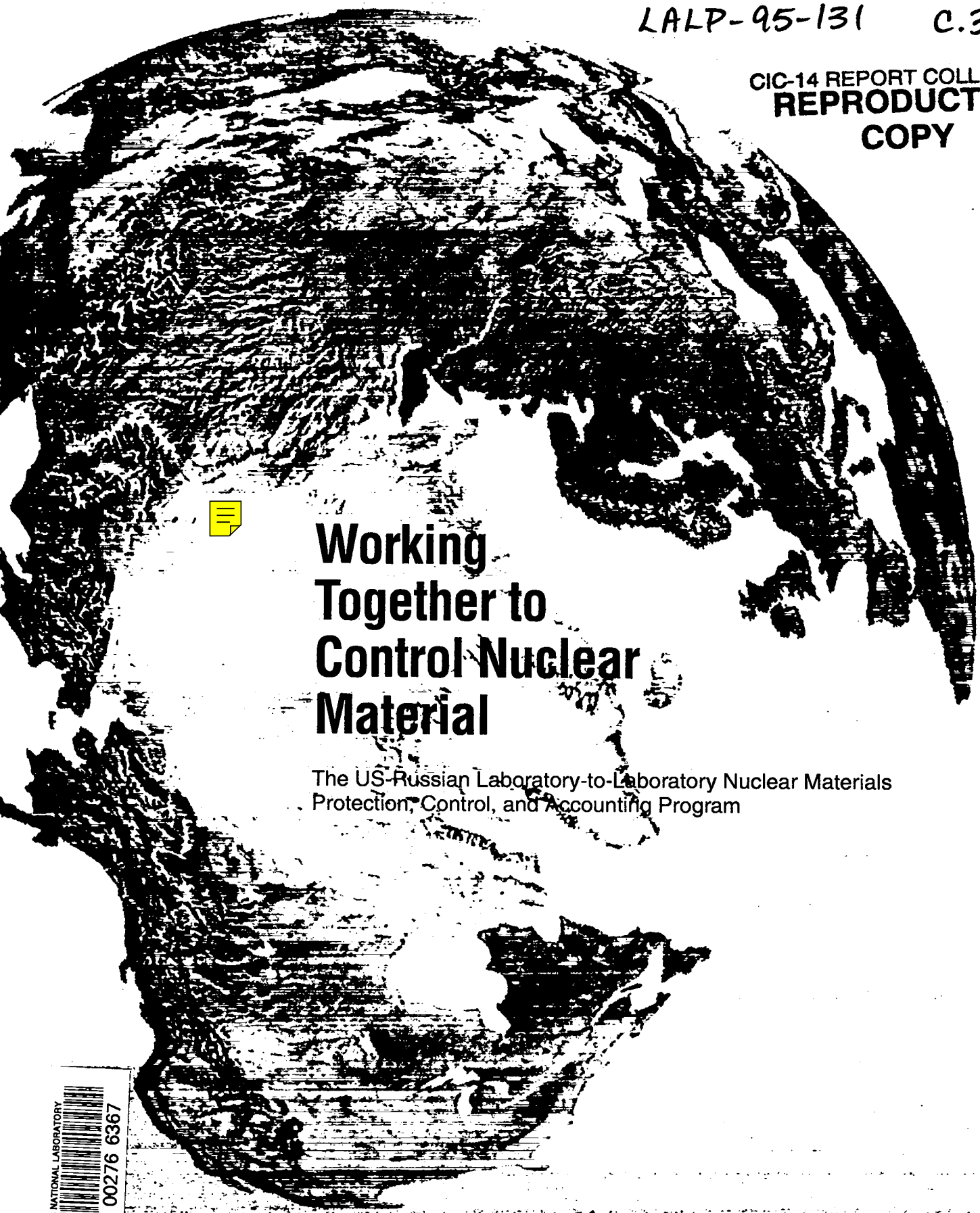
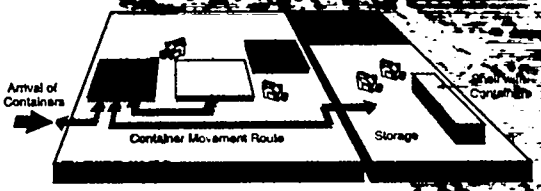


Working Together to Control Nuclear Material

The US-Russian Laboratory-to-Laboratory Nuclear Materials Protection, Control, and Accounting Program

Los Alamos
NATIONAL LABORATORY



The demonstration facility at Arzamas-16. Containers of material begin at the entry control station (blue). The material can be disassembled and repackaged in the yellow area and sent to storage. The green arrows show possible routes. People enter through the dispatcher's area (brown) and the personnel control center (red).

