problems
- **Partnerships** … technical depth and reach to leverage technology solutions from federal, state, local and tribal governments, universities, and the private sector - across the US and internationally

**Under Secretary for Science and Technology**

**Deputy Under Secretary**

- **First Responders Group (FRG)**
- **Homeland Security Advanced Research Projects Agency (HSARPA)**
- **Acquisition Support & Operations Analysis (ASOA)**
- **Research & Development Partnerships (RDP)**

- **Office of Research & Development Analysis & Assessment**
  - Transportation Security Lab (TSL)
- **Office of Standards**
- **Federally Funded Research & Development Centers Program Management Office**
- **Office of Operational Test & Evaluation**
- **Office of Systems Engineering**

**Strengthening America’s security and resiliency by providing knowledge products and innovative technology solutions for the Homeland Security Enterprise**
ASOA Organizational Responsibilities

- **Component Acquisition Executive** – Serves as DHS Senior Acquisition official for S&T (MD 102-01 and Oct. 12 ADM)
- **Acquisition Insight** – Coordinate S&T position on requirements analysis and technology for DHS major acquisitions (MD 102-01)
- **Acquisition Oversight** – OT&E oversight responsibility of all Major DHS Acquisition programs (6 United States Code (U.S.C.), Title 3, Section 112, 182, 188, Delegation 10003, MD 102-01, and MD 026-02)
- **FFRDC Executive Agent** – Oversight and execution of DHS’ FFRDCs that includes $130M/yr of work (Federal Acquisition Regulation (FAR) 35.017-4, FAR 35.017-5, 6 U.S.C. §185, and MD 143-04)
- **Standards Executive** – Coordinate and represent all Standards activities across DHS. Supports the development of performance standards and establishes test protocol for equipment and processes (6 U.S.C. §112(g) as they relate to the implementation of Office of Management and Budget Circular A-119 and 15 C.F.R. 287)
- **Operations Analysis** – Provide scientific, engineering and analytical support for strategic investments (6 United States Code (U.S.C.), Title 3, Section 302-5)
- **System Assessment & Validation for Emergency Responders** – Conducts 20+ objective assessment of commercially available responder equipment each year. Meets the intent of Section 509 of the Homeland Security Act (Public Law 107-296. November 25, 2002)
- **DHS Acquisition COEs** – Lead DHS Systems Engineering and Test & Evaluation COEs (MD 102-01 and App B of Acquisition Instruction Guidebook)
- **Developmental T&E** – Performance oversight of TSL and other developmental test efforts (ISO/IEC 17025)
- **Certification Testing** – Explosives Detection (Air Transportation Security Act) (Public Law 93-366)
ASOA strengthens the Homeland Security Enterprise mission to secure the nation by providing analyses, engineering, and test expertise and products connecting Research, Development, and Acquisition to the operational end-user.
## ASOA Capability Offering

### ASOA Capability Key:

<table>
<thead>
<tr>
<th>Current Strength</th>
<th>Limited Capability &amp; Growth</th>
<th>New Growth Area</th>
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### Capability Areas

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<th>Systems Analysis</th>
<th>Systems Engineering</th>
<th>Standards</th>
<th>Acquisition Planning</th>
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<td>Requirements Engineering</td>
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<td>Certification Testing</td>
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<td>Operational Context / Visualization</td>
<td>Technology Optimization</td>
<td>Conformity Assessment</td>
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- Performance Specifications
- Test Methods
- Conformity Assessment
- Training
- Concept of Operations
- Developmental Testing
- Certification Testing
- Operational Test and Evaluation (OT&E)
- Field Experimentation
- Technology Assessment
- Anomaly/Explosives Detection & Screening
- OT&E
- System Assessment and Validation for Emergency Responders (SAVER)
## ASOA FY 2010-2014 Budget

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<td>6,640,891</td>
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</tbody>
</table>
ASOA Organization

Acquisition Support and Operations Analysis (ASOA)
Deb Durham
Director
Gibson Kerr
Deputy Director

Operational Test & Evaluation (OTE)
Incoming Director

Standards (STN)
Phil Mattson
Director

Office of Systems Engineer (OSE)
Jim Tuttle
Chief Systems Engineer

Federally Funded Research and Development Centers Program Management Office (FFRDC PMO)
Michael Powell
Program Manager (Acting)

Homeland Security Studies & Analysis Institute (HSSAI)
Homeland Security Systems Engineering & Development Institute (HSSEDI)

Research & Development Analysis and Assessment (RAA)
John Dargan
Director

Systems Analysis
Acquisition Planning
Developmental Test & Assessment
Transportation Security Lab (TSL)
Susan Hallowell
Director
Office of Research & Development, Analysis, and Assessment (RAA)

Value Add

- Operational Context / Visualization
- Mission Analysis
- Predictive Analytics
- Acquisition Strategy
- Transition Planning
- Process Improvement
- Alternatives Analysis
- Technology Insertion

Overview

- Using practitioner-driven methodologies, RAA advises S&T and DHS components on how to successfully transition technologies and products to the field.
- RAA applies an innovative systems-based approach to complex problems, assisting the Homeland Security Enterprise in defining and analyzing needs, gaps, and alternatives.
- RAA defines operational contexts, plans programs, and ensures technical rigor by applying its expertise in systems analysis, acquisition planning, developmental testing, systems engineering, and process improvement.
IILCM Capabilities & Requirements Council

Process:
- **Planning**
  - Strategy: Defining priorities and approaches for meeting mission goals and objectives
- **Programming**
  - Capabilities and Requirements: Prioritizing capability improvements to meet mission objectives
- **Budgeting**
  - Programming and Budgeting: Portfolio allocation, affordability, and cross-portfolio trade space decisions
- **Execution**
  - Major Investment Oversight: Major investment oversight

Key Products:
- **Enterprise Baseline**
- **Integrated Requirements**
- **Capability Baseline Assessment**
- **Integrated Capabilities**
- **Capability Map**
- **Gap Analysis**
- **Alternative Solutions**
- **Prioritized Capability List**
- **Operational Analysis Report: Problem Understanding**

