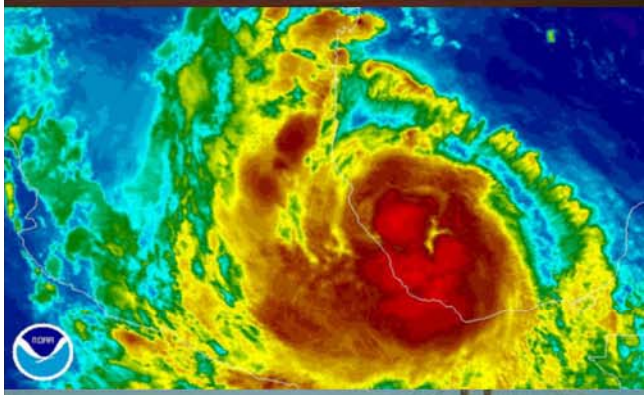
3rd Annual Arizona Nanotechnology Symposium

Scottsdale, AZ • April 10, 2008



DHS Science and Technology

Presented by:
Brad Buswell
U.S. Department of Homeland Security

Homeland Security

April 10, 1912
Titanic Embarks on Maiden Voyage

Global Challenge: Preparing for the Unexpected

Homeland Security

The Sears Tower (above) and shocked, slightly damp rescue workers (right).

ONION SECURITY WATCH

Conceptual Terrorists Encase Sears Tower In Jell-O

CHICAGO—In what is being called the first conceptual terrorist attack on American soil, the landmark Sears Tower was encased in 18 million tons of strawberry gelatin early Tuesday morning, leaving thousands shocked, angry, and seriously confused.

Authorities called to the scene of the senseless attack said they could do little to control the large crowds of dangerously bewildered citizens, many of whom searched desperately for some semblance of meaning in what had just taken place. As of press time, 11 night security guards were still trapped inside the famous structure, their rescue seeming

see **JELL-O**, *page 6*

DHS S&T FY09 Investment Portfolio

Balance of Risk, Cost, Impact, and Time to Delivery

Product Transition (0-3 yrs) ▪ Focused on delivering near-term products/enhancements to acquisition ▪ Customer IPT controlled ▪ Cost, schedule, capability metrics Goal: 50% FY09: 49%	**Innovative Capabilities (2-5 yrs)** ▪ High-risk/High payoff ▪ "Game changer/Leap ahead" ▪ Prototype, Test and Deploy ▪ HSARPA Goal: 10% FY09: 8%
Basic Research (>8 yrs) ▪ Enables future paradigm changes ▪ University fundamental research ▪ Gov't lab discovery and invention ▪ Homeland Security Institute Goal: 20% FY09: 20%	**Other (0-8+ years)** ▪ Test & Evaluation and Standards ▪ Laboratory Operations & Construction FY09: 23%

Customer Focused, Output Oriented

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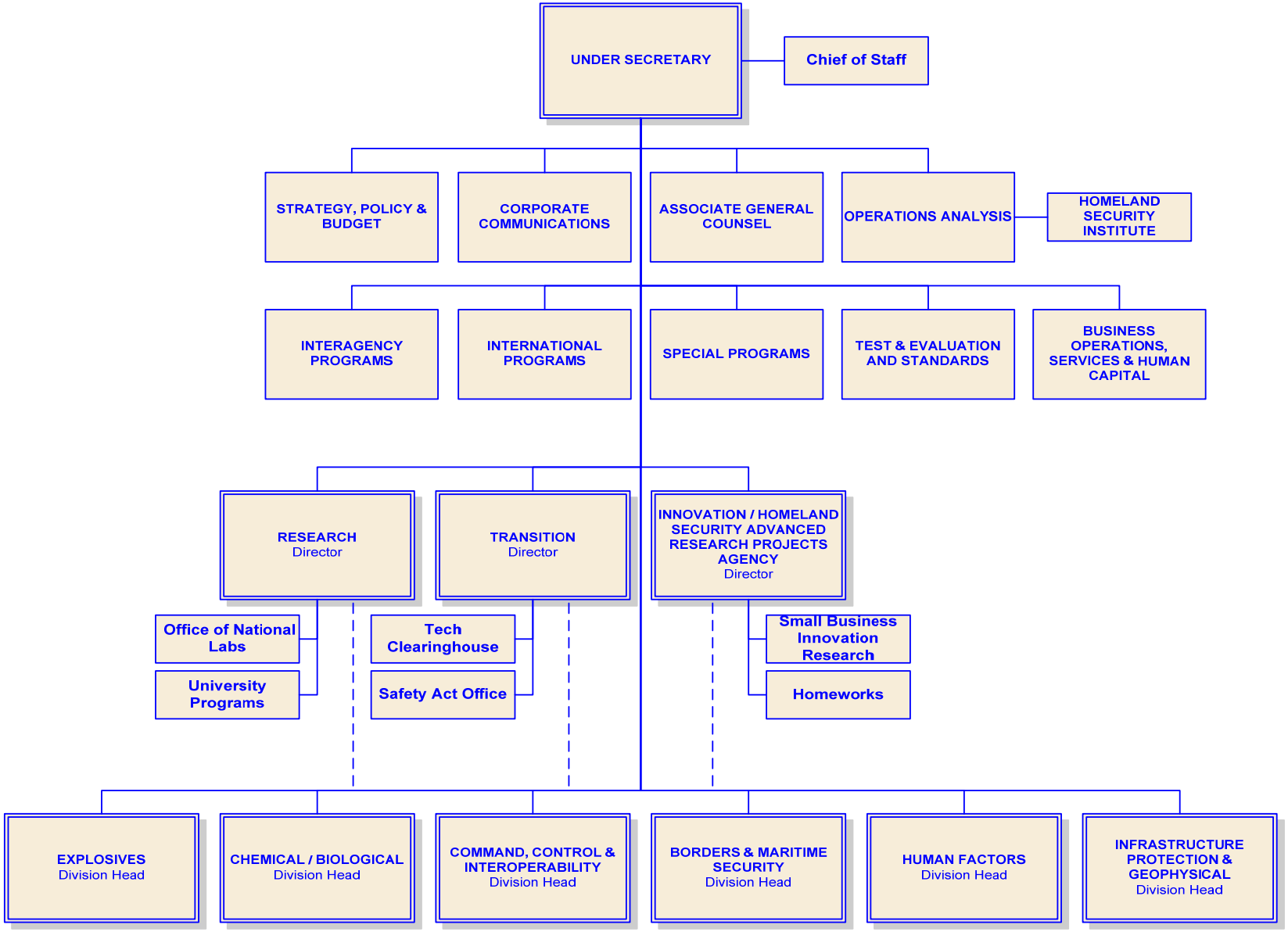
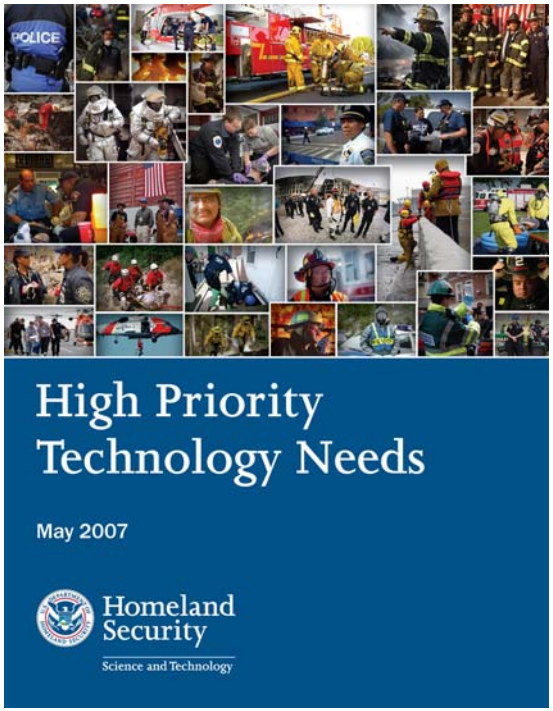
Office of the Under Secretary for Science and Technology



