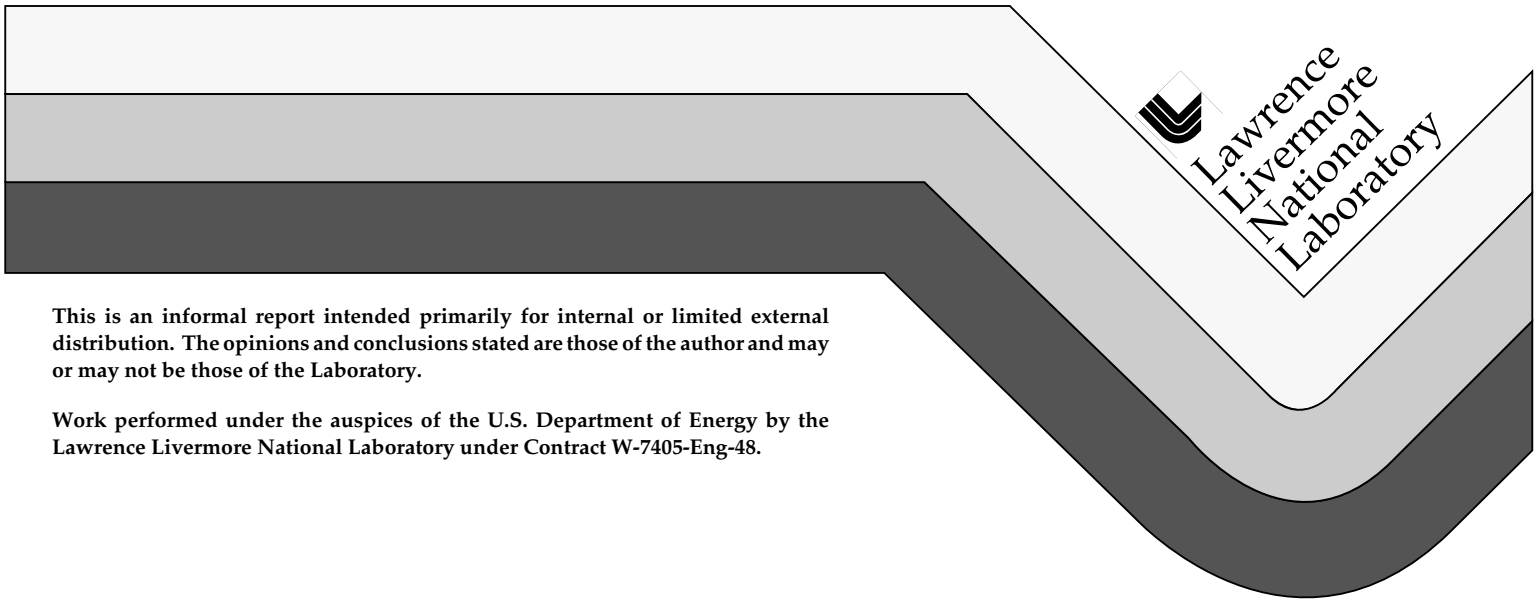
UCRL-ID-128702

US./Russian MPC&A Program at the VNIITF Institute, Chelyabinsk-70

V. Teryohin, G. Tsygankov, Y. Churikov, A. Churikov, A. Karpov, J. Blasy, B. Abramson, R. Wallace, L. Satkowiak, J. Allentuck, L. Neymotin, A. Eras, J. Smoot

September 22, 1997



Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.

US./Russian MPC&A Program at the VNIITF Institute, Chelyabinsk-70

Authors:
Gennady Tsygankov, Yuri Churikov, Alevtin Karpov, Edward Magda (VNIITF, Chelyabinsk-70, Russia), Jack Blasy, Bill Abramson (LLNL), Richard Wallace (LANL), Larry Satkowiak (ORNL), Jack Allentuck, Lev Neymotin (BNL), Albert Eras (SNL), and John Smoot (PNL)

ABSTRACT

The All Russian Institute of Technical Physics (VNIITF) is one of the major sites in the nuclear weapons complex in Russia. The site contains a number of research facilities which use nuclear material as well as assembly, disassembly, and testing of prototypes (pilot samples) of nuclear weapons. Chelyabinsk-70 (C-70) also has ties to the major nuclear materials production facilities in the Urals region of Russia.