Arzamas-16 Milestones

April 1994: Lab-to-Lab program begins with DOE approval.

June 1994: Six weeks after the official start of the program, contracts are signed for work at Arzamas-16 and the Kurchatov Institute.

August 1994: Within two months, the first training on computerized material accounting software and nuclear measurements is completed and the first accounting equipment is received in Russia.

November 1994: Demonstration at Arzamas-16 of final deliverable for the Neutron Passportization Task.

January 1995: Within seven months of contract signing, the improved materials protection, control, and accounting systems and equipment are demonstrated in Russia.

January 1995: Meeting of US and Russian Steering Groups at Los Alamos.

February-March 1995: Second demonstration of integrated MC&A system at Arzamas-16 to US technical team representing all six US laboratories.

March 1995: Training of Russian facility operators at Arzamas-16 using demonstration model.

Weapons of mass destruction, especially nuclear weapons, are the only strategic threat to the United States. By far, the greatest challenge to a potential proliferant is obtaining the necessary nuclear material—uranium or plutonium—that forms the heart of the weapon. The fragmentation of the Soviet Union following the end of the Cold War presents new challenges in safeguarding large stores of fissile materials. Protecting, controlling, and accounting for nuclear material (MPC&A) has become one of the highest priority goals for both Russia and the US. The governments of the US and Russia have asked nuclear material control experts at their national laboratories to lead the effort in strengthening MPC&A in both countries.

Building on a foundation of trust and cooperation established through scientific collaboration between US and Russian weapons laboratories since 1992, the US Department of Energy in April 1994 proposed and initiated a "bottom up" approach to MPC&A: the Lab-to-Lab Program. Scientists and engineers, working with general guidance and oversight by their governments, plan and manage the work. This approach has been very successful in highly technical programs such as MPC&A improvements. Examples of the rapid progress possible with this approach can be seen at Arzamas-16 and the Kurchatov Institute.

Arzamas-16, one of two Russian nuclear weapon design laboratories, leads the effort for the Russians. The best of Russian and American nuclear material control and accounting (MC&A) technology is being combined in an extensive demonstration facility that will certify equipment for implementation throughout the Russian nuclear weapons complex. Arzamas-16 successfully demonstrated this integrated MC&A system to US participants and Russian facility operators, incorporating mod-

A laser (red flash) is reading a barcode symbol on this container of nuclear material stored at Arzamas-16. The hardware and accounting system were obtained and developed through the US and Russia Lab-to-Lab program.

Caption for cover:
Russian and American nuclear experts are working together to protect special nuclear material—the most immediate threat for the proliferation of nuclear weapons. The realistic colors of the map of the two countries indicate the depth of the collaboration between the US and Russia. The members of the US and Russian Steering Groups are facilitating the efforts of the national laboratories in each country to better control nuclear materials.

ules for entry control, nondestructive assay measurements, various item control functions, and inventory verification. A near-real-time computerized accounting system integrated the data from the modules and monitored the MC&A status of the demonstration facility. The US provided equipment and technical support as its part of the collaboration. The Russian scientists have excellent ideas for material control that complement our own. Half of the 39 systems incorporated in the demonstration are of their design. This demonstration facility will introduce the technology and operating philosophy to Russian nuclear facility operators, who will implement the equipment and ideas in their plants.

At the Kurchatov Institute, a leading designer of reactors for space and naval propulsion, a basic MPC&A system was installed at one building within the Institute involved in experiments with highly enriched uranium. Prior to this joint Lab-to-Lab activity, the building did not have proper safeguards for the material it contained. As a direct result of the US-Russian collaboration, this building now has effective physical protection and computerized nuclear material accounting systems. The capabilities of the systems were demonstrated to wide audiences in Russia and the US.