Approved: January 29, 2007

High Priority Technology Needs

- 77 High Priority Technology Needs for DHS components and their customers
- Posted at www.hsarpabaa.com
- Updated on annual cycle aligned with DHS funding and acquisition processes



Customer Focused…Output Oriented

Explosives Division
Thrust Areas & Programs

Counter MANPADS

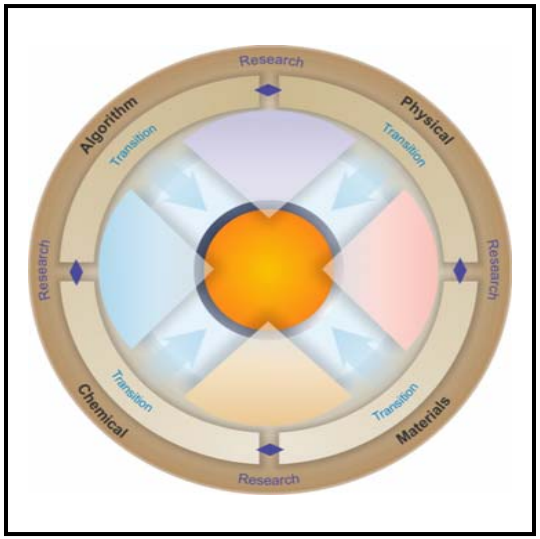
- DIRCM – Directed Infrared Countermeasures
- Emerging Counter-MANPADS Technologies
- Unmanned Aerial Vehicle (CHLOE)

Checkpoint Explosives Detection

- Passenger Screening
- Carry-on & Checked Baggage
- Cargo Screening

Explosives Characterization and Blast Mitigation

- Homemade Characterization
- Conveyance Protection



Suicide and Vehicle-Borne IEDs

- Response
- Standoff Detection

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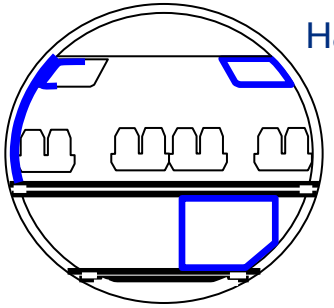
How S&T Adds Value to Counter Terrorism Efforts

Blast Mitigation: Luggage Cargo Hardening

Standard Aluminum Container

video



Hardened Unit Load Device (HULD)

video

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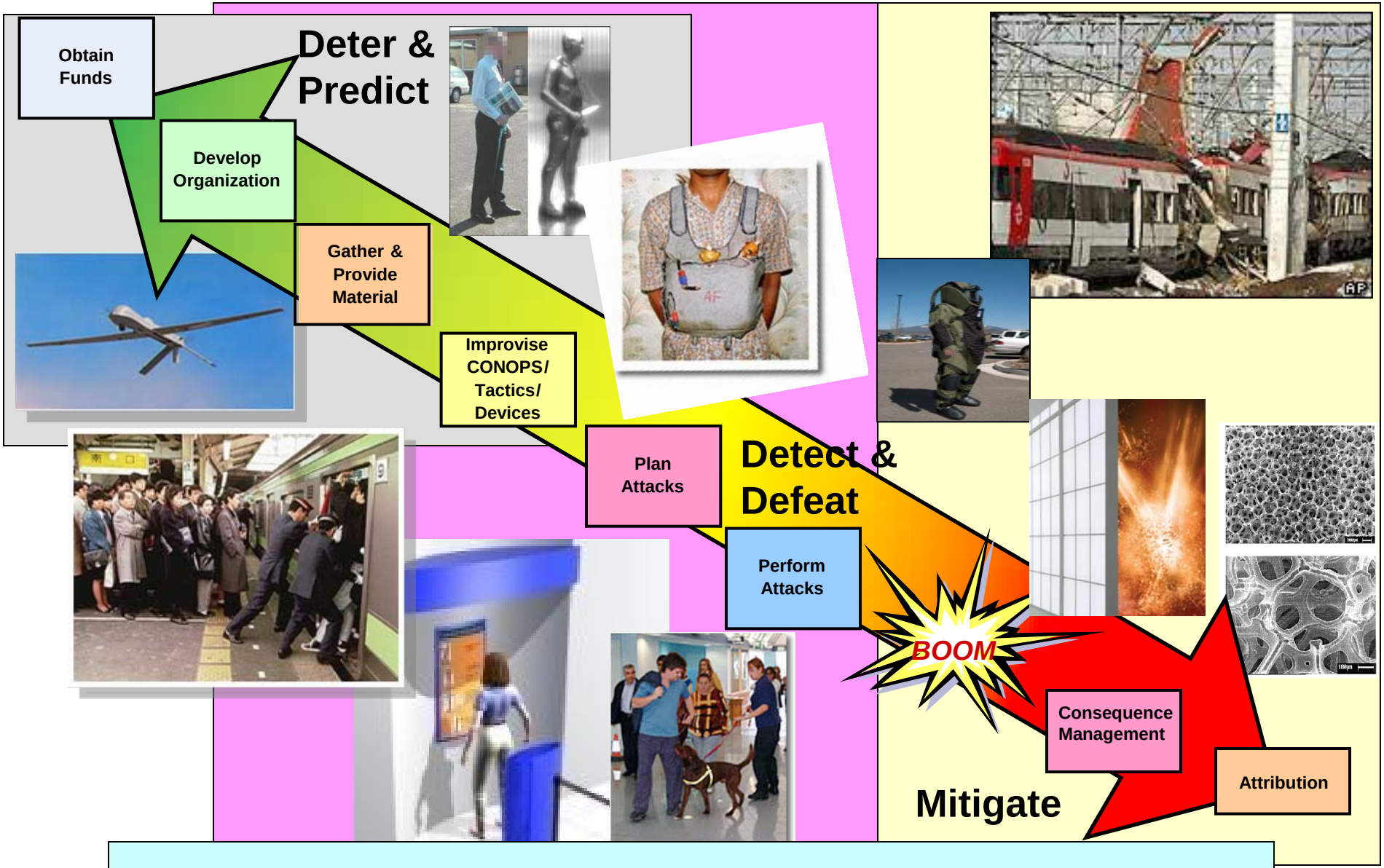
Who, What, Where, When, How?

