Role of Nuclear Science in Homeland Security (Beyond Basic Research)

June 17, 2008

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Homeland Security

Lab vs Field: Detection

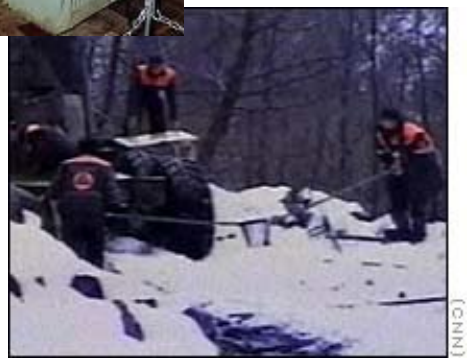
Homeland Security

Lab vs Field: Detection

Lab vs Field: “Offices”

Lab vs Field: “Offices”

“Targets”: All Shapes and Sizes



“Growth Industry”: Benchmarks

- IEEE Nuclear Science Symposium
  - 2005: “The Role of Science and Technology in Nuclear and Radiological Counterterrorism for Homeland Security” (lead plenary talk)
  - 2006: “The Role of Detection Technology in Nuclear Counter-Terrorism for Homeland Security”
  - 2007: “Testing Challenges for Next Generation Radiological/Nuclear Detection”
- 2006/2008 Symposium on Radiation Measurements and Applications at U. Michigan/LBL
  - Partial funding by DOE, DTRA, DNDO

Increasing focus on Homeland Security applications

at conferences and in media

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Nuclear Terrorist Threat: Media Coverage

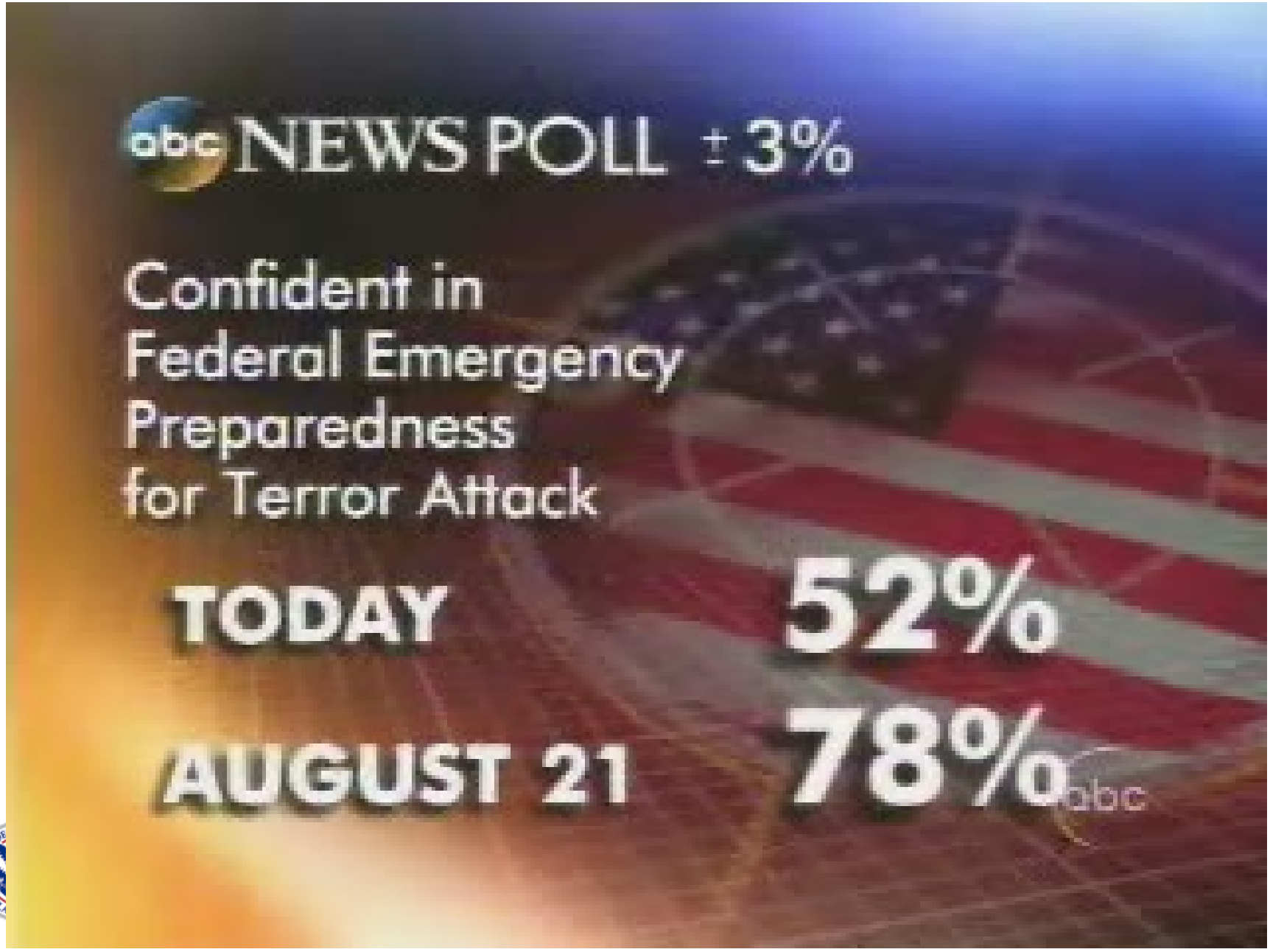
- **"…the single most serious threat to US national security"**
  - President George W. Bush and Senator John F. Kerry
    1st Presidential Debate 2004