Risks:
- Trade space: Material Non material

Resources Considerations:
- Data driven decisions

**Department Strategy Council (DSC)**
- **Capabilities & Requirements Council (CRC)**
- **Program Review Board (PRB)**
- **Investment Review Board(s) (IRB)**
Systems Analysis Process

Define Problem
- Support requested
- Document Problem Statement
  - Define strategic context
  - Validate problem statement with relevant stakeholders

Establish Vision and Success Criteria
- Document prioritized success criteria
- Validate prioritized success criteria with stakeholders
- Formal S&T/Customer Support Strategy
  - Component expectations
  - S&T support LOE
- Signed S&T and Customer MOU/MOA

Describe and Evaluate Current Baseline
- Baseline current processes and technologies
- Characterize and validate operational capability gap(s) with stakeholders
- Characterize, validate, prioritize operational capability requirements with stakeholders

5 Ws
- Why?/Who?/What/?When?/Where?

Technology Foraging
- Technology Foraging Findings
  - HSARPA/FRG/RDP Technologies
  - DHS Technologies
  - S&T Standards
  - Partnerships
  - Other “Knowledge Products”

Identify and Evaluate Alternative Solution
- Establish and validate alternative solution evaluation criteria with stakeholders
- Characterize, validate, and prioritize Alternatives to Close Operational Capability Gap(s)

Plan and Implement Solution
- Document and validate Solution Development Plan with stakeholders
  - Solution Delivered or
  - Non-Materiel Solution Effected

Assess and Refine Change
- Document Lessons Learned
- Document Best Practices
Transportation Security Lab (TSL)

- **Value Add**
  - Technology Assessment, Validation, and Certification
  - Anomaly and Explosives Detection & Screening

- **Overview**
  - TSL is the leading federal laboratory supporting the development of explosive detection equipment and blast mitigation solutions for aviation security and other DHS operational needs
  - TSL is the Transportation Security Administration’s (TSA’s) designated qualification test authority for all airport security technology
  - TSL conducts both developmental test activities for anomaly and explosive detectors and certification testing for technologies to be fielded
Transportation Security Laboratory

The mission of the TSL is to apply our scientific and technical acumen to advance explosives and contraband detection technologies for the field.
TSL Mission Activities

DT&E TOPs Process

Firewall

IT&E

Applied R&D

Exploratory TOPs
Readiness Assistance
Readiness Testing
Qualification/Certification Testing

Qualification/Certification (TSA)

Vulnerability & Mitigation
Office of Systems Engineering (OSE)

- **Value Add**
  - Requirements Engineering
  - Technical Process Integration
  - Technology Optimization

- **Overview**
  - OSE is coordinating across DHS to institutionalize a “systems thinking” approach for managing programs that increase efficiencies and transform needs and requirements into operational capabilities.
  - Systems Engineering tools and training guides help managers balance costs, schedules, and performance objectives throughout a program or project’s life cycle.
  - In coordination with the Undersecretary for Management (USM), established the DHS Systems Engineering Center of Excellence—a collaborative forum designed to provide advice to DHS components and connect project managers with systems engineering products and services.
Office of Standards (STN)

- **Value Add**
  - Performance Specifications
  - Conformity Assessment
  - Concept of Operations Development
  - Test Methods
  - Training

- **Overview**
  - Standards ensure technologies and equipment are safe, stable, and successful in the field
  - STN works actively to ensure responders receive quality, high-performing, safe equipment through standards development and testing
  - Where standards do not exist but are needed, STN works with end users to develop new standards and test methods
  - STN identifies standards and test methods that verify equipment performance and meet acquisition requirements
The Case for Standards

Our Products & Services enable effective capability delivery

NOW AVAILABLE!
Radiation/Multi Toxin Detection Meter
$299.99*
- Advanced Radiation and Bio-Chemical Agent Protection!
- Industry Leading Working Duration
- Completely Self-Contained

* Special GSA rates on request

---

Does this work? (Performance Standards)

How do I test this? (Test Methods)

Does this solve the right problem? (CONOPS/standard operations guides)

How do I use this? (Training)

Will this work with my other devices? (Test Methods)

Should I buy this? How do I comparison shop? (Conformity Assessment)
# Relationship of Standards to the S&T Technology Development Cycle

## Technology Readiness Levels (generic)

<table>
<thead>
<tr>
<th>Basic Research</th>
<th>Research to Prove Feasibility</th>
<th>Technology Development</th>
<th>Technology Demonstration</th>
<th>Operational Test &amp; Evaluation</th>
<th>Production &amp; Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic R&amp;D to understand the phenomenon</td>
<td>Studies to exploit the phenomenon to develop a useable technology</td>
<td>Lab level R&amp;D for specific elements of the technology that may be used in a system</td>
<td>Integration of the specific elements into basic modules or components</td>
<td>Prototype ready for testing in a relevant, high-fidelity lab environment</td>
<td>Production and deployment</td>
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<tr>
<td>TRL – 1</td>
<td>TRL – 2</td>
<td>TRL – 3</td>
<td>TRL – 4</td>
<td>TRL – 5</td>
<td>TRL – 6</td>
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</table>

## Standard Types and Notional Ranges of Application

- **Management System and Quality Process Standards**
- **Basic Metrology and Reference Standards**
- **Standard Datasets**
- **Product and Process Interoperability/Interface Standards**
- **Data Exchange-Interchange Protocol Standards**
- **Standard Test Methodologies**
- **Personnel Certification Standards**
- **Product Performance Standards**
- **Operational & Maintenance Standards**
- **Accreditation/Certification Standards**
Standards Focus Areas

Biometrics

Chem/Bio Countermeasures

Explosives Countermeasures

Responder & Resiliency Standards

Robotics
Office of Operational Test & Evaluation (OTE)

- **Value Add**
  - Operational Test

- **Overview**
  - OTE provides oversight for the entire Department’s 135 DHS major acquisition programs
  - OTE ensures each acquisition has a robust T&E strategy to test, verify progress towards meeting specific requirements, and ultimately ensure through formal validation via operational test and evaluation that acquisitions meet operational requirements
  - OTE also applies a risk-based T&E approach for DHS’s major information technology acquisitions that focuses on the acquisition’s design, architecture, and impact to the mission if failure occurs
Value Add

