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Sandia National Laboratories

Physical Protection of Nuclear Material:

Support and Facilities

John Matter
Manager, International Physical Security Department

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Exceptional Service in the National Interest

National Nuclear Security Administration

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Briefing Content

- SNL Activities in Support of the DOE/NNSA/NA-241 International Nuclear Security Program
- SNL Physical Protection Test, Demonstration, and Training Facilities

SNL Support of NA-241 Program

- **Physical protection of nuclear material during production, use, storage, and transport**
- **U.S.-obligated nuclear material in countries with bilateral agreements**
- **Physical protection exchanges and assessment visits support in kind**
- **IAEA Office of Nuclear Security and Member States**
- **Nuclear Security Series guidance documents**
- **Bilateral collaboration with non-weapon states**
  - Excluding implementation of upgrades

Site Assessments I

- **Countries with U.S.-obligated nuclear material (approx. 50)**
  - Physical protection obligation specified in “123” Agreement
  - Based on international norm of IAEA INFCIRC/225
    - Compliance required for exports
  - Physical protection exchange visits
  - Assessment is not an inspection

Site Assessments II

- **IAEA International Physical Protection Advisory Service (IPPAS)**
  - Requests by Member State (approx. no.)
  - Scope is legal and regulatory framework and implementation example
  - Outbriefing and report with recommendations, suggestions, and good practices
  - International team of experts with complementary expertise
    - U.S. a frequent participant

Technical Guidance (*NA241/SNL support)

- **IAEA Nuclear Security Series**
  - Fundamentals*
  - Recommendations*
  - Implementing Guides*
  - Technical Guidance*
- **Process**
  - Document Preparation Profile
  - Consultancy Meetings*
  - Technical Meeting*

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Professional Training I

- Original U.S. commitment in Nuclear Nonproliferation Act of 1978
- International Training Course (ITC) on Physical Protection of Nuclear Facilities and Materials
- Over 600 participants from 60 countries
- Lectures, subgroup exercises, field activities, and final comprehensive exercise using hypothetical facility
- Taught by SNL in ABQ, 3 weeks, in English
- ITC-22 completed in November 2010

Professional Training II

Physical Protection courses developed and presented via NA241/SNL process

Physical Protection Training Courses		
Introductory	***Intermediate***	***Advanced***
• Foundations of Physical Protection • Nuclear Security Culture • Physical Protection of Nuclear Facilities and Materials (ITC/RTC/NTC) • Physical Protection of Research Reactors • Physical Protection of Radioactive Sources • System Effectiveness Evaluation	• Design Basis Threat • Crisis Management • Insider Protection • Transport Security • Vulnerability Analysis • Security System Performance Testing • Vital Area Identification (VAI)	• Advanced Vulnerability Analysis • Advanced VAI Techniques • Performance Testing Program Development 

Professional Training III

Courses Presented in South Africa

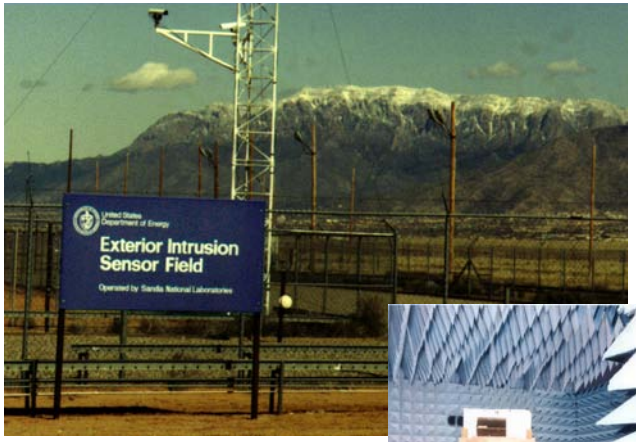
Course	Date	Number of Participants
Design Basis Threat	**August 2003**	14
Physical Protection of Research Reactors	**July 2004**	24
Physical Protection of Radioactive Sources	**March 2006**	48
Physical Protection of Nuclear Facilities and Material	**October 2006**	36
Vital Area Identification	**May 2007**	40
Nuclear Security Culture	**September 2008**	25
Protection Against Insiders	**March 2009**	26
Physical Protection of Nuclear Facilities and Material	**December 2009**	22
Vulnerability Analysis	**February 2010**	27

