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Sandia National Laboratories

International Security News

International Security Programs
Dori Ellis, Director

Focus on Nuclear Material and Weapon Security

FOCUS

Sandia National Laboratories first became heavily involved in international nuclear material and weapon security by helping to protect Russian weapons through the Cooperative Threat Reduction (CTR) program. In November 1991 US Senators Sam Nunn and Richard Lugar sponsored the Soviet Nuclear Threat Reduction Act, which established CTR to provide assistance for dismantling or safely storing the weapons in the Soviet nuclear arsenal. CTR provided for collaboration between the US Departments of Defense (DOD) and Energy (DOE) and the Russian Ministries of Defense (MOD) and Atomic Energy (MINATOM). In 1995 the Nunn-Lugar funding was extended and became known as the Nunn-Lugar-Domenici legislation in honor of the continued support for the program by Senator Pete Domenici from New Mexico.

The mission of CTR has been to improve US national security by reducing the threat of nuclear proliferation and terrorism through rapidly improving the security and accountability of all nuclear weapons and weapons-usable nuclear material throughout the former Soviet Union (FSU). CTR responded to the post-Soviet deterioration of security for nuclear material stored at 53 identified sites

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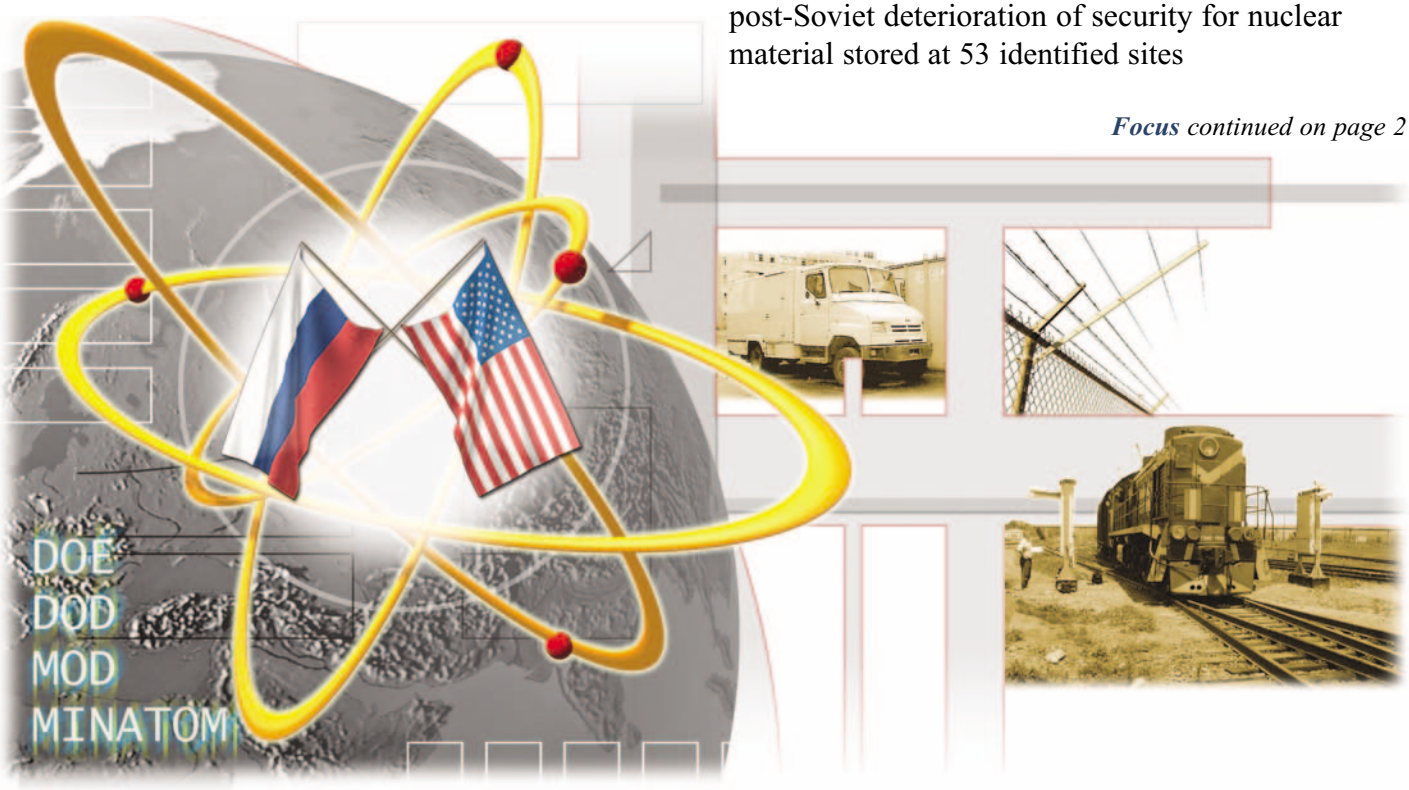

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in Russia, the New Independent States (NIS), and the Baltics.

Because as little as 25 kilograms of uranium or 8 kilograms of plutonium is defined by the IAEA as a significant quantity of nuclear material,[1] protecting sites possessing these quantities of materials is vitally important. The magnitude of the problem can be emphasized by the estimate that the Soviet Union possessed about 1,350 metric tons of nuclear material at the time it was dissolved. Approximately 700 metric tons were in nuclear weapons and approximately 650 metric tons were in metals, oxides, and scrap, enough nuclear material to produce more than 40,000 nuclear bombs. The material was spread among eight countries that spanned 11 time zones. With the dissolution of the Soviet Union, the weapons and some of the material were returned to Russia, but much of the material remained in its original locations.

Initially Sandia provided armored security blankets and containers for weapons and weapon parts in transit and has improved the security of Russian railcars for transporting nuclear weapons and materials for the CTR program. More recently Sandia's technical experts have been actively involved in weapon site security as technical advisors to the DOD/Defense Threat Reduction Agency (DTRA) program, especially on matters concerning physical security and monitoring for the Mayak Fissile Material Storage Facility (FMSF) and for the Security Assessment and Training Center (SATC). The Mayak FMSF was designed for secure storage of excess nuclear material obtained from dismantled Russian nuclear weapons. The SATC was established to integrate and test security equipment for use at MOD operational nuclear weapons storage sites in Russia. The SATC is also used to train Russian technicians to install, maintain, and operate the security equipment.

In September 1993, the US and Russia signed a government-to-government agreement to cooperate more fully in protecting nuclear material. In April 1994, the Department of Energy (DOE) became the executive agency for the material protection part of CTR. A laboratory-to-laboratory program of cooperation between the DOE national laboratories and the Russian Federation's nuclear institutes, with the same goal as the government-to-government program, was initiated as a parallel effort. The DOE/NNSA Material Protection, Control, and Accounting (MPC&A) program was established to assist the Russian Federation with physical protection

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Focus on Nuclear Material and Weapon Security