- Technology Assessment

Overview

- SAVER assists federal, state, and local first responders with making informed procurement decisions
- SAVER conducts impartial, practitioner-relevant, operationally-oriented assessments of responder equipment enabling responders to better select, purchase, use, and maintain emergency response equipment
Uses for SAVER Products

- Individual Products Provide Important and Useful Information
  - Market Survey Reports
  - Focus Group Reports
  - Verification Reports
  - Assessment Reports
  - SAVER Summaries
  - Handbooks
  - Guides
  - Application Notes

- Used as Responders Make Procurement Decisions
- Used When Preparing for a Competitive Procurement
- Other uses Include Reference Material for Training
Federally Funded Research & Development Centers Program Management Office (FFRDC PMO)

Value Add

- FFRDC Oversight
- Strategic Planning
- Policy Studies
- Threat and Risk Analysis
- Trade-off Studies
- Systems Engineering Analyses

Overview

- The FFRDCs PMO provides technical and contractual oversight as well as programmatic support to two FFRDCs, unique entities established to directly support DHS
- FFRDCs provide independent analyses of homeland security issues
- The Homeland Security Studies and Analysis Institute (HSSAI) focuses specifically on homeland security strategy, threats, and policy studies
- The Homeland Security Systems Engineering and Development Institute (HSSEDI) addresses enterprise systems engineering issues and complex acquisition program support
Department of Homeland Security
Science & Technology

HSSTAC -- RDP 101

Dr. Keith Holtermann
Director, RDP
Science & Technology Directorate

December 5, 2013
Research & Development Partnerships

- Fosters collaboration throughout the federal government and private sector, and internationally
- Creates partnerships and leverages S&T technological resources to deliver needed capabilities to the Homeland Security Enterprise
Research & Development Partnerships

- **Office of National Laboratories**
  - Administers five state-of-the-art facilities and partners with Department of Energy’s National Labs to combat threats to the nation’s security

- **Office of University Programs**
  - Leads Centers of Excellence (COE) networks that focus on multidisciplinary research and education to explore key challenges in homeland security

- **Office of Public-Private Partnerships**
  - Works with private industry to communicate the technical needs of DHS Components and enables and leverages partnerships with the business community to find solutions

- **International Cooperative Programs Office**
  - Pairs US entities engaged in homeland security research with foreign counterparts to actively share expertise and resources in cooperative research programs

- **Interagency Office**
  - Coordinates with federal, state, local, and territorial partners to share information and leverage homeland security efforts at all levels of government
Research & Development Partnerships

RDP FY 2014 President's Budget ($M)

* excludes NBAF

RDP Budget: FY 2010 – FY 2014

<table>
<thead>
<tr>
<th></th>
<th>FY 2010 ($M)</th>
<th>FY 2011 ($M)</th>
<th>FY 2012 ($M)</th>
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<td>40.0</td>
<td>50.0</td>
<td>30.7</td>
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Easy Access to Science-Based Capabilities Through Mature, Established Partnerships
Office of National Laboratories

- **S&T Mission**
  - Strengthen America’s security and resiliency by providing knowledge products and innovative technology solutions for the Homeland Security Enterprise

- **ONL Support to the S&T Mission**
  - Overseeing, implementing, and leveraging the DOE and DHS S&T laboratory capabilities that support research, testing and evaluation, and technology development needs for DHS and the Homeland Security Enterprise.

- **ONL’s Vision**
  - A safer and more resilient America through an integrated laboratory network that provides advanced scientific capabilities and technology solutions to the Homeland Security Enterprise.
ONL Establishes Strategic Partnerships with the DOE and S&T National Lab Network

In FY 2013, DHS funded $340 million to the S&T and DOE National Laboratories for homeland security-related research.

Examples of Homeland Security research conducted:
- Critical Infrastructure/protection analysis
- Radiological and nuclear countermeasures
- Chemical, bio, and nuclear forensics
- Multi-scale modeling and simulation
- Transportation security
- Biodefense countermeasures, bio-detection capability and preparedness
- Nuclear weapons technology, defense and maintenance
- Test and evaluation for first responder technologies
- Foreign Animal Disease research and diagnostics
- Cybersecurity

DHS has equal access to capabilities and technologies at the DOE labs.

Legend
- DHS Science and Technology Laboratories
  - Chemical Security Analysis Center (CSAC)
  - National Biodefense Analysis and Countermeasures Center (NBACC)
  - National Urban Security Technology Laboratory (NUSTL)
  - Plum Island Animal Disease Center (PIADC)
  - Transportation Security Laboratory (TSL)

- Proposed DHS S&T Laboratory
  - NBAF is proposed replacement for Plum Island Animal Disease Center

- Department of Energy National Laboratories
  - Innovative scientific and technological capabilities are often developed beyond scope of academia and industry
  - Operated as FFRDCs
  - Argonne National Laboratory (ANL)
  - Brookhaven National Laboratory (BNL)
  - Idaho National Laboratory (INL)
  - Lawrence Berkeley National Laboratory (LBNL)
  - Lawrence Livermore National Laboratory (LLNL)
  - Los Alamos National Laboratory (LANL)
  - National Renewable Energy Laboratory (NREL)
  - Nevada Test Site (NTS)
  - Oak Ridge National Laboratory (ORNL)
  - Pacific Northwest National Laboratory (PNNL)
  - Sandia National Laboratories (SNL)
  - Savannah River National Laboratory (SRNL)
  - Y12 National Security Complex (YNSC)
S&T Labs Support the DHS Mission

- S&T Labs Support DHS Core Missions Areas:
  - Securing and managing our borders
  - Ensuring resilience to disasters
  - Maturing and strengthening the Homeland Security Enterprise

- By Addressing Specific Mission Needs in:
  - Bioforensic operations and timely biological threat characterization (NBACC)
  - Detection of explosives at transportation hubs (TSL)
  - Test and evaluation of tools for first responders (NUSTL)
  - Timely knowledge products to plan for and respond to chemical threats (CSAC)
  - Diagnostics and vaccines for foreign animal diseases (PIADC)

Core Capabilities - Comprised of a substantial combination of foundational research, specialized infrastructure (facilities and equipment), expertise, and processes (e.g. enabling registration and accreditations) to provide scientific and technological solutions to meet the current and future needs of the HSE
Office of University Programs

Mission

- OUP provides streamlined access to the expertise of the Nation’s colleges and universities to address pressing homeland security needs.
- OUP’s university research centers and education programs are integrated with DHS operating agencies through immersion and faculty exchanges.