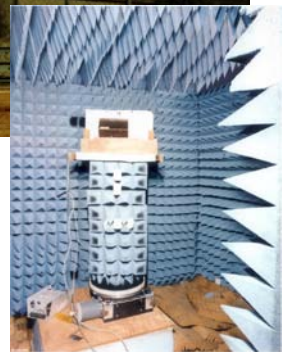
Bilateral Collaboration

- **Based on U.S. nuclear material security interests**
- **Twin objectives**
  - Enhance international nuclear security
  - U.S. intellectual gain
- **Recent and current partners**
  - Japan
  - Republic of Korea
  - France
  - Brazil
  - Argentina

SNL Training, Test and Demonstration Facilities

- Intrusion Detection Sensor Test Field
- Nuclear Security Center of Excellence (NSCOE)
- Technical Evaluation Assessment Monitor Site (TEAMS)
- Technology Training and Demonstration Area (TTD)





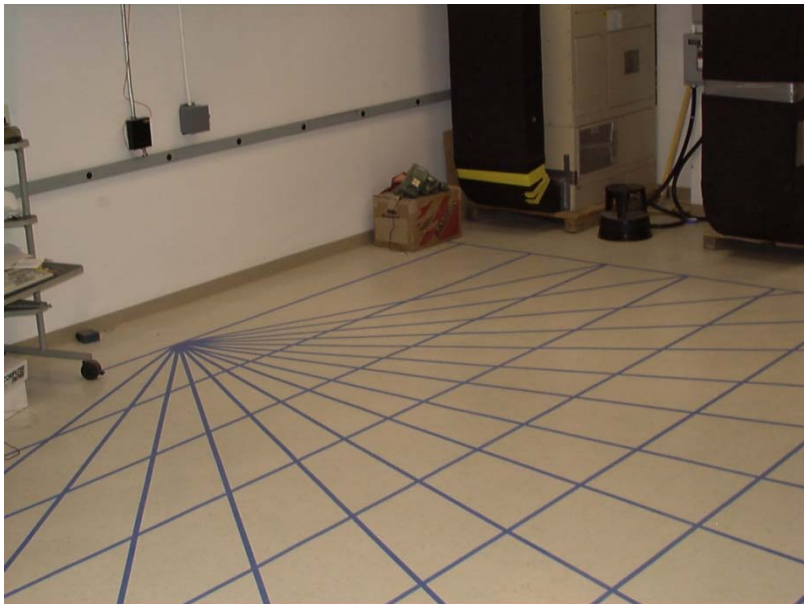