- "Loose Nukes on Main Street" by ABC News

- "Behind Closed Doors" on ABC News

Homeland Security

“Loose Nukes on Main Street”



The Players

- Federal Government
  - (e.g. DOE, DHS, DoS, DoD, NRC, NIST)
- National Labs
  - (e.g. DOE, DoD)
- Universities
- Private Industry
  - The usual list of detector manufacturers plus more
  - Contracted to government
  - Tech transfer from labs
- State and local governments

Homeland Security

Scientists' Roles

- Research and Development
- Test and Evaluation
- System Architecture Modeling
- Manage lab, vendor, and university work
- Analysis of data in support of field operations
- Standards
- Policy
- Field Operations

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Sample* of Activities

Institution	R&D	Model & Simulation	T&E	Ops Support	Emergency Response	Technical Reachback analysis	Policy
ANL	X				X		
BNL	X			X	X	X	
INL	X			X	X		
LANL	X	X	X		X	X	
LBNL	X						
LLNL	X	X	X		X	X	
ORNL	X				X	X	
PNNL	X	X	X	X	X		
RSL			X	X	X	X	
SNL	X	X	X		X	X	
SRNL			X	X	X	X	
Univ.	X	X					
Industry	X	X					
Gov't	X		X	X	X	X	X

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*Areas focus on primary homeland security roles. Institutions work in areas beyond those listed.

R&D Areas

- Hardware
  - Detection materials: larger, higher resolution, more rugged, cheaper
  - Detection Strategies
    - Passive detection: directional, imaging
    - Radiography: accelerator-based (single/dual energy), muon-based
    - Active interrogation: (n or γ) in > (n or γ) out
  - Electronics: smaller, lower power, cheaper
  - Systems: smaller, simpler, more rugged, more automated
- Software
  - Analysis: Spectral, Patterns, Anomalies
  - Automatic Z determination
- Modeling
  - Detector performance
  - High level: encounter analysis

Near-term: Improve systems and techniques

Long-term: Transform the way we do business

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Test and Evaluation Areas

- Proof of Concept
- Developmental
- Operationally Relevant
- Operational

Mission

Ensure all technologies, tactics, and processes are thoroughly evaluated & demonstrated prior to widespread deployment.

