Case Number: 2014-0838-M

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001a. report	re: The PCAST Panel's Findings in Summary (10 pages) partial release	03/29/1995	P1/b(1) KDE 7/12/2021 +b(3)
001b. report	re: Securing Weapons-Usuable Nuclear Materials in the Former Soviet Union (50 pages) partial release	03/28/1995	P1/b(1) KDE 7/12/2021 + b(3)

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RECORD ID: 9502466
RECEIVED: 29 MAR 95 17

TO: PONEMAN

FROM: LAKE

DOC DATE: 29 MAR 95
SOURCE REF:

KEYWORDS: NUCLEAR SAFEGUARDS ARMS CONTROL

PERSONS:

SUBJECT: REQUEST REVIEW OF RPT FM PANEL ON US - FSU COOPERATION TO PROTECT / CONTROL / & ACCOUNT FOR WEAPONS USEABLE NUCLEAR MATERIALS

ACTION: SEE 9503221 FOR FINAL ACTION DUE DATE: 01 APR 95 STATUS: C

STAFF OFFICER: PONEMAN LOGREF: 9503221

FILES: WH NSCP: CODES:

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001	PONEMAN	Z	95032917	APPROPRIATE ACTION
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RECEIVED: 29 MAR 95 17

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ACTION: APPROPRIATE ACTION DUE DATE: 01 APR 95 STATUS: S

STAFF OFFICER: PONEMAN LOGREF:

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	BELL	SESTAK
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THE PCAST PANEL'S FINDINGS IN SUMMARY

LARGE AMOUNTS OF Pu AND HEU IN THE FORMER SOVIET UNION ARE INADEQUATELY SAFEGUARDED.

THESE MATERIALS REPRESENT AN IMMEDIATE AND SERIOUS THREAT TO U.S. & WORLD SECURITY.

COOPERATIVE US-FSU PROGRAMS TO REDUCE THIS THREAT EXIST AND RECENTLY HAVE BEGUN TO MAKE PROGRESS.

THESE PROGRAMS HAVE BEEN AND CONTINUE TO BE HAMPERED BY INADEQUATE RESOURCES AND OTHER DIFFICULTIES IN BOTH THE UNITED STATES AND THE FSU.

SUBSTANTIAL FURTHER STEPS ARE NEEDED AND ATTAINABLE, BUT WILL REQUIRE PRESIDENTIAL LEADERSHIP.

THE MONETARY AND POLITICAL COSTS OF THE NEEDED PREVENTATIVE MEASURES ARE FAR LESS THAN THOSE LIKELY TO RESULT FROM FAILURE TO ADDRESS THIS PROBLEM ADEQUATELY.

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LARGE AMOUNTS OF Pu AND HEU IN THE FORMER SOVIET UNION ARE INADEQUATELY SAFEGUARDED.

ALTOGETHER THERE ARE ABOUT 170 TONS OF Pu AND ABOUT 1000 TONS OF HEU IN THE FSU. ABOUT HALF OF THIS MATERIAL IS IN NUCLEAR WEAPONS AND IS WELL GUARDED IN THE CUSTODY OF THE MINISTRY OF DEFENSE. THE REST IS NOT IN WEAPONS, IS SPREAD AMONG SOME 100 NON-MOD SITES, AND IS INADEQUATELY GUARDED.

PREVIOUSLY, PROTECTION OF THIS MATERIAL FROM THEFT DEPENDED HEAVILY ON THE CLOSED CHARACTER OF SOVIET SOCIETY AND THE PERVASIVE OVERSIGHT BY THE KGB OF NUCLEAR MATERIALS AND PERSONNEL. NEITHER OF THESE CONDITIONS HOLDS TODAY.

MUCH OF THE Pu AND HEU IS STORED IN ORDINARY LABORATORY BUILDINGS AND STORAGE SHEDS, WITHOUT ADEQUATE FENCES, INTRUSION DETECTORS, PERSONNEL-ACCESS RESRICTIONS, ALARMS, PORTAL MONITORS, OR GUARD FORCES. RUSSIA HAS NO NATIONAL SYSTEM OF NUCLEAR MATERIALS CONTROL & ACCOUNTING, AND NO NATIONAL INVENTORY OF THESE MATERIALS EXISTS.

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DOCUMENT NO. AND TYPE	SUBJECT/TITLE	DATE	RESTRICTION
001a. report	re: The PCAST Panel's Findings in Summary [partial] [Atomic Energy Act] (2 pages)	03/29/1995	P1/b(1), P3/b(3)

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THESE MATERIALS REPRESENT AN IMMEDIATE AND SERIOUS THREAT TO U.S. & WORLD SECURITY.

LIMITED ACCESS TO Pu & HEU HAS BEEN THE PRINCIPAL TECHNICAL BARRIER AGAINST THE SPREAD OF NUCLEAR-WEAPONS CAPABILITIES TO ADDITIONAL COUNTRIES AND SUBNATIONAL GROUPS.

[redacted]

EO 13526 1.4h, 6.2(a), (b)(3)

ECONOMIC DEPRIVATION, INSTITUTIONAL DISARRAY, AND THE EXPLOSIVE GROWTH OF ORGANIZED AND DISORGANIZED CRIME IN RUSSIA — PLUS INTENSIFIED INTEREST IN WEAPONS OF MASS DESTRUCTION IN 3rd-WORLD COUNTRIES & TERRORIST ORGANIZATIONS — HAVE GREATLY INCREASED THE DANGER OF NUCLEAR THEFT.

ALREADY THERE HAVE BEEN MULTIPLE SEIZURES, BY AUTHORITIES IN RUSSIA AND ELSEWHERE, OF KILOGRAM QUANTITIES OF STOLEN HEU AND OF HUNDREDS OF GRAMS OF Pu. THERE IS NO WAY OF KNOWING HOW MANY THEFTS HAVE GONE UNDETECTED, OR WHETHER STOLEN MATERIAL IS ALREADY IN THE HANDS OF POTENTIAL PROLIFERATORS.

COOPERATIVE US-FSU PROGRAMS TO REDUCE THIS THREAT EXIST

---

3 PRINCIPAL PROGRAMS:

- GOVERNMENT-TO-GOVERNMENT, CHANNELED THROUGH MINATOM

  FUNDING:

  FY92-FY95: $30 MILLION FOR RUSSIA

  $22.5 MILLION FOR UKRAINE

  $20 MILLION FOR KAZAKHSTAN

  FY96: $20 MILLION REQUEST

  TRANSITIONING FROM NUNN-LUGAR TO DOE

- LAB-TO-LAB

  FUNDING:

  FY92-FY95: $17 MILLION

  FY96: $40 MILLION REQUEST (DOE)

- COOPERATION WITH GAN (RUSSIAN NUCLEAR REGULATORS)

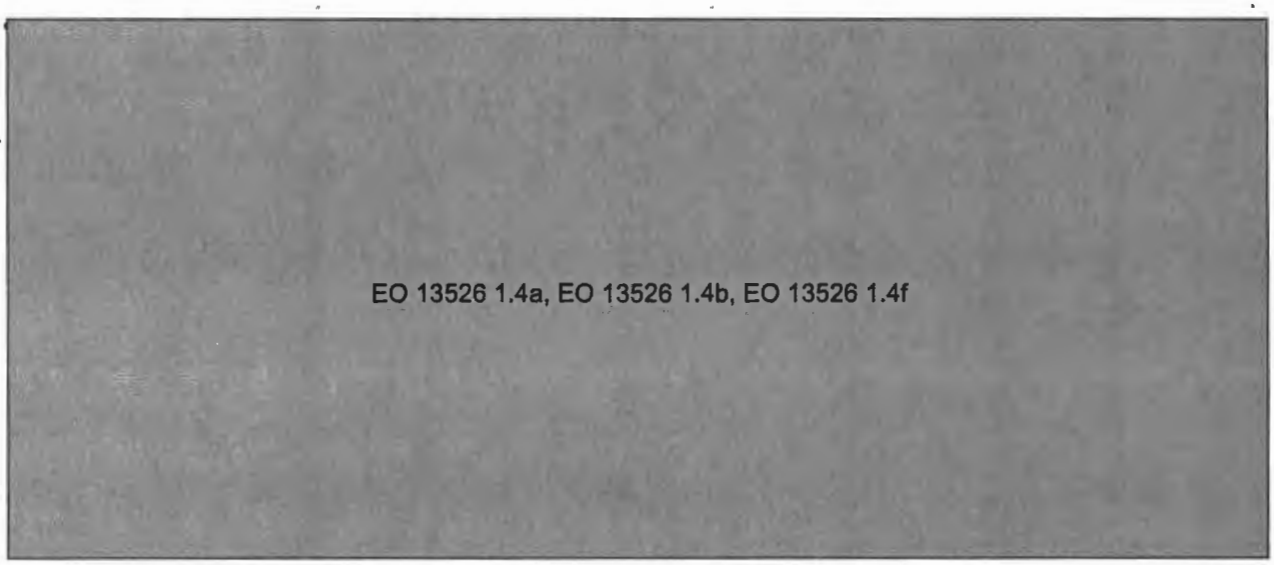
  FUNDING:

  FY92-95: $300,000

  FY96: $10 MILLION REQUEST (DOE)

TOTAL FY96 REQUEST: $70 MILLION (DOE)

THE COOPERATIVE PROGRAMS HAVE RECENTLY BEGUN TO MAKE PROGRESS

- IN MID-1994 AN NSC-LED INTERAGENCY FISSILE-MATERIALS WORKING GROUP WAS FORMED; AN MPC&A SUBGROUP REPORTING TO THIS GROUP WAS FORMED IN FALL 1994.
- AT THEIR SEPTEMBER 1994 SUMMIT, PRESIDENTS CLINTON AND YELTSIN ENDORSED CONTINUED U.S.-RUSSIAN COOPERATION ON MPC&A.
- 

- AGREEMENTS REACHED IN LATE 1994 AND EARLY 1995 IN THE GOVERNMENT-TO-GOVERNMENT AND LAB-TO-LAB PROGRAMS PROVIDE FOR COOPERATIVE EFFORTS TO IMPROVE SECURITY & ACCOUNTING FOR TONS OF MATERIAL AT SEVERAL SITES OVER THE NEXT YEAR.

THESE PROGRAMS HAVE BEEN AND CONTINUE TO BE HAMPERED BY INADEQUATE RESOURCES AND OTHER DIFFICULTIES IN BOTH THE UNITED STATES AND THE FSU

- HUNDREDS OF TONS OF MATERIAL AT SCORES OF SITES MUST BE PROTECTED AND ACCOUNTED FOR, A TASK FOR WHICH THE RESOURCES NOW AVAILABLE ARE CLEARLY INSUFFICIENT.

- WHILE THESE PROGRAMS HAVE BEEN "COOPERATION-LIMITED", THEY ARE NOW CLEARLY RESOURCE-LIMITED. WE HAVE ALREADY HAD TO POSTPONE VALUABLE PROJECTS , WHICH THE RUSSIAN SIDE WAS WILLING TO DO, BECAUSE THE FUNDS AND PERSONNEL WERE NOT AVAILABLE.

- IN RUSSIA, BOTH MINATOM AND THE FINANCE MINISTRY REFUSE TO DIVERT SIGNIFICANT RESOURCES FROM OTHER PRIORITIES TO ADDRESS THIS ISSUE, DESPITE ORDERS FROM YELTSIN AND CHERNOMYRDIN. TURF DISPUTES AMONG THE RELEVANT RUSSIAN AGENCIES ARE FURTHER HOBBLING PROGRESS.

- IN THE UNITED STATES, LONG-STANDING INTERAGENCY DISAGREEMENTS ABOUT THE TERMS OF U.S.-FSU COOPERATION ON THIS ISSUE — ESPECIALLY ABOUT THE CONDITIONS TO BE ATTACHED TO U.S. FUNDS — HAVE NOT BEEN FULLY RESOLVED.