General Interest

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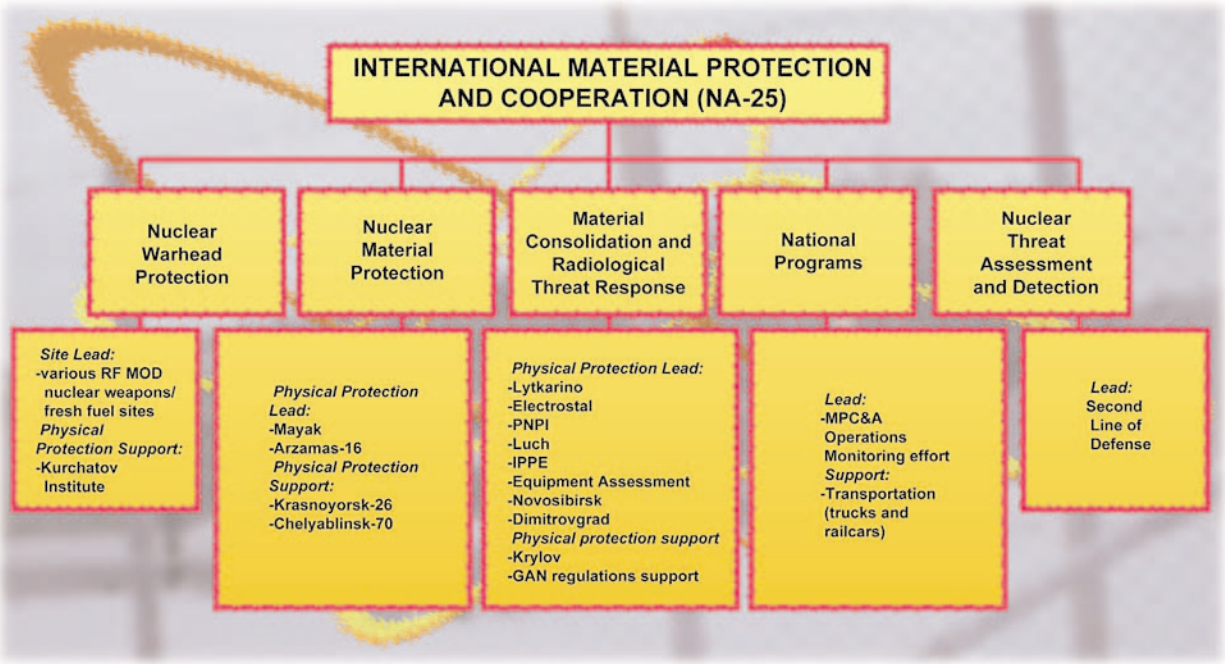
and material control and accounting measures to prevent theft of weapons-usable materials. The MPC&A program is installing improved security systems for nuclear material at civilian nuclear sites, naval fuel sites, and nuclear weapons laboratories in Russia and is helping to secure nuclear materials in other countries of the FSU. (See "Material Protection, Control, and Accounting," page 9) Sandia has essentially been the lead laboratory for physical protection. Other national laboratories have overseen material control and accounting (MC&A), the other major element of MPC&A.

needed, and Sandia was able to respond to that need. (See "Physical Protection Upgrades Completed at Uzbekistan INP Facility," page10)

By mid-2001, DOE had identified more than 400 buildings at 95 sites in Russia that required nuclear security systems. In addition to installing security systems, DOE is providing sites with long-term operational assistance through equipment warranties, operating procedure development, and training. DOE also has projects underway to help MINATOM and



Sandia tasks associated with NNSA/NA-25 components

By 1999, the necessary MPC&A equipment installations were successfully completed at the non-Russian sites, and DOE management determined that the non-Russian sites were ready to convert to an operations and maintenance mode. The transition of non-Russian sites enabled the MPC&A program to concentrate entirely on complex challenges in Russia, where the majority of the nuclear material security concerns exist. However, a recent terrorist threat against a nuclear reactor in Uzbekistan suggested that additional improvements to the physical security system were

Russia's nuclear regulatory authority Gosatomnadzor (GAN) to develop a total inventory of nuclear material, regulations to ensure the effective operation and maintenance of the systems, and inspection and enforcement systems to ensure that sites comply with regulations. In addition, DOE is supporting security improvements for trains and trucks that transport nuclear material between and within sites and for nuclear material security training centers. The chart above illustrates Sandia's involvement in these

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DOE programs in relation to the five major offices within the National Nuclear Security Administration (NNSA)/Office of International Material Protection and Cooperation NA-25.

Office on Nuclear Warhead Protection The mission of the Office on Nuclear Warhead Protection is to cooperate closely with the Russian Navy to provide MPC&A upgrades to nuclear material fuel storage facilities at Naval sites in Russia and to sites with spent and damaged nuclear fuel. This office also provides support and assistance to over 40 nuclear warhead storage sites.

Sandia has been involved in all of the Russian Navy site upgrades and was the project lead for most of the sites. Sandia has also performed the role of coordination manager to ensure consistency among sites.

Office on Nuclear Material Protection The Office on Nuclear Material Protection manages cooperation with MINATOM to secure nuclear materials at the MINATOM weapons complex, which is composed of Russian closed cities, including seven sites and four serial production enterprises. These sites account for more than 70 percent of Russia's most highly attractive weapons-usable material. The strategy of this joint cooperative program is to focus on areas that store highly attractive material and to consider both internal and external threats. The office's approach is to place the highest priority on protection of the most attractive material, with emphasis on areas in which large amounts of the material exist.

Canisters under protection at Mayak

Sandia has been the physical protection lead for the Mayak, the Mining and Chemical Combine (MCC) at Krasnoyarsk-26 (K-26), and the All-Russian Scientific Research Institute of Experimental Physics (VNIIEF) sites. At Mayak, 15 metric tons of nuclear material were placed under protective blocks. Sandia is also involved in the design and construction of new central storage facilities at Chelyabinsk-70 and Arzamas-16. (See "MPC&A Activities at Chelyabinsk-70 and Arzamas-16," page 9.)

Office of Material Consolidation and Radiological Threat Response The Office of Material Consolidation and Radiological Threat Response is responsible for four key nuclear nonproliferation initiatives. The first focuses on cooperative efforts with MINATOM to install comprehensive MPC&A upgrades at the seven large Russian civilian and nuclear facilities that store weapons-usable highly enriched uranium (HEU) and plutonium (Pu). Second, the office is working to ensure the long-term operation and maintenance of MPC&A systems already completed at nine Russian civilian research reactor sites. Third, in 1999 the office began the Material Consolidation and Conversion (MCC) project. (See "MPC&A Success at Luch," page 11.) The primary objective of this initiative is to simplify the task of protecting Russia's weapons-usable nuclear materials by reducing the number of proliferation targets through the consolidation of HEU and Pu into fewer buildings at fewer sites. An equally important element of this activity involves the conversion of the nuclear material into a form not usable in weapons, thus eliminating proliferation concerns. Finally, the Radiological Threat Program has emerged in direct response to the September 11, 2001, terrorist attacks and seeks to address the need to protect non-weapons-usable nuclear material that can be used in a radiological dispersal device (RDD), also known as a dirty bomb. (See "ISC Takes on Role in Combating RDDs," page 15) Sandia has been the physical protection lead at IPPE (Institute of

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Physics and Power Engineering), Luch, Lytkarino, Dmitrovgrad, Novosibirsk, and Electrostal.

Office of National Programs The Office of National Programs focuses on crosscutting issues that foster Russian capabilities and commitments to the operation of installed MPC&A systems. By developing regulations and procedures, training and equipment repair centers, a national accounting system, secure transportation of nuclear materials, and other operational support initiatives, the office helps MINATOM establish and implement national and other infrastructure components. One such component is assisting with national protective force upgrades, which are necessary for the long-term support of MPC&A systems.

Sandia was the project lead for transportation upgrades for trucks and railcars until December 2000. Truck upgrades have been completed or are in progress for 48 cargo trucks, 29 escort vehicles, and 32 overpacks. Overpacks are multi-ton shipping containers that make theft virtually impossible without the use of sophisticated cranes. Sandia has also been heavily involved in the Obninsk test and evaluation site, in the Operations and Sustainability Project, and in the MPC&A Operations Monitoring (MOM) Project, focused on sustainability of MPC&A upgrades at civilian non-MINATOM facilities, primarily research reactors. Sandia also led the development of a graduate program in MPC&A at the Moscow Engineering Physics Institute (MEPhI), an effort begun in 1995.

Office of Nuclear Threat Assessment and Detection The Office of Nuclear Threat Assessment and Detection focuses on the Nuclear Assessment Program (NAP) for assessing nuclear extortion threats and the illicit trafficking of SNM, including radiological threats and forensic analysis. The office is now expanding to address emerging threats, such as the RDD (dirty bomb) threat.

The Second Line of Defense (SLD) program cooperates with foreign governments to address nuclear proliferation and terrorism by strengthening their overall capability to deter, detect, and interdict illicit trafficking of nuclear material at their sea, air, and land border crossings. The SLD program is installing equipment at entry points on land, in airports, and in seaports to secure and detect radiological materials that could easily be used with conventional explosives to spread contamination. The SLD Program was originally intended to prevent smuggling of direct-use nuclear material across Russia's borders. This program is now exploring upgrades outside of Russia and has begun installing systems to monitor operations to ensure effective threat reduction.