Key Programs

- DHS S&T Centers of Excellence (COE)
- S&T Education Programs
- Minority Serving Institutions Programs
Office of University Programs

- The COEs are a network of university R&D centers addressing DHS’s long-term operational needs through:
  - Partnerships with DHS Components
  - Mission-tailored tools and technologies
  - Subject matter expertise
  - Rapid response coordination and assistance
  - Education programs, workforce development and training
  - Access to world-class laboratories and facilities

- DHS and Federal agencies can engage the COEs through:
  - Basic Ordering Agreements and Cooperative Agreements
  - Education and Fellowships
  - Operations-based research and internship opportunities
  - Competitions and Peer Reviews
  - Advisory Councils
COE Partnership Network

- Center of Excellence (COE) Lead Universities (17 States)
- Center of Excellence (COE) Partners (45 States + D.C., P.R.)
- Department of Energy Lab Partners (11 States)
- DHS Science and Technology Directorate Labs (3 States)
- Minority Serving Institution Award Recipients (13 States + D.C., P.R.)
COE Leads & Acronyms

Funded in FY 2012 (Working on Border Security Issues)

1. **Center for Risk & Economic Analysis of Terrorism Events (CREATE):**
   University of Southern California

2. **National Center for Zoonotic & Animal Disease Defense (ZADD):**
   Kansas State University and Texas A&M University

3. **National Center for Food Protection & Defense (NCFPD):**
   University of Minnesota

4. **National Consortium for the Study of Terrorism & Responses to Terrorism (START):**
   University of Maryland

5. **The Center for Visual and Data Analytics (CVADA):**
   Purdue University and Rutgers University

6. **The Center for Awareness and Location of Explosives-Related Threats (ALERT):**
   Northeastern University

7. **The National Center for Border Security and Immigration (NCBSI):**
   University of Arizona and University of Texas at El Paso

8. **The Center for Maritime, Island, Remote and Extreme Environment Security (MIREES):**
   University of Hawaii and Stevens Institute of Technology

9. **Coastal Hazards Center (CHC):**
   University of North Carolina at Chapel Hill and Jackson State University
Office of Public Private Partnerships

Mission

- Serve as the primary interface to industry in order to create strategic partnerships that identify, generate, and transfer innovative, cost-effective, proven and safe solutions to the homeland security enterprise (HSE)

Key Activities

- Seek and identify solutions from Industry
- Perform outreach to inform partners of HSE requirements and capability needs
- Link external partners to internal performers and vice-versa
Business Partnership Opportunities

- **S&T Webinar Series**
  - Variety of desired outcomes on topics across S&T:
    - Information sharing
    - Identification of S&T priorities and potential transition technologies

- **Office of SAFETY Act Implementation**
  - Certification Program for Qualified Anti-Terrorism Technologies
  - In FY13 60 approved applications were tied to over $1.2B in projected technology revenues, supporting more than 50,000 private sector jobs.

- **Commercialization Office**
  - Links stakeholders’ articulated requirements to private sector technologies/services/capabilities
  - Promotes solutions for DHS at market speeds
  - Industry Liaison to connect business with DHS S&T

- **Technology Transfer**
  - Facilitate information sharing, licensing, and transition between DHS and Industry
  - Popular avenues:
    - Cooperative R&D Agreement (CRADA)
    - Memorandum of Agreement/Understanding (MOA/MOU)
    - Partnership Intermediary Agreements (PIAs)

- **Long Range Broad Agency Announcement**
  - Open solicitation vehicle used to select and fund innovative R&D projects
  - Provides ~$30-35M annually to small, medium, and large businesses, universities, & other R&D programs
  - Preparing for annual release of topics for CY14
    - 67 Topic Areas in current solicitation

- **Small Business Innovation Research (SBIR)**
  - Domestic set-aside program to assist small businesses to participate in Federal research/R&D
  - Provides ~$12M annually through two solicitations
  - Commercialization Assistance Program helps awardees plan for sustained technology delivery
  - ~500 projects aligned to S&T priorities supported since 2004

- **Technology Foraging**
  - Internal process of identifying research and development activity across numerous communities
  - Drives discovery of capabilities and enables identification of potential strategic partners
  - Addresses a wide variety of topics and presents findings useful in targeting new audiences
Mission/Statutory Mandate

SEC. 317. Promoting Antiterrorism Through International Cooperation Program

- Develop understandings and agreements to allow and to support international cooperative activity in support of homeland security
- Develop strategic priorities for international cooperative activity for the Department
- Facilitate planning, development, and implementation of the strategic priorities
  - Including grants, cooperative agreements, contracts
- Facilitate the matching and partnership of U.S. entities engaged in homeland security research with non-United States R&D entities performing research
Key Activities

International Bilateral Agreements

- Nearly 100 activities underway
- Foreign government partners have provided over $12M USD to S&T
- Cost avoidance through info sharing, access to equipment, personnel and facilities

- Canada (2004)
- Australia (2004)
- United Kingdom (2005)
- Singapore (2007)
- Sweden (2007)
- Mexico (2008)
- Israel (2008)
- France (2008)
- Germany (2009)
- New Zealand (2010)
- European Commission (2010)
- Spain (2011)
- Netherlands (2013)

Targeting opportunities through other mechanisms:

- Other U.S. Government Agreements, Contracts with Foreign Entities (i.e. Universities), Cooperative Research and Development Agreements
# International Engagement Outcomes

<table>
<thead>
<tr>
<th>Country</th>
<th>Activities Underway</th>
<th>Proposed Activities</th>
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</thead>
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<tr>
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<tr>
<td>Netherlands</td>
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</tr>
<tr>
<td><strong>TOTAL</strong></td>
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<td><strong>159</strong></td>
</tr>
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</table>
Interagency Office