SUBSTANTIAL FURTHER STEPS ARE NEEDED AND, WITH PRESIDENTIAL LEADERSHIP, ATTAINABLE. WE RECOMMEND THAT THE PRESIDENT:

- ISSUE A DECISION DIRECTIVE DESIGNATING COOPERATION WITH THE FSU ON MPC&A TO BE AN URGENT NATIONAL-SECURITY PRIORITY OF THE UNITED STATES

- APPOINT A SENIOR ADMINISTRATION OFFICIAL TO TAKE FULL-TIME RESPONSIBILITY FOR IMPLEMENTATION OF THIS COOPERATIVE EFFORT

- ESTABLISH UNDER THAT OFFICIAL'S LEADERSHIP A STRONGER AND MORE FOCUSED INTERAGENCY PROCESS DESIGNED TO BRING THE TALENTS OF ALL THE RELEVANT AGENCIES TO BEAR

- DIRECT THAT ADEQUATE FUNDS & PERSONNEL BE ALLOCATED SPECIFICALLY FOR MPC&A COOPERATION, AND THAT HIGH PRIORITY BE GIVEN TO PROTECTING THESE FROM CUTBACKS

- MAKE EFFECTIVE MPC&A AN IMPORTANT FACTOR IN U.S. RELATIONS WITH THE STATES OF THE FSU, AND USE THE OPPORTUNITY OF THE UPCOMING SUMMIT TO GAIN AGREEMENT ON SPECIFIC NEW STEPS TO IMPROVE MPC&A

THE PANEL RECOMMENDS THAT THE PROGRAM IMPLEMENTERS

- ADOPT THREE GUIDING PRINCIPLES FOR THE PROGRAM:

  -- FOCUS ON HIGHEST PRIORITIES

  -- FOSTER INDIGENOUS CAPABILITIES

  -- BUILD TOWARD NATIONAL SYSTEMS

- DEVELOP A PRIORITIZED ACTION PLAN BASED ON A SPECIFIC SET OF NEAR-TERM, MID-TERM, AND LONG-TERM GOALS

- CONTINUE TO TAKE A FLEXIBLE, MULTI-PRONGED APPROACH, WITH BOTH GOVERNMENT-TO-GOVERNMENT AND LAB-TO-LAB COMPONENTS

- MAKE A COMPREHENSIVE EFFORT TO ANALYZE AND DEAL WITH RECIPIENT-STATE SENSITIVITIES AND INCENTIVES

  -- CONFIDENTIALITY

  -- COOPERATION, NOT ASSISTANCE

  -- RECIPROCAL ACCESS

  -- INDIGENOUS EQUIPMENT

- CONTINUE TO FOCUS PROGRAMS ON SPECIFIC DELIVERABLES, TO ENSURE FUNDS ARE SPENT FOR THEIR INTENDED PURPOSES

SPECIFIC, NEW NEAR-TERM ACTIONS RECOMMENDED BY THE PANEL INCLUDE:

- ESTABLISH RUSSIAN MPC&A ASSESSMENT & IMPROVEMENT TEAMS
- ESTABLISH RUSSIAN NUCLEAR MATERIAL INVENTORY TEAMS
- INITIATE A PROGRAM TO PROTECT & ACCOUNT FOR RUSSIAN NAVAL & ICEBREAKER FUEL
- BEGIN DISCUSSING CONSOLIDATION OF MATERIALS AT FEWER LOCATIONS
- FORM "QUICK RESPONSE" TEAMS
- STATION A SMALL CADRE OF FULL-TIME U.S. PERSONNEL IN MOSCOW TO FACILITATE THESE PROGRAMS
- PROVIDE TO THE RUSSIANS A FRANK AND DETAILED BRIEFING ON PAST U.S. MPC&A PROBLEMS, AND RAPID UPGRADE MEASURES THAT ADDRESSED THEM

THE MONETARY AND POLITICAL COSTS OF THE NEEDED PREVENTATIVE MEASURES ARE FAR LESS THAN THOSE LIKELY TO RESULT FROM FAILURE TO ADEQUATELY ADDRESS THE PROBLEM.

- THEFT OF EVEN A TINY FRACTION OF THE MATERIAL NOW INADEQUATELY PROTECTED COULD LEAD TO NUCLEAR WEAPONS IN THE HANDS OF TERRORISTS OR ROGUE STATES.

- SUCH PROLIFERATION COULD POSE DEVASTATING NEW THREATS WITH VIRTUALLY NO WARNING.

- IT COULD SERIOUSLY CONSTRAIN U.S. OPTIONS IN FUTURE CRISES.

- THE COSTS OF DEFENSE OR PRE-EMPTION AGAINST PROLIFERATED NUCLEAR WEAPONS WOULD BE EXTREMELY HIGH, WITH UNCERTAIN PROSPECTS OF SUCCESS.

- ACTION NOW IS A PRUDENT AND NECESSARY INVESTMENT TO AVOID HUGE COSTS AND RISKS LATER.

Securing Weapons-Usable Nuclear Materials in the Former Soviet Union: Urgent Measures to Prevent Nuclear Proliferation

Report of the Panel on U.S.-FSU Cooperation to Protect, Control, and Account for Weapons-Usable Nuclear Materials

March 28, 1995

The President's Committee of Advisors on Science and Technology

The President's Committee of Advisors on Science and Technology

Members of the Panel on U.S.-FSU Cooperation to Protect, Control, and Account for Weapons-Usable Nuclear Materials

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Class of 1935 Professor of Energy
University of California, Berkeley
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DOCUMENT NO. AND TYPE	SUBJECT/TITLE	DATE	RESTRICTION
001b. report	re: Securing Weapons-Usuable Nuclear Materials in the Former Soviet Union [partial] [Atomic Energy Act] (15 pages)	03/28/1995	P1/b(1), P3/b(3)

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Securing Weapons-Usable Nuclear Materials in the Former Soviet Union: Urgent Measures to Prevent Nuclear Proliferation

Executive Summary

A Grave Security Threat

- Grossly inadequate safeguards and security for nuclear materials in the former Soviet Union pose a clear and present danger that the essential ingredients of nuclear bombs could fall into the hands of terrorist groups or rogue states.
- This is among the most serious and urgent threats to national security the United States faces in the coming decade—an unprecedented crisis on the "supply side" of nuclear proliferation.
- Already, there have been multiple seizures of kilogram-quantities of weapons-usable materials stolen from nuclear facilities in the former Soviet Union. EO 13526 3.3(b)(2), 6.2(a), (b)(3)
- EO 13526 3.3(b)(2), 6.2(a), (b)(3)
- EO 13526 1.4c, (b)(3)
- While there is no evidence that such materials have yet fallen into the hands of potential proliferators, we do not know what has not been detected. Such a proliferation disaster could occur at any time.

Urgent Presidential Action Needed

U.S. programs to cooperate with the states of the former Soviet Union in reducing this threat are beginning to make progress after a slow start, and deserve strong support.

The Panel recommends that the President should:

- issue a decision directive designating the effort to control and account for fissile material as a critical and urgent security priority of the United States, and direct that it be given commensurate resources and top-level attention;
- appoint a senior Administration official to take full-time, personal responsibility for ensuring that cooperative programs with the former Soviet states to control fissile materials are being effectively implemented;
- establish, under the leadership of that senior official, a stronger and more focused interagency process designed to bring the talents of all critical agencies to bear in addressing this problem;
- direct the senior official responsible for these programs to prepare a prioritized nuclear material security and accounting action plan within 60 days, specifying near-term, mid-term, and long-term goals and objectives, and the resources needed to accomplish them;

- direct that adequate funds and personnel be allocated specifically for nuclear material security and accounting cooperation, and that a high priority be assigned to protecting these resources from cutbacks;
- direct the senior official responsible for these programs to develop and implement a plan to secure needed legislative and public support;
- make effective security and accounting for weapons-usable material an important factor in U.S. relations with the states of the former Soviet Union, and use the opportunity of the upcoming summit to gain agreement on specific new steps to improve security and accounting for nuclear materials;
- direct that higher priority be placed on providing information support to efforts to reduce nuclear theft risks EO 13526 1.4c 1.4(c)
- designate efforts to enhance security and accounting for nuclear materials worldwide as a key mission of the national laboratories.

In addition, the Panel provides a wide range of specific recommendations for those implementing these programs. Especially important among these recommendations are that these programs:

- follow three guiding principles, namely: focus on the highest priorities; foster indigenous capabilities in the former Soviet states; and build toward national systems in those states;
- continue to take a flexible, multi-pronged approach, with both government-to-government and lab-to-lab components;
- make a comprehensive effort to analyze and deal with recipient-state sensitivities and incentives, including: maintaining confidentiality; emphasizing cooperation, not assistance; offering reciprocal access to facilities; and using equipment produced in the former Soviet states;
- continue to focus on specific deliverables, to ensure that funds are spent for their intended purposes.

Further, the Panel suggests a specific set of near-term, mid-term, and long-term objectives, and a specific set of near-term recommended actions, spelled out in the body of the report.

Cost-Effectiveness of Early Action

The cost of ensuring adequate security for these weapons and materials, while not insignificant, is dwarfed by the potential costs of the necessary defense responses, and the potential threats to U.S. security, should theft of these materials result in uncontrolled nuclear proliferation. Thus, *a decision not to take available steps that could substantially reduce these proliferation risks would be a strategic misstep of profound proportions.* In this area as in others, an ounce of prevention is worth a pound of cure.

I. INTRODUCTION

Nothing could be more central to U.S. security than ensuring that plutonium and highly-enriched-uranium (HEU) do not fall into the hands of potential proliferators. These materials are the essential ingredients of nuclear weapons, and access to them is the primary technical barrier to nuclear proliferation in the world today. Gaining access to such materials could shorten a third-world bomb program from a decade to months, or even days if other preparations had already been made.

With the collapse of the Soviet Union and the ensuing political, economic, and social turmoil in the former Soviet states, the world is faced with an unprecedented crisis on the "supply side" of nuclear proliferation. Never before has the world dealt with the phenomenon of breakup, rapid political and economic transformations, and internal disarray in a nuclear superpower with tens of thousands of nuclear weapons and hundreds of tons of weapons-usable material. Nuclear material security systems that once relied on the Iron Curtain and the iron hand of the KGB are grossly inadequate for the new environment.

Under current conditions, virtually all of the weapons-usable material in the former Soviet Union (FSU) is potentially at risk. Already, there have been multiple seizures, by authorities in Russia and elsewhere, of kilogram quantities of stolen weapons-usable uranium and of hundreds of grams of weapons-usable plutonium. EO 13526 3.3(b)(2), 6.2(a), (b)(3) EO 13526 3.3(b)(2), 6.2(a), (b)(3) 1.4(c) EO 13526 1.4c 1.4(c) Such a proliferation disaster could occur at any time. *This problem of "loose materials" is among the most serious and urgent threats to national security the United States faces in the coming decade.*

The cost of ensuring adequate security for these weapons and materials, while not insignificant, is dwarfed by the potential costs of the necessary defense responses, and the potential threats to U.S. security, should theft of these materials result in uncontrolled nuclear proliferation. Thus, *a decision not to take available steps that could substantially reduce these proliferation risks would be a strategic misstep of profound proportions.* In this area as in others, an ounce of prevention is worth a pound of cure. (See "The Consequences of Failure to Act," p. 2.)

Recognizing this danger, and the critical role that science and technology must play in resolving it, the White House, in the winter of 1994–1995, requested the President's Committee of Advisors on Science and Technology (PCAST) to form a panel to conduct an urgent independent review of U.S. programs to cooperate with the states of the former Soviet Union in reducing these proliferation risks. The charge to the Panel was to prepare a report for the President on the status and effectiveness of U.S.-FSU cooperation to enhance security and accounting for nuclear materials—what is working, what is not working, and what further action by the President and by others might be needed. This report summarizes our findings.

The Consequences of Failure to Act

The risks of unpredictable nuclear proliferation resulting from inadequately secured nuclear material in the former Soviet Union are unacceptably high. The potential costs of *not* taking action to reduce these risks—measured in both threats to U.S. national security and the cost of defense responses to them—would be far higher than the cost of timely preventative action now. Any missed opportunity could well come back to haunt us.

The potential consequences of nuclear weapons in the hands of terrorists or rogue states are far-reaching. If a state such as Iran or Libya were to suddenly acquire the essential ingredients of nuclear weapons on the black market, the international community could be faced with a devastating new threat with virtually no warning before the threat springs full-blown on the scene. The horror of the recent use of chemical weapons by terrorists in the Tokyo subways would have been unimaginably greater had the weapons been nuclear explosives.

Such proliferation—which could result from diversions of even a tiny fraction of the hundreds of tons of weapons-usable material now spread across scores of poorly-protected sites in the former Soviet Union—could have dire implications for U.S. defense and foreign policy decision-making. In such a circumstance, the flexibility of the United States to deploy troops and intervene in foreign crises would be severely constrained. For example, it would seem unlikely that the U.S. Congress would have approved the deployment of troops to the Persian Gulf had it been known that Iraq possessed nuclear weapons and was capable of delivering them. Even had the troops been deployed, they could not have been concentrated at a handful of decisive points—a critical element of U.S. strategy in the Gulf War—for fear of a key concentration node being wiped out in a nuclear attack. In such a world, the already strained deterrent to local mischief could be severely undermined.