Railcar Overpacks, multi-ton shipping containers, make theft virtually impossible.

Sandia's role for the SLD program is as project lead to develop strategies and processes to rapidly provide integrated, sustainable systems to rapidly minimize the risk of nuclear proliferation and terrorism. (See "Second Line of Defense," page 16.) In Russia, 26 site surveys have been performed at airports, seaports, railroad checkpoints, and border crossings.

Source: Jim Chapek 5350, MS 1379, 505-284-4795, fax 505-844-6067, jfchape@sandia.gov

[1] *IAEA Safeguards Glossary: 2001 Edition,* Vienna, Austria: 2002. International Nuclear Verification Series, Number 3. (available in pdf format at http://www.iaea.or.at/worldatom/Programmes/)

Securing Nuclear Warheads and Materials - Seven Steps for Immediate Action

Matthew Bunn
Managing the Atom Project, John F. Kennedy School of Government
Belfer Center for Science and International Affairs, Harvard University

In the last decade, substantial progress has been made toward improving security and accounting for nuclear weapons and weapons-usable nuclear material worldwide, both by states' own domestic actions and through international cooperation. Thousands of nuclear warheads and hundreds of tons of nuclear material are demonstrably more secure than they were before, and through programs such as the US-Russian Highly Enriched Uranium (HEU) Purchase Agreement, enough potentially vulnerable bomb material for thousands of nuclear weapons has been verifiably destroyed.

Since the attacks of September 11, 2001, the international community has attempted to expand and accelerate these efforts. The attacks demonstrated that the threat of terrorist groups with global reach and bent on causing mass destruction is not hypothetical but real. Al Qaeda has been actively attempting to establish a nuclear weapon capability based on stolen nuclear material or nuclear weapons. Nothing could be more central to the security of every nation, therefore, than ensuring that nuclear weapons and their essential ingredients are secure and accounted for, wherever they may be: Insecure nuclear material anywhere is a threat to everyone, everywhere.

Following the September 11 attacks, the US Congress added hundreds of millions of dollars to US cooperative threat reduction programs, and the Bush administration then reversed its earlier efforts to cut budgets for these efforts. As a result, the speed and effectiveness of the main US efforts in these areas are no longer primarily limited by money but rather by policy and leadership issues.

Despite these efforts, much, much more remains to be done than has been done so far. To date, US-Russian cooperative programs have accomplished initial rapid upgrades on only 40 percent of the weapons-usable nuclear material in Russia and comprehensive security and accounting upgrades on only half of that. Less than one-seventh of Russia's stockpile of HEU, and still less of the US stockpile, has been destroyed, and virtually none of the weapons plutonium in either country has yet been eliminated. While salaries and conditions for nuclear workers and guards in the former Soviet Union have notably improved, Russia plans to lay off tens of thousands of nuclear weapons scientists and workers in the next few years, and the infrastructure to create jobs for these people has not yet been built.

HEU-fueled research reactors in countries around the world remain dangerously insecure, and questions remain about the security of nuclear stockpiles in countries where both insider and outsider threats may be particularly severe, such as Pakistan. The International Atomic Energy Agency's Action Plan to prevent nuclear terrorism remains dangerously underfunded, as does the Agency's global safeguards system.

In a report[1] published in May, 2002, two coauthors and I recommended seven further steps for immediate action in US-Russian and international cooperation:

1. Forging a Global Coalition to Secure Weapons of Mass Destruction. Stockpiles of weapons of mass destruction (WMD) – not just nuclear weapons but chemical and biological ones as well – and their essential ingredients exist in dozens of countries throughout the world, in both the military and civilian sectors. We recommended that the US and Russian

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presidents, along with their colleagues from other leading states, seek to forge a global coalition to secure WMD stockpiles and their essential ingredients everywhere. In June 2002, the leaders of the Group of Eight (G-8) industrialized democracies pledged $20 billion over ten years to a Global Partnership Against the Spread of Weapons and Materials of Mass Destruction. Very high priority should be placed on transforming this first step into an effectively functioning international partnership to secure the world's nuclear stockpiles as rapidly as practicable.

2. Appointing One US and One Russian Official to Lead the Respective Countries' Efforts to Secure Nuclear Weapons and Materials. Today, no senior official anywhere in the US government is tasked with full-time responsibility for leading and coordinating the entire panoply of efforts related to securing nuclear weapons and materials. We recommended that President Bush appoint a senior official in the White House, reporting directly to him, who has no other mission but this. This senior leader should be given the authority and resources needed to do such a job effectively and should be tasked with preparing an overall integrated plan tying these many efforts together. Russian President Putin should make a similar appointment of a single leader; the need for improved coordination and leadership of such efforts is, if anything, even more urgent in Russia.

3. Accelerating and Strengthening Security Upgrades for Warheads and Materials in Russia. We recommended that the United States and Russia jointly develop and implement a strategic plan to accomplish all rapid upgrades of security and accounting for warheads and materials within two years and comprehensive upgrades within four years and take a series of steps to build an accelerated partnership to achieve that goal. We also highlighted the need for additional steps to ensure that effective security and accounting will be maintained over time and to ensure that security systems are adequate to meet post-9/11 threats.

4. Launching a "Global Cleanout and Secure" Effort to Eliminate or Secure Stockpiles of Weapons-Usable Nuclear Material Worldwide. Currently hundreds of facilities in scores of countries have from kilograms to tons of plutonium or HEU. This number can and should be greatly reduced, with an approach that balances the continuing scientific needs, the proliferation risks, the safety hazards, and economic costs. We recommended that a flexible new program be established, funded at approximately $50 million per year for several years, which would (a) provide a range of targeted incentives to facilities around the world to give up their highly enriched uranium or plutonium and (b) implement rapid security upgrades at facilities where these materials would remain. What is needed on the US end is a single program that integrates such efforts and puts expertise, legal authority, and money to do what it takes to get these vulnerable stockpiles removed into a single set of hands.

5. Leading Toward Stringent Global Nuclear Security Standards. Terrorists and hostile states will steal nuclear material from wherever it is easiest to get and will buy it from anyone willing to sell. Yet today, no binding international standards have been established for security of weapons-usable nuclear material, and national practices vary enormously. The G-8 Global Partnership pledges its participants to provide "appropriate" and "effective" security for all

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their nuclear materials. A new statement embodying a political commitment to meet an effective common standard – perhaps based on a minimum design basis threat – combined with an offer to assist other states willing to join in that commitment, could provide the basis for rapid progress toward a stringent global standard.

6. Accelerating the Blend-Down of Highly Enriched Uranium. We urged the Bush Administration to begin negotiating with Russia an accelerated approach to destroying Russia's excess bomb uranium, in which tens of tons of additional material would be blended and stored each year for later sale.

7. Creating New Revenue Streams for Nuclear Security. We recommended that new revenue streams be developed to supplement ongoing government expenditures for securing nuclear weapons and materials in the former Soviet Union, such as a "debt for nonproliferation" swap or a set-aside of revenues from spent fuel imports, if an acceptable approach to such imports moves forward.

The time for action is now. Immediate further steps are needed to ensure that all of the tens of thousands of nuclear weapons and hundreds of tons of weapons-usable nuclear materials around the world are secure and accounted for. Accomplishing this as rapidly as possible must be a top security objective of the entire international community. After September 11, "business as usual" is simply not good enough.

The leaders of the major states in the international system should each be asking themselves: "On the day after a terrorist nuclear attack, what actions would we wish we had taken to prevent it?" – and then begin taking those steps before disaster strikes.