- **Mission/Statutory Mandate**
  - “... coordinating with other appropriate executive agencies in developing and carrying out the science and technology agenda...to reduce duplication and identify unmet needs...”
  - [§302 (13) of the Homeland Security Act of 2002]

- **Key Activities**
  - **Focused interagency partnerships**
    - Example: DHS-DoD Capability Development Working Group
      - Leverages DoD’s much larger R&D budget for addressing joint DHS-DoD technology requirements
  - **Operational experimentation and demonstrations**
    - Example: Joint Interagency Field Exploration (JIFX)
      - “Level playing field” for testing potential HSE technologies selected by FEMA, CBP, TSA, USCG, etc.
  - **Special Projects (coordinates sensitive/classified S&T programs)**
    - Example: North American Air Domain Awareness
     - DHS (Borders), DoD (NORAD), FAA (NEXTGEN), DOE (Wind turbine radar interference)
  - **External Advisory Committees**
    - Example: HSSTAC
      - TSA Task Force, etc.
  - **White House Liaison**
    - Example: National Science and Technology Council
     - Committee on Homeland and National Security
Interagency Office

Interagency Experimentation Program

- Joint Interagency Field Exploration (JIFX)
  - Explores new and emerging technologies for homeland defense and security gaps: improves products, steers technology development to requirements, reduces the time to transition technology

- Adaptive Red Team/Technical Support and Operational Analysis (ART/TSOA)
  - Benefits program managers/component operators with special missions (border protection; maritime security; urban operations; command, control and communications; intelligence and surveillance; sensors; and law enforcement operations)

- Technical Exploration (TE)
  - Explores new and emerging technologies for rapid transition to first responders and DHS component special operators

- Results
  - New set of aerial imaging/crowd sourcing procedures used during Super Storm Sandy
  - New technology insertion with immediate impact to Moore, OK tornado response
Department of Homeland Security
Science & Technology

HSSTAC – HSARPA’s Resilient Systems Division (RSD) 101

Jalal Mapar
Director, Resilient Systems Division
Science & Technology Directorate

December 5, 2013
Established Nov 2012 by merging IDD & HFD
“Plans are nothing; planning is everything.”

-- Dwight D. Eisenhower
Understanding Resilience

Resilience Definitions:

- *Quadrennial Homeland Security Review*: individual, community, and system robustness, capacity for *rapid recovery*, and *adaptability*.

- *Presidential Policy Directive 8*: to *adapt* to changing conditions and *withstand* and *rapidly recover* from disruption due to emergencies.

- *Presidential Policy Directive 21*: to prepare for and *adapt* to changing conditions and *withstand* and *recover rapidly* from disruptions.

- *National Security Strategy*: to *adapt* to changing conditions and prepare for, *withstand*, and *rapidly recover* from disruption.

- *National Academy of Sciences*: the ability to prepare and plan for, *absorb*, *recover* from, and more successfully *adapt* to adverse events.
Common Resilience Attributes

Resilience Definitions:

- *Quadrennial Homeland Security Review*: individual, community, and system robustness, capacity for rapid recovery, and adaptability.

- *Presidential Policy Directive 8*: to adapt to changing conditions and withstand and rapidly recover from disruption due to emergencies.

- *Presidential Policy Directive 21*: to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions.

- *National Security Strategy*: to adapt to changing conditions and prepare for, withstand, and rapidly recover from disruption.

- *National Academy of Sciences*: the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.

Common Resilience Attributes: Robustness, Adaptability, Recovery Capacity
The United States faces **evolving risks** with increasingly costly impacts:

- **Natural Disasters**: *They will keep on coming*
- **Terrorism**: *Coming to a theater near you*
- **Industrial Accidents**: *Cyber Physical Systems*

2012: **11** mega-disasters (> $1B in losses); an **increasing trend** for both frequency and cost.*

**2050: Flooding to cost $1 Trillion**

To enhance the nation’s resilience against increasing risks, RSD delivers science and technology capabilities that enhance the **robustness**, **adaptability**, and **recovery capacity** of individuals, communities, and systems.

- **Robustness**: resisting and absorbing shocks
- **Adaptability**: managing dynamic risks & emergencies
- **Recovery Capacity**: quickly restoring functionality

**Disaster Resilience: An Essential DHS Mission**
RSD Vision & Mission

Vision: Strengthen our homeland resilience to all-hazards through S& T-based solutions.

Mission: Rapidly develop and deliver innovative solutions that enhance the resilience of individuals, communities, and systems by enabling the Whole Community to prevent and protect against threats, mitigate hazards, effectively respond to disasters, and expedite recovery.
Rapidly develop and deliver innovative solutions...

...that enhance the resilience of individuals, communities, and systems...

...by enabling the Whole Community...

...to prevent and protect against threats, mitigate hazards, effectively respond to disasters, and expedite recovery.

Meeting Agency, End-User, and National Priorities
RSD Thrusts

Vision
Strengthen our homeland resilience to all-hazards through S&T-based solutions.

Mission
Rapidly develop and deliver innovative solutions that enhance the resilience of individuals, communities, and systems by enabling the Whole Community to prevent and protect against threats, mitigate hazards, effectively respond to disasters, and expedite recovery.

Prevent and Protect
Mitigate & Respond
Recover

Robustness
Adaptability
Recovery capacity

Adaptive Risk Mitigation
Agile Disaster Management
Resilient Infrastructure
Effective Training, Education, and Performance

RSD Thrust Areas flow directly from our Vision and Mission
Identifying End-User Requirements, Priorities

Engaging stakeholders through a systemic process to achieve the largest resilience pay-off for the Nation

- Capability gaps, high-priority demands, Operational requirements

RSD Technology Road Map Development

Deliver Risk-Informed, Customer-Driven, Operationally-Focused Solutions
Adaptive Risk Mitigation

Reduce the risk to people and infrastructure by fielding **tools and processes** that can adapt to an evolving threat, a changing environment, and shifting demographics; tools that support managing the cascading consequences of interactions among infrastructure and all hazards.