The Challenge:

Preparing for the unexpected in our post 9/11 world

Homeland Security

Countering the IED Threat



Breaking the links in the IED Delivery Chain

Chemical/Biological Division Thrust Areas & Programs

Biological

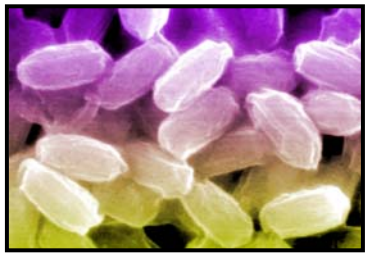
- Systems Studies
  - System tradeoffs e.g. Gen 3 BioWatch
- Threat Awareness
  - Risk assessment; lab studies to close gaps
- Surveillance and Detection R&D
  - Detection systems for air, food
- Forensics
  - Enhance and operate National Bioforensics Analysis Center (NBFAC)
- Response and Restoration
  - System approaches for recovering from bio attack

Agriculture

- Foreign Animal Diseases
  - Modeling, vaccines & diagnostics

Chemical

- Analysis
  - Chemical threat Characterization
- Detection
  - Chemical detection and systems for facility monitoring and first responders
- Response and Recovery
  - Decontamination tools and systems approaches for chemical decontamination



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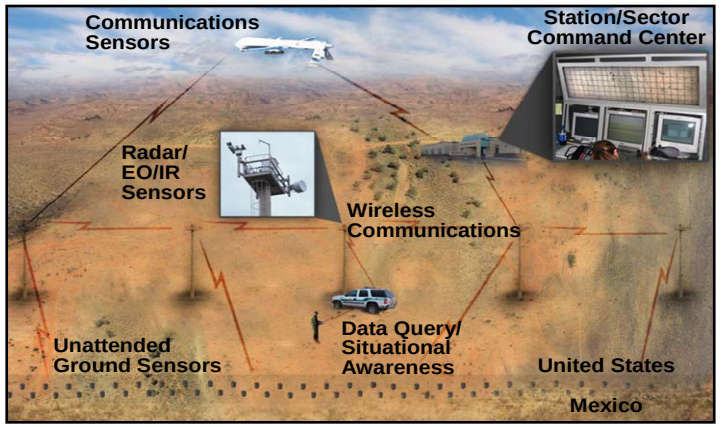
Border and Maritime Security Thrust Areas & Programs

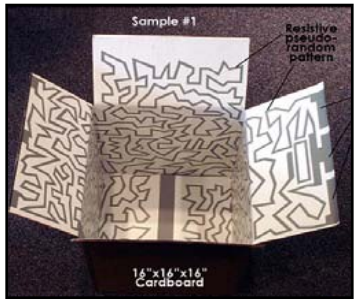
Border Watch

- Border Technologies Program
  - Delivers technologies for providing advanced protection, identification and enforcement capabilities along land and maritime borders

- Maritime Technologies Program
  - Focuses on developing sensors and surveillance and enhance situational awareness and information management along our maritime borders



- Border Officer Tools and Safety Program
  - Provides tools and technologies to support border security law enforcement officers in the area of vehicle and vessel inspections



Cargo Security

- Cargo and Conveyance Security Program
  - Focus is on a Marine Asset Tracking System, Advanced Container Security Device, Supply Chain Security Architecture and more

Command, Control and Interoperability Thrust Areas & Programs

Communications, Interoperability and Compatibility

- Multi-Band Radio
- Project 25 Compliance Assessment Program (P25 CAP)

Cyber Security

- Domain Name System Security (DNSSEC)
- Secure Wireless Access Prototype (DSWAP)

Knowledge Management Tools

- Critical Infrastructure Inspection Management System (CIIMS)
- AZLink technology system

Basic/Futures Research

- Visual Analytics and Physics-based Simulation Program
- National and Regional Visualization and Analytics Centers

Reconnaissance, Surveillance, and Investigative Technologies

- Fully Searchable Digital Ink Library
- Forensic Speaker Recognition

Homeland Security

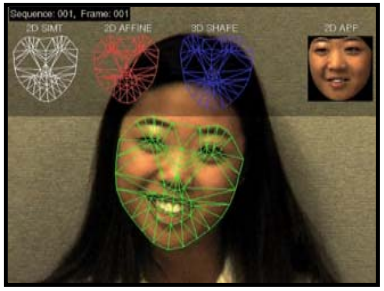
Human Factors Division Thrust Areas & Programs

Social-Behavioral Threat Analysis

- Precursors, Signatures, and Deterrence of Radicalization
- Suspicious Behavior Detection
- Community Preparedness, Response, and Recovery

Human-System Research & Engineering

- Personal Identification Systems
- Technology Acceptance and Integration
- Human-System Optimization



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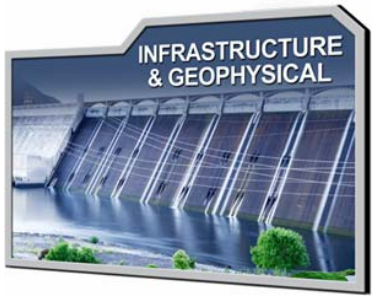
Infrastructure and Geophysical Division Thrust Areas & Programs



Critical Infrastructure

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

Preparedness and Response

- Incident Management Enterprise
- Advanced Concepts and Studies
- First Responder Technologies

Geophysical

- Southeast Regional Research Initiative (SERRI)
- Secure Against Fires and Embers (SAFE)