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[1] Matthew Bunn, John P. Holdren, and Anthony Wier, *Securing Nuclear Weapons and Materials: Seven Steps for Immediate Action* (Cambridge, MA: Harvard University Managing the Atom Project and Nuclear Threat Initiative, May 2002, available on-line at http://www.nti.org/)

HARVARD UNIVERSITY
JOHN F. KENNEDY SCHOOL OF GOVERNMENT

MATTHEW BUNN is a Senior Research Associate in the Managing the Atom Project at Harvard University's John F. Kennedy School of Government. His current research interests include security for weapons-usable nuclear material in the former Soviet Union and worldwide; nuclear theft and terrorism; verification of nuclear stockpiles and of nuclear warhead dismantlement; disposition of excess plutonium; conversion in Russia's nuclear cities; and nuclear waste storage, disposal, and reprocessing. From 1994-1996, Bunn served as an adviser to the White House Office of Science and Technology Policy, where he took part in a wide range of US-Russian negotiations relating to security, monitoring, and disposition of weapons-usable nuclear materials. He was the staff director for the classified study of security for nuclear materials conducted by the President's Committee of Advisers on Science and Technology in 1995 and for the two-volume National Academy of Sciences study, Management and Disposition of Excess Weapons Plutonium.

Opinions expressed by the Guest Editor are not necessarily the opinions of Sandia National Laboratories.

Material Protection, Control, and Accounting

Initially DOE/NNSA's Material Protection, Control, and Accounting (MPC&A) program was directed toward two scenarios for nuclear terrorism, both of which had potentially very grave consequences. In the first scenario, a complete nuclear weapon is taken over by terrorists or by a rogue country - this is the one that movies such as *Peacemaker* focus on. In the second scenario, nuclear materials are stolen for the subsequent construction of a nuclear explosive device. A third scenario for nuclear terrorism has recently emerged, one in which a terrorist could accomplish great damage by combining highly radioactive nuclear material with conventional explosives to create a radiological dispersal device (RDD), a so-called dirty bomb. This last scenario has become of much greater concern after the events of September 11, 2001. Through the MPC&A program, Sandia National Laboratories, with personnel from other national laboratories and personnel from NNSA Headquarters, has played and is playing a major role in fighting all of these forms of terrorism in the countries of the FSU.

NNSA estimates that the MPC&A program will be completed in 2020 at a cost of about $2.2 billion. In Russia, the MPC&A program has completed or partially completed the installation of security systems in 115 buildings holding 192 metric tons, or about 32 percent, of the 603 metric tons of weapons-useable nuclear material at risk of theft. The completed systems are installed in 81 buildings housing 86 metric tons, approximately 14 percent, of Russia's nuclear material. The partially completed systems, known as rapid upgrades, have been installed in 34 additional buildings to protect 106 metric tons, another 18 percent, of the nuclear material. Rapid upgrades consist of such things as bricking up windows in storage buildings; installing strengthened doors, locks, and nuclear container seals; and establishing controlled access areas around the nuclear material. Completed systems include such components as electronic sensors, motion detectors, physical barriers, closed circuit surveillance cameras, central alarm stations to monitor the cameras and alarms, and computerized material accounting systems. By installing rapid upgrades, the MPC&A program helps Russian sites establish basic control over their nuclear material while US project teams finish installing the security systems.

Reviews of installed systems at nine nuclear sites in Russia indeed indicate that most of the security systems are currently reducing the risk of theft. The MPC&A program has established an internal review team known as the Technical Survey Team that examines project documents and meets with project teams to determine if the installed systems meet departmental guidelines for effectively reducing the risk of nuclear theft in Russia.

Even though progress has been made in installing MPC&A systems, project teams do not have access to 104 of the 252 buildings requiring improved security systems. These buildings, located mostly at Russian nuclear weapons laboratories, contain hundreds of metric tons of nuclear material. MINATOM is reluctant to grant access to these buildings because of Russian national security concerns and Russian laws on the protection of state secrets. MPC&A program access to these buildings is necessary to confirm the type of material to be protected, to design systems that provide adequate protection for the material, to ensure that the systems are installed properly, and to ensure that the sites operate the systems properly. In 2001, NNSA reached a draft agreement with MINATOM to provide program personnel

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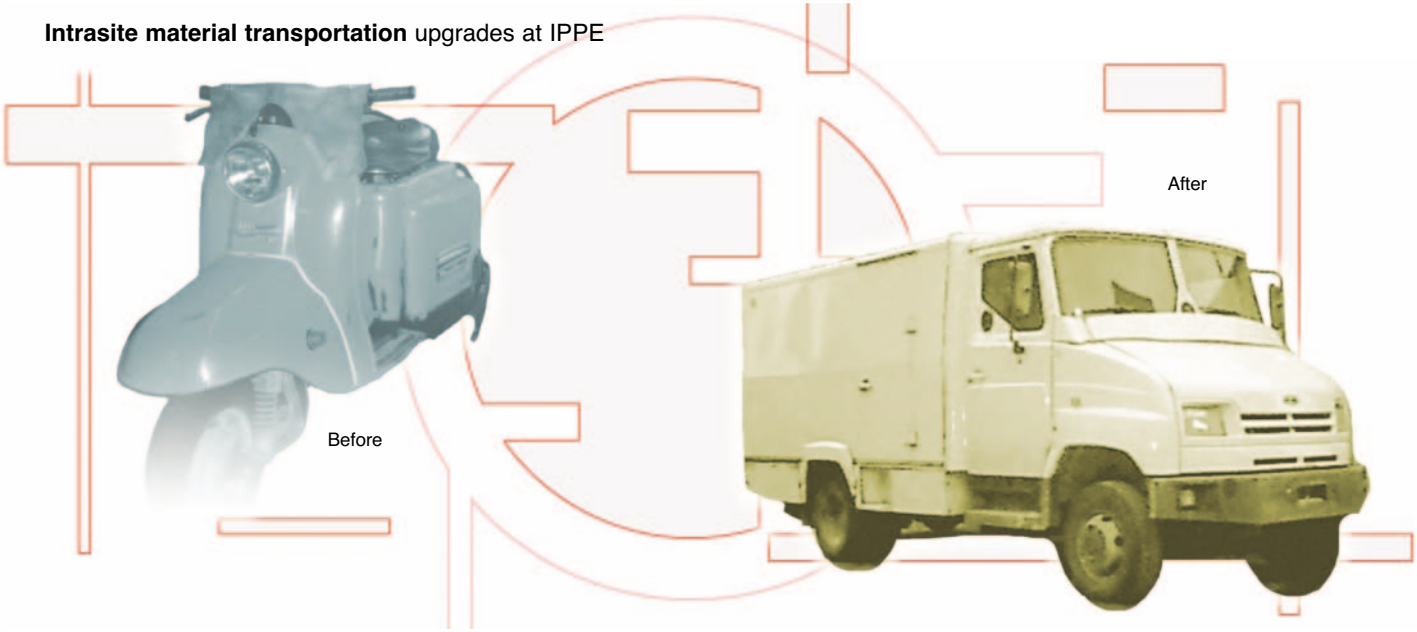
with greater access to sensitive MINATOM sites. Even with the agreement, some of the more sensitive MINATOM sites will apparently remain inaccessible to program personnel, although the agreement as it exists has allowed the program to further expand its work.

Installing security systems alone will not ensure the long-term success of the MPC&A program. However, the MPC&A program is currently collecting information from individual sites that will be useful in measuring the new systems' effectiveness. For example, MPC&A project teams visit sites and observe systems that have been installed and at certain sites have contracts with the Russians to collect information on the functioning of equipment. If they are accepted at the operational sites, the MPC&A Operations Monitoring (MOM) systems will aid in this assessment. In addition, before installing security systems, MPC&A and Russian site officials conduct vulnerability assessments that assess the risk of theft of material at a site. The MPC&A program is also working with Russia to consolidate nuclear material into fewer buildings and to convert the HEU in these buildings into forms that cannot be used in nuclear weapons. While this effort could reduce the program's costs by reducing the number of sites and buildings requiring protection systems, MINATOM has not yet identified which buildings and sites it plans to close.