Under the U.S./Russian Materials Protection Control and Accounting (MPC&A) cooperative program, enhanced safeguards systems are being implemented, initially at a reactor test area that contains two pulse reactors and a nuclear material storage facility. Current year projects include site-wide improvements and next year, expansion of work into other facilities at the site.

C-70 has developed an extensive computerized system that integrates the physical security alarm station with elements of the nuclear material control system. Under the MPC&A program, the existing systems have been augmented with Russian and US technologies. Additional facilities were added in 1997 to broaden the impact of the MPC&A program at the site.

The integrated MPC&A system will be demonstrated to US and Russian audiences when completed in the spring, 1998.

This paper will describe the on-going activities and describe the cooperative effort between the Lawrence Livermore, Los Alamos, Sandia, Oak Ridge, Pacific Northwest, and Brookhaven US Department of Energy National Laboratories in support of VNIITF .

INTRODUCTION

The work described in this paper is part of an effort called the Nuclear Materials Protection, Control, and Accounting (MPC&A) Program which was created in response to a DOE directive to the national laboratories to develop a cooperative program between the US. and Russian institutes in the area of nuclear materials non-proliferation. The objective of the program is to accelerate progress toward a common goal: to reduce the risks of nuclear proliferation by strengthening systems of MPC&A in both countries. The program is being carried out by Russian institutes and US laboratories mutually developing and

implementing a collaborative program for the improvement of nuclear MPC&A systems at Russian facilities. More specifically the MPC&A program is attempting to make rapid improvements in the protection, control, and accounting of nuclear material, especially weapons-grade materials such as separated plutonium and highly enriched uranium, by working directly and cooperatively with each other.

This paper describes that portion of the MPC&A program that is tailored specifically to the needs of the Russian Federal Nuclear Center: Institute for Technical Physics (VNIITF), Chelyabinsk-70, which is inside the town of Snezhinsk. VNIITF was established in 1955 as a second nuclear weapons design institute for competition and peer review of the initial Russian nuclear design institute at Arzamas-16. Chelyabinsk-70 is located in the Ural mountains, approximately 2000 km east of Moscow.

HISTORICAL BACKGROUND OF VNIITF SECURITY

The physical security program at VNIITF was designed at a time when the former Soviet Union emphasized strict control systems such as enforcement of personnel passport controls. Russia is now in a very different situation, where their diversification activities are resulting in an influx of business and industrial people whose reliability cannot be guaranteed through personnel screening. VNIITF is therefore evolving its security systems to apply to this different situation.

VNIITF began modernizing its security system in 1993, at the direction of MinAtom. At that time, a specific program was created with emphasis on MPC&A. People from separate laboratories within VNIITF were brought together to work on the enhanced MPC&A program. The program was approved by MinAtom, however, VNIITF has not received additional money to implement this program. Lack of money has therefore limited the rate of progress.

SELECTION OF A DEMONSTRATION SITE

C-70 has several facilities with weapons-grade material, plutonium and highly enriched uranium (HEU). The facilities, which were selected for initial MPC&A improvements, are one metal and two liquid pulse reactors in buildings 711 and 712, at the Pulse Research Reactor Facility, (PRR) at Site 20. A reactor control system is housed in Building 713, which is where the MPC&A security control system will also be located

MPC&A UPGRADES STRATEGY

Previous FY activities:

In the first two years of the VNIITF project, emphasis has been given to a single facility, the PRR, with some work being done which is applicable at the

entire VNIITF site. The PRR was selected as a site where the US and VNIITF team could introduce up-to-date MPC&A technologies to enhance control over significant amounts of materials. Future facilities may require less information sharing for security reasons.