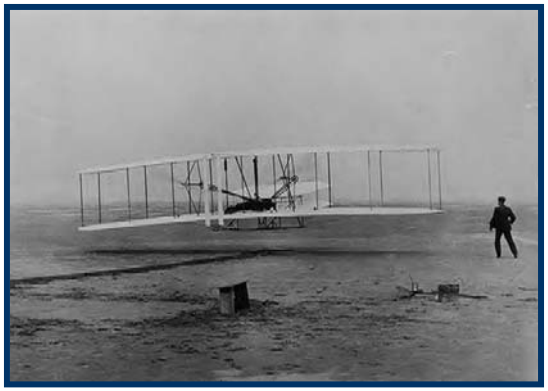
Secure Against Fires and Embers

Homeland Security

Innovation Portfolio

*KNOW **Risk***

*KNOW **Reward***

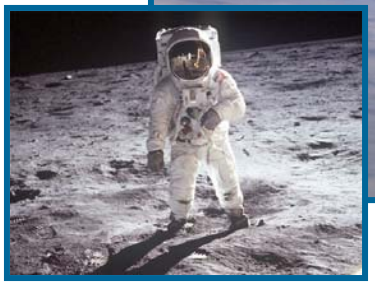


The Wright Brothers First Flight

Boeing 787 Dreamliner

Robert Goddard & First Liquid-Fueled Rocket

NASA Goddard Rocket Launch



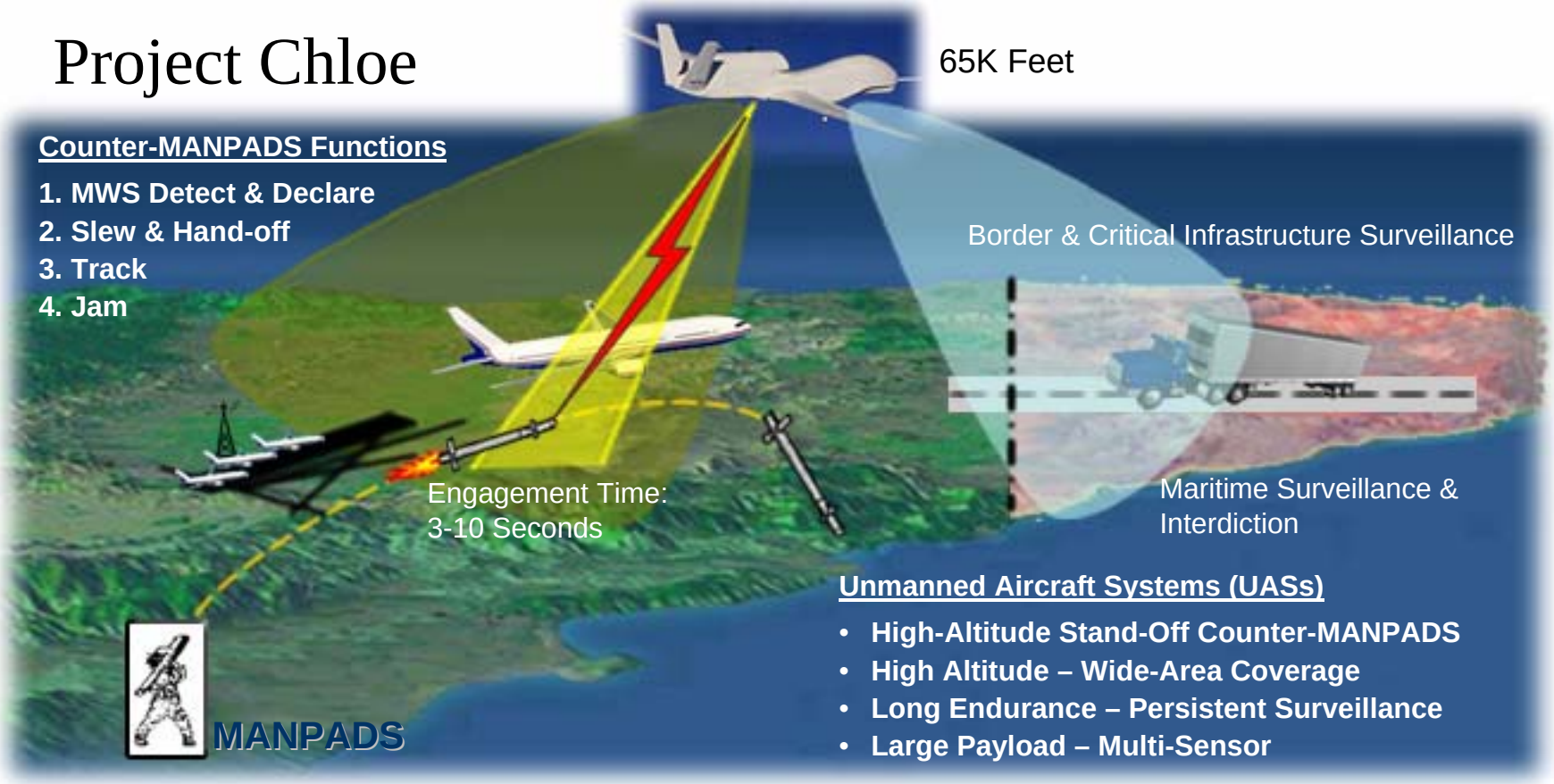
First Man on Moon

Homeland Security

Counter-MANPADS/Persistent Surveillance

Office of Innovation - Homeland Innovative Prototypical Solutions

Project Chloe



Operational Characteristics

- Real-time sensor fusion/dissemination
- Multi-user / border surveillance requirements
- Commercial Aircraft MANPADS protection
- Automatic target detection/recognition
- Persistence (24/7, all-weather coverage)

Homeland Security

Project CHLOE

High Altitude Unmanned
Counter-MANPADS / Persistent Surveillance

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High Impact Technology Solutions

Cell-All Ubiquitous Chem/Bio Detect

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DHS S&T Nanotechnology Projects

- Carbon Nanotube: Next Gen X-ray Source is expected to have a major impact on explosive detection capabilities
- Novel wide-area Toxic Industrial Chemical Neutralization Technology offers efficient means of de-risking chemical threat
- Reliable Peroxide-based Explosives Detection with low false alarm rate provides affordable solution
- New high performance concrete that is extremely blast and fire resistant and affordable
- Lightweight, highly selective and sensitive sensor for explosives
- New water testing tools for rapid detection of unacceptable levels of contaminants in water

Homeland Security

Center of Excellence Alignment

S&T DIVISIONS

Explosives	Chemical/Biological	Command, Control & Interoperability	Borders/Maritime	Human Factors	Infrastructure/ Geophysical
NEW *National Center for Explosives Detection & Counter-measures*	National Center for Food Protection and Defense — A Homeland Security Center of Excellence FAZD Center — National Center for Foreign Animal and Zoonotic Disease Defense CAMRA — Center for Advancing Microbial Risk Assessment *Consolidated Chem/Bio Center*	**IDS-UACs** **RVACs** *Consolidated CCI Center*	**NEW** *National Center for Border Security & Immigration* **NEW** *National Center for Maritime Domain Awareness and Island & Remote/Extreme Environment*	START	PACER (Basic Research, Applied Science, Preparedness & Response, Education) **NEW** *National Center for Gulf Coast Natural Disaster & Port Security*

Operations & Analysis

Risk Sciences Branch & HSI Risk Determination

Homeland Security

CREATE Homeland Security Center

DHS / DOE Laboratory Alignment

	S&T DIVISIONS					
	Explosives	Chemical/Biological	Command, Control & Interoperability	Borders/Maritime	Human Factors	Infrastructure/ Geophysical
DOE	LANL PNNL SNL NTS INL	LLNL SNL ANL LANL PNNL LBNL SRNL	LANL LLNL PNNL ORNL NTS INL LBNL NREL	LLNL SRNL BNL NREL	ANL BNL ORNL SNL	ORNL ANL INL BNL LBNL NREL
DHS		PIADC NBACC				
			NASA	NASA	NASA	NOAA

Standards
Test and Evaluation

TSL / EML

Homeland Security

Revised 03/27/08

Scholars, Fellows and Other Opportunities

Scholarships and Fellowships Program

Since 2003:

- Number of student participants: 467
- Represents 47 states and 155 institutions
- 467 summer internships completed at DHS, DHS laboratories, DHS Centers of Excellence and National Laboratories

American Association for the Advancement of Science

- 14 fellows at DHS S&T since 2004
- Six are now DHS employees, two are DoD employees

International Science and Engineering Fair

- Since 2004, 29 college scholarships awarded to high school students

HS-STEM Career Development Grants

- Awarded eight institutional grants in 2007

Homeland Security

Putting the Question to the DHS S&T Research Council:

What role might nanotechnology play in helping to solve some of the challenges you face?

Homeland Security

Potential Nanotechnology Applications for Homeland Security

Biometrics and Credentialing

- Self-cleaning/disinfecting surfaces for fingerprint capture devices
- Flexible fingerprint capture sensors that conform to the shape of the finger or hand
- Video sensors for collecting face images that automatically and continuously optimize for real-world environments and that communicate with other sensors to deliver identification information
- Electronic credentials or implants for verifying a person's identity

Chem/Bio/Explosives Detection and Tracking

- Enhanced chemical and biological sensors and analytical instruments
- Small, embedded sensors for tracking the movement of materials, packages, and even chemicals or biological substances
- New materials for enhanced sensitivity in trace detection (nanogram level) for explosives and chem/bio agents

Homeland Security

Potential Nanotechnology Applications *cont'd*

Advanced Surveillance

- New surveillance and monitoring systems that provide miniaturized video, audio, and imaging collection capabilities
- Real-time, on-site processing and analysis of sensor or surveillance data via computer or embedded computing systems based on optical or biological materials or quantum effects on the nanoscale

Personal and Infrastructure Protection

- Better, lighter, and simpler protective equipment for first responders or hazmat teams
- Blast-resistant construction materials to protect buildings and other infrastructure

Homeland Security

Doing Business with DHS S&T

Broad Agency Announcements (BAA)

Current Solicitation Topics

- Long Range BAA – addresses needs of 6 S&T divisions
- Explosives Detection
- Communications and Maritime Safety
- Unified Incident Command & Decision Support

Visit www.FedBizOpps.gov and www.hsarpabaa.com

Small Business Innovative Research

- Two Solicitations issued annually address multiple technical requirements that cut across six DHS S&T divisions
- Small business expertise sought in specific topic areas

