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Learning from the Past and Challenges for the Future: The Role of International Technical Cooperation

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International technical cooperation is essential to building confidence and achieving nuclear arms control objectives.

- **Historical examples demonstrate the role of international technical cooperation**
  - **Nuclear testing treaties**
  - **Intermediate nuclear forces treaty**
  - **Preparations for future nuclear arms reductions**
- **International technical cooperation can play an important role in developing options for the future**
  - **Establishing relationships and maintaining contacts**
  - **Building confidence among potential partners**
  - **Test and evaluation of monitoring options**
  - **Joint development of monitoring technologies and approaches**

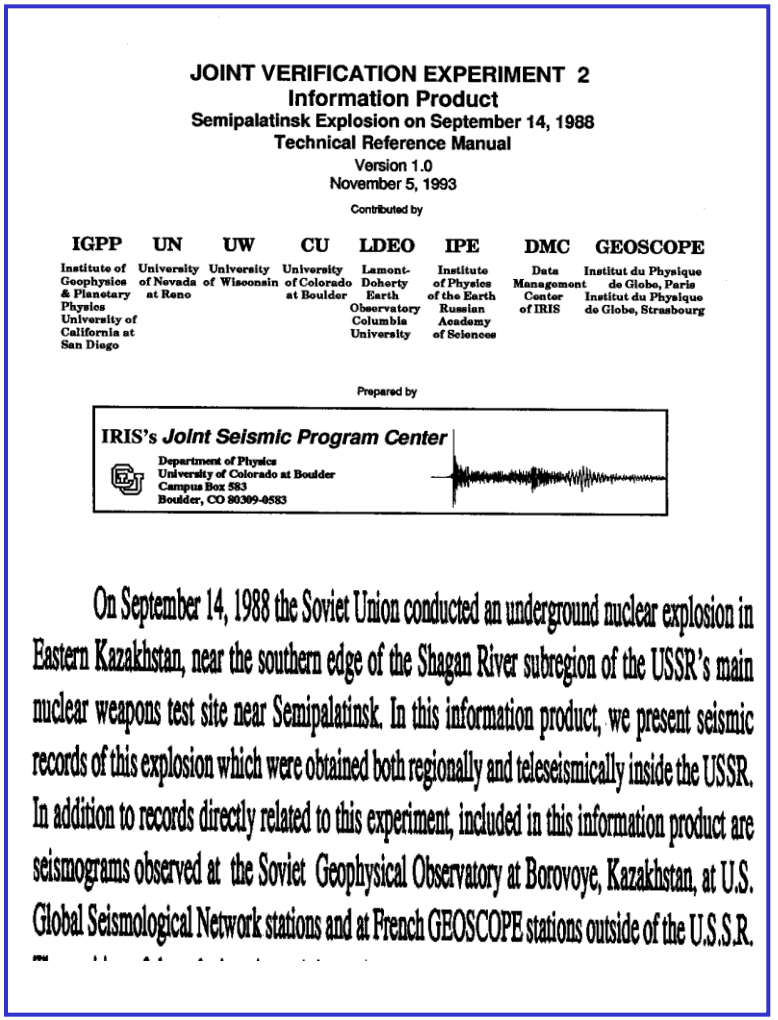
Historical Examples: US-USSR Joint Verification Experiment Facilitated Agreement on Verification Measures for TTBT

Soviets Prepare For Verification At Nevada Site
SANDRA BLAKESLEE, Special to the NY Times
Monday, August 15,1988

For the first time, teams of Soviet scientists have converged on the nuclear test site in the Nevada desert.

One team has lowered Russian-made cables into a shaft 36 feet from a 2,020-foot-deep shaft holding an American-made nuclear device, and a second team has set up instruments on the California-Nevada border to monitor shock waves from the nuclear device when it is detonated on Wednesday.

"This is unquestionably an historic event," said Ambassador C. Paul Robinson, chief United States negotiator at the United States-Soviet Nuclear Testing Talks in Geneva. 'Joint Verification Experiment'.



JOINT VERIFICATION EXPERIMENT 2
Information Product
Semipalatinsk Explosion on September 14, 1988
Technical Reference Manual
Version 1.0
November 5, 1993

Contributed by

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Prepared by

IRIS's *Joint Seismic Program Center*

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On September 14, 1988 the Soviet Union conducted an underground nuclear explosion in Eastern Kazakhstan, near the southern edge of the Shagan River subregion of the USSR's main nuclear weapons test site near Semipalatinsk. In this information product, we present seismic records of this explosion which were obtained both regionally and teleseismically inside the USSR. In addition to records directly related to this experiment, included in this information product are seismograms observed at the Soviet Geophysical Observatory at Borovoye, Kazakhstan, at U.S. Global Seismological Network stations and at French GEOSCOPE stations outside of the U.S.S.R.