The security systems installed by NNSA are reducing the risk of theft of nuclear material in Russia, but hundreds of metric tons of nuclear material still lack improved security systems. Close to $900 million has been spent by the MPC&A program since its inception. The systems installed in Russia, while not as robust as those installed in the United States, are designed to prevent individuals or small groups of criminals from stealing nuclear material. Russian officials' concerns about divulging national security information continue to impede NNSA's efforts to install systems for several hundred metric tons of nuclear material at sensitive Russian sites. The program's continued progress depends on NNSA's ability to gain access to these sensitive sites and to reach agreement with Russia on reducing the number of sites and buildings where nuclear material is located and security systems are needed. The MPC&A program currently does not have monitoring systems installed at sensitive sites to monitor the provided security systems to ensure that they are operating properly on a continuing basis. However, MOM demonstration systems are being evaluated in cooperation with Russia. Source: Jim Chapek 5350, MS 1379, 505-284-4795, fax 505-844-6067, jfchape@sandia.gov

Intrasite material transportation upgrades at IPPE



MPC&A Success at Luch

As part of the NNSA MPC&A Program, Sandia National Laboratories has been involved for the last seven years in upgrades at the Russian Scientific Research Institute of Scientific Industrial Association "Luch," also known simply as Luch. While the project team is comprised of representatives from various national laboratories and has undergone multiple changes in personnel over the years, Sandia has maintained the lead role for the implementation of physical protection upgrades at Luch since the onset of the project in late 1995.

Luch is a scientific research facility and an industrial uranium processing facility located in the town of Podolsk approximately 35 km south from the center of Moscow. The compact site in an urban setting is divided into two sections by a public street. The two sections, each enclosed by its own perimeter, are connected by an underground passage and are referred to by Luch personnel as the "old site" (the southern section) and the "new site" (the northern section). A rail station is located directly to the west of Luch, making it a readily accessible site.

Luch is well known for research in materials sciences, with major accomplishments in the fields of ceramics, metallurgy, high-temperature materials, lasers, and space reactors (including the TOPAZ reactor). Luch also processes nuclear materials in various forms including metals, alloys, oxides, carbides, nitrides, phosphides, sulphides, borides, and

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MPC&A Activities at Chelyabinsk-70 and Arzamas-16

Sandia National Laboratories is participating on MPC&A program teams that are engaged in material protection activities at the All-Russian Scientific Research Institute of Technical Physics (VNIITF), also known as Chelyabinsk-70, and the All-Russian Scientific Research Institute of Experimental Physics (VNIIEF), known as Arzamas-16. These two Russian facilities are key elements of the MINATOM weapons complex, and significant amounts of weapons-grade nuclear material are located at these sites. The sensitivity of VNIITF and VNIIEF has limited progress at times because of the difficulty of the US obtaining the necessary information about existing facilities and of negotiating assurances related to the operation of proposed MPC&A upgrades.
Recently NNSA and MINATOM have agreed to proceed with projects at VNIITF and VNIIEF to construct central storage facilities. The justifications for embarking on projects of this scale are to reduce the quantity of nuclear material currently being stored in multiple aging buildings at both facilities and to centralize the storage of the material in new facilities where the material will be much more secure from theft. This approach also has the added benefit of simplifying the information exchange and access assurances needed to protect a large portion of the attractive nuclear material at VNIITF and VNIIEF. These ambitious projects will each require several years to complete at costs of more than $10 million each. Assurances have been negotiated with VNIITF and VNIIEF to verify that the existing facilities will be emptied of weapons-grade nuclear materials and to verify the continued operation of the central storage facilities for at least three years after nuclear materials are loaded into the new facilities.

The All-Russian Design and Scientific Research Institute of the Energy-Technology Complex (VNIPIET) will be responsible for the design of both proposed central storage facilities. At this time, designs for the facilities are in different stages of completion. Several options were considered at VNIITF and VNIIEF, including renovation of existing structures and construction of an entirely new building. While new construction is planned for the central storage facility at VNIITF, the proposed facility at VNIIEF will take advantage of an existing structure that was begun in 1990 and left incomplete in 1992.

The MPC&A project teams working at VNIITF and VNIIEF are proceeding carefully to manage the programmatic risks of conducting large construction projects in Russia, but the clear objective is to significantly increase the security of tons of highly attractive nuclear material. Source: Ken Ystesund 5352, MS 1379, 505-844-4388, fax 505-844-6067, kjystes@sandia.gov

Success at Luch *continued from page 11*

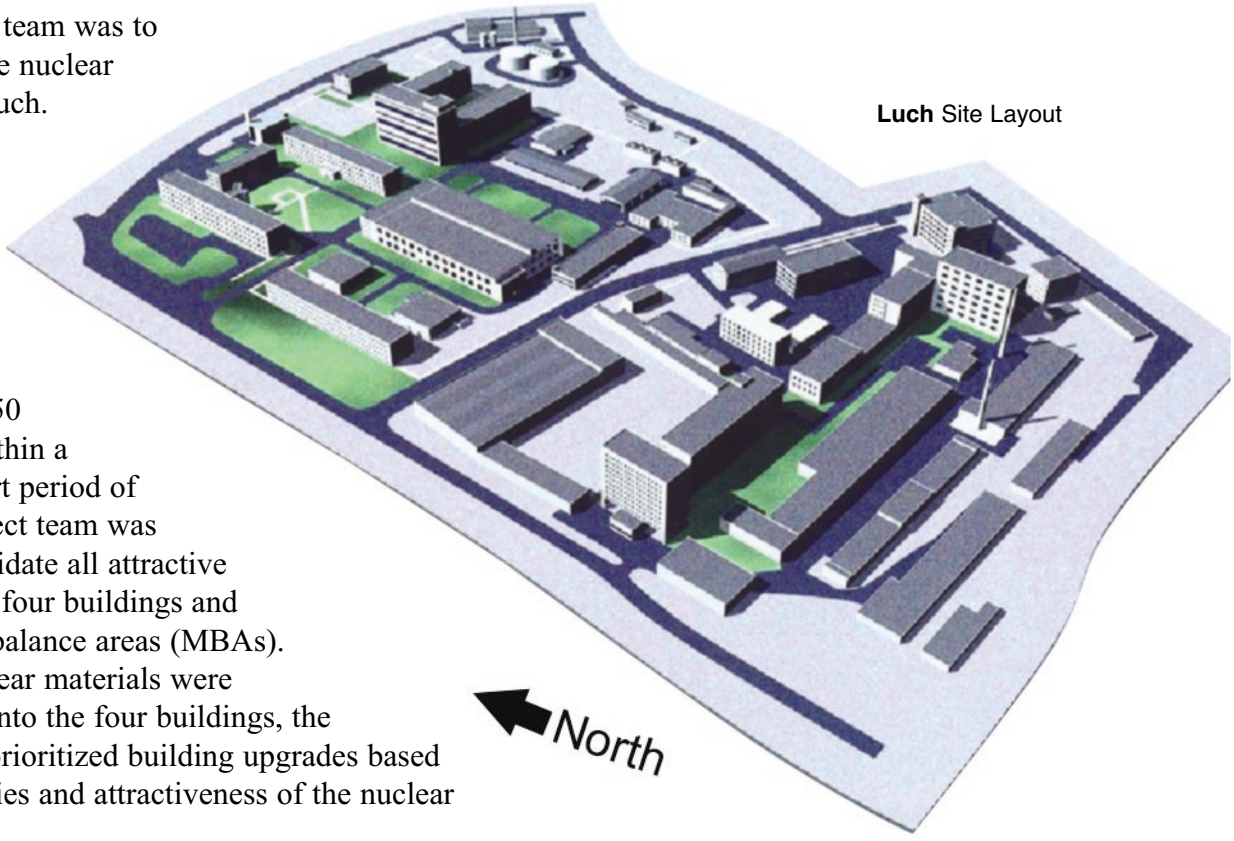
solutions. Uranium compounds dispersed in a metal or graphite matrix and samples of varying shapes, such as cylinders, sleeves, plates, and bars, for mechanical, thermal, physical and corrosion tests are also in use at Luch. Between 1000 and 1500 kilograms of highly enriched uranium (HEU) are processed at Luch on a continual basis, with much of this material being enriched up to 96 percent. Many of these materials are easily transportable making them especially susceptible to theft.

In contrast to its many attributes highlighted above, Luch is also known for a highly publicized theft of nuclear materials in the early 1990s. In this case Yuri Smirnov, a Luch employee, was stealing small amounts of nuclear material over an extended period and accumulating them at his apartment. By the time his protracted theft was discovered by happenstance, Mr. Smirnov had accumulated 1.5 kilograms of highly enriched uranium.