**Envisioned RSD Solutions for the Next 5-10 Years**

- Testbed/Environment/Platform is used to analyze in near real-time alternative scenarios, understand impacts of cascading effects, and assess cost/benefit implications of various responses (*Holodeck Lite*)

- Mobile Monitoring Platform is deployed, including rapid integration of Geo-dispersed monitoring assets, e.g. pictures, video, analytics, etc., to accelerate forensics and rapidly respond to evolving risks

- Countering Violent Extremism (CVE) repository of evolving knowledge products is deployed, available, and widely used by appropriate personnel at all levels of government (*CVE Lexis-Nexis*) to discourage/prevent violent extremism
Agile Disaster Management

Make disaster response more rapid and effective and reduce recovery times for individuals, communities, and infrastructure with better tools for situational awareness and real-time decision support, including logistics (inventory, deployment, distribution)

Envisioned RSD Solutions for the Next 5-10 Years

- **Predictive Analytics Toolbox** is in use at national/regional response coordination centers and state/local EOCs, enabling users to understand cascading effects and make decisions faster/better (real time)

- **Secured, cloud-based access to imagery** for an ongoing disaster, tagged with source, time, and location, etc., is immediately available to expedite recovery operations: debris/damage/etc., integration with other systems to facilitate disbursement of disaster relief funds

- **Unified Supply Chain/Logistics System** is used by decision makers to manage/distribute critical supplies (hours)
Increase the resilience of critical infrastructure by fielding **resilient designs** and promulgating resilient **design standards** for all hazards

**Envisioned RSD Solutions for the Next 5-10 Years**

- **Agile Energy System:** Self-healing new distribution grid architectures and devices enable rapid restoration and increased resilience to multiple threats. Interoperability among micro-grids support the restoration of services.

- Critical infrastructure is designed with **Built-in Resilience:** inexpensive sensor webs broadcast health/warning information to mitigate catastrophes (water/gas network, tunnels, bridges, dams, etc.)

- Critical infrastructure key sectors (power, water, transportation, etc.) are made secure through deployment of **Cyber-Physical System solutions**
Sample Projects
Countering Violent Extremism (CVE)

GOAL
- Enhance the capability of the Department to assess and counter violent extremism

APPROACH
- Develop database on Terrorism and Extremist Violence in the U.S. (TEVUS) that incorporates incident, perpetrator, and geospatial information and is accessible through an easy-to-use portal that includes graphing, mapping, and analysis functions
- Conduct surveys on public attitudes toward terrorism and government countermeasures
- Interview former terrorists to identify how others can be encouraged to disengage

PARTNERS & CUSTOMERS
- DHS Intelligence & Analysis
- DHS Office of the Counterterrorism Coordinator
- DHS Office of Policy
- UK Home Office
- Performers:
  - National Consortium for the Study of Terrorism and Responses to Terrorism (START)
  - University of Massachusetts, Lowell

PAYOFF
- FY15 World’s most comprehensive unclassified database on terrorism and extremist violence in the United States
GOAL & SOLUTION

- Enables the emergency preparedness community to access modeling and simulation tools to support planning, exercises and operations

APPROACH

- Provides a modeling and simulation integration platform that enhances national preparedness
- Provides capability to create, test and exercise response tactics, plans and procedures throughout the preparedness cycle, from pre-incident planning through post-incident operations and generations of lessons learned

PARTNERS & CUSTOMERS

- FEMA National Simulation and Exercise Center
- State/local emergency managers
- First Responders

PAYOFF

- M&S support to 14 federal, state and regional exercises and operational planning efforts such as:
  - NLE11; NLE12; Planned Capstone
  - FEMA Region 2 Blue Surge Tsunami Exercise 2013;
  - Utah Shakeout Earthquake Exercise 2012;
  - Anaheim/Santa Ana Urban Area Threat and Hazard Identification and Risk Assessment (THIRA) planning process 2012;
  - Presidential inauguration planning 2012;
  - US-Sweden international exercise
  - GA State Surge
  - Super Bowl 2014
  - Response/Recovery Ops
Resilient Electric Grid (REG)

**GOAL**
- Enable a more resilient electric distribution grid architecture with multiple paths for power to increase the grid's reliability and resiliency to natural and man-made disasters while protecting the system from cascading fault currents.

**APPROACH**
- "Keeps the lights on" with an inherently fault current limiting, high temperature superconducting (IFCL-HTS) cable system.
- Enables self-healing by allowing substations to interconnect to share power and assets while simultaneously eliminating the risk of fault currents cascading through the system.

**PARTNERS & CUSTOMERS**
- Electric utilities
- ConEd (primary electric utility partner)
- REG Manufacturers: American Superconductor Corporation, Southwire
- Testing facility: Oak Ridge National Lab

**PAYOFF**
- Increases flexibility, resiliency and reliability of the grid.
- Significant savings in equipment and real estate.
- Ability to transmit more power with significantly smaller footprint.
Resilient Tunnel Plug

GOAL

- Reduce the vulnerability of transportation tunnels to flooding, resulting from a terrorist attack or natural disaster

APPROACH

- Withstands water pressures associated with a breach using three-layer fabric plug
- Reduced cost compared to flood gates
- Minimally intrusive, easy to install in complex transit environments

PARTNERS & CUSTOMERS

- Mass Transit Agencies
- Transportation Security Administration (TSA), Port Authority of New York and New Jersey (PANYNJ), Washington Metropolitan Area Transit Authority (WMATA)
- San Francisco’s Bay area Rapid Transit, Boston, New York City Metropolitan Area Transportation Authority (NYMTA)
- Plug manufacturer: ILC Dover

PAYOFF

- FY15 installation to mass transit partner
- Prevents millions of dollars of damage to mass transit infrastructure
- Enables more rapid restoration following a disaster
Drinking Water Resilience

GOAL
- Deliver threat, risk and vulnerability assessment capability of the Nation’s drinking water infrastructure

APPROACH
- Provides HITRAC with ability to accurately, reliably, and credibly predict threats to drinking water infrastructure, including cyber, physical, biological and chemical contaminants
- Automates and web hosts accredited drinking water utility risk assessment tool

PARTNERS & CUSTOMERS
- National Protection and Programs Directorate (NPPD)/Homeland Infrastructure Threat and Risk Analysis Center (HITRAC)
- Water sector/utilities

PAYOFF
- Enhances robustness of the method, reduces cost and reduces assessment time for each participating utility
- Individual utilities pay small fee to utilize assessment tool
Centralized Hostile Intent

GOAL

- Improve capability to identify aviation security threats through remote video-based behavioral observation and back-tracking.