The costs of the necessary defense responses would dwarf the costs of protecting these materials to prevent the threat from arising. One need only look at the immensely costly buildup that was being seriously contemplated for Korea last year—and the vast cost in lives and value had the Korean crisis led to war—to make that calculation.

The primary focus of the review was on cooperation with the states of the former Soviet Union in enhancing security and accounting for weapons-usable nuclear materials—known formally as material protection, control, and accounting (MPC&A). The principal MPC&A programs on which this review has mainly focused include: the government-to-government MPC&A programs (funded through FY95 from the Nunn-Lugar program, and after that in the DOE budget); a U.S.-Russian laboratory-to-laboratory MPC&A program, initiated in April 1994; and expanding cooperation with nuclear regulatory bodies, particularly GAN, the Russian counterpart to the U.S. Nuclear Regulatory Agency. (See Table 1.)

Two further kinds of activities were considered more briefly in the Panel's review: smaller-scale MPC&A support activities such as the safeguards projects funded by the International Science and Technology Center in Moscow (ISTC) and safeguards assistance to former Soviet states other than Russia, Kazakhstan, and Ukraine,[1] and a wider range of related

[1]These programs are carried out in coordination with other donor countries and organizations, with the efforts partly coordinated through the International Atomic Energy Agency (IAEA). A number of donor countries and organizations, including Japan, EURATOM, Sweden, and the United Kingdom, among others, have established programs designed to assist the former Soviet states in upgrading MPC&A, focusing in most cases on the non-Russian states, though no other donor country has yet established an MPC&A assistance program of comparable scale to that of the United States. Japan, France, and the United Kingdom have programs valued in the tens of

If cooperative approaches to forestalling this potential threat fail, all of the options that will then be available are hazardous and uncertain of success. 3.3(b)(5)

EO 13526 3.3(b)(5)

The task of defense once these materials were constituted into the form of nuclear weapons is even more daunting. Intercepting such weapons delivered by ballistic missile is the province of ballistic missile defense—a mission wherein a great deal of technical progress has been made in recent years. Nonetheless, the economic cost of providing full-area coverage with near leak-proof quality is extremely high, running into many billions of dollars for the continental United States alone. To protect both the United States and U.S. and allied forces abroad would cost even more. Even if such a capability to intercept ballistic missiles were deployed, there would still be the matter of "engaging" the small number of weapons which, for extortion purposes, might be smuggled in the hold of a cargo ship, on board an airliner, or in some other manner that experience suggests we would find difficult to intercept (say, in a bale of marijuana).

In short, should theft of these materials lead to unpredictable nuclear proliferation, the resulting security threats to the United States would be severe, and the possible defense responses would be both expensive and of uncertain effectiveness. A world in which any dictator or terrorist group who wants a nuclear bomb can purchase the essential ingredients on a thriving nuclear black market is simply not an acceptable world to bequeath to our children. Action must be taken now to prevent such a world from arising.

As Senators Nunn and Lugar wrote in the summer of 1992 following a fact-finding trip in the former Soviet Union: "The United States has spent trillions of dollars defending against the military threat imposed by the former Soviet Union. We now have the unique opportunity to help ensure that our children and grandchildren will not be confronted with a comparable threat from that region of the world. This is an opportunity we cannot afford to miss."

programs that, while not directly focused on MPC&A, are related to the management of nuclear weapons and nuclear materials in the FSU. Initiatives in this latter category include: cooperation to improve security for assembled nuclear weapons (as opposed to materials outside of weapons); purchases of nuclear materials (such as Project Sapphire); assistance (under the Nunn-Lugar program) in construction of a safe and secure storage facility for plutonium and HEU from dismantled weapons; cooperation in combating nuclear smuggling (including police, intelligence, and customs cooperation); proposals to increase openness and transparency related to nuclear stockpiles, including exchanges of data and reciprocal visits; proposals and agreements to end further production of materials for weapons (such as the June 1994 plutonium production cessation agreement); and disposition efforts designed to transform some of these nuclear materials into forms that pose much lower security risks (such as the HEU purchase agreement, and the recently inaugurated joint study of options for plutonium disposition). (See Table 2.)

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millions of dollars for purposes similar to those of the U.S. Nunn-Lugar program, and Germany, Italy, Canada, Norway, and Sweden, among others, have smaller programs. While a few of these programs include modest investments in MPC&A in the non-Russian states, none of them other than a modest EURATOM program involve significant contributions to MPC&A in Russia.

Table 1 Principal U.S.-FSU MPC&A Programs

- Government-to Government
  (Transitioning from Nunn-Lugar to DOE)

  Funding:
  FY92-FY95: $30 million for Russia (focused on MINATOM facilities)
  $22.5 million for Ukraine
  $20 million for Kazakhstan

  FY96: $20 million request (DOE)

- Lab-to-Lab

  Funding:
  FY92-FY95 $17 million
  FY96: $40 million request (DOE)

- GAN Cooperation

  Funding:
  FY92-FY95: $300,000
  FY96 $10 million request (DOE)

Total FY96 request: $70 million (DOE)

Note: In addition to these principal programs, there are modest efforts funded by the International Science and Technology Center, and by DOE program funds. DOE program funds for states other than those listed include $100,000 for Belarus, and $300,000 for all of the other former Soviet states. The $300,000 listed for GAN cooperation in FY92-FY95 is complemented by regulatory support funds from the $30 million allocated to Nunn-Lugar MPC&A programs in Russia.

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The Panel believes that all of these related efforts are important (and in many cases synergistic with efforts to improve MPC&A), and a number of recommendations related to them can be found in this report. Nevertheless, they were not the principal focus of this review, which centered on the establishment of effective security and accounting systems at the wide range of sites where such materials are held. This is the most fundamental requirement for success in reducing the proliferation risks from possible theft of nuclear materials.[2]

In conducting its review, the Panel discussed the problem and current programs to address it with representatives of the White House, including the National Security Council and the Office of Science and Technology Policy; the Central Intelligence Agency and other intelligence organizations; the Departments of Energy, State, and Defense; the Nuclear Regulatory

[redacted]
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Table 2 Related U.S.-Russian Fissile Material Management Programs

Securing Nuclear Materials
- Nunn-Lugar Storage Facility
- DoD-MoD Nuclear Weapons Security Talks
- Combating Nuclear Smuggling

Building Confidence Through Openness
- Safeguards, Transparency, and Irreversibility Talks
- Reciprocal Nuclear Stockpile Declarations
- Reciprocal Inspections of Material From Dismantled Weapons
- IAEA Safeguards on Excess Materials
- Nunn-Lugar Storage Facility Transparency
- HEU Purchase Agreement Transparency

Halting Accumulation of Excess Stocks
- Plutonium Production Cessation Agreement
  - Monitoring
  - Alternate Energy for Production Reactors
- Fissile Material Cutoff
- Reduced Enrichment for Research and Test Reactors

Disposition of Excess Material
- HEU Purchase Agreement
- U.S.-Russian Plutonium Disposition Options Study

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Commission and the Arms Control and Disarmament Agency; the national laboratories; and outside experts. In addition, the chairman of the Panel and the principal staff member traveled to Moscow and discussed these issues with representatives of the Russian Ministry of Atomic Energy (MINATOM); the Federal Nuclear and Radiation Safety Authority (the Russian nuclear regulatory agency, known by its Russian acronym, GAN); the Federal Counterintelligence Service (FSK); Arzamas-16, one of Russia's two principal nuclear weapons laboratories; and the Kurchatov Institute (where the new MPC&A system recently installed at Building 116 with U.S. assistance was also reviewed). Appendix A provides a list of the principal briefings the Panel received.

Given the urgency of the problem, the Panel was forced to conduct its review in a very short period, and the level of detail we were able to pursue was necessarily limited. We recommend that mechanisms be established for further, ongoing review of the implementation of these programs.

Before going further it is important to emphasize the sensitivity of this issue in the former Soviet Union. While grave problems exist with security and accounting for nuclear materials in these nations, it is unwise for official statements to say so. Unguarded public statements suggesting that these nations are unable to effectively control their nuclear materials can quickly poison the atmosphere for cooperation. Such statements are already feeding Russian paranoia

concerning U.S. intentions; Minister of Atomic Energy Victor Mikhailov expressed a widely-held view in a recent interview when he said that the West was whipping up fears of nuclear smuggling in order to suggest "that Russia is unable to handle its nuclear industrial complex and the West should take control over it into its own hands."[3] After some stories that have appeared in the Western press, individuals who have been open and cooperative with the United States on MPC&A matters have been sternly warned by the FSK.[4] Sensitivities about cooperation in this area also exist in the other former Soviet states. Hence, extreme care must be taken to avoid incautious public statements and sensationalized press reports. As one official from the U.S. Embassy in Moscow put it to the Panel: "Trust that took thousands of hours to build can be destroyed in a ten-minute speech."

In the remainder of this report, we begin by describing in more detail the scope and nature of the deficiencies in security and accounting for weapons-usable nuclear materials in the former Soviet Union. We then discuss the U.S. response to this problem to date, and outline some key lessons learned from the experience so far. We then conclude with a series of recommendations for next steps, including actions we believe the President should take and actions that should be taken by the program's implementers.

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[3]Interviewed in the new Russian journal *Yaderny Kontrol* (Nuclear Control), translated in *The Monitor: Nonproliferation, Demilitarization, and Arms Control*, University of Georgia, Center for East-West Trade Policy, February 1995.

[4]See Moscow 001888, January 1995, "Holes in the Fences: Protecting Nuclear Materials in Russia's Closed Nuclear Cities," (Secret).

II. THE PROBLEM

The Soviet Union had a nuclear materials security system that was highly effective for decades. But the threat, and the environment, have changed. Today, this system, once effective, has become grossly inadequate.

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The system that is still in place was designed almost exclusively to counter an "outsider" threat—such as American spies getting into nuclear facilities.[6] The "insider" threat—workers within a facility who might steal materials—was virtually non-existent, because of the location of most of the materials within closed cities or at least closed facilities, the extensive monitoring of personnel within these cities and facilities by the KGB, and the limitations imposed on the operation of black markets (whereby stolen materials might be transported out of the country) by the characteristics of the closed, authoritarian society.

With a burgeoning black market, ever-increasing corruption, porous borders, and severe economic distress for nuclear workers, the "insider" threat has grown astronomically, and the old system is simply unable to cope. The nuclear cities that once received the best the Soviet economy had to offer are now stricken by genuine poverty. At many sites, workers go unpaid for months; several strikes and other labor actions at major nuclear sites have occurred. With nuclear workers struggling to feed their children, the temptation to steal could be overwhelming. Already, there have been many cases of insiders at nuclear facilities stealing nuclear materials for possible sale.