Visit www.sbir.dhs.gov

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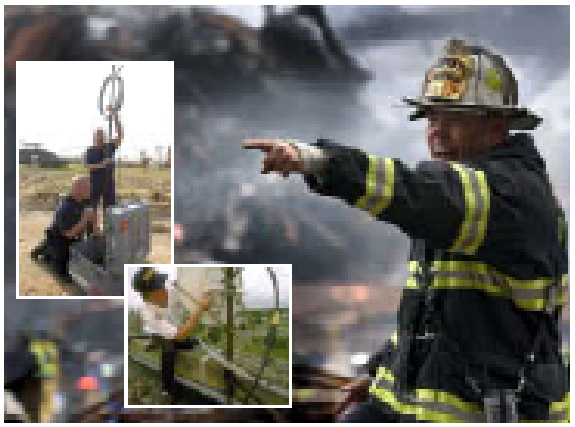
Homeland Security

FROM SCIENCE...SECURITY

Explosives

Chemical/Biological

Command, Control, & Interoperability



Borders/Maritime

Human Factors

Infrastructure/Geophysical

FROM TECHNOLOGY...TRUST

Back-Up Slides

S&T Outreach

2008 Schedule

- ***S&T Stakeholders West*** Los Angeles, January 14-17
- ***ChemBio Conference***, January 28-February 2
- ***Second Annual DHS University Network Summit***, Washington, DC, March 19-21
- ***S&T Stakeholders East***, Washington, DC, June 2-5
- ***S&T Stakeholders PacAsia***, Hawaii, October 7-10

2009 Plans

- ***S&T Stakeholders West,*** Pacific Northwest, February
- ***Global Security Asia***, Singapore, March 17-19
- ***S&T Stakeholders East***, Washington, DC, May
- ***S&T Stakeholders Eurasia***, Sweden, Fall (tentative)

Homeland Security

S&T Points of Contact

Division	Email
Jim Tuttle	S&T-Explosives@dhs.gov
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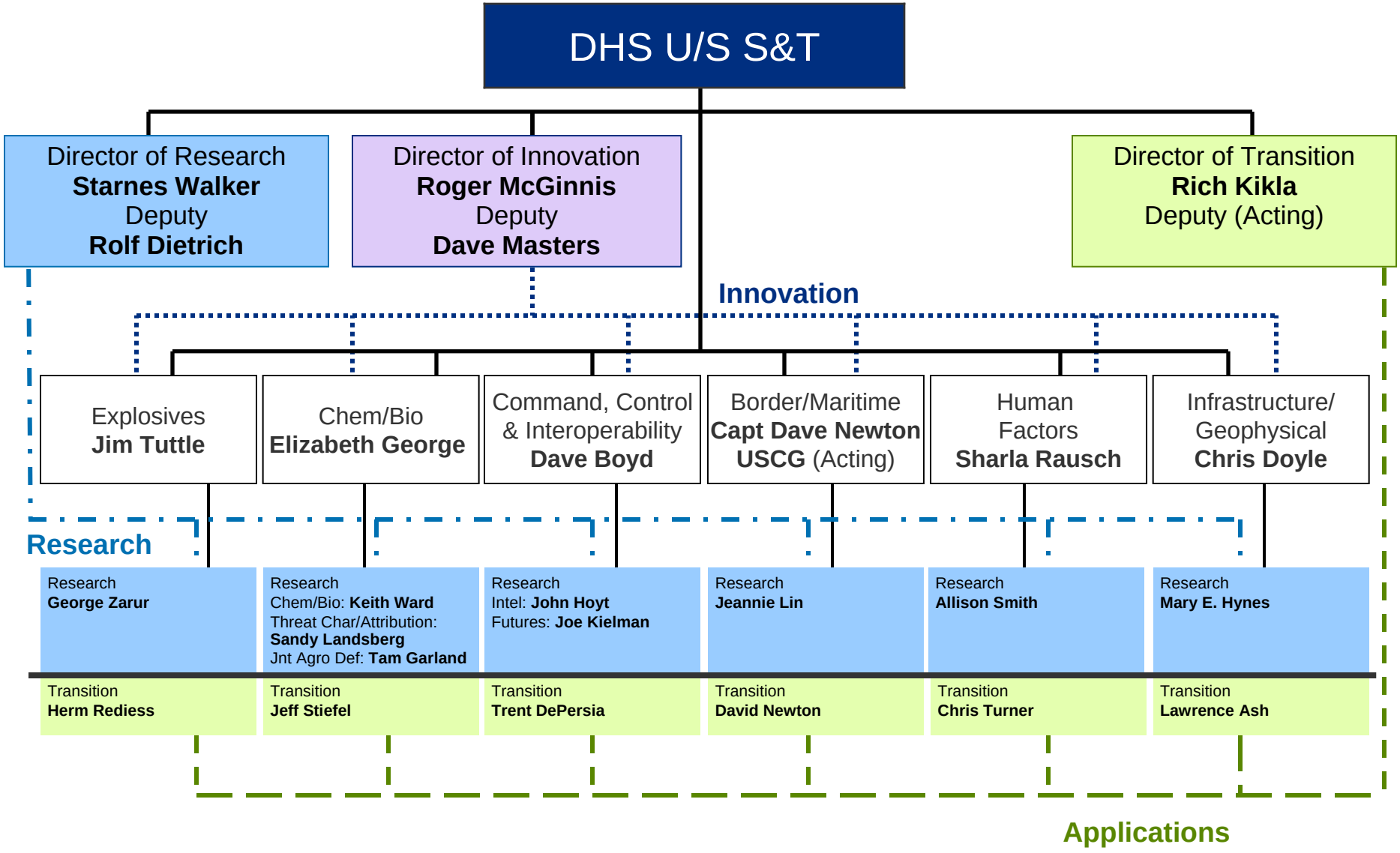
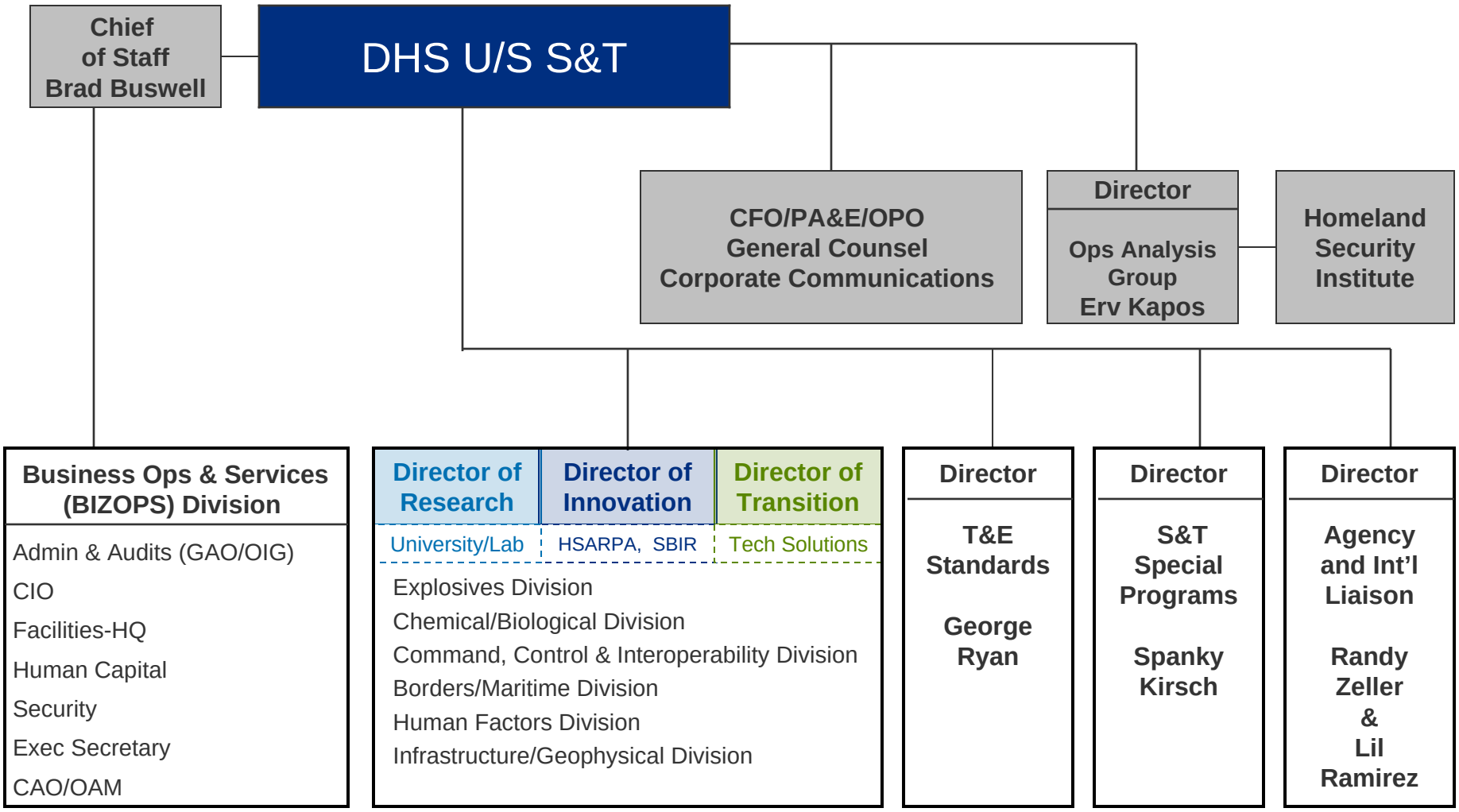
David Boyd	S&T-C2I@dhs.gov
Dave Newton	S&T-BordersMaritime@dhs.gov
Sharla Rausch	S&T-HumanFactors@dhs.gov
Chris Doyle	S&T-InfrastructureGeophysical@dhs.gov
Rich Kikla	S&T-Transition@dhs.gov
Starnes Walker	S&T-Research@dhs.gov
Roger McGinnis	S&T-Innovation@dhs.gov
Lil Ramirez	S&T-InternationalPrograms@dhs.gov