Several collaboration tasks required to implement a comprehensive enhanced MPC&A system at VNIITF were approved for implementation at the site. The tasks were prioritized to form a planned approach beginning with a site characterization study and quantitative analysis of the existing system followed by system design and installation.

A site characterization survey of the VNIITF (C-70) Pulse Reactor Facility, was conducted to assist in the design of a Physical Protection (PP) and a Material Control and Accounting (MC&A) system, to examine the facility to determine where PP and MC&A should be implemented or where existing PP and MC&A should be increased and to provide immediate short term fixes based on the survey.

US and Russian personnel shared safeguards and security Vulnerability Assessment (VA) techniques and approaches to obtain some early results by actually applying them to the PRR and to study and analyze changes which need to be made to the analytic tools and procedures for their use at VNIITF. It included a two week Vulnerability Assessment workshop conducted jointly by LLNL and SNL at VNIITF. A continuous process of improving the techniques and applying them to new VNIITF facilities is a long-term goal of the project team.

The earliest projects for the PRR were tasks to establish the conceptual designs for the Physical Protection (PP) and Material Control and Accounting (MC&A) systems. These conceptual design projects helped establish the direction and scope of the work which VNIITF was proposing.

Current FY activities:

Implementation of upgrades to protect significant quantities of Special Nuclear Materials remains the focus of the project team. Work on the PRR facilities should be completed by the end of the next fiscal year (1998).

Current Physical Protection activities include barrier, intrusion detection, video assessment, and access control system upgrades; control station implementation; implementation of an enhanced radio communications system; and an administrative fence around the PRR facility.

MC&A upgrades include rapid inventory using Gamma measurement and bar code technologies, computerized MC&A system, barcode and TID implementation at the entire site, implementation of a data transfer network, and a scale and measurement control program.

Portal metal and nuclear material detection upgrades include moving and stationary vehicle portal monitors and portal and hand-held metal detectors at the VNIITF site.

Non Destructive Assay (NDA) instrumentation yet to be completed include measurement of bulk and large quantities of material; gamma ray measurement

and passportization; and measurement of bulk materials using Active Well Coincidence Counter (AWCC).

Site-wide upgrades to be completed include an internal review and assessment program, and a demonstration of integrated operations of MPC&A systems.

Future FY activities:

C-70 has proposed five new facilities for joint MPC&A work starting in FY 1998. Three are facilities located within Site 20, buildings 726 and 717/718 are research facilities and building 326 will contain the integrated control station for all of Site-20. The other two are more sensitive facilities at other locations not specified by C-70. With the possible exception of building 726 these new buildings will require agreement on certain terms and conditions limiting US access and knowledge of operations there.

Twenty seven tasks have been proposed by VNIITF and the US Project team for implementation during the next fiscal year. These tasks have been prioritized by the US Project team and were coordinated with the VNIITF team during their visit in August 1997. The US Project Team has placed the highest priority on the development of a "Site -wide" plan for the protection of Special Nuclear Materials to include consideration of consolidation of Nuclear Materials.

CONCLUSION

Through increased cooperation it is hoped that the MPC&A program effort at VNIITF will continue to make rapid improvements in the protection, control, and accounting of nuclear material, especially weapons-grade materials such as separated plutonium and highly enriched uranium, by working directly and cooperatively with each other. The US National Laboratories plan to continue contracting directly with VNIITF to carry out MPC&A improvements and provide support, technical assistance, and equipment as needed to further the objectives of the program. Since the complex of buildings in PRR contain up to date technologies in property protection and MC&A, they can be used for future training of MPC&A specialists. VNIITF has taken the primary responsibility to provide the effort needed to improve their MPC&A system based upon their requirements. Our mutual long range goal is for the VNIITF to institutionalize the improvements and transfer them to other facilities at VNIITF where the US may not be able to go, because of sensitivity or other reasons.

ACKNOWLEDGMENTS

Work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.

Technical Information Department • **Lawrence Livermore National Laboratory**
University of California • Livermore, California 94551