The systems in place to protect nuclear materials were never designed to deal with the insider threat that is now predominant. The facts are stark:

- EO 13526 3.3(b)(6)

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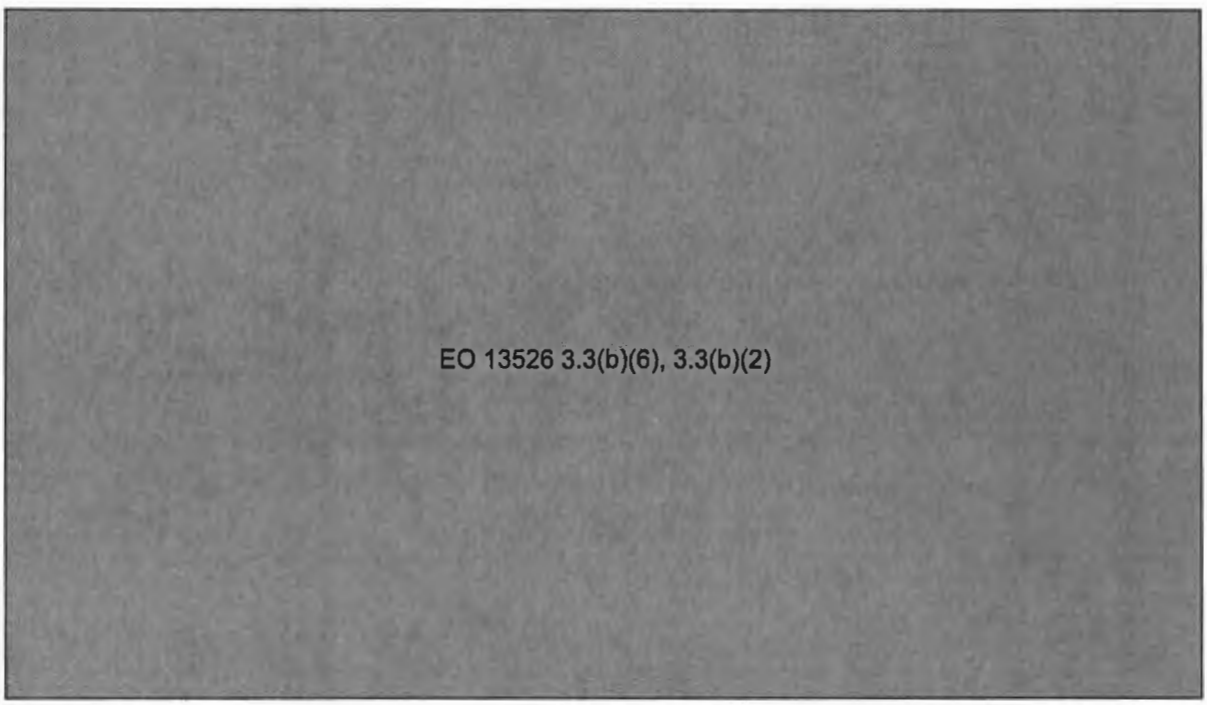
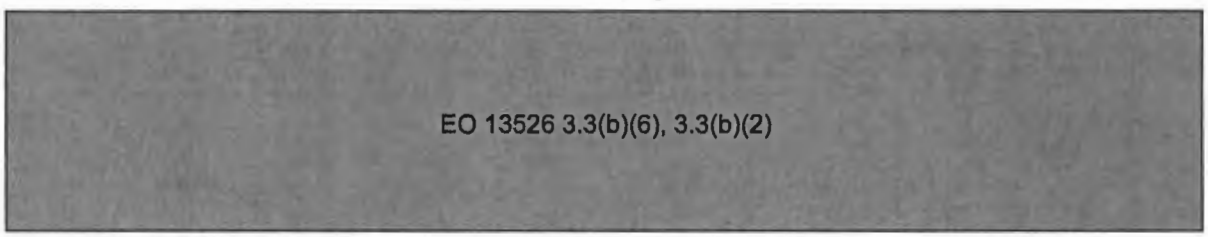
[6] Given that this was a key threat around which Soviet security systems were designed, it is not surprising that it has been difficult to convince Russian security officials that Americans in Russian nuclear sites are part of the answer, not part of the problem.

- In several known cases, individuals have simply "walked off" with kilograms of weapons-usable materials, and no one noticed until long after the materials were gone.
- 

- While in theory there is a "two-man-rule" barring any individual alone from getting access to nuclear material, this crucial safeguard is widely ignored.
- 

- Guards at some facilities are not properly paid, equipped, or trained. At one facility with weapons-usable materials, for example, a fence around the guard house is intended to prevent the guards from stealing bread from the bakery next door.

Two aspects of the Soviet economic system have exacerbated the problem. First, under the quota system, if a particular facility produced more than central planners had demanded in a given year, there was a considerable incentive to set the extra material aside in a secret stock, to make up any shortfalls that might occur in subsequent years. Thus many facilities have secret "honey pots" potentially representing hundreds of kilograms or even tons of nuclear material, unknown to central authorities.

Second, since HEU was difficult to get, research institutes typically would try to acquire substantially more HEU than was needed for their immediate purposes, so as to have enough available to do further experiments. Since HEU might come in handy later, and there were no

[7] "Holes in the Fences," *op. cit.*

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regulations requiring expensive protection for such material, there was no incentive to send any "leftovers" back to central authorities. In some cases, it has been found that leftover HEU was simply forgotten when researchers retired or moved on to other projects: there have been a number of recent instances in which facilities have discovered stashes of HEU that they did not know they had.

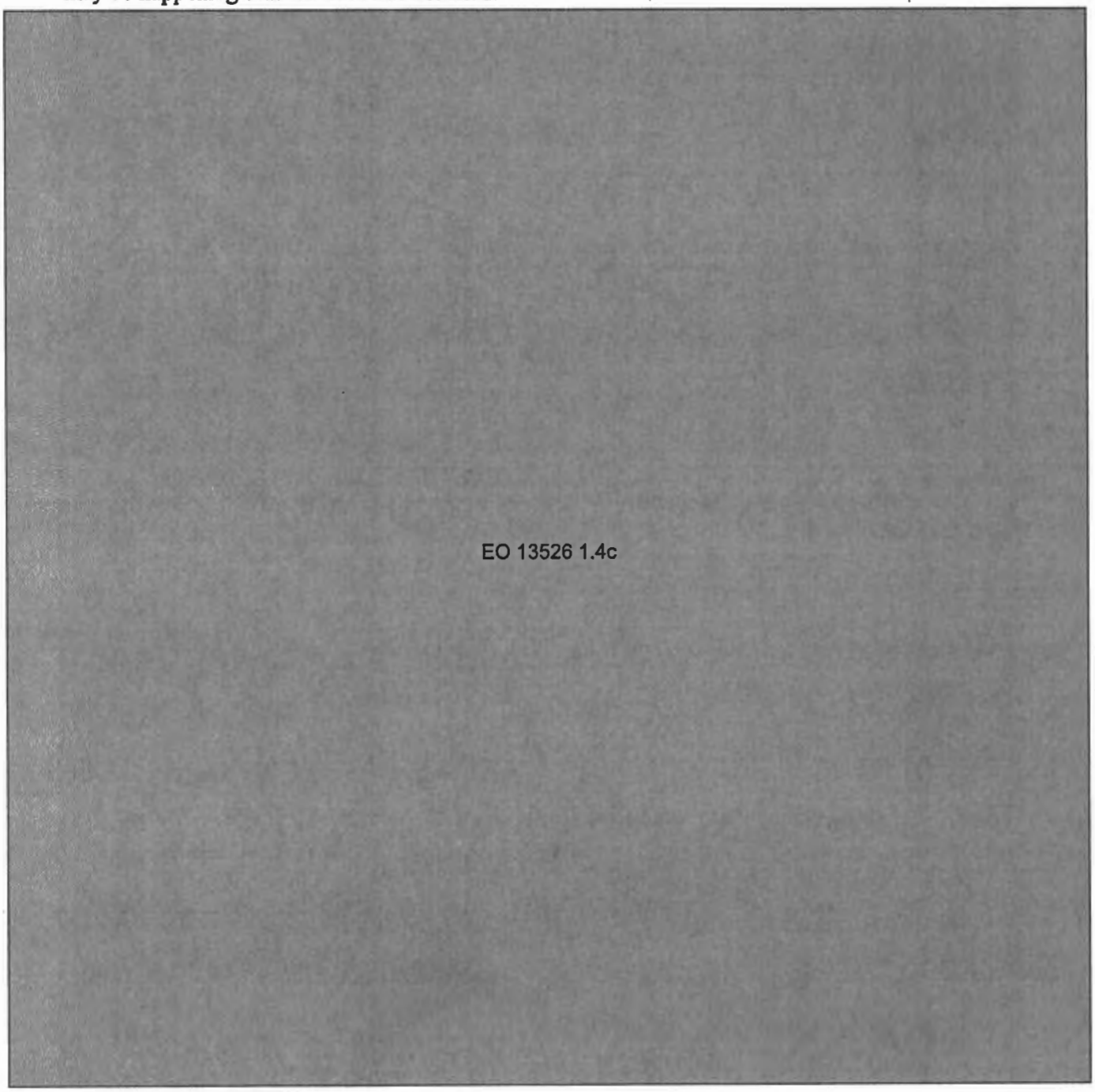
EO 13526 1.4c, 3.3(b)(1), 3.3(b)(6)

EO 13526 1.4c, 3.3(b)(1), 3.3(b)(6)

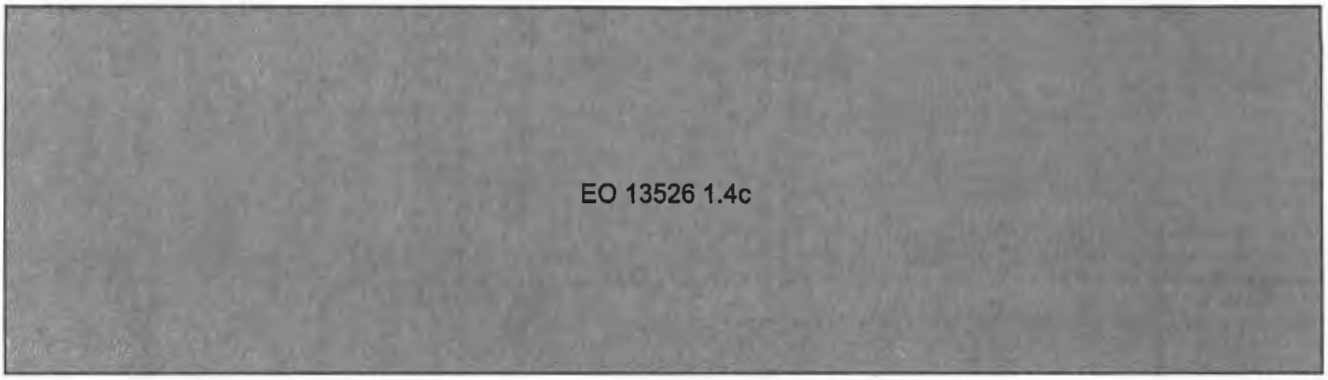
EO 13526 1.4c

[9]See, for example, Moscow 032874, "Overview of Nuclear Material Protection, Control, and Accounting in Russia," November 1994 (Secret).

Fortunately, there is as yet no evidence of a substantial "market" of agents of proliferating states looking to buy such materials: the very large number of scams being run by con artists claiming to be selling valuable weapons-usable material appears to have spooked some of the potential buyers. Nor is there any evidence, as yet, of the involvement of organized crime in thefts of weapons-usable nuclear materials. Here too, however, we simply cannot know what may be happening that we have not detected.



[10]See note 2.



4. *Naval Fuel.* A substantial quantity of HEU ranging from 20–90 percent enrichment exists in the naval complex, including fuel for submarines, surface combatants, and civilian icebreakers. Much of this material is in the lower range of enrichment, and is therefore less attractive as bomb material, but more recent vessels (including icebreakers) use enrichments of up to 90%. Naval fuel storage sites (such as the one at Murmansk where several kilograms of fuel was recently stolen) are controlled by the Navy. Despite being controlled by the military and its contractors, naval fuel sites appear to be startlingly insecure. In the Murmansk case, for example, a single thief simply walked through one of the many holes in the fence, sawed off the padlock on a shed holding naval fuel, pried open the door (using a pole he found at the site), broke open several fuel elements, poured the material into his bag, and retraced his steps. While the theft was detected within hours, the thief was not arrested until six months later, when he began trying to market the material. The prosecutor concluded publicly that in Russia it is easier to steal nuclear material than to steal a sack of potatoes.

5. *Beyond Russia.* When the Soviet Union collapsed, Russia was left with more than 95% of the weapons-usable nuclear materials that were not in nuclear weapons. Operation Sapphire, which airlifted 600 kilograms of HEU from Kazakhstan to safe storage at Oak Ridge, eliminated the largest known stock of weapons-usable material remaining outside Russia. The other material of concern outside the Russian Federation is at a small number of research institutes, in Ukraine, Kazakhstan, Belarus, Latvia, Georgia, and Uzbekistan. As with the research institutes in Russia, these facilities have minimal physical protection or material accounting, and pose high proliferation risks. It appears possible, however, that sufficient funds will be made available by the United States and other donor countries to greatly improve security and accounting for all sites outside Russia with weapons-usable materials during 1995–1997.

In short, the problem is a gigantic one: hundreds of tons of material, at scores of sites spread across the 11 time zones of the former Soviet Union, in weapons, production facilities, and research institutes.

The governments of the region, faced with a wide range of other urgent priorities in a wrenching time of transition, have failed to devote the attention and resources needed to solve these problems. In Russia, while President Yeltsin and Prime Minister Victor Chernomyrdin have both issued orders and decrees calling for urgent programs to upgrade security for nuclear materials, interagency disagreements and conflicting budget pressures have stymied effective action.