S&T Organization



DHS S&T Directorate



Homeland Security

Homeland Security

Science and Technology

FY-08 Planned Demonstration Timeline

Homeland Innovative Prototypical Solutions (HIPS)

High Impact Technology Solutions (HITS)

HURRICANE & STORM SURGE MITIGATION

FY08 4Q – Storm surge mitigation system concept demonstration at the Army Corps of Engineers, Vicksburg, MS

LEVEE STRENGTHENING

FY08 4Q – New survey methods demonstration using a variety of geophysical sensors on multiple platforms and address weak levees at the Army Corps of Engineers, Vicksburg, MS

MagViz

FY08 4Q – Liquid explosives field demonstration of a screening prototype for TSA 3-1-1 bags in a coin size tub at Los Alamos National Laboratory, NM

RESILIENT TUNNEL

FY08 3Q – Trial prototype inflatable plug device at the West Virginia Memorial Tunnel

REG

FY08 2&4Q – Laboratory demonstrations of fault limiting superconducting cable at Oak Ridge National Laboratory, TN

TUNNEL DETECT

FY08 3Q – Field experiments for improved airborne wide area surveillance system to increase the accuracy of detection

FAST M2

FY08 1Q – Non-invasive sensor demonstration, validation and metrics at MIT Draper Laboratory

CRITICAL INFRASTRUCTURE CHANGE DETECTION

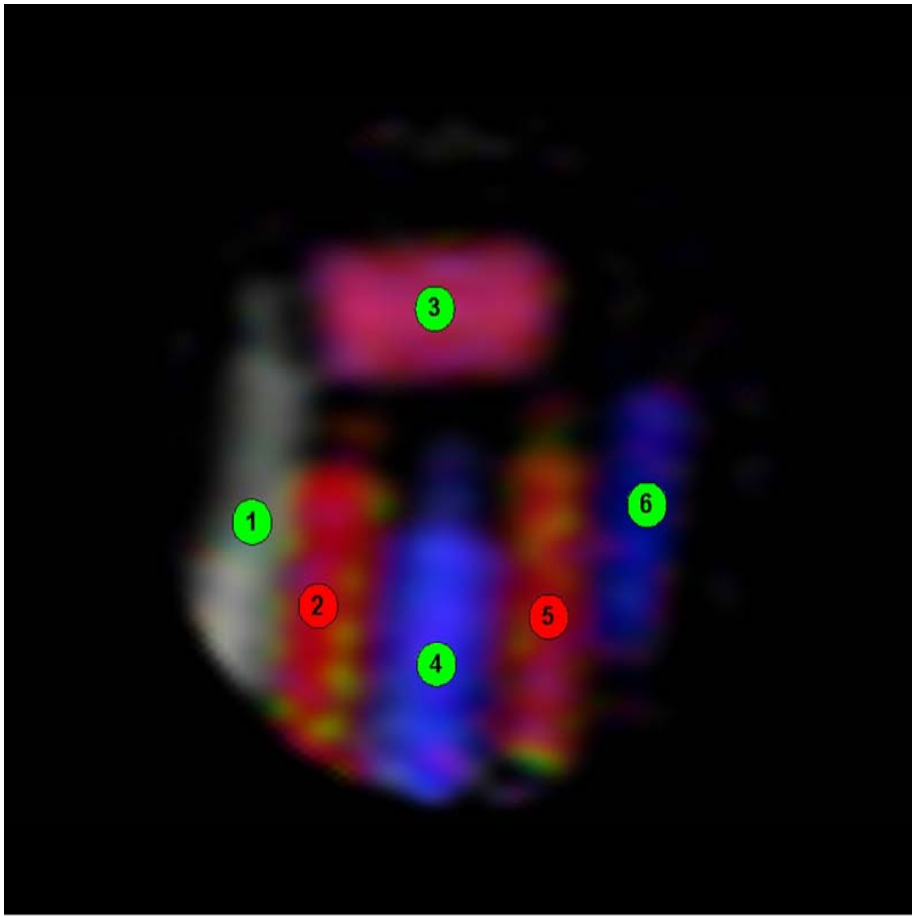
FY08 1Q – Examine technical characteristics of a new ultra high resolution optical sensor in lower Manhattan in coordination with the New York Police Department

CHLOE

FY08 1Q – Live-Fire Counter-Manpads Detection demonstration at White Sands Missile Range

