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Warhead Monitoring

Technical Challenges to Maintaining a Chain of Custody

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Baseline for Discussions

- **Both the US and Russia will maintain a triad of forces and some will be "deployed".**
- **In a future treaty, all nuclear warheads will be accountable items.**
  - **Deployed**
  - **Non-deployed**
  - **Excess to military requirements**
- **Declarations would likely include:**
  - **Total number of warheads**
  - **All locations that possess warheads**
  - **Number of warheads at each location, perhaps by type**

Chain of Custody - Definition

- **The process of monitoring and maintaining the status, security and authenticity of an accountable item throughout a defined lifecycle.**
- **Specifically for Warhead Monitoring: Ensure that a declared warhead, once identified, is continually accounted for and tracked from deployment to dismantlement.**

Technical Challenge

- **Design and implement a warhead monitoring regime that will support verification of treaty declarations and maximize the risk of treaty subversion (cheating).**
  - **Classification Issues**
  - **Complexity**
  - **Sustainment**
  - **Nuclear certification**
  - **Varied operational environment**

DoD/DOE Operational Environment

Navy SSBN Bases

SSBN Launcher Tubes
Storage
Deployed
Non-deployed
Support Facilities

Air Force ICBM Bases

ICBM Launch Facilities
Storage
Deployed
Non-deployed
Support Facilities

Air Force Bomber Bases

Deployed on Launchers
Storage
Non-deployed
Support Facilities

Forward Deployed in Europe

Dual Capability Aircraft
Deployed
Storage
Non-deployed
Support Facilities

Intra- and Inter-Site/ OCONUS Transportation

DoD Central Storage Sites Navy and Air Force

Storage
Non-deployed
Military Excess
Support Facilities

DOE Storage Site

Storage
Non-deployed
Military Excess
Support Facilities

Warhead Life Cycle is a Dynamic Process That Directly Impacts the Design and Implementation of a CoC

- Deployment Preparations
- Maintenance (local, depot, or DOE)
  - System failures
  - Component replacements
- Inventory Verifications
- Stockpile Life Extension Program
- Surveillance Program
- Flight Test Program

Monitoring Challenge at Deployment Site

Deployed

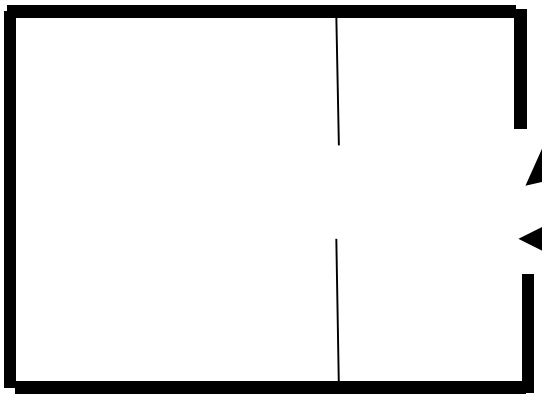
- Installation and removal of warhead

Activities Related to Storage

- Periodic Inventory
- Maintenance to bunker
- Transfer to MX facility
- Receipt from MX facility
- Receipt of new warheads
- Transfer to DOE transportation

Storage

Maintenance Facility



Activities at MX Facility

- Warheads in various configurations
  - Warheads in maintenance
  - Preparation for deployment
  - Inter/intra -site shipment prep
- Interim storage
- Staging for deployment