APPROACH

- Comparative analysis of direct-based versus video-based observation and decentralized versus centralized remote observation techniques for identifying high-risk behavior.
- Increases the scale of the screening process to accommodate higher passenger volumes across multiple airports.
- Extends observation/screening area to include entire airport.
- Increases behavior-based screening accuracy and increases capability to identify:
  - High risk passengers
  - Co-travelers and covert co-travelers associated with high risk passengers
  - Observation time

PAYOFF

- Increased capability to interdict potential threats to aviation security further from the checkpoint.
- Potential cost offsets through behavior-based screening of more passengers using fewer operational personnel employing a centralized remote behavioral screening approach.

PARTNERS & CUSTOMERS

- Transportation Security Administration (TSA)
GOAL

- Augment and advance our DHS Component’s pre-screening capabilities of non-cooperative subjects prior to encountering a DHS agent

APPROACH

- Collect a corpus of operationally realistic video data to test facial recognition algorithms’ ability to identify specific volunteers, which may or may not also be included in a video scene
- Data will be gathered using multiple cameras to capture various and overlapping views at different heights
- Evaluate biometric algorithms submitted by the vendor community against the video data to assess the algorithms’ maturity and current performance against various use cases

PARTNERS & CUSTOMERS

- Customs and Border Patrol
- Transportation Security Administration
- United States Secret Service
- Federal Protective Services
- State and local law enforcement, Metropolitan Transit Agencies

PAYOFF

- Video dataset of a realistic operational environment (includes ground truth) to validate a challenge-type of event
- Performance Evaluation Report of current biometric systems against the video dataset that will inform DHS Components on the current state of facial recognition technologies, as well as provide industry areas for improvement
Programs in Practice
Adaptive Risk Mitigation in Practice

Boston Marathon Bombing Bombing Revisited with \textit{RSD}

\textbf{Solutions:}

\begin{itemize}
  \item In 2013:
    \begin{itemize}
      \item Bombing suspect caught on video but aggregation time-consuming
      \item Opportunities for more resilient design features
    \end{itemize}
  \item In the future:
    \begin{itemize}
      \item Integrated surveillance quickly enables suspect identification
      \item Resilient CI better withstands hazards
    \end{itemize}
\end{itemize}

\begin{itemize}
  \item On April 15, 2013, two improvised explosive devices (IEDs) detonated near the finish line of the 117th Boston Marathon
  \item 264 people were injured and three were killed during the attacks
  \item Surveillance Systems Integration (SSI)
    \begin{itemize}
      \item Develop and integrate innovative sensors, displays, algorithms, etc.
      \item Quickly and efficiently provide actionable information to law enforcement, infrastructure operators
    \end{itemize}
  \item High Performance Resilient Designs
    \begin{itemize}
      \item Provides CIKR analytic tools, resilient design guidance
      \item Calculates risk & resilience for all-hazards scenarios including costs
    \end{itemize}
  \item Actionable Indicators and Countermeasures
    \begin{itemize}
      \item Indicators of movement toward extremist violence for use by law enforcement, intelligence agencies
      \item Supports DHS efforts to counter violent extremism
    \end{itemize}
\end{itemize}

Dzhokhar A. Tsarnaev, a U.S. citizen, indicted

Identify individuals prone to VE before they act
Agile Disaster Management in Practice

East Coast Earthquake Revisited with RSD Solutions:

In 2011:
- Epicenter 11 miles from Nuclear Plant
- Rapid dissemination via twitter
- Post-earthquake damage assessment

In the future:
- Assistance to areas most in need
- Immediate situational awareness
- Rapid, thorough assessments speed recovery

Predictive Analytics Toolbox
- Identify Hot Zones: needs/resources
- Identify risks, monitor developments, and provide public risk information

Overhead Imagery Data
- Suite of remote sensing and geospatial information capabilities
- Expedites situational awareness, search & rescue, and damage assessment

Standard Unified Modeling Mapping Integrated Toolkit
- Individual building damage; damage probabilities
- Medical surge data for region
- Casualty counts by county within region of interest

- Strongest since 1897
- 5,500 tweets per second, beating Osama bin Laden raid and tying Fukushima disaster
- Tweets travelled to NYC faster than earthquake tremors
- Distributed structural damages, < $100M
Resilient Infrastructure in Practice

Hurricane Sandy Revisited with *RSD Solutions:*

**In 2012:**
- **Unsafe Water:** 61 community water systems affected in NY State
- **Manhattan Power Outage:** $5.7B in lost economic activity
- **Subway Flooding:** $4.8B+ damages & lost revenue

**In the future:**
- **Safe drinking water during and after emergencies**
- **REG keeps the lights on**
- **Tunnel flooding prevented, saving billions of dollars**

**Drinking Water Resilience**
- New capability to assess, predict, and recommend preventive action against threats to drinking water infrastructure
- Includes cyber, physical, biological, and chemical contaminants

**Resilient Electric Grid**
- Advanced grid devices & architecture
- Suppresses fault current and allows substations to share capacity during disasters

**Resilient Tunnel**
- Three-layer inflatable plug, made of advanced materials
- Stops floodwaters to minimize damage, expedite restoration
Looking Ahead: Key Challenges

- **Adaptive Risk Mitigation**
  - Technology Readiness Level vs. Timeline
  - Privacy Issues
  - Adoption/Cost to Deploy
  - Technology Effectiveness/Measures of Effectiveness

- **Agile Disaster Management**
  - Customer Changing Requirements
  - Acquisition Path/Adoption/Cost to Buy and Operate
  - Federal Solution vs. Locally Developed Solutions
  - Standards

- **Resilient Infrastructure**
  - Transition to Asset/Sector Owners
  - Adoption/Acceptance

- **Training, Education, and Performance**
  - Deployment/Operations and Maintenance
  - Performance Metrics and Efficiency/Accuracy
Ongoing Activities