Science & Technology
Innovation Portfolio
HSARPA

MagViz: Using MRI-Like Technology to Detect Liquid Explosives



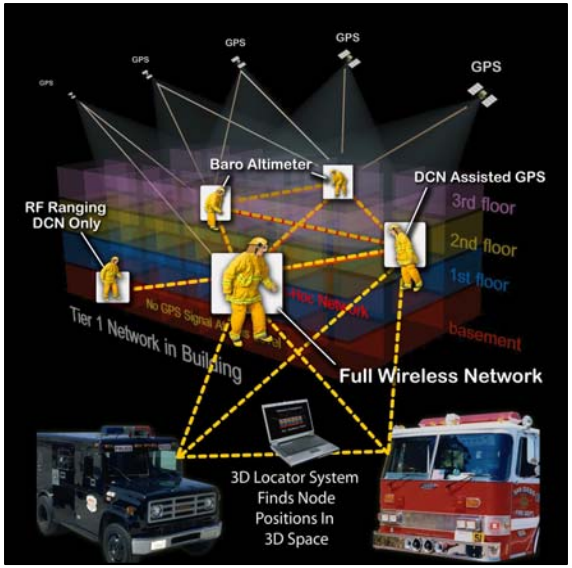
Homeland Security

TechSolutions Projects

Next Generation Breathing Apparatus

Ocular Scanning Nerve Agents/Toxic Gases

3-D Location

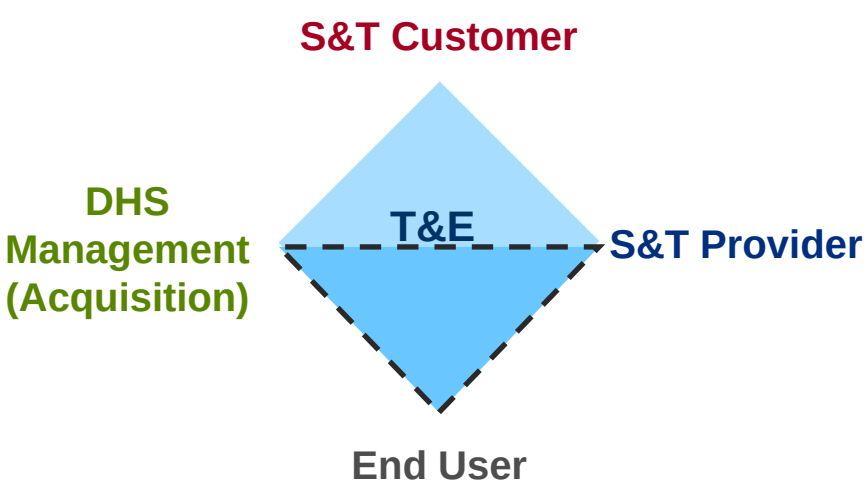


Biometric Identification

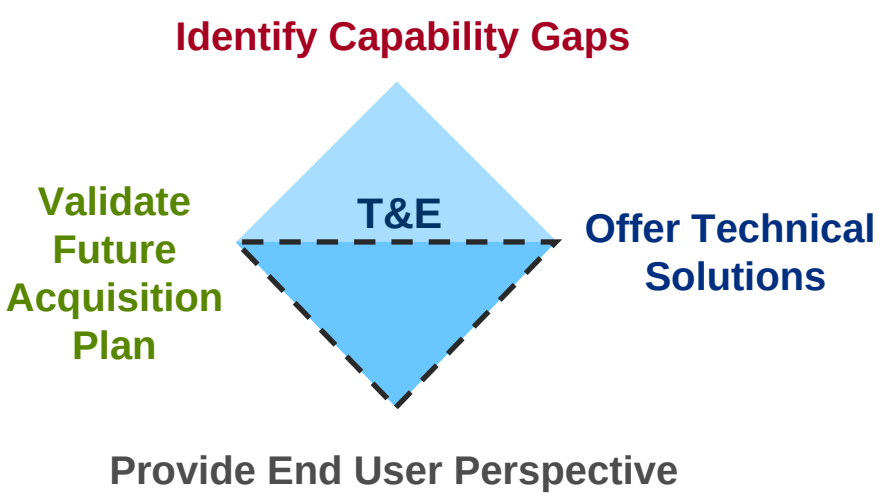
Fire Ground Compass

Carrizo Cane – Bio Agent

S&T Transition IPT Members and Function



- Industry Board of Directors Model
- Consensus-driven Process



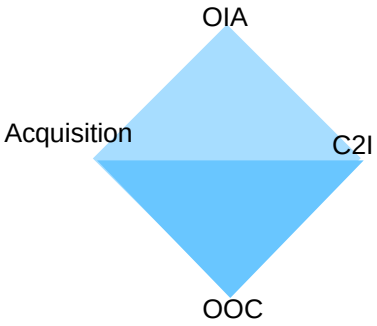
End Result :
Prioritized Investments in S&T

Homeland Security

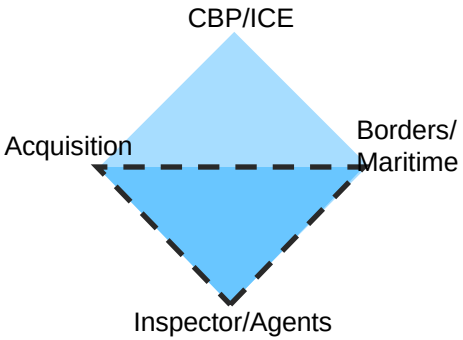
DHS Requirements/Capability Capstone IPTs

DHS S&T Product – "Enabling Homeland Capabilities"