The Ministry of Atomic Energy (MINATOM), which controls most of the nuclear materials in Russia, continues to tell Russian authorities and the world at large that there is no problem, that it is impossible to steal nuclear materials in Russia, and that they know for certain that every gram of material is in its proper place. Nothing could be farther from the truth—as other ministries, such as the Federal Counterintelligence Service (FSK) and the Ministry of Internal Affairs (MVD) are beginning to point out within the Russian government.

But from MINATOM's perspective, the whole issue represents a profound economic threat: admitting that there is a problem would mean admitting that substantial resources should be diverted from favored MINATOM projects to address it. (As an indication of the scale of resources involved, the United States spends some $800 million every year on safeguards and security in the DOE complex.) And MINATOM's budget is already stretched extremely thin, as Minister Mikhailov attempts to maintain his million-person empire even after its Cold War mission is over. Moreover, acknowledging that there were problems controlling nuclear materials where they are now would be a fundamental challenge to MINATOM's vision of a future in which reactors running on weapons-usable plutonium fuel would be spread throughout the Russian Federation.

Just as the Russian government is not a monolith, however, MINATOM is not a monolith. Many of the institutes and facilities involved in MPC&A cooperation with the United States are developing an acute understanding of the problem and considerable enthusiasm for continued cooperation. Tension between MINATOM headquarters' efforts to go slow and MINATOM facilities' desire to move forward is building.

While decrees signed by Yeltsin have given the nascent nuclear regulatory agency, GAN, authority to regulate security and accounting for both civilian and military materials, GAN has only recently begun to gain the real authority needed to implement that mandate. GAN is a tiny organization with few staff and fewer resources, trying to regulate some of the most powerful ministries in Russia. During 1993 and most of 1994, GAN was effectively barred from MINATOM facilities handling military materials, and from Ministry of Defense facilities—both of which Yeltsin had decreed GAN should regulate.

In September 1994, however, Yeltsin issued a decree calling for an interministerial commission, chaired by GAN, to make recommendations for urgent steps to be taken to improve security for nuclear materials. Working closely with MINATOM, and with support from the FSK and the MVD, GAN succeeded in securing agreement of all ministries on a report to Yeltsin, and later on a government order that was signed by Chernomyrdin in January of 1995. A new Atomic Law which will provide the legal foundation for GAN's regulation of MPC&A is expected to be approved by the Duma this spring. Nevertheless, despite explicit instructions in Chernomyrdin's order that funding should be made available, the Ministry of Finance has failed to provide the roughly $4 million that GAN and MINATOM agreed was needed to implement the "most urgent" steps called for in the order.

In short, while this issue has come to the attention of the very highest levels of the Russian government, no comprehensive plan of action is yet being implemented in response, and

MINATOM headquarters continues to deny even the existence of a problem. For the other former Soviet states, the situation varies from one nation to another—but none of them has undertaken a comprehensive program to do what needs to be done. Indeed; in Ukraine, the main organization which had been in charge of security and accounting for nuclear materials—and with whom the United States had signed agreements calling for joint work on upgrades—has recently been abolished, with its responsibilities folded into a new ministry headed by a leading opponent of Ukraine's accession to the Nonproliferation Treaty.

III: THE U.S. RESPONSE TO DATE

U.S. programs to enhance security and accounting for weapons-usable nuclear materials in the former Soviet Union got off to a slow start, but they are now beginning to show solid achievements and appear likely to make additional progress during 1995.

A Slow Start: 1991–1993

In the years immediately following the collapse of the Soviet Union, efforts to improve security and accounting for weapons-usable materials in the former Soviet states made little progress—hobbled by lack of priority, lack of policy coherence, and lack of top-level attention in both the United States and the FSU, and by the extreme sensitivity on the FSU side about the issue of security at nuclear sites. Indeed, until early 1993, U.S. experts had not recognized the full scope and severity of the MPC&A problem that existed in the former Soviet Union.

As early as 1991, when Congress voted to establish the Nunn-Lugar program and provide $400 million for its first year, preventing proliferation and securing nuclear weapons and materials were designated as key priorities. Material protection, control, and accounting (MPC&A) was one of the seven areas of cooperation agreed to by Secretary of State James Baker and his Soviet and Russian counterparts in late 1991 and early 1992. Nevertheless, this issue received little priority on either side, and a variety of interagency conflicts delayed progress. In retrospect, setting up a program in which the Department of Energy was to spend the Department of Defense's money was a recipe for interagency conflict (some of which has continued to this day). In addition, acting on a strict interpretation of Congressional direction, DOD decided that the Nunn-Lugar program must "buy American," using normal DOD procurement regulations, for essentially all goods and services procured (so that only a tiny fraction of the money flowed to the former Soviet states). DOE's pace and priorities were criticized by other agencies as oriented more toward discussion than action. No one of sufficient authority in the White House or anywhere else brought such issues to closure to move the program forward.

It took until September 1993—a year and a half after the inception of the program—to complete a very simple implementing agreement providing the legal basis for MPC&A cooperation at Russian facilities handling civilian nuclear materials. (During this period, however, initial technical contacts were established that were to prove fruitful later, principally through conferences and the joint effort to design the MPC&A system for the proposed Nunn-Lugar storage facility for fissile materials from dismantled weapons.)

At that time, because of Russian sensitivities and resource constraints, MPC&A cooperation plans were limited to extremely modest steps. The approach was to establish a small number of "model" facilities with highly effective MPC&A systems, with the idea that Russia would then apply the lessons learned at these facilities more broadly. The schedule was leisurely: initial plans called for the "model" facilities to be established over a period of years, with implementation at other sites requiring years beyond that. A similar "model facility" approach was taken with Ukraine and Kazakhstan. (No Nunn-Lugar agreement on MPC&A has yet been

MPC&A in the Non-Russian Former Soviet States

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The United States, Japan, Sweden, the United Kingdom, and other countries are involved in providing MPC&A assistance to these countries. The efforts of these donor countries are coordinated through meetings sponsored by the IAEA.

Given the relatively small number of facilities with weapons-usable material outside Russia, it would be desirable to make it an objective to deal with them all within the next two years—either by significantly improving security and accounting for the material there, or by removing it to a secure location (as in the case of Project Sapphire). A plan for accomplishing this objective would have to be drawn up with the participation of the other donor countries and the recipient states.

The United States has Nunn-Lugar MPC&A agreements with Ukraine and Kazakhstan. The United States has recently suggested to these countries increasing the amount of Nunn-Lugar funding for MPC&A, with the objective of covering all the facilities in these two nations that have substantial quantities of weapons-usable material (as well as establishing MPC&A training programs).

There is no Nunn-Lugar MPC&A agreement with Belarus, and hence consideration is being given to providing MPC&A assistance through the International Science and Technology Center (ISTC) in Moscow, so that a new funding agreement would not have to be negotiated. The other relevant states are not currently eligible for Nunn-Lugar assistance, but DOE has provided some initial seed money that has covered some site visits for analyses of needs. Several million dollars might be required to assure effective MPC&A for the small number of facilities in the states not already covered by Nunn-Lugar MPC&A assistance. This could potentially be accomplished by other donor states, if they were willing to take responsibility.

concluded with Belarus; other former Soviet states are not eligible for Nunn-Lugar assistance. See "MPC&A In the Non-Russian Former Soviet States," p. 15)

The Russian side insisted that the initial "model facility" efforts be limited to low-enriched uranium (LEU) facilities, even though these facilities posed virtually no proliferation risk—arguing that the two sides had to take "one step at a time," and needed to build confidence before working on more sensitive materials. In addition, although the U.S. side proposed cooperating in the development of national standards for MPC&A, MINATOM negotiators declined: national standards were now to be developed by the Russian nuclear regulatory agency, GAN, whose regulatory interference MINATOM was seeking to minimize.

Thus, as of January 1994, the only significant effort underway to cooperate with Russia to improve security and accounting for nuclear materials was focused on modest upgrades at a single low-enriched uranium fuel fabrication facility at Elektrostal. Ten million dollars of Nunn-Lugar funding was then available for MPC&A in Russia, with modest additional funds for Ukraine and Kazakhstan.

New Initiatives: January-October 1994

It was clear that different approaches were needed, which would focus on the most urgent upgrade needs and attempt to address Russian sensitivities. The United States therefore launched two new initiatives: a concept in the Nunn-Lugar MPC&A program that came to be called the "quick fix," and a separate U.S.-Russian lab-to-lab MPC&A program. Later in the year, the United States also decided to undertake a third initiative—a greatly expanded effort to cooperate with the Russian nuclear regulatory agency, GAN.

The "Quick Fix"

The idea of the "quick fix," which was modeled on steps the United States had taken to upgrade MPC&A in its own weapons complex years before, was for the Russian government to form a series of teams to inspect Russian nuclear sites, determine what MPC&A upgrades were most urgently needed, and provide a prioritized list to the U.S. side, which could then be the basis for discussions of assistance and cooperation.

The United States proposed that a Russian team should come to the plutonium storage site at Hanford to observe U.S. MPC&A approaches and means of assessing upgrade needs; this would be followed by a U.S. visit to the Russian civilian plutonium storage facility at Mayak (chosen because of its civilian character, the large amount—nearly 30 tons—of material there, and a Soviet-era government report that had called attention to poor security there). That visit would in turn be followed by Russian-led assessments of MPC&A upgrade needs at Russian nuclear sites, beginning with 10 facilities in 180 days. To fund the high-priority upgrades (and to fund a proposal, made at the same time, to upgrade MPC&A at the Yekaterinburg blending facility for the HEU purchase agreement), the United States indicated it would be willing to increase the amount of Nunn-Lugar funding available for MPC&A from $10 million to $30 million, and to expand the Nunn-Lugar MPC&A agreement's scope to cover military as well as civilian materials.

The Russian side accepted the reciprocal visits to Hanford and Mayak (which were conducted successfully in July and October of 1994), but declined the idea of a broad-based "quick fix" approach, preferring instead to limit cooperation to a small number of specific sites. The Russian side also rejected the proposal to expand cooperation to include military materials, and declined the specific proposal to upgrade MPC&A at the Yekaterinburg blending facility (arguing that MPC&A there was already adequate, and that any upgrades that might be needed could be carried out in the context of the ongoing negotiations concerning transparency for the HEU purchase agreement).

By late 1994, however, a number of factors were converging to change attitudes regarding the importance of ensuring that nuclear materials were secured and accounted for. A series of seizures of weapons-usable material in Europe culminated in August 1994 with the seizure of 350 grams of plutonium (in some 560 grams of material, including uranium) on a plane from Moscow to Munich, provoking widespread press coverage and public concern. A top-level German official flew to Moscow and reached an agreement to cooperate in stopping nuclear smuggling. The issue was unavoidably on the international agenda, and, within Russia, there was considerable discussion of the issue in the public press. On September 15, President Yeltsin issued a decree

establishing an interagency commission to report to him within one month on urgent measures to improve security and accounting for nuclear materials; later that month, Presidents Clinton and Yeltsin endorsed continued cooperation in this area at their Washington summit. At the same time, the less formal U.S.-Russian lab-to-lab program (described below) was beginning to make real progress, helping to establish U.S. bona fides.

Thus, during November and December 1994, the Russian side agreed to MPC&A cooperation at half a dozen sites, all of them high-risk facilities with hundreds of kilograms of weapons-usable material. These included every single one of the sites listed by the JAEIC as "most seriously deficient," except for the Kurchatov Institute, which was covered in the lab-to-lab program. Compared to the situation only a few months before, when cooperation was limited to protecting only LEU, this represented a major breakthrough. In addition, by that time the two sides had reached agreement that the United States would help establish an MPC&A training center at Obninsk—a critically important project, if a new "safeguards culture" is to be developed in Russia. Based on these agreements, the United States agreed to sign an amendment to the Nunn-Lugar MPC&A agreement increasing the available funds to $30 million, without insisting that the agreement also expand cooperation to include military materials.

Funding currently available for the government-to-government program includes some $30 million in FY94 and prior year Nunn-Lugar funds. While only a small fraction of that amount has yet been spent, the recent agreements on specific sites are expected to enable a significant acceleration of the effort. In late 1994, an interagency decision was taken to remove MPC&A from Nunn-Lugar and consolidate both the government-to-government and lab-to-lab MPC&A programs in DOE's budget request. DOE's FY96 request includes $20 million to continue the government-to-government programs channeled through MINATOM.