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T & E: Developmental
(Advanced Spectroscopic Portals)

Homeland Security

T & E: Operationally Relevant
(Handheld, Backpack, and Mobile Systems)

ANOLE

- **Inform F/S/L acquisition**
- **Optimize operational use**

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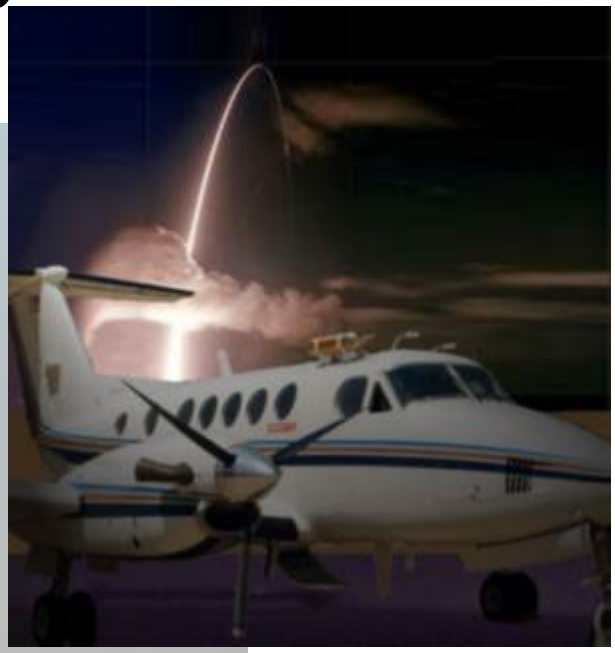
DOE Field Operations (examples)

- Aerial Surveys
- Emergency Response

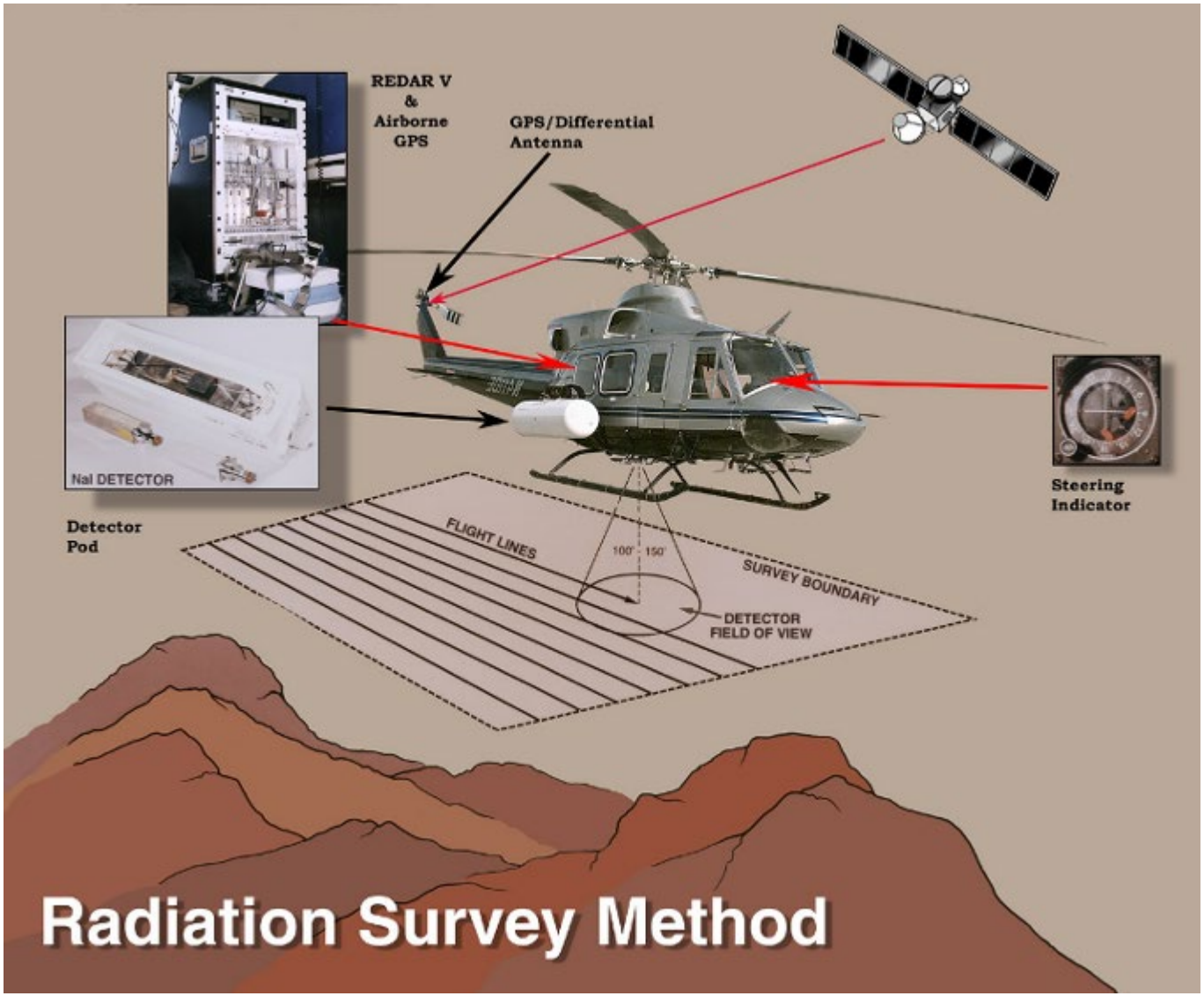
•Apply technology and experience in fast-paced, uncontrolled environments