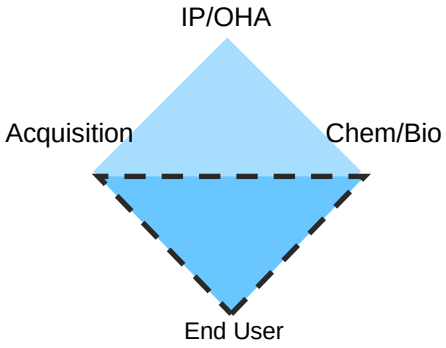
Information Sharing/Mgmt



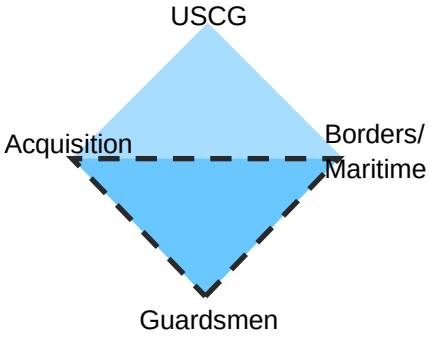
Border Security



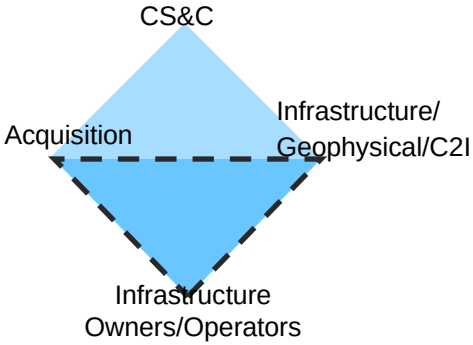
Chem/Bio



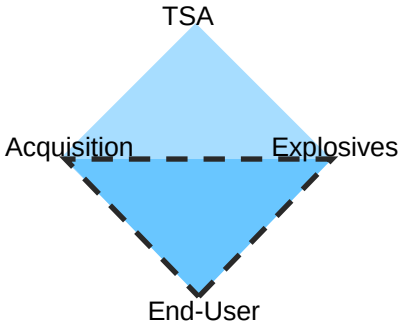
Maritime Security



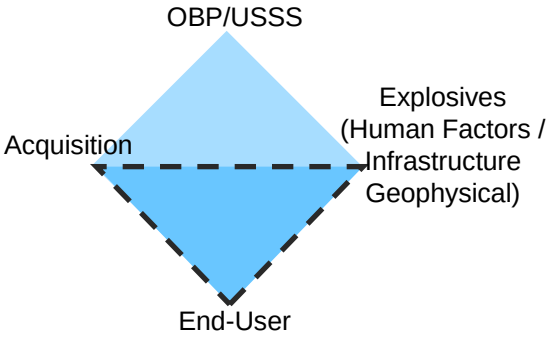
Cyber Security



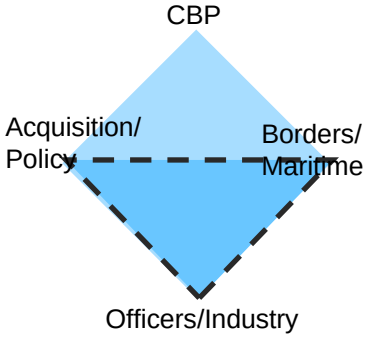
Transportation Security



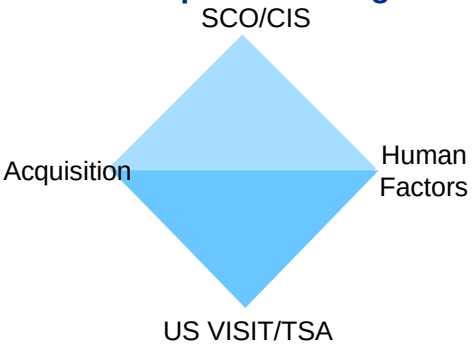
Counter IED



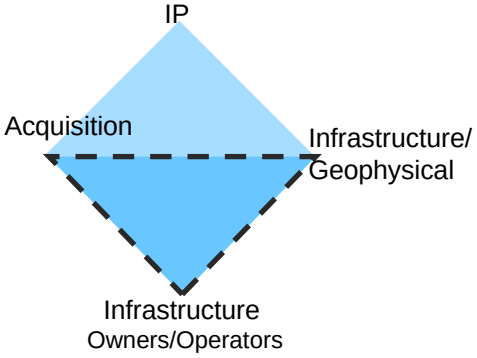
Cargo Security



People Screening

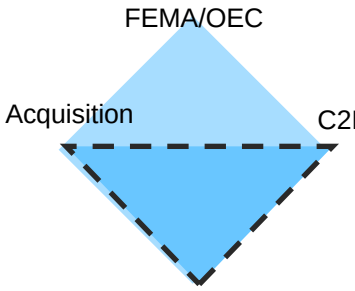


Infrastructure Protection

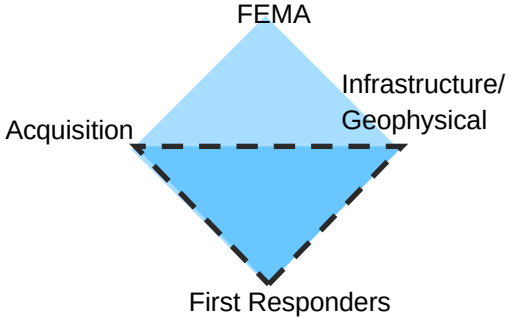


Incident Management

Interoperability



Prep & Response



The Dazzler Wins TIME Magazine Award!

Law & Order

Blinded by the Light

The hunt for better non-lethal weaponry gained new urgency when several people died in recent years after being shocked by a Taser. The LED Incapacitator, funded by the Department of Homeland Security, is a novel alternative. When officers shine the flashlight-like device in a person's eyes, high-intensity LEDs, pulsating at varying rates, will make the suspect temporarily blind and dizzy.

Available: 2008

Homeland Security

DHS Goals: Secretary's Priorities

- Protect our nation from dangerous people
- Protect our nation from dangerous goods
- Protect critical infrastructure
- Build a nimble, effective emergency response system and culture of preparedness
- Strengthen and unify DHS operations and management

Homeland Security

Taking Stock of the Threat

“To protect the American people, we are on the offense against the terrorists across the world. It is better to defeat them over there than to face them here in the United States.”

– President George W. Bush

"The growing number of radical, self-generating terror cells in Western countries indicates that the radical and violent segment of the West's population is expanding."

– Senator Susan Collins

"Bin Ladin has inspired affiliates and imitators. The societies they prey on are vulnerable; the terrorist ideology is potent; and the means for inflicting harm are readily available. We cannot let our guard down.“

– 9-11 Commission Report

Homeland Security

S&T Goals

Consistent with the Homeland Security Act of 2002

- Accelerate delivery of enhanced technological capabilities to meet requirements and fill capability gaps to support DHS Agencies in accomplishing their mission
- Establish a lean and agile GS-manned, world-class S&T management team to deliver the technological advantage necessary to ensure DHS Agency mission success and prevent technology surprise
- Provide leadership, research and educational opportunities and resources to develop the necessary intellectual basis to enable a national S&T workforce to secure the homeland

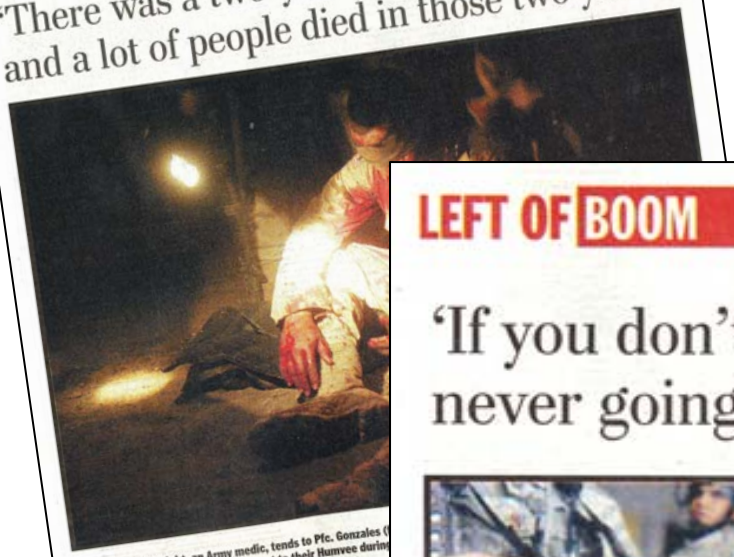
The Washington Post

Sept. 30-Oct. 3, 2007

LEFT OF BOOM

THE STRUGGLE TO DEFEAT ROADSIDE BOMBS

'There was a two-year learning curve . . . and a lot of people died in those two years'



Spec. Luis Casas, right, an Army medic, tends to Pfc. Gonzales (shrapnel from an IED that exploded next to their Humvee durin

LEFT OF BOOM

THE STRUGGLE TO DEFEAT ROADSIDE BOMBS

'You can't armor your way out of this problem'

LEFT OF BOOM

THE STRUGGLE TO DEFEAT ROADSIDE BOMBS

'The single most effective weapon against our deployed forces'

LEFT OF BOOM

THE STRUGGLE TO DEFEAT ROADSIDE BOMBS

'If you don't go after the network, you're never going to stop these guys. Never.'

Homeland Security

TERRORIST ROADMAP

LIKELIHOOD OF OCCURRENCE

HIGHER

LOWER

LOWER

HIGHER

CONSEQUENCE OF OCCURRENCE

Cyber

IEDs

Gov't, economy, societal instability

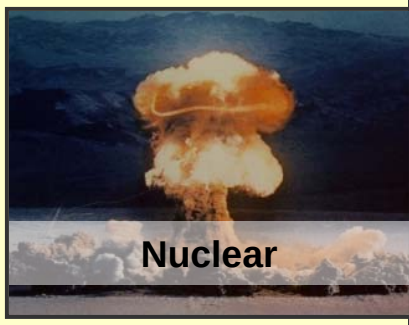
Trans Nat'l Migration

Biological

Chemical

Physical Critical Infrastructure Attack

Radiological



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BOMBS, BORDERS, BUGS, AND BUSINESS