The Lab-to-Lab Initiative

In April 1994, Undersecretary of Energy Charles Curtis, in collaboration with the national laboratory directors, decided to establish a lab-to-lab MPC&A program, building on the lab-to-lab relationships that already existed in other areas. A total of $2 million was moved from other projects to kick off the program in FY94.

The U.S. laboratories quickly began meeting among themselves and with their Russian counterparts to discuss possibilities for cooperation. By the summer, the U.S. side was drafting a rough plan for cooperation, and contracts for initial steps were being signed. Los Alamos was designated as the leader of a multi-lab team on the U.S. side. On the Russian side, one group of participants was a team of laboratories designated by MINATOM, led by Arzamas-16, one of Russia's premier nuclear weapons laboratories.[11] This group also included the Institute of Physics and Power Engineering at Obninsk, which was expected to play an important role in MPC&A for civilian MINATOM facilities. At the same time, a parallel lab-to-lab effort was undertaken at the Kurchatov Institute, the largest nuclear institute independent of MINATOM, which had long been an advocate of improved MPC&A in Russia.

[11] Sometimes known by its Russian acronym, VNIIEF.

From its inception, the lab-to-lab program was implemented in a different and more flexible way than the Nunn-Lugar MPC&A program, and was able to move more quickly. (For details, see "Lessons Learned,"p. 22.)

In October of 1994, Undersecretary Curtis traveled to Russia and provided a copy of the draft cooperation plan that had been prepared by the U.S. laboratories. Within weeks, the Russian laboratories had responded with a plan of their own, covering a wide range of activities. Moreover, while the Russian side in the government-to-government MPC&A effort had consistently rejected proposals to cooperate on MPC&A for military materials, in the lab-to-lab program weapons laboratories and weapons facilities were included from the outset. The lab-to-lab program also provided an opportunity for reaching outside MINATOM to independent institutes such as Kurchatov, which had been beyond the scope of the Nunn-Lugar MPC&A agreement, which was channeled through MINATOM.

A total of $15 million has been budgeted for lab-to-lab MPC&A cooperation in FY95.[12] The FY96 DOE budget includes a request of $40 million for this purpose.

Expanding GAN Cooperation

For some time, the NRC has been cooperating with GAN, its Russian counterpart, on development of a new MPC&A regulatory structure for Russia. In mid-to-late 1994, GAN and U.S. officials began discussing broadened cooperation, including the provision of training and equipment. During Undersecretary Curtis' trip to Russia in October 1994, he signed a DOE-GAN memorandum of intent for expanded cooperation. Three main areas were identified as particularly promising:

- equipment and training for GAN MPC&A inspectors (GAN provided a list of requested equipment in mid-1994);
- establishment of a national computerized material accounting system (Russia does not have such a national accounting system at present); and
- MPC&A at non-MINATOM, non-MoD sites (where GAN could serve as the single point of contact for facilities controlled by a wide array of different agencies and groups).

Current funding specifically targeted for cooperation with GAN on MPC&A is only a few hundred thousand dollars, channeled through the NRC. DOE's FY96 budget request includes $10 million for this purpose (out of the total of $30 million for government-to-government MPC&A programs).

[12]In late 1994, an interagency decision was taken that these funds would be provided from DOD's FY95 Nunn-Lugar funding. At the time of the Panel's review, however, while a substantial fraction of these funds had already been spent or committed (borrowing from other DOE programs), DOE and DOD had not yet reached agreement on the terms and conditions for this transfer.

Demonstrable Progress: November 1994-Present

By late 1994, the U.S. government had established a multi-pronged approach to MPC&A cooperation with Russia, including three principal programs:

- government-to-government (funded through FY95 from Nunn-Lugar, but transitioning to DOE funding in FY96);
- lab-to-lab;
- expanded GAN cooperation.

During late 1994 and early 1995, these programs began to make demonstrable progress on the ground. Until late 1994, it was still correct to say (as critics sometimes did) that there was not a single kilogram of weapons-usable material for which security had been improved as a result of U.S.-FSU cooperation efforts. This is no longer true. Recent successes include:

Project Sapphire

This well-publicized operation airlifted 600 kilograms of HEU from Kazakhstan to safe storage at Oak Ridge in November 1994, at Kazakh request. This represented a key nonproliferation success, born of complex and intensive interagency cooperation. Given the politics of bringing foreign nuclear material into the United States, however, such an approach will probably only be applicable in a limited number of cases. The Administration should continue to examine expedited options for achieving similar objectives in the future (see "Project Sapphire—and Beyond," p. 25).

The Kurchatov Institute

In the course of just two months, in November and December 1994, a radically improved MPC&A system was installed at Building 116 at the Kurchatov Institute in Moscow—home to two critical assemblies fueled with over 100 kilograms of HEU. 3.3(b)(6) EO 13526 3.3(b)(6) 3.3(b)(6) Built for less than $1 million, the system includes almost exclusively Russian equipment, though the design was a cooperative effort between U.S. and Russian laboratories. This was the first site where major improvements in MPC&A were actually implemented as a result of U.S.-Russian cooperation. Similar upgrades are planned for two other buildings at the Kurchatov Institute housing substantial quantities of HEU. Largely because of the use of Russian equipment, the Russian participants (Kurchatov and Eleron, a principal Russian producer of security equipment affiliated with MINATOM) have become enthusiastic backers of the approach, and are actively working to sell similar systems to other facilities. GAN, the Russian nuclear regulatory agency, has publicly advocated installing similar systems at nuclear facilities throughout the Russian Federation.

Government-to-Government and Lab-to-Lab Agreements

In addition to these specific successes in securing materials at particular sites, agreement has been reached on next steps for both the government-to-government and lab-to-lab programs.

As noted earlier, in November-December 1994, agreement was reached to expand Nunn-Lugar MPC&A cooperation to include a half-dozen key, high-priority nuclear sites, including the key facilities listed by the JAEIC as "most seriously deficient." After a brief effort by MINATOM to walk this agreement back, agreement was reached in March 1995 to proceed with implementation of MPC&A upgrades at 5 of these sites. Major upgrades are expected to be implemented during 1995 and early 1996.

Similarly, in January 1995, the U.S. and Russian multi-lab steering groups reached agreement on a plan calling for a wide array of activities at a variety of Russian nuclear sites. Upgrades at Kurchatov will continue; at Arzamas-16, a demonstration MPC&A system has just been installed, and analyses of U.S. and Russian MPC&A equipment are continuing; at Obninsk, a complete MC&A system for two major facilities is expected to be installed by June of 1995; at the Tomsk-7 facility where HEU from weapons will be converted to oxide, tentative agreement (pending MINATOM approval) was reached to implement an MC&A system by late 1995 or early 1996; and a similar system will be installed for Site 20 at Chelyabinsk.

Remaining Issues

Despite these successes, a number of key issues remain:

- Only a tiny fraction of the job is yet done: most of the work remains before us. Cooperative MPC&A programs must continue and must receive high priority and commensurate resources, if the grave proliferation risks that now exist are to be substantially reduced.
- The Russian government remains a cautious partner. MINATOM continues to exclude military materials (the majority of the weapons-usable materials in Russia) from government-to-government cooperation, and to seek to limit the number of sites where such cooperation proceeds. MINATOM is also seeking to exert greater government control over the lab-to-lab program (a request which should be resisted). Despite decrees from President Yeltsin and an order signed by Prime Minister Chernomyrdin, MINATOM and the economic ministries are still giving MPC&A low priority. As noted earlier, the Ministry of Finance has refused to provide the roughly $4 million that GAN and MINATOM agreed was necessary to implement the "most urgent" steps in the Russian government's MPC&A plan, signed by Chernomyrdin.
- Within the U.S. government, interagency squabbles continue. While some important steps have been taken to resolve these issues (such as establishing an NSC-led interagency coordinating group, and consolidating MPC&A funding in the DOE budget, rather than leaving it split between DOE and Nunn-Lugar), some disagreements remain unresolved. As one indicative example, DOE and DOD have been disagreeing for weeks over the specifics of how $15 million will be transferred from DOD Nunn-Lugar accounts to DOE to fund the FY95 lab-to-lab program, and this disagreement has now been allowed to spill over into discussions with congressional committees, potentially imperiling the viability of the FY95 lab-to-lab program.
- Resources remain limited. In a number of cases, particularly in the lab-to-lab program, the United States has had to put off Russian proposals for further cooperation, because

sufficient funds and personnel were not available to carry them out. In other words, while MPC&A programs through mid-1994 were primarily "cooperation-limited"—that is, available funds could not be spent because sufficient cooperation had not yet been achieved—these programs are now clearly resource-limited.

- Currently the critical managers of the MPC&A effort at DOE are burdened with many other responsibilities. Additional, qualified, full-time personnel are needed at all levels to implement DOE's expanding program. The team of qualified people at the implementing level at DOE and the laboratories also needs to be expanded.
- There is insufficient coordination with other related efforts, such as various transparency initiatives, the HEU purchase agreement, and plutonium disposition.

IV. LESSONS LEARNED

The United States, in its attempt to assist the former Soviet states in remedying weaknesses in the system to protect, control, and account for nuclear materials inherited from the former Soviet regime, has been faced with a daunting task. Never before has one nation, in so short a period of time, attempted to assist a former adversary to meet such security needs. Never before has the United States been faced with the delicate task of providing assistance of this sort while being sensitive both to the democratic evolution of its former adversary and to the significant security dangers that remain in the transition. The short history of this program suggests a number of important lessons, and these lessons must be applied if the assistance effort is to produce maximum benefits in the future.

1. An effective program requires sustained top-level leadership, including positive direction and support by the President and active, personal participation by cabinet-level officials.

The history of these programs unfortunately makes clear that if working-level agency officials are allowed to let their disagreements block action, that is precisely what will happen. Leadership by top-level officials is required to break through such logjams. The priority of this issue within the Executive Branch must be increased if the program is to succeed. The program requires clear lines of authority from President, and a strong interagency focal point.

Top-level leadership is also required to mobilize opinion within the Executive Branch, the Congress, and the public, to support the modest costs required for these crucial programs. This is particularly important when the assistance is for programs that are often misunderstood, such as those in the nuclear area.

2. Maximum progress requires maximum flexibility.

Experience demonstrates that the best way to make progress is to push forward on several fronts at once, while constantly searching for new ways to get around obstacles that arise.

Faced with multiple actors on the Russian side with differing (and sometimes conflicting) responsibilities and interests, the United States has taken a multi-pronged approach, cooperating with MINATOM, with GAN, and with individual laboratories and institutes. This flexible approach has proved its worth and should be continued.

To date, the DOE's lab-to-lab program has achieved greater successes and moved more rapidly than has the portion of the Nunn-Lugar program devoted to securing nuclear materials. The flexibility of the lab-to-lab program is a large part of the reason for this difference. In particular, explanations for this success include:

- basing the program on direct collaborative efforts between scientists and engineers focused on common goals, bypassing detailed negotiation by governments;
- a willingness to provide a substantial portion of the funds for direct purchase of equipment and services from entities in the former Soviet states, giving the Russian laboratories

strong incentives to participate and to assign personnel to this task (rather than providing only U.S. equipment and excluding payment of recipient-state salaries, as has been the case in Nunn-Lugar); and

- the absence of some Nunn-Lugar requirements, including the need to follow all DOD procurement regulations and the need for the U.S. to insist on the "audit and examination rights" called for in the Nunn-Lugar implementing agreement.

In particular, the willingness to use Russian equipment in those cases where suitable equipment is available (which is not the case in all areas of MPC&A) increased Russian incentives to cooperate; lowered costs; and resulted in equipment that was easier for Russian personnel to operate, maintain, and replicate at other sites.

This flexibility has been achieved without sacrificing protection for the taxpayer. Instead of the "audit and examinations" called for under Nunn-Lugar, for example, the laboratories have been contracting for specific deliverables at specific prices, with a full demonstration required of each system paid for under the program.

3. Responsiveness to recipient-country concerns is essential.

The effort to protect, control, and account for fissile material in the former Soviet states is ultimately the responsibility of those states. Hence U.S. efforts will not be successful unless undertaken cooperatively. To build a continuing basis for cooperation, there must be a constant effort to understand how the various states (and the various actors within those states) view the problem and the cooperative program, to respond to their concerns, and to provide incentives for cooperation.