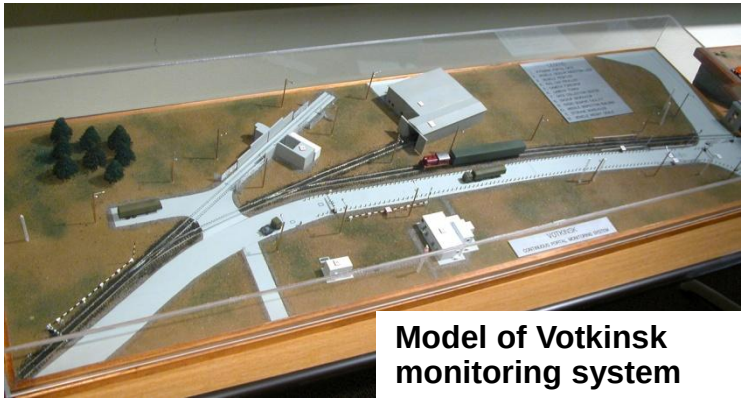
Historical Examples

Verification Options for Intermediate Range Nuclear Forces (INF) Treaty

- **Design and evaluation of portal-perimeter monitoring system**
  - **Technical On-Site Inspection (TOSI) facility on Kirtland Air Force Base**
- **Verification of permitted missile production**
  - **Radiographic methods**
  - **Physical measurements**
- **Technical cooperation with USSR to evaluate verification approaches**
- **Technical and operational support**
  - **Installation of monitoring systems at Votkinsk, Russia**

TOSI facility at Kirtland Air Force Base

Model of INF monitoring system



Model of Votkinsk monitoring system

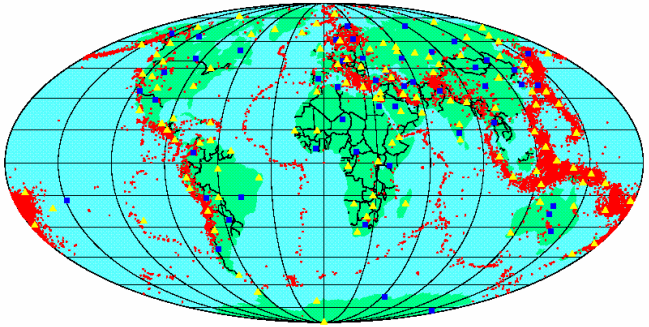
The Group of Scientific Experts for CTBT

- International group of seismic experts developed basic design for international seismic monitoring system
- Coordinated national R&D efforts
- Conducted tests of data handling and analysis procedures
- Hands-on experience supported treaty text on verification

GSE Meeting March 1978

Ola Dahlman
Chair of GSE

Proposed IMS Auxiliary Seismic Stations



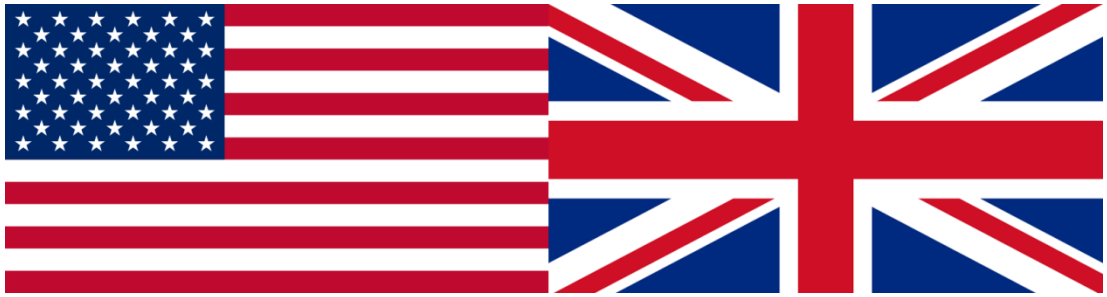
Historical Examples

US / Russia Warhead Safety and Security Exchange (WSSX)

- **Agreement between the United States and the Russian Federation**
  - **Signed in 1994, extended in 2000, expired in 2005**
- **Provided for sensitive but unclassified technical exchanges in three areas**
  - **Safety and security of nuclear warheads**
  - **Technologies for potential future nonproliferation initiatives**
  - **Technologies to combat nuclear-related terrorism**
- **Examples of projects**
  - **Warhead and fissile material monitoring**
  - **Warhead safety in storage**
  - **Warhead authentication**
  - **Tamper-indicating devices**
  - **Dismantlement transparency**
  - **Accident characterization and response**
  - **High explosives aging**
  - **Combating terrorism**

Historical Examples

US / UK Collaboration on Warhead Dismantlement Transparency



- **Partners**
  - **NNSA and AWE**
- **Purpose**
  - **To share information about issues and technical approaches to nuclear weapons dismantlement transparency**
  - **Develop technologies for dismantlement transparency**
- **Activities**
  - **Workshops (information barriers, authentication)**
  - **Measurement campaigns to evaluate possible technologies and procedures**