Intrusion Detection Sensor Test Field

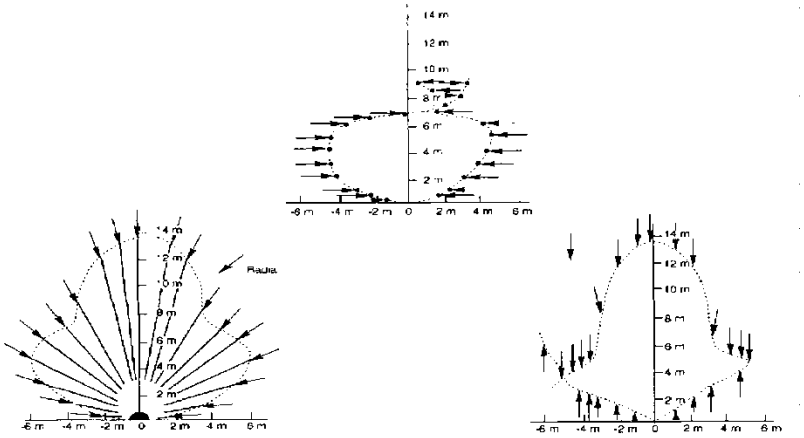
Exterior Intrusion Sensor Test Field

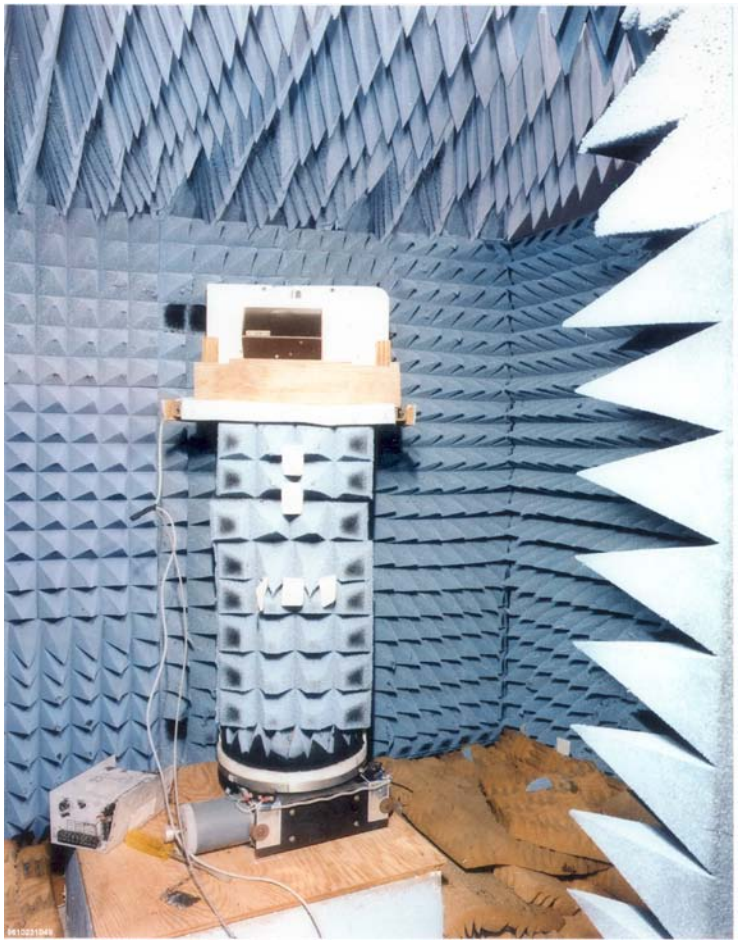
Primary focus:

- **Perimeter intrusion detection sensors**
- **Video alarm assessment systems**
- **Interior sensor testing**
- **Some Extended Detection Sensor testing capability**

Interior Sensor Testing







Remote Testbeds

Prior to installation candidate sensors are often tested at the facility where they will be used

Video Test Laboratory (VTL)

Small Facility with several storage bunkers originally designed as a demonstration site

Primary focus:

Video Assessment Testing

Access Delay Demonstration and Training

Sensor Evaluation

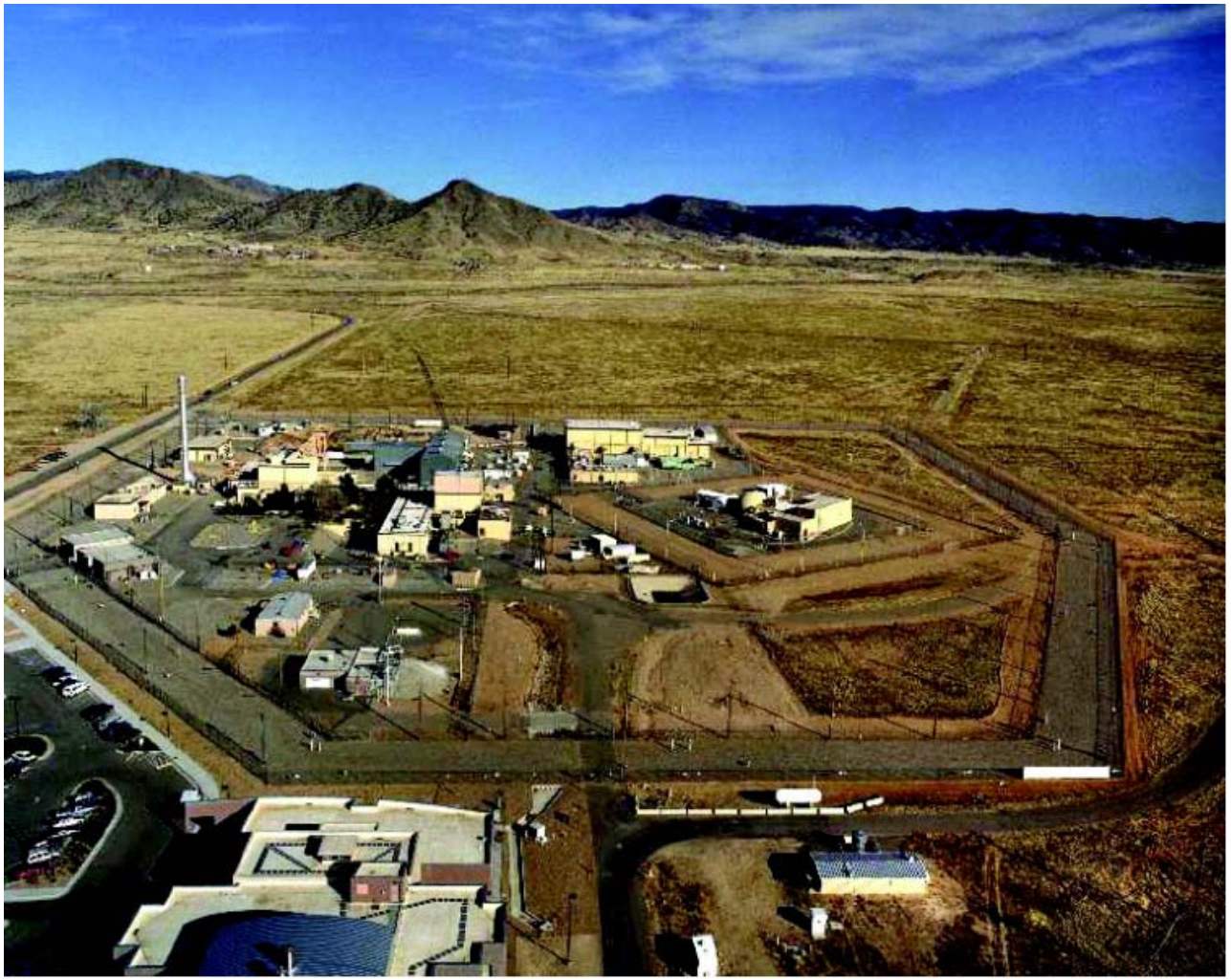
Outdoor Test Facility (OTF)

Mostly open area

Primary focus:

Border Applications and Extended Detection sensor evaluations

Nuclear Security Center of Excellence



Former Category I nuclear facility

Planned Activities:

Primary focus will be training

- **Perimeter systems**
- **Response force**
- **System integration**

NSCOE Vision, Mission, Location

Vision

- The Nuclear Security Center of Excellence (NSCOE) serves as a model for engagement internationally and domestically on nuclear security issues

Mission

- The Center integrates Sandia ST&E and program foundations to address security challenges for physical protection systems, nuclear material management, and nuclear security

Proposed Location

- The NSCOE will integrate existing facilities and capabilities located across Sandia with a primary focus on the existing security systems in Tech Area V (TA-V)

Unique Opportunity to Enhance Nuclear Security Training

- TA-V is a national asset that can be used for the demonstration and training of physical protection technology at relatively low initial costs without impacting its current mission

TA-V Contains Elements of An Entire Physical Security System

Perimeter Intrusion Detection & Assessment System (PIDAS)

Entry Control Portal (ECP)

Central Alarm Station (CAS)

TA-V is Strategically Located Near Other Security Facilities

Technical Evaluation Assessment Monitor Site (TEAMS)

- Originally built for Technical On-Site Inspection
- CONUS Testbed
- Port of Albuquerque

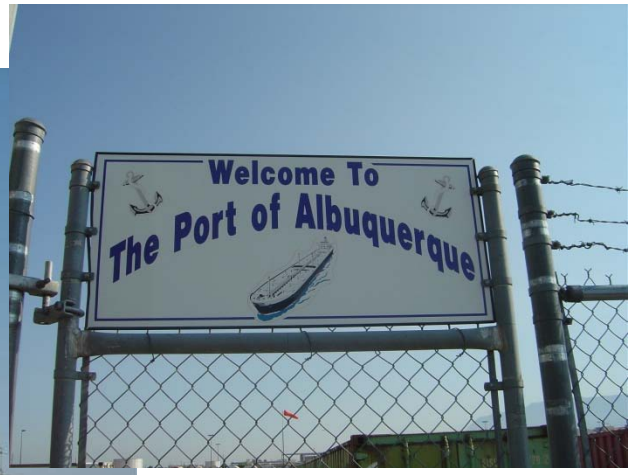
CONUS Testbed (TEAMS)