Multi-laboratory steering groups have been formed in both countries to oversee the programs and to unite the six US national laboratories and eight Russian technical institutes participating in the program. The US steering group, under DOE guidance, has been the principal instrument for managing the program and providing technical support and equipment. Representatives from five Russian institutes and nuclear material facilities met with their US counterparts in January 1995 to establish, review, and enact a joint "US Russian Action Plan" for the implementation of stringent safeguards practices in the Russian nuclear weapons complex. The Russians arrived with 46 concrete proposals for tasking and collaboration. Some of the proposals have already been initiated during the first quarter of 1995.

Working together with the Russians on problems of common interest and concern is the key to the success of this program.

A key building, in which nuclear materials are used, at the Kurchatov Institute before recent efforts by the US and Russia Lab-to-Lab program to improve nuclear materials control at the facility.

Kurchatov Milestones

July 1994: Kurchatov MC&A team visits US laboratories.

August 1994: Agreements signed with Kurchatov Institute on MPC&A program.

September 1994: Multi-laboratory team visits Kurchatov Institute.

October 1994: Agreements reached with Kurchatov Institute on physical protection systems.

December 1994: Demonstration of computerized accounting system at Kurchatov Institute.

December 1994: Demonstration of physical protection system around Building 116 at Kurchatov Institute.

February 1995: Demonstration of MPC&A system capabilities to a wide audience of Russian and US participants.

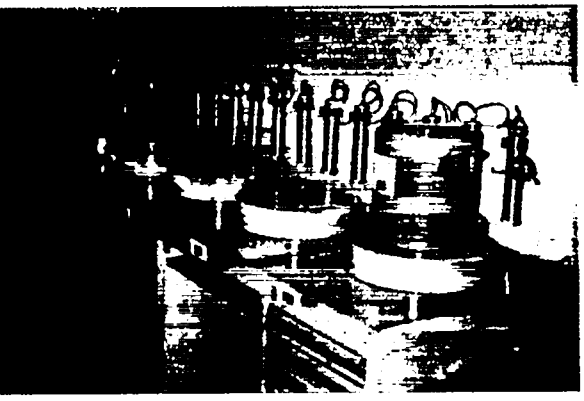
A few months later, the same building at Kurchatov is surrounded by a fence equipped with intrusion sensors and sophisticated entry and exit control equipment.

US and Russian laboratories participating in the Lab-to-Lab program

United States Laboratories
Los Alamos National Laboratory
(Lead Laboratory)
Sandia National Laboratories
Lawrence Livermore National Laboratory
Oak Ridge National Laboratory
Brookhaven National Laboratory
Pacific Northwest Laboratory

Russian Institutes
Experimental Physics, VNIIEF, Arzamas-16
Technical Physics, VNIITF, Chelyabinsk-70
Automatics, VNIIA, Moscow
Non-organic Materials, VNIINM, Moscow
Physics and Power Engineering, IPPE, Obninsk
Kurchatov Institute, RRCKI, Moscow
Eleron, Moscow

Russian Processing Facility
Siberian Chemical Combine, SKhK, Tomsk-7



The same container of nuclear material shown on page 2 is shown above in the storage area at Arzamas-16. The containers sit on pressure sensors that sound an alarm if the can is moved. This palm reader shown at left is now an integral part of the entry control measures in the nuclear material storage area at Arzamas-16.

Conclusions

Russian and US technical experts are identifying the most pressing MPC&A needs and the technology best-suited to each facility. They are working with facility operators to design complete MPC&A systems, and they are training a corps of experts to operate the systems. The successes at Arzamas-16 and the Kurchatov Institute greatly improved the physical security, control, and accounting procedures for nuclear materials at those locations. The improvements at other facilities will be implemented in stages and most of the work will be done by the Russians at Russian facilities. This is the beginning of what can be accomplished when the scientists of both countries work together to solve an important problem.

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May 1995
LALP-95-131

Los Alamos
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