One of the first tasks undertaken by the project team was to consolidate the nuclear materials at Luch. Initially, nuclear materials were distributed throughout the Luch site in more than 50 locations. Within a relatively short period of time, the project team was able to consolidate all attractive materials into four buildings and five material balance areas (MBAs). Once the nuclear materials were consolidated into the four buildings, the project team prioritized building upgrades based on the quantities and attractiveness of the nuclear materials.

The physical protection system at Luch is based on the Eleron "Evridika" alarm communication and display system. The decision to use the Eleron system was not an easy one since many projects commencing prior to the Luch project had experienced difficulties in working with Eleron. Despite the pressure from some not to use Eleron, the project team decided that the benefits of installing an Eleron system outweigh the potential difficulties. Such benefits include being a MINATOM entity and being located in Moscow. In the end, the decision proved to be a good one. Although negotiations with Eleron were challenging, the overall cooperation and support from Eleron has been and continues to be very favorable. The Luch/Eleron relationship has been very close since the onset of the project. While

Success at Luch *continued on page 13*



Luch Site Layout

Success at Luch *continued from page 12*

Eleron was designing and upgrading the CSF and the CAS, Eleron personnel were also training Luch personnel to perform these activities. As a result, upgrades to the final buildings were completely designed and implemented by Luch, using Eleron only as a consultant.

Since the beginning of the project, Luch has been extremely cooperative with the MPC&A Program. While Luch did not always agree with the methodologies proposed by the US Project Team, both sides were always able to reach agreeable compromises. In the end, a culture shift has occurred at Luch unlike that at most other Russian facilities participating in the MPC&A Program. Their cooperative nature has benefited them greatly, in that many new NNSA initiatives have been piloted at Luch.

In 1999, because of their technological capabilities and because of their cooperative nature with the MPC&A Program, Luch was chosen to participate in a new NNSA initiative – the Material Consolidation and Conversion (MCC) project. The goal of the MCC project is twofold: to consolidate unused nuclear material throughout Russia into a single location, thus minimizing the number of locations that would require extensive MPC&A upgrades, and to convert attractive HEU to lesser attractive low-enriched uranium (LEU). In all, more than three tons of HEU have been downblended under the MCC project. One specific example of the MCC project's success is the removal and subsequent conversion of more than 100 kilograms of extremely attractive material from the Research Institute of Scientific Instruments (RISI) in Lytkarino. This removal of material resulted in immediate risk reduction at RISI by the elimination of several target locations that would have otherwise required extensive upgrades. Participation in the MCC project has also provided Luch with the necessary resources for sustaining the MPC&A upgrades. Under the MCC contract, Luch is required to use 10 percent of the proceeds for enhancing, operating, and sustaining the MPC&A program, and as a result no US funds have been required for the past several years to sustain the upgrades installed at Luch.

While upgrades at Luch, the largest site to be completed under the MPC&A Program to date, have essentially been completed, additional work requiring US participation is ongoing. In addition to the MCC project, which is expected to continue for several years, the US hopes to work with Luch in developing comprehensive sustainability related programs, such as performance testing, training, and maintenance.

Based on Project Team observations over the duration of the Luch project, the likelihood that Luch will continue to operate and sustain the new MPC&A systems once the time comes to end our cooperation is extremely high. While the upgrades at Luch are impressive, the cultural change at Luch demonstrates the ultimate success of the Luch Project Team. Source: Dan Lowe 5352, MS 1379, 505-284-0182, fax 505-284-8484, dllowe@sandia.gov

Commissioning of the Central Storage Facility – August 1998

Physical Protection Upgrades Completed at Uzbekistan INP Facility

Uzbekistan has a single nuclear reactor located at the Institute of Nuclear Physics (INP) in Ulegbek, outside Tashkent. In September 2000, the government of Uzbekistan urgently requested physical protection upgrades at the INP VVR-SM reactor facility, citing terrorist acts attributed to the IMU (Islamic Movement of Uzbekistan). In response the US government agreed to assist. Following the events of September 11, 2001, the National Security Council directed that the upgrade program be accelerated, and Sandia responded with air shipments of equipment and materials to Tashkent. Working with the US physical protection company Advantor and the INP, Sandia completed Phase I of the upgrades in early 2002.

Later in 2002, the US State Department allocated funds from the Nonproliferation and Disarmament Fund (NDF) to further enhance physical protection features of the INP facility with external video surveillance and lighting. Under these US government programs, the added physical protection capabilities move the facility from a containment strategy toward one of adversary denial, a strategy in which the adversarial force is not able to successfully attack and take over the facility. Following the completion of these Phase II video surveillance and lighting upgrades, the new physical protection perimeter shown in the photo is providing the INP security forces with an enhanced capability to detect an adversary in a timely manner.

On October 18, 2002, a formal ceremony was held at the INP to celebrate the completion of the new upgrades. Representatives of the US government and the Republic of Uzbekistan participated in the ceremony. US Ambassador to Uzbekistan Herbst presented to the Vice Premier of Uzbekistan Khamidulla Karamatov a commemorative plaque symbolizing the completion of the physical protection enhancements at the INP.

Although these security enhancements at the INP have been completed, US cooperative activities with the INP are by no means complete. For instance, The NNSA/Office of International Material Protection and Cooperation NA-25 is cooperatively working with the INP to address the issue of radioactive dispersal devices in Uzbekistan. In this program, other nuclear isotopic source and storage facilities at the INP are receiving security enhancements; signals from these new security enhancements will then be sent to the enhanced computer-based security system in the central alarm station. Second, the NNSA/Office of Nonproliferation and International Security NA-24 is working with Russia and the INP to remove irradiated HEU fuel from the facility for shipment back to Russia. This program is expected to be completed by the end of fiscal year 2003. Sandia is involved in further lighting and security enhancements within the reactor hall to support this fuel loading and transport project. Finally, NA-24 has begun a program in which Sandia National Laboratories and Oak Ridge National Laboratory experts are working with the Uzbek Ministry of Internal Affairs security response forces to enhance their capabilities to ensure that the nuclear assets at this facility are adequately protected. Source: Roger Case 5352, MS 1379, 505-844-5139, fax 505-844-6067, rscase@sandia.gov

The interior of the upgraded security perimeter at the Uzbek Institute Of Nuclear Physics VVRSM Facility October 2002

ISC Takes on Role in Combating RDDs

FOCUS

A new and important part of the US/former Soviet Union MPC&A Program is the security of foreign radiological material that could potentially be acquired and used against US interests in a radiological dispersal device (RDD), also known as a dirty bomb. In the aftermath of the September 11, 2001, attacks, Congress provided NNSA/NA-25 with $20 million in supplemental FY02 funding to start an RDD Program. The NA-25 FY04 RDD budget is estimated to be $36 million.

Recently Sandia's International Security Center (ISC) became a key player in the NA-25 RDD program. ISC personnel have briefed the NA-25 team about Sandia's progress regarding efforts to combat RDD domestically, have participated in the development of a strategic plan to secure and control foreign-origin RDD source materials, and are part of a team that surveyed and recommended security improvements for AZOTOP, a major distribution facility for radiological medical materials in the Moscow region. A similar effort is scheduled for the All-Russian Scientific Research Institute of Technical Physics and Automation (VNIITFA) during the period of April 22 to May 1, 2003.