Located at TEAMS

Primary function:

Radiation Detection System Integration Evaluation

Port of Albuquerque (TEAMS)



Located at TEAMS

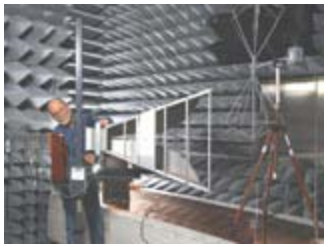
Primary Function:

Cargo Container Security Device Testing

ISSTEC Features

Other Test Facilities Available at Sandia

- Acoustic/Vibration
- Anechoic chambers
- Electrostatic Discharge
- Mechanical shock
- Climatic (Temperature, Humidity, Salt Fog, Thermal Shock)
- Centrifuge
- Nondestructive testing
- Modeling/Analysis
- Structural Mechanics
- Explosives/Burn Facilities
- Radiation Effects



Cooperative Monitoring Center (CMC)

- **The CMC was established in 1994 to provide a forum for technical and policy experts to explore how technology could help implement confidence building measures, treaties, or other agreements.**

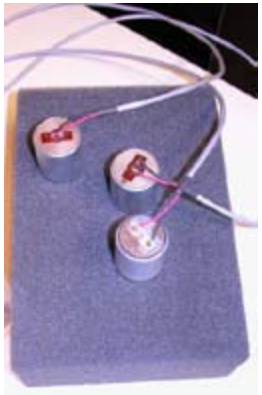
- **Facilities and partnerships include:**
  - Training on the technologies, procedures, and approaches (e.g., on-site inspection, remote monitoring, imagery analysis, sensors, tags and seals)
  - Analysis of security issues and development of options for implementing solutions
  - Test and evaluation of technical approaches
  - Implementation and operation of technical measures.

Technology Training and Demonstration Area (TTD)

- **Exhibit area for technologies used for:**
  - Nonproliferation
  - Combating terrorism
  - International security
  - Arms control
- **Technologies include**
  - Sandia-developed
  - Commercial vendor products

TTD Arms Control Verification Exhibits

- Satellite Monitoring
- Seismic Monitoring
- On-site Inspections (Portable measurement equipment)
- Video Monitoring



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TTD Physical Protection Exhibits

- Intrusion Detection
- Access Control
- Delay Technologies
- Analysis Tools

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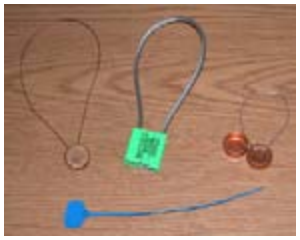
TTD Tags and Seals

- Loop seals
- Bolt seals
- Tamper tape
- Cobra seal
- Active fiber optic seals
- Tamper-evident shrink wrap
- Reflective particle tags
- Bar code tags



TTD Fissile Material Storage Monitoring Exhibit

- **Simulated material storage vault**
- **Entry captured by a motion detecting** camera
- **Two containers that can be used for** fissile materials and are monitored electronic sensor platforms with fiber optic seals
- **Storage pallet for high-density storage of containers**
- **Collection of containers from Russia and the US that are equipped with a selection of smart bolts**
- **Material Monitoring System (MMS), a network-based data system that collects, stores, and displays sensor data.**

TTD Radiological Source Monitoring

Radiological Threat Reduction (RTR) Program addresses:

- **Security of radioactive sources in hospitals, manufacturing plants, universities, construction sites**
- **Location, recovery, safe storage or disposal of orphaned sources**

TTD Other Exhibits

- Cooperative Border Monitoring
- Second Line of Defense - Megaports
- Shipping Container Security
- Nuclear Energy
- International Biological Threat Reduction

Conclusion

- **SNL has been the DOE lead laboratory for physical protection for almost 40 years**
- **Support activities for NA-241 include:**
  - Physical protection of nuclear material during use, storage, and transport
  - U.S.-obligated nuclear material in countries with bilateral agreements
  - IAEA Office of Nuclear Security and Member States
  - Bilateral collaboration with non-weapon states
- **Facilities include world class test, demonstration, and training facilities for physical protection components, systems, and technology**