Historical Examples
US / China Arms Control Exchange

- Technical collaborations between U.S. national laboratories and Chinese counterparts (1994 – 1998) with close oversight by respective governments
- Goals
  - Joint development and deployment of integrated systems of modern technologies
  - Exploration of new technical means for building mutual trust
  - Establish long-lasting professional relationships to enhance understanding
- Examples of projects
  - Material protection, control and accounting
  - CTBT verification
  - Cooperative monitoring technologies
- Collaboration with China's nuclear weapons laboratories ended in 1998 amidst political tension

Lessons Learned from Past Technical Cooperation

- **Focus on most important common problems**
- **Exercise sound scientific principles, such as peer review, when selecting projects and evaluating results**
- **Obtain commitment at the highest levels on both sides and develop a clear legal framework for cooperation**
- **Insulate technical programs from political issues**
- **Obtain funding sufficient to accomplish meaningful work**
- **Emphasize partnership over contractual relationships**
- **Maintain consistency of personnel: success depends on strong personal relationships that can take years to develop**

Looking to the future: technical cooperation can contribute to a range of objectives

- **Build confidence through better understanding**
  - Nuclear warhead lifecycles
  - Nuclear weapons infrastructures
  - History of nuclear programs
- **Develop common approaches to future challenges**
  - Joint development of monitoring technologies and approaches
  - Test and evaluate monitoring options
  - Develop common understanding about the capabilities and limitations of technology
- **Develop solutions to common problems relevant to nonproliferation and arms control**
  - Nuclear safety and security
  - Nuclear emergency response
  - Nuclear proliferation and terrorism

Examples of needs and opportunities for technical cooperation

Topical Area	Challenges	Potential Activities
Nuclear Arms Control	• Greater transparency for warhead life-cycles in states with nuclear weapons • Baselines for numbers of NW world wide	• Multi-language glossary of technical terms • Development of models (computer or physical) of warhead lifecycle • Model declarations for NW stockpiles • Development of monitoring options (for warheads or facilities) • Demonstrations or tests of monitoring approaches
CTBT	• Enhance test site transparency	• Joint development of on-site measures • Site visits
FMCT	• Baseline inventories of fissile material production • Develop monitoring options for material in a classified form • Managed access for on-site-inspections	• Inventories of fissile material production (e.g., analogue to US Pu production inventory) • Monitoring options for “excess” fissile material • Table-tops on managed access techniques in realistic environment

Russian "Warhead Safety and Security" Tests and Evaluations

- **Test Scenario**
  - Operational site storage monitoring
  - Monitored transportation (rail and road)
  - Central storage monitored
  - Russian military nuclear experts conducted testing
- **Testing Facilities**
  - Storage Magazine
  - Rail Car Test Beds
  - Central Monitoring Facility
- **Test and Evaluation**
  - Automated Monitoring and Inventory System – Storage (Apr 05)
  - Automated Monitoring Inventory System - Transportation (Jun 07)
  - End-to-End System Tests – projected for Mar 09 – Terminated (Dec 08)

St. Petersburg, RU

Storage Magazine

Model Test Site (MTS)

Rail Car Test Bed

Kamaz Truck

Central Monitoring Facility

Storage T&E

Transportation T&E

Sandia's CMC provides resources to enable broad range of international technical cooperation

Cooperative Monitoring Center Facilities

Technology Training Demonstration Area

CMC-Amman

Outdoor Test Facility

NATO Bunkers: Simulated Warhead Storage Monitoring

DTRA TEAMS Site: Test and Evaluation of Radiation Detection

Partners

- Lawrence Livermore National Laboratory
- Los Alamos National Laboratory
- National Center for Nuclear Security (NCNS at Nevada Test Site)
- Rosatom (VNIIA, VNIIEF, VNIITF)
- UK Atomic Weapons Establishment (AWE)
- …..

Capabilities

- Visiting Research Scholars
- Analysis
- Test and Evaluation
- Training

Summary

- International technical cooperation has played a significant role in achieving arms control goals since the 1980's and can play an important role in developing options for the future
- Lessons learned from past international technical cooperation should be incorporated into future plans that focus on new problems and different partners
- There are many potential topics for future cooperation to further nuclear security, confidence building, and arms control.
- Clarifying objectives will help focus and sustain long-term efforts.

Questions for Discussion

- What is primary purpose of technical cooperation?
  - Building confidence?
  - Test and evaluation of options for monitoring and transparency?
  - Developing monitoring technologies?
- What are the most critical topics for technical cooperation?
  - Monitoring and transparency for nuclear material production, nuclear warheads, or nuclear complexes?
  - Establishing baselines for nuclear material and weapons?
  - Test site transparency?
  - Nuclear weapons safety and security?
- Who are essential participants? What are their roles?
  - U.S. and Russia? P-5? all states with nuclear weapons?
  - Non-nuclear weapon states?
  - Bilateral or multilateral projects?