•Public Safety

Aerial Surveys



Aerial Survey Method



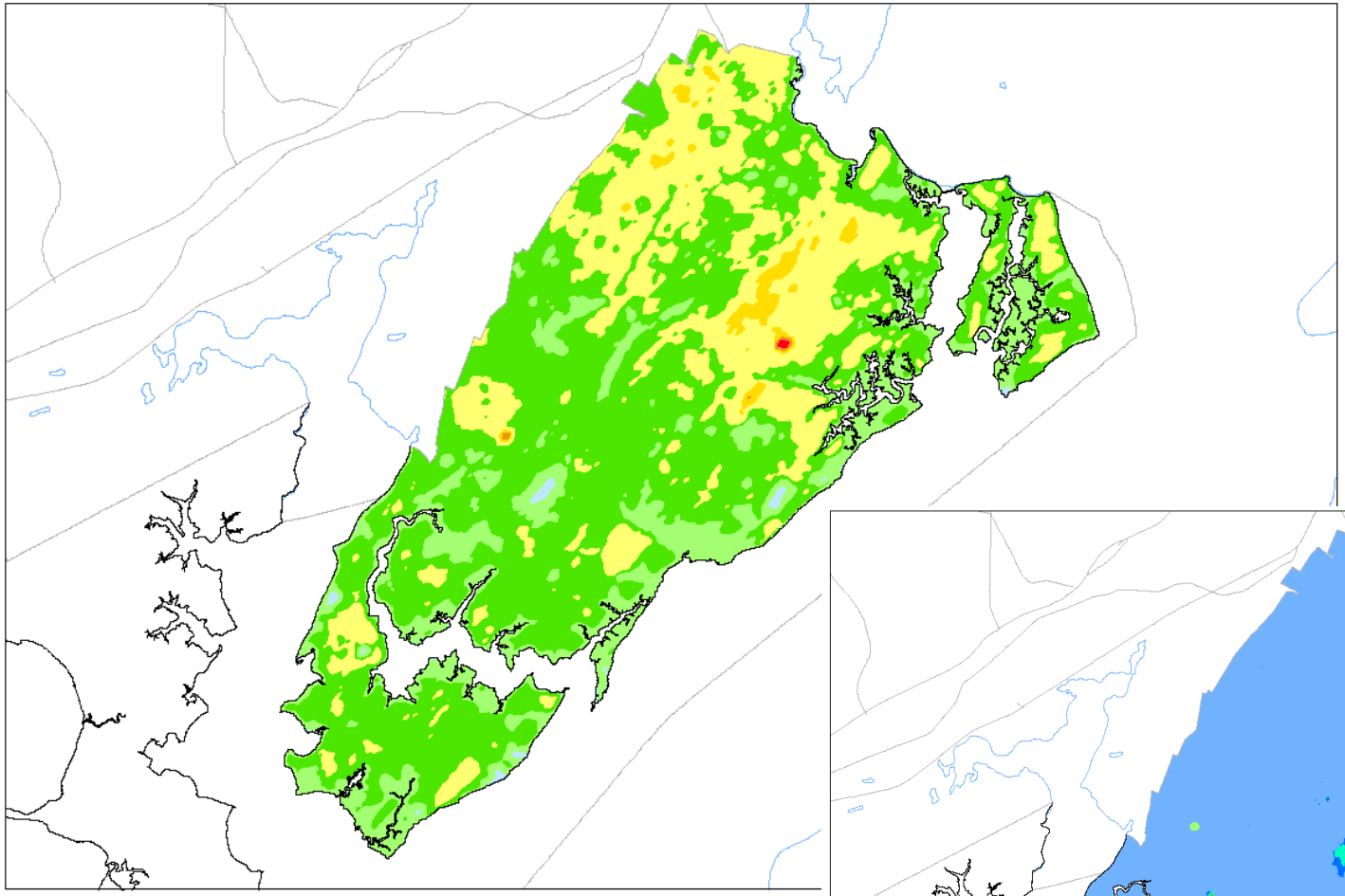
- Sensitive
- Good spatial resolution
- Spectral