NA-25 has provided some funding to the International Atomic Energy Agency (IAEA) and is working with the IAEA to identify and secure RDD material internationally. Jim Chapek, acting manager of Sandia's International Physical Protection Group 5350, represented Sandia at a major IAEA conference in Vienna on March 10 through 13, 2003. The conference was convened to raise governmental and public awareness of key issues relating to the security of radioactive sources and to promote a wide exchange of information. Source: Jim Chapek 5350, MS 1379, 505-284-4795, fax 505-844-6067, jfchape@sandia.gov

Radiological Dispersal Devices

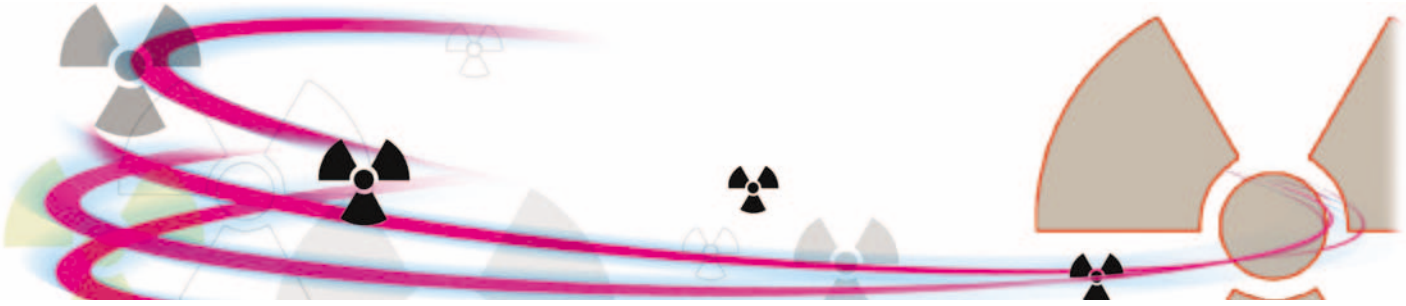
A radiological dispersal device (RDD), or dirty bomb, is an old concept with a renewed life since the events of 9/11. The concept of using radiation from dispersed material as a weapon has been studied since the recognition that radiation exposure could lead to death or grave illness and was even part of the Manhattan Project.

Early studies all led to the conclusion that the dispersal of radiological materials would not be an effective battlefield weapon due to the difficulties of delivering a lethal or incapacitating dose in a short time period. But the situation is very different when one looks at the potential harm that could be caused if such a dispersal exposed noncombatants and had the goal not of incapacitating but of terrorizing the targeted society.

Estimates of the financial damage that would ensue subsequent to an RDD event in a major metropolitan area or in a major port facility are devastating, based on criteria such as a requirement to remediate the site to superfund cleanup levels specified by the Environmental Protection Agency. Thus, an RDD is not so much a weapon of death as an effective economic weapon that works by denying access.

Overall, RDDs are a major concern, with radioactive materials being relatively easy to obtain and to spread using straightforward techniques, resulting in the potential for huge economic harm.

Source: excerpted with permission from "Reducing the Terror: Radiological Dispersal Devices and Terrorism," (ACG Newsletter, February 2003) by John Whitley 16000, MS 0839, 505-845-9763, fax 505-284-4778, jbwhitl@sandia.gov, <http://www-irn.sandia.gov/pubs/ACG/Pages/current.html>



Second Line of Defense

NNSA's Second Line of Defense (SLD) program is our nation's primary international program for interdiction of nuclear smuggling and nuclear terrorism. The mission of the SLD program is to minimize the risk of nuclear proliferation and terrorism, which is accomplished through cooperative efforts with foreign governments to strengthen their overall capability to deter, detect, and interdict illicit trafficking of nuclear material across their borders. Borders are broadly defined within SLD and encompass sea, air, and land crossings.

Sandia National Laboratories is the SLD Field Operations Manager and Project Manager for NNSA. Los Alamos National Laboratory, Oak Ridge National Laboratory, Lawrence Livermore National Laboratory, and Pacific Northwest National Laboratory each have a role in the program as well.

Securing airports is one of the many "crossings" covered by SLD

The SLD strategy has two components: to address immediate needs at strategic points of entry in the short term and to strengthen the long-term capability of our partners to detect and respond to illicit trafficking in nuclear materials. Both strategic components are based on the innovative and systematic adaptation of commercially available technology in configurations useful for enforcement officials. The SLD program has systematically adapted commercially available radiation detection equipment, security cameras, and communications equipment to work comprehensively for Russian Customs and other foreign agencies. The program is unique in innovatively adapting existing capabilities in a systems model refined for use by border enforcement officials. By taking a systems approach to the problem of border protection, the equipment and training provided through the program will not only be more effective but is also tightly integrated into the foreign government's customs or border security operations and therefore is more likely to be utilized in the long term.

Coordination and implementation of the SLD program requires close cooperation among various US agencies, including the Department of State, the United States Custom Service, the Department of Defense, the Department of Commerce, and the intelligence community. NNSA works closely with the interagency working group to ensure that the SLD Program complements other US government nonproliferation initiatives in foreign nations and regularly briefs interagency community representatives regarding the status and progress of the SLD Program.

As of December 2002, the SLD program has installed well over 200 nuclear material detection systems. The security of many border crossings has dramatically improved as a result of the recommendations and the installation of physical security improvements by the SLD program. Border crossings successfully addressed include vehicle crossings, rail crossing, airports, and seaports. Several hundred new detection systems have been ordered and are in various states of manufacture, with many ready for installation in 2003. In 2002, the SLD team performed work at over 80 air, sea, and land crossings in at least five different countries, including Russia and Kazakhstan. In 2003, SLD will be working in approximately 30 countries around the globe.

The success of the SLD program has also resulted in a request from US Customs to provide the nuclear detection capability for its Container Security Initiative. As a result, SLD teams are addressing security at megaports around the globe.

Source: Charles Massey 5356, MS 1377, 505-845-0773, fax 505-284-9038, cdmasse@sandia.gov

Operation Safe Commerce

Operation Safe Commerce (OSC) is an initiative of the Department of Homeland Security (DHS) and the Transportation Security Administration (TSA). OSC will explore business processes and technology prototypes that protect commercial shipments from threats of terrorist attack, illegal immigration, and contraband while minimizing the economic impact upon the maritime transportation system. OSC is funded by TSA at the three major US port complexes at Los Angeles/Long Beach, Seattle/Tacoma, and New York/New Jersey. Los Angeles/Long Beach is the largest, with transshipment of over $200 billion in foreign cargo each year.

OSC will analyze weaknesses in security along the entire supply chain from the foreign factory to the final point of distribution in the US. This will include all of the intermodal transportation and ports of call along the way. Improvements to security, both procedures and technologies, will be identified and demonstrated by the ports.

The City of Los Angeles and the City of Long Beach have provided their own initial funding to begin this effort with a security evaluation of the ports. The International Borders/Maritime Security Department 5356 at Sandia National Laboratories has established Work for Others (WFO) agreements with both cities. Department 5356 will be the Program Manager for Operation Safe Commerce, representing both ports, and is partnering with several other Sandia organizations, including Security Systems and Technology Center 5800, Systems Assessment and Research Center 5900, Protective Force Program 12210, and Infrastructure and Information Systems Center 6500 in this effort.

Sandia representatives will provide technical guidance and oversight and will serve on the coordinating committee to help plan and execute a layered and balanced security posture for both ports. Other organizations represented on the committee include US Customs, both port authorities, the Department of Commerce, unions, and the US Coast Guard. The initial task of security assessment has already begun and will be completed and documented by July 2003, and an initial demonstration of an integrated supply chain security system is anticipated by September 2004.

Source: Dick Wayne 5356, MS 1377, 505-844-6856,
fax 505-284-9038, rawayne@sandia.gov

GAO Reports on Improving Russian WMD Security

The Russian Federation has the world's largest stockpiles of weapons-usable nuclear material, nuclear warheads, dangerous biological pathogens, and chemical weapons. The US General Accounting Office (GAO) was tasked by a US Senator to prepare a report on US programs that address the threat of the possibility of terrorists and countries of concern gaining access to poorly secured weapons of mass destruction (WMD) at sites throughout Russia.

During the course of its work, GAO reviewed documents and met with officials from the Russian government. GAO also visited 14 nuclear, biological, and chemical sites in Russia that have received or will receive US security assistance. The GAO report, *Weapons of Mass Destruction: Additional Russian Cooperation Needed to Facilitate US Efforts to Improve Security at Russian Sites*, was released in March 2003. The report concluded that additional Russian cooperation is needed to facilitate US efforts to improve security at Russian WMD sites.