Using Monitoring Scenarios To Drive Requirements

Main Operating Base

Launch Facilities

PTV

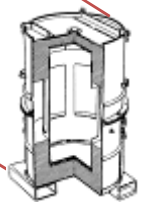
Transport Container

Weapons Storage and Maintenance

Transit

Long-Term DoD Storage

Tag & Seal



Storage

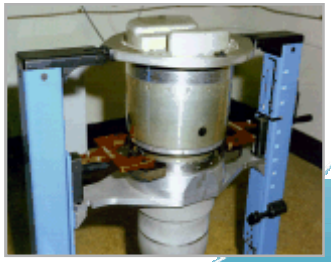
Transit

DOE/Pantex

Weapon Storage

Handoff

Dismantlement



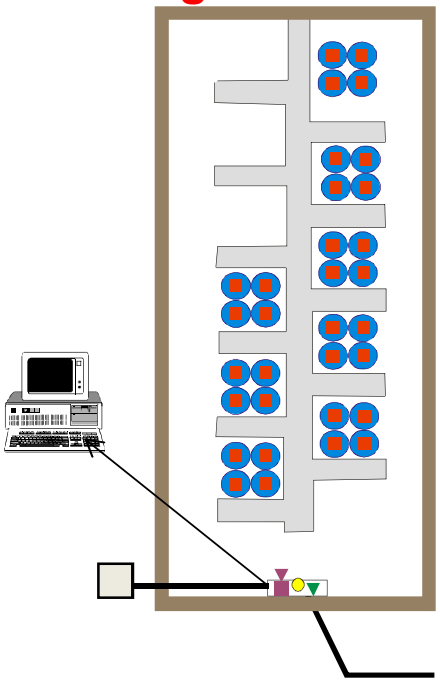
Scenario Objectives:

1. Capture treaty-accountable warheads (TAI) in quantity during baseline inspection
2. Maintain safe, secure continuity of knowledge during transportation and storage
3. Minimize impact on site operations and protect classified information

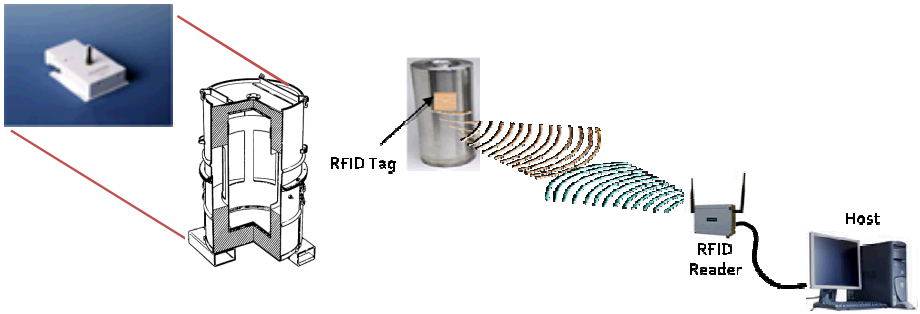
Chain of Custody Component Definition

Warhead Authentication

Storage Monitoring

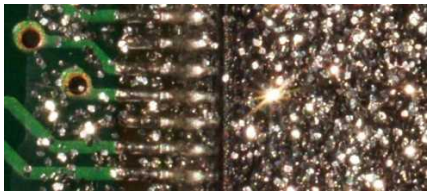


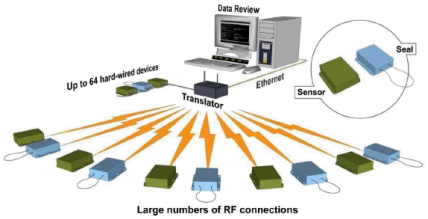
Item Monitoring

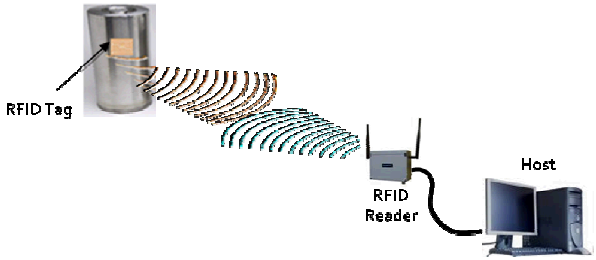


Transportation Monitoring

Current State of Technology (Selected)







Elements of Chain of Custody

	Tamper Detection	WHD/Equipment Security	Facility Security	Unique Identification	Remote Monitoring	Transportation Tracking	Authentication
1. Tiny Gamma Spectrometer	●	●			●		
2. Reflective Particle Tag	●			●			●
3. Flash Thermography	●	●	●				●
4. RF Remote Monitoring of High-value Assets	●	●		●	●	●	
5. Remotely Monitored Seal Array	●	●			●	●	
6. RF Inventory Tag/Seal System	●	●		●	●	●	
7. Multi Band RFID High-value Asset Tracking	●	●			●	●	

Conclusions

- The gap between a policy of capturing all warheads as treaty accountable and executing a viable warhead monitoring regime is significant.
- Understanding the dynamics of the warhead lifecycle and nuclear operations is key to closing that gap.
  - Determining what processes are crucial to monitor and which ones are “off limits” will help the technical community understand their task