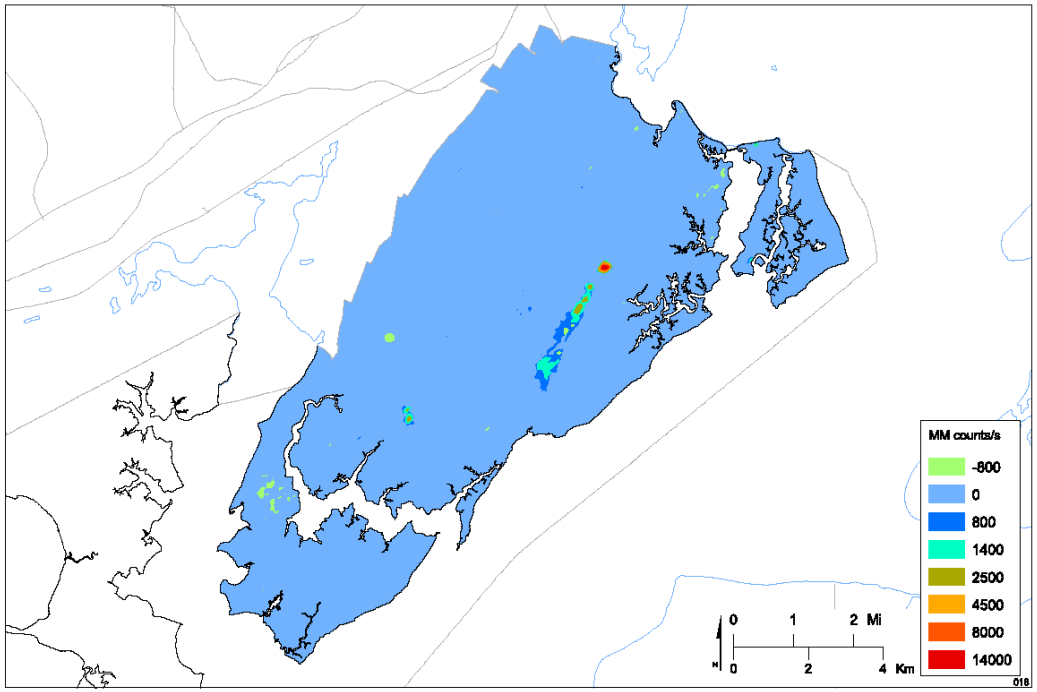
Lab-quality data

in

harsh environment

Aerial Survey Products





Radiological Assistance Program

The RAP mission is to provide a flexible, 24-hour, first response capability to Federal, State and local governments for incidents involving radiological emergencies.

“Behind Closed Doors”

Diversity

Yale graduate physics “class of 85” (**22 students**)

- Homeland security
- Detectors for gamma-ray astrophysics (& other applications)
- Technically focused venture capital
- Management consulting
- Wall Street analyst
- Medical imaging
- Microsoft
- AT&T Bell Labs
- Physics professor

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