Failing to be sensitive to recipient country concerns can greatly damage prospects for gaining cooperation in upgrading MPC&A. As noted, some key officials have already been warned about excessive cooperation with the United States, after sensationalized stories appeared in the Western press. The concerns that must be addressed fall into four main categories: confidentiality and limiting negative press commentary; a focus on conceiving of these programs as cooperation, not as assistance; reciprocal access to U.S. facilities; and the use of indigenous equipment and expertise. The first and last of these appear to be concerns shared by many of the recipient states, while the middle two primarily apply in the case of Russia:

i. *Confidentiality.* Cooperation will not be forthcoming if, whenever Russia opens a nuclear site to the United States, the press is then filled with stories about the inadequacies of the security and accounting at that site. Extreme care must be taken to protect information the recipient states consider confidential. Efforts should be made to avoid sensationalized press accounts of the state of MPC&A in the former Soviet Union. Public statements that Russian MPC&A systems are inadequate, that seizures of nuclear material in Europe and elsewhere came from Russia, or that Russian technology is inferior to Western technology should be avoided.

ii. *Emphasize Cooperation, Not Assistance.* Particularly in Russia, which conceives of itself as an advanced nuclear power on a par with the United States, it is very important that these

programs be presented as joint cooperation to mutual benefit—not as an assistance program for countries incapable of properly managing their nuclear materials by themselves. Public statements should emphasize that this is a global problem, not just a Russian one, and that programs to cooperate with the FSU states in addressing the problem represent cooperation on mutual problems to mutual benefit, not assistance.

iii. *Reciprocal Access.* Given Russian sensitivities, gaining necessary access to the wide range of facilities in Russia requiring MPC&A upgrades will inevitably require offering similar access to U.S. nuclear sites. There is little doubt, for example, that the U.S. decision to give a high-level Russian team a detailed look at the security and material control systems in place at the Hanford plutonium storage site was a critical factor in the Russian decision to allow cooperation to begin at similar sites with weapons-usable material in Russia. Indeed, the Russian official who led the U.S. return visit to the Mayak plutonium storage site informed the group that his instructions were to provide exactly as much access as the Russian group had received at Hanford—no more, and no less. Thus, the Clinton Administration's decision to offer reciprocal transparency measures—in contrast to the Bush Administration's "pay per view" approach, which demanded unilateral Russian transparency in return for Nunn-Lugar assistance—is critical to continued success.

iv. *Indigenous Equipment.* As already mentioned, making use of equipment produced in the former Soviet states themselves, rather than using only American equipment (as has been the case to date in most of the Nunn-Lugar program, including the Nunn-Lugar MPC&A program) is critically important to addressing recipient-state sensitivities. One official of the Russian security service told the Panel bluntly that if the United States insisted on using its own equipment, cooperation would go no further.

4. There is no substitute for a strong management team to lead these programs.

Particularly in a complex, multi-pronged program such as this one, effective management is essential to keep the programs focused on the central goal of achieving the largest possible reductions in proliferation risk per dollar spent, as quickly as possible, and to keep participants focused on a prioritized plan of action. In both Russia and the United States, participants in these programs have a variety of interests (including financial interests in receiving as large a fraction of the program's funds as possible) in addition to their interest in reducing proliferation risks. This is not to criticize any of the participants: it is simply a fact of human nature, which must be kept in mind. Given that situation, strong managers, aware of these different and sometimes conflicting interests, are essential to keep the program on track.

5. Public support in the United States, the former Soviet Union, and among their present and former allies is needed.

Project Sapphire—And Beyond

Project Sapphire, which airlifted some 600 kilograms of HEU from a vulnerable fuel fabrication facility in Kazakhstan to safe storage at Oak Ridge, was a major nonproliferation success, for which the Clinton Administration deserves great credit.

A variety of lessons can be drawn from the Sapphire experience. The effort took many months, far longer than was originally anticipated. Indeed, the operation was not over when the material arrived in the United States; some important issues, such as how the material will be managed in the United States, and precisely how the promised assistance to Kazakhstan would be paid for, remained unsettled at the time of the Panel's review.

An intensive effort was needed to accomplish this mission, including the establishment of an interagency "Tiger Team" and, ultimately, the personal involvement of the President and several Cabinet Secretaries. (The press conference announcing the operation after it was complete featured the Secretaries of State, Defense, and Energy.) In addition to reaching agreement with Kazakhstan (and confirming that Russia did not object, and had no interest in taking the material itself), there were important issues that had to be resolved within the U.S. government, including the responsibilities and authorities of different agencies; where funds could be found with sufficient flexibility to pay for the activities required for this effort; locations in the United States where such material could be received; compliance with environment, safety, and health regulations; difficulties of packaging and transport (including the touchy question of overflights of other countries carrying nuclear materials); and others. The dedication of those who took part in this effort was responsible for its ultimate success.

The involvement of the President and several Cabinet Secretaries in this successful effort demonstrates the need for, and value of, such top-level leadership in pushing to a successful conclusion programs related to reducing risks of theft of fissile materials. The obstacles that arose and were overcome demonstrate the need for a strong and focused interagency process to deal with such issues, led by a senior official with day-to-day responsibility for coordinating these efforts. The Panel believes it would be very useful for the participants in Sapphire to prepare a "lessons learned" report. The insights contained therein could help guide cooperative MPC&A programs and future efforts to purchase materials.

As far as is known, Sapphire took care of by far the largest stockpile of weapons-usable fissile material outside Russia. There is little reason for confidence, however, that other stockpiles will not be found whose removal would be determined to be an urgent matter of national security. The Clinton Administration is establishing a process for examining, on a case-by-case basis, whether other such purchases would be justified. No assumption is being made that the specific arrangements made for Sapphire would be repeated for the next purchase—but the experience of Sapphire should make similar efforts far easier to implement should they prove necessary in the future.

There may be simpler approaches to such purchases that should be explored. For example, if effective MPC&A systems were established at the facilities processing HEU for the HEU purchase agreement, then HEU could be purchased from a site with an insecure stockpile, and sent to the blending facilities in Russia to be processed into LEU as an add-on to the HEU deal. (The entire Sapphire stock would have increased the scale of the HEU purchase agreement by just over one-tenth of one percent.) The price for the HEU could be the same as that in the HEU purchase agreement, or some other arrangement might be made if there were security reasons for offering a higher price. Proceeds from such purchases might be divided in such a way as to provide incentives to research institutes to give up their HEU, and incentives to the relevant government to participate in the collaborative purchase arrangement. Further exploration of such concepts is needed.

The cooperative MPC&A program is difficult to describe to the public because of the obvious sensitivities involved, described above. Support from the public sector is required, however, if the program is to maintain adequate funding from the United States and benign cooperation, at least, from others. A difficult balance must be drawn between providing sufficient

information to make a public case for the importance and urgency of these programs, and maintaining sufficient confidentiality to ensure continued recipient-state cooperation. A proactive approach under Presidential leadership is essential.

The need for such leadership is particularly acute in those cases where cooperation is perceived to have a negative impact on the interests of segments of the U.S. public. For example, the HEU purchase agreement has the potential to displace U.S. jobs in uranium mining and enrichment. Project Sapphire required bringing foreign nuclear material to Tennessee, where local residents believe they are carrying a big enough nuclear burden already. Purchasing MPC&A equipment produced in the former Soviet states will mean that the money will not go to American contractors. In all these cases, the public and the Congress need to understand the substantial security benefits from the modest sacrifices called for.

6. Effective collection and analysis of information is essential.

Analysis by experts of data available to the U.S. Government to ensure adequate understanding of the true situation is crucial. Important information can be gained from the existing analytical resources of the intelligence community if it is properly tasked and focused. Since information related to accounting and control procedures within particular facilities is not available through national technical means, however, much of the most important information is coming not from the intelligence agencies, but from U.S. MPC&A experts who have visited many of these facilities. Increased attention needs to be devoted to ensuring that information available from individuals who have worked at or visited these facilities is collected and integrated with other information.

V. RECOMMENDATIONS

Our recommendations fall into two categories: recommendations for Presidential action, and recommendations for those who will implement the policies prescribed by the President.

Recommendations for Presidential Action

1. The President should issue a decision directive designating the effort to protect, control, and account for fissile material as a critical and urgent security priority of the United States, and directing that it be given commensurate resources and top-level attention.

The nuclear proliferation threat posed by inadequately secured nuclear materials in the former Soviet Union is among the most serious and urgent threats to national security the United States faces in the coming decade. Only Presidential action can firmly establish efforts to reduce this threat as a top priority. The directive should clearly establish the Administration's policy and outline a coherent approach to implementing that policy throughout the government.

2. The President should appoint a senior Administration official to take full-time, personal responsibility for ensuring that cooperative programs with the former Soviet states to control fissile materials are being effectively implemented, and should give that individual clear authority to get the job done.

Security and control for nuclear materials, as one of the preeminent security challenges facing the United States, is an issue that requires sustained top-level leadership. The gigantic scope of the challenge of managing these materials—involving hundreds of tons of materials at scores of sites in the former Soviet Union and the United States—has spawned a wide array of initiatives, ranging from securing nuclear materials (the primary focus of this report), to mutual reciprocal inspections of storage sites, to providing alternative energy sources to replace plutonium production reactors (see Table 2). A dozen or more interagency groups have been established to coordinate various aspects of these efforts. To maximize the prospects for success, these initiatives require a single coordinator, not burdened with other responsibilities, with the responsibility and the authority to ensure that these programs receive adequate resources and are effectively implemented, to resolve interagency disputes, and to coordinate these efforts with related programs. Such a role will allow the coordinator to balance priorities among these initiatives and ensure that key synergies are pursued.

3. The President should establish, under the leadership of the senior official just described, a stronger and more focused interagency process, with clearly defined lines of responsibility, authority, and organizational roles, designed to bring the talents of all critical agencies to bear in addressing this problem.

U.S.-FSU cooperation to reduce the risk of theft of nuclear materials is a broad problem that requires the expertise of many agencies. DOE is now the principal implementing agency, though NRC continues to play an important role. DOE is well-suited for this role: it has

expertise in fissile materials; it has the responsibility for most U.S. domestic MPC&A; it has good working relations with Russians involved in this effort; and, most important, it has a top leadership which is committed to this program and assigns substantial priority to getting the job done. (As noted below, however, DOE needs to assign additional capable, trained staff to manage and implement these programs.)

Other agencies can and must make critical contributions. The State Department and the Arms Control and Disarmament Agency will continue to have important roles to play, in interacting with other countries (both the former Soviet states and other donor countries) and the IAEA, and in providing additional safeguards expertise. The contribution of the intelligence agencies will also be important. The Defense Department's On-Site Inspection Agency (OSIA) has considerable expertise in quickly organizing visits to sites in the former Soviet Union, arranging interpretation services, and the like; this expertise could provide key support to the MPC&A cooperation program, and should be utilized where appropriate (though sensitivities of the recipient states regarding the participation of an "inspection" agency in this endeavor must be kept in mind).

As noted above, a large number of interagency groups have been established to coordinate various parts of the effort to cooperate with the states of the former Soviet Union in managing fissile materials. In mid-1994, the National Security Council staff established a central coordinating group for issues related to fissile materials in the former Soviet Union. Interagency groups on MPC&A, transparency, and plutonium disposition all report to this overall coordinating group. Using that mechanism and others, in late 1994, the National Security Council staff successfully brought the interagency process to agreement on significantly increasing the funds available for MPC&A in the FY96 budget request (as well as arranging for additional funds for FY95 activities that were then beginning).

These are important steps in the right direction. Nevertheless, to bring the talents of all agencies to bear in moving this program forward, a stronger and more focused interagency process is needed, under the leadership of a senior official with clear authority from the President, who is not burdened with other responsibilities.

4. The President should direct the senior official responsible for these programs to prepare a prioritized MPC&A action plan within 60 days. This plan should identify specific near-term, mid-term, and long-term goals and objectives, and resources needed to accomplish them, and it should be updated regularly.

The importance of a such a plan to any effective program can hardly be overemphasized. DOE has much of the basis for such a plan in place, in its lab-to-lab action plan and the list of initial sites for government-to-government cooperation that has been agreed with Russia.

The fundamental goal of this program must be to achieve the *maximum reduction in proliferation risk* per dollar spent, as quickly as possible. Note that this is *not* the same as protecting the maximum total quantity of material (since some large stockpiles of material may

already be substantially better protected, and thus pose lower proliferation risks, than some small stockpiles) or protecting the largest possible number of sites.