- RSD Technology Roadmap: Aligned with HSARPA/S&T
- New Starts: Aligned with Thrust Areas
  - Complex Systems/Cascading Effects
  - High priority infrastructure sectors
  - ...
- Collaborative programs: CSD, FRG, others
  - Cyber Physical Systems
- Projects with Transition Objectives
  - Component buy-in, Local User advocacy/acceptance
- Stronger focus on staff Development: PM Expertise/Experience, Mentoring, ...
If you don’t know where you’re going, any road will get you there!
HSSTAC – AM Conclusions

Dr. Daniel Gerstein
Under Secretary (Acting)
Science & Technology Directorate

December 5, 2013
Working Lunch
HSSTAC – Industry Engagement
Vision: Communicate and engage in opportunities that result in the delivery of technologies and capabilities to the Homeland Security Enterprise.
Building Partnerships for Technology Transition to Operational Use

Tools

Industry Collaboration

1: Early

2: Mid

3: Late

4: As Needed

S&T R&D

Cooperative R&D Agreements (CRADA)
Long Range Broad Area Announcement (BAA)
Small Business Innovation Research (SBIR)
SAFETY Act
SECURE
Technology Foraging
Systems Analysis

Informs

S&T Priorities:
- Biodefense
- Cybersecurity
- Home-made Explosives
- First Responder Support

- LRBA & White Papers
- CRADA
- Centers of Excellence
- International

DoD/DHS differences

Joint S&T and Industry Effort

Industry Partner through CRADA

Transition to Industry

Examples

ARMOR

FMD Vaccine

CIRT

RECX

S&T Value Added Proposition

Operational Relevance …

Innovation …

Partnerships …
Strategy

- **Educate** – Provide information to industry on efforts and mechanisms to foster engagements
  - Full Response Packages distributed by the Commercialization Office
  - Webinars
  - Speeches
  - Technical Support Operational Activity (TSOA) and Joint Interagency Field Exploration (JIFX)

- **Notify** – Publicize information sharing events
  - Periodic Outreach Messages
  - Cross-promotion of DHS activities

- **Incentivize** – Provide value to engagement partners
  - SAFETY Act – Certification, Designation
  - SECURE – Product evaluation and certification
  - Small Business Innovation Research (SBIR) – Awards, Commercialization Assistance Program
  - Long Range Broad Agency Announcement (LRBAA) - Awards
  - Grants
  - Tech Transfer/Formal Agreements – Information Sharing, Cooperative Research & Development
  - Prizes/Grand Challenges

- **Solicit** – Request targeted information and proposals in response to DHS needs
  - Small Business Innovation Research (SBIR)
  - Long Range Broad Agency Announcement (LRBAA)
  - Targeted Broad Agency Announcements (BAAs)
  - Requests for Proposals (RFPs)

- **Elicit** – Gather information to find new ideas, technologies, trends, and identify potential partners
  - Requests for Information (RFIs)
  - Conference Attendance
  - Seeking new Audiences (Vendors, Users, R&D Communities)
  - Vendor meetings
  - Interaction with DHS S&T’s partner network
  - Technology Foraging
Mechanisms

There are many ways that DHS actively engages with the private sector. Each tool provides unique pathways to success:

- Webinars and Invited Speeches
  - SAFETY Act Webinar Series
  - Commercialization Office webinars with MOU partners

- Industry Days
  - HSARPA Big Data and Analytics Workshop

- Open Solicitations
  - SBIR, LRBAA, Targeted BAAs

- Publications and Marketing Materials
  - Science & Technology Review 2014, OUP Newsletters

- Field Experimentation/Product Demonstrations
  - Technical Support Operational Activity (TSOA) and Joint Interagency Field Exploration (JIFX)

- Formal Agreements
  - Cooperative Research and Development Agreements (CRADAs)
  - Memoranda of Agreement/Understanding (MOAs and MOUs)
Partner Network

DHS S&T boasts a large network of partners internally and externally to reach the private sector

Internal Partners:
- DHS Private Sector Office
- DHS Industry Liaison Council
- NPPD Infrastructure Protection – Sector Coordinating Councils
- DNDO Commercial First Initiative
- Federal Laboratory Network
- Interagency/Intelligence Community Network
- University and Centers of Excellence Network

External Partners:
- MOU Partners:
  - AutoHarvest Foundation
  - Security Industry Association
  - GD EDGE Innovation Network
  - Maryland TEDCO
  - Massachusetts High Technology Council
  - Tech Comm
- Trade Associations
- Non-Profit/Not-for-Profit Organizations
- In-Q-Tel
Results

The Success of these Engagements can be measured many ways:

- **Formal Agreements** – DHS executed 60 Cooperative Research and Development Agreements (CRADAs) in FY12 and 80 CRADAs in FY13.

- **Contracts/Grants** – SBIR and LRBAA provide approximately $25-$50 million per year to their solicitations (depending on budget stability).

- **Information Collection** – Findings from industry outreach contribute to overall Technology Foraging activities at DHS S&T.

- **Expansion of Audiences** – Communications distributed to wide audiences result in higher attendance at Industry Days, Webinars, and provide awareness of DHS S&T priorities.

- **SAFETY Act Economic Impact** – As of May 2013, over 600 approvals for products, services and technologies were granted. In FY13, 60 approved applications were tied to more than $1.2 Billion in projected technology revenues, supporting more than 50,000 private sector jobs.

- **Establishment of New Partnerships** – Research & Development Working Groups initiated with Infrastructure Protection Sectors, and MOUs signed with new strategic partners.
Next Steps

- Continue increasing partnership agreements through MOUs, CRADAs, and Partnership Intermediary Agreements (PIAs) with strategic partners
- Expand technology demonstrations, such as TSOA and JIFX, with participation from more industry and government partners
- Educate internal DHS S&T staff on various avenues available for private sector engagements, and validate outreach successes through the Portfolio Review process
- Promote S&T Services – SAFETY Act, Information Sharing Agreements, Grant and Funding Opportunities
- Increase Partnership Opportunities – Gather expertise from professional user communities, work with industry venues as test-beds and partners for technology evaluations
- Create a “Grand Challenge” to address a hard problem at DHS
- Compile a comprehensive list of existing and anticipated capability gaps that can be shared with the private sector