DOD and DOE have obligated more than $1.8 billion since 1992 to help improve security at Russian WMD sites. GAO found that DOD and DOE have made slow progress, because Russia is not providing needed access to many sites. NNSA recently scaled back its plans, and the two agencies will face coordination issues, such as deciding which agency will secure sites included in both of their plans.

After the lead responsibility for securing weapons-usable nuclear material was transferred to DOE in 1995, DOE helped secure reactor fuel that the Russian Navy used to fuel its nuclear submarines and icebreaking ships as part of its program. DOE also began securing some of Russia's nuclear warheads after the Russian Navy asked for assistance in 1998. DOE, specifically DOE/NNSA since June 2000, has helped secure 33 of the 36 Russian Navy sites due to cooperation received from the Russian Navy. However, NNSA has had to scale back its plans and reconsider its time frames since new guidelines limit assistance to operational sites that support deployed nuclear weapons, out of concern that US assistance could enhance Russia's military capability. Russia's tight restrictions on access to non-Navy nuclear warhead storage sites have severely limited DOD's efforts to improve security at these sites. This is in contrast to the progress that NNSA has made with the access it receives from the Russian Navy.

NNSA has had plans to secure all weapons-usable nuclear material in Russia by 2008, but the department's lack of access to many of the most sensitive sites in Russia's nuclear weapons complex represents a significant impediment. GAO recommends that NNSA reevaluate its plans for securing Russia's nuclear material by 2008 and, with DOD, develop an integrated plan to ensure coordination of efforts to secure Russia's nuclear warheads. The departments will also have to work together to ensure that the different types of equipment and guard force training they provide to Russia are standardized. GAO suggests in the report that Congress consider allocating additional funds for improving security at three sites in Russia that store nerve agents but have not received US security assistance. The GAO also recommends that the US Secretary of Defense work with Russian officials to develop practical plans for securing chemical weapons while in transit to the planned destruction facility. Source: Joseph A. Christoff and Robert A. Robinson, *Weapons of Mass Destruction: Additional Russian Cooperation Needed to Facilitate US Efforts to Improve Security at Russian Sites,* GAO-03-482, March 2003

Sandia's Role in Russian WMD Security

Sandia National Laboratories has played an active role in supporting DOD and DOE in improving security of Russia's weapons of mass destruction. Along with several other national laboratories, Sandia supports DOE's Material Protection, Control, and Accounting (MPC&A) program and similar DOD programs, such as the Defense Threat Reduction Agency (DTRA) initiatives. For DTRA, an example of Sandia's role has been to provide technical support for the maintenance and replacement of railcars for nuclear weapons transportation. Sandia is also the lead laboratory working with the Russian Navy to secure nuclear material and warheads.

Within the DOE MPC&A framework, Sandia's primary subprograms include:

- Civilian Nuclear Material Protection: Sandia serves as the physical protection lead laboratory to reduce the threat of weapon-grade material theft for several large fuel facilities and research reactor sites.
- MINATOM Nuclear Material Protection: Sandia serves as both a lead and a support laboratory for physical protection at major nuclear material storage sites within the Russian Federation nuclear weapons complex.
- National Programs: Sandia serves as program lead for training initiatives and operations documents that help foster Russian capabilities and commitments to operate and sustain US-installed MPC&A systems.
- Russian Federation Navy: Sandia leads the effort to install and sustain physical protection upgrades at Russian Navy sites where nuclear materials such as reactor fuel or warheads may be stored.

In short, Sandia provides expertise on physical protection and vulnerability assessments to these and other projects by upgrading physical protection systems at specific facilities, enhancing the protection of materials during transportation, facilitating long-term usefulness of installed systems, and building a capability for interdiction of illegally diverted materials at borders.

Source: Amber Lewis 5351, MS 1234, 505-844-9318, fax 505-844-0001, allewis@sandia.gov

Calendar: Visits, Workshops, and Conferences

Workshops and Conferences

July 13-17 *Phoenix, AZ: Institute of Nuclear Materials Management (INMM) 44th Annual Meeting will be held at the Marriott Desert Ridge Resort and Spa. John Matter 5323, 505-845-8103*

September 6-26 *Albuquerque, NM: Seventeenth International Training Course on Physical Protection of Nuclear Materials and Facilities (NA-243, IAEA) David Ek 5323, 505-845-9891*

November 16-20 *New Orleans, LA: Global 2003: Advanced Nuclear Energy and Fuel Cycle Systems conference. Sessions of interest to Sandians include Advanced Reactors, Fuel Cycles, Waste Management, Repository Development, Nonproliferation Technology/Policy/Implementation, Preventing Nuclear Terrorism, and Developments in International Cooperation. Gary E. Rochau 6415, 505-845-7543*

February 29 *– March 4, 2004 Charleston, SC: American Nuclear Society (ANS)-INMM 7th International Conference on Facility Operations – Safeguards Interface. <http://ntr.ornl.gov/ANS2004/> Janie McCowan, ORNL, 865-576-4003; Teressa McKinney, ORNL, 865-241-9695*

Visits

August 4-6 *Albuquerque, NM: Dori Ellis, Director of International Security Center 5300, hosts the Distinguished Panel for Arms Control and Nonproliferation. The panel advisory members, from universities, private corporations, and DOD, will focus on issues of homeland security, China reengagement, DPRK nuclear proliferation, postwar Iraq, and US unilateralism on international cooperation. (NP/MC Program Management, SBU-2) Dori Ellis 5300, 505-845-3077*

Acronyms

CAS	central alarm station
CSF	central storage facility
CTR	Cooperative Threat Reduction (DOE and DOD cooperative program)
DHS	Department of Homeland Security (US)
DOD	Department of Defense (US)
DOE	Department of Energy (US)
DTRA	Defense Threat Reduction Agency (DOD)
ENWC	Enterprises of the Nuclear Weapons Complex (Russia)
FMSF	Fissile Material Storage Facility (Mayak, Russia)
FSU	former Soviet Union
GAN	Gosatomnadzor (Federal Nuclear and Radiation Safety Authority, Russia)
GAO	General Accounting Office (US)
GOST	Gosstandart (State Committee of the Russian Federation for Standardization and Metrology, the Russian Equivalent of the American National Standards Institute - ANSI)
HEU	highly enriched uranium
IMU	Islamic Movement of Uzbekistan
INP	Institute of Nuclear Physics (Uzbekistan)
IPPE	Institute of Physics and Power Engineering (Russia)
MBA	material balance area
MC&A	material control and accounting
MCC	Material Consolidation and Conversion (NNSA project)
MINATOM	Ministry of Atomic Energy (Russia)
MOM	MPC&A Operations Monitoring
MPC&A	Material Protection, Control, and Accounting (NNSA program)
NA-24	Office of Nonproliferation and International Security (NNSA)
NA-25	Office of International Material Protection and Cooperation (NNSA)
NAP	Nuclear Assessment Program (NNSA program)
NDF	Nonproliferation and Disarmament Fund (US Department of State)
NIS	New Independent States (FSU)
NNSA	National Nuclear Security Administration (DOE)
OSC	Operation Safe Commerce
PIDAS	Perimeter Intrusion Detection and Assessment System
Pu	plutonium
RDD	radiological dispersal device (dirty bomb)
RISI	Research Institute of Scientific Instruments (Lytkarino)
SATC	Security Assessment and Training Center (Russia)
SLD	Second Line of Defense (NNSA program)
TSA	Transportation Security Administration (US)
VNIIA	All-Russian Scientific Research Institute of Automatics (Russia)
VNIIEF	All-Russian Scientific Research Institute of Experimental Physics (Russia)
VNIITF	All-Russian Scientific Research Institute of Technical Physics (Russia)
VNIITFA	All-Russian Scientific Research Institute of Technical Physics and Automation (Russia)
VNIPIET	All-Russian Design and Scientific Research Institute of the Energy-Technology Complex (Russia)
WMD	weapons of mass destruction
WSSX	Warhead Safety and Security Exchange (agreement between US and Russia)

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Doris E. Ellis, Director

EDITOR:
Barbara Dry 5302, MS 1376
location: IPB/3123
phone: 505-844-9860
fax: 505-845-0331
e-mail: badry@sandia.gov