Achieving such a goal will require a systems engineering approach—one that includes all aspects of the problem and looks for the maximum return for the marginal dollar. It will also require a set of guiding principles around which to organize the plan, and a set of specific objectives deriving from those principles. (Some specific suggestions regarding the content of this action plan are offered below.)

5. The President should direct that adequate funds and personnel be allocated specifically for MPC&A cooperation, and that a high priority be assigned to protecting these resources from cutbacks.

Funding should be provided that is sufficient to meet a clear set of objectives, rather than tailoring the objectives to fit within a pre-determined funding ceiling. It would be a serious error to fail to provide the funds for actions that could greatly reduce serious proliferation risks for modest costs.

It is essential that adequate funds be appropriated specifically for this purpose, rather than simply "taxing" funds otherwise provided to various agencies, or expecting agencies to fund this cooperation by taking funds from other programs in their budgets.

This program is now funded primarily in the Department of Energy. The probability of further reductions in DOE's budget appears high. Given the priority of the MPC&A effort, the President should direct that its funding be protected in allocating budget reductions (as has been directed, for example, in the case of DOE's stockpile stewardship program).

6. The President should direct the senior official responsible for these programs to develop and implement a plan to secure needed legislative and public support.

The crucial effort to build support for these programs must maintain a difficult balance between providing sufficient information to make a public case for these programs and maintaining sufficient confidentiality to avoid poisoning the well for cooperation with the recipient states. Bipartisan support for the MPC&A program on Capitol Hill is essential. Any DOE program whose budget is increasing will inevitably come under close scrutiny—particularly if, as in this case, it appears to involve "Russian aid." The Administration must develop and execute an effective legislative and public information plan to win the support these programs deserve.

As noted in the lessons learned, a proactive approach to building public support for these programs, under Presidential leadership, is needed—particularly in cases where the actions required in the interest of national security have conspicuous economic or other costs.

7. The President should make effective security and accounting for weapons-usable material an important factor in U.S. relations with the states of the former Soviet Union. In

particular, the President should seize opportunities such as that afforded by his upcoming summit with President Yeltsin to gain agreement on specific new steps to improve MPC&A.

Nonproliferation policies are already central to our relations with the former Soviet states, as the current crisis in relations with Russia over the proposed sale of reactors to Iran illustrates. The single most essential step the former Soviet states must take to prevent nuclear proliferation beyond their borders is to protect the nuclear weapons and weapons-usable materials on their territories. That issue, therefore, deserves a central place at the diplomatic table in discussions with these countries.

At their January 1994 summit, President Clinton and President Yeltsin identified cooperation in this area as a "high priority." The issue was highlighted again at their September 1994 summit. The issue has also been discussed seriously in the Gore-Chernomyrdin Commission. At the next summit, the United States should seek more detailed commitments to take specific new steps by agreed deadlines.

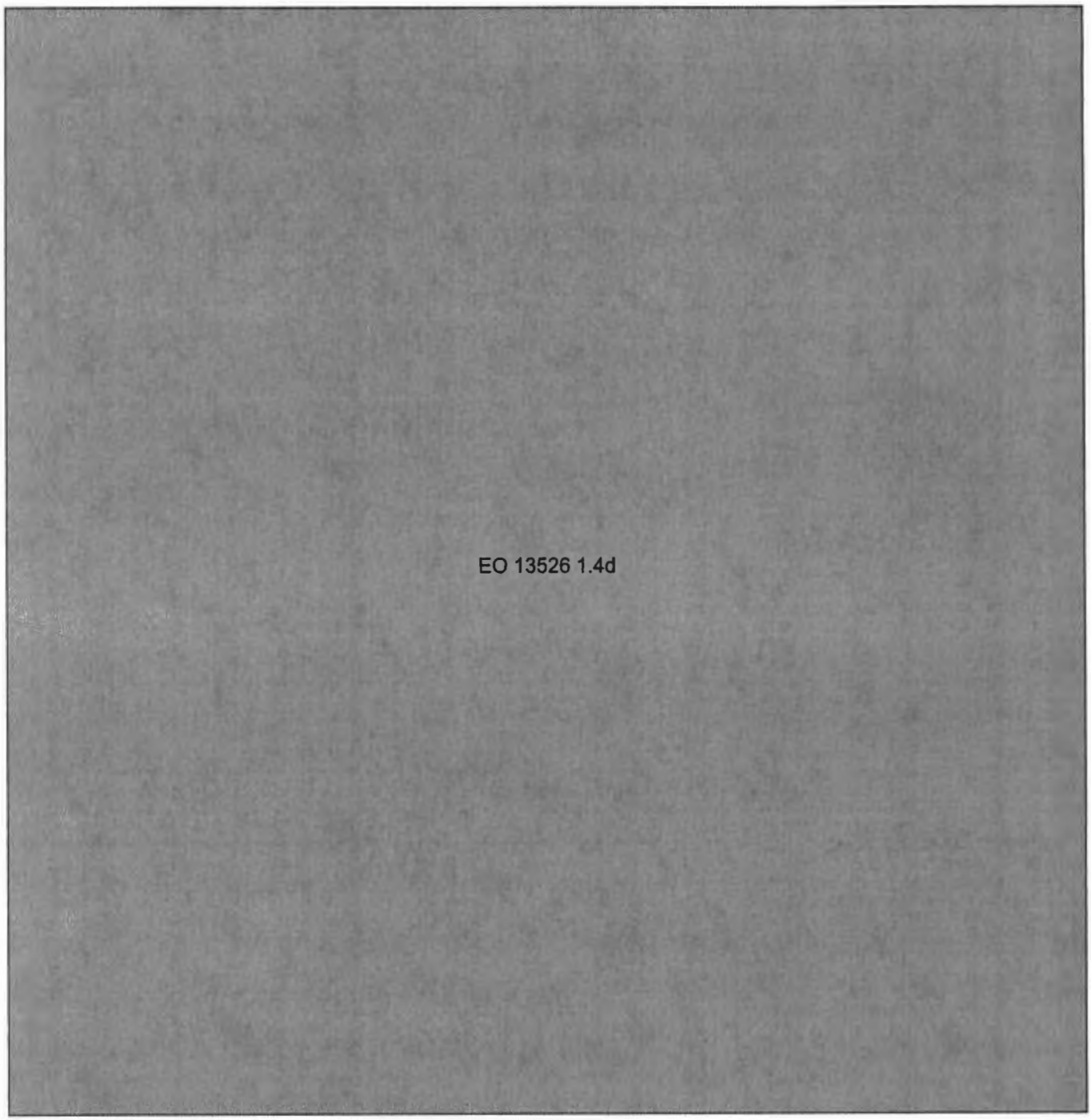
For example, the two Presidents could agree:

- to endorse the cooperation already underway, including the government-to-government effort channeled through MINATOM, the lab-to-lab effort, and the expanding GAN cooperation (giving each of these efforts Presidential authorization);
- that Russia would carry out a series of fast-paced inspections of its own fissile materials sites, to identify and prioritize needs for MPC&A improvements, and that the United States would contribute to defraying the cost of this survey and of implementing the highest-priority improvements identified;
- that MPC&A cooperation would be extended to include materials in military use (including naval fuel) as well as civilian materials, with appropriate measures to protect secrets that remain important to the security of each side;
- that MPC&A cooperation would be extended to additional sites beyond those already agreed to, including, for example, the major bulk-handling facilities at Tomsk-7 (Seversk), Krasnoyarsk-26 (Zeleznogorsk), Chelyabinsk-65 (the Mayak plant), and Sverdlovsk-44 (Yekaterinburg);
- that the two sides will exchange lists of major sites where fissile materials are handled and stored, and will exchange visits to major sites on a schedule to be agreed, to discuss and observe security and accounting arrangements at those sites;
- that the two sides will establish a joint working group to explore cooperation between their intelligence, police, and customs services in tracking and responding to thefts of, and illegal trade in, nuclear materials;
- that the two sides will explore possibilities for reducing the number of sites where weapons-usable fissile materials are used and stored, for example by using non-weapons-usable materials in research reactors;
- that the two sides will explore means to improve economic conditions for personnel responsible for accounting and security for nuclear weapons and fissile materials;

- that the two sides will continue to work together in establishing improved MPC&A regulations and enhancing regulatory oversight of these activities; and
- that the two sides will work out specific agreements on these points for the next meeting of the Gore-Chernomyrdin Commission, and prepare a joint report on what had been accomplished and additional steps that could be taken for consideration at the next summit.

8. 1.4(d)

EO 13526 1.4d, 3.3(b)(1), 3.3(b)(6)



9. The President should designate efforts to enhance security and accounting for nuclear materials worldwide as a key mission of the national laboratories.

Already, the national laboratories have made a substantial contribution to U.S. security through the lab-to-lab MPC&A program. The lab directors, however, need Presidential direction to make efforts to enhance MPC&A—not only in the former Soviet Union but worldwide—a fundamental part of their mission. The outstanding technical expertise in nuclear materials

management built up at several of the national laboratories is a global resource that must be applied effectively to this mission. While the national laboratories are already involved in this effort, there is substantial room for elevating its priority: at the six laboratories involved, a total of only about 30 full-time equivalents are devoted to lab-to-lab MPC&A cooperation with Russia, out of thousands of personnel at the laboratories.

Recommendations for Implementers

The individuals responsible for implementing the President's guidance on strengthening security and accounting for nuclear materials in the former Soviet Union will need the authority to get the job done and the flexibility that goes with such authority. Without wishing to prejudge all the issues that will face them, we offer some recommendations—based on our review of the current state of these cooperative MPC&A efforts—that the implementers may find useful.

1. The senior official given responsibility for these efforts should establish a set of key guiding principles around which program planning and execution can be organized.

A program of this importance and scope requires a set of guiding principles. As noted above, the overall objective must to be to achieve the maximum reduction in proliferation risk per dollar spent, as quickly as possible. At the same time, the United States cannot do everything, and cannot expect to be allowed to participate in MPC&A upgrades at every site that may require them. As noted earlier, the states of the former Soviet Union themselves bear the long-term responsibility for protecting and accounting for these materials. The U.S. role is to:

(1) assist in implementing high-priority MPC&A upgrades; and

(2) help the FSU states develop their own indigenous MPC&A capabilities and approaches, so that they can protect and account for these materials over the long term after the cooperative MPC&A program winds down.

Given this objective and this role for the United States, guiding principles for this program should include:

- *Focus on Top Priorities.* This requires identifying and addressing the highest proliferation risks wherever possible. In particular, to the extent possible, "quick fixes" should be identified and implemented. The problem is so acute that remarkably inexpensive and low-tech upgrades can make a huge difference in some cases: one obvious example is piling massive concrete blocks in front of the doors of vaults storing nuclear materials to delay illicit access, if regular authorized access is not required. The emphasis should be on making the most urgent improvements at a wide range of sites, not making wholesale and expensive changes at only one or two. The top priority must be implementing upgrades with whatever effective technology is already available, rather than developing new technologies (though development efforts can be an important means of building mutual trust and cooperation). We cannot afford to wait for (or pay for) a Rolls Royce when a Ford will suffice to do much of the job.

- *Foster Indigenous FSU Capabilities.* As noted, the nations of the former Soviet Union themselves must bear responsibility for ensuring effective MPC&A. Therefore building indigenous MPC&A expertise and a new "safeguards culture" should be a key priority. This

again implies a focus on using equipment designed and produced in the former Soviet states wherever effective equipment is available, and transferring the technology needed to build effective equipment where it is not. Wherever possible, the work should be done by FSU personnel and companies, with the U.S. team as consultants. As the adage goes, "give a man a fish, and you feed him for a day; teach a man to fish and you feed him for a lifetime."

- *Build Toward National Systems.* Efforts at individual sites should be coordinated so that they fit together and contribute to the goal of creating a national system providing a generally consistent level of MPC&A for all weapons-usable materials. The creation of national-level tracking and accounting systems for nuclear materials, as well as effective regulatory functions, should be an important priority. While regulations are often taken to have less urgency than securing materials on the ground, the fact is that only a sound set of regulations requiring effective MPC&A, backed up by realistic enforcement, will provide facility managers the incentives necessary to lead them to invest in, operate, and maintain MPC&A systems.

There will often be some tension between these principles: for example, funds spent establishing a national computerized accounting system will be funds not spent on "quick fixes." But we believe that an overall balanced program requires pursuit of all three of these principles in parallel.

2. The Administration should establish a specific set of near-term, mid-term, and long-term objectives for the MPC&A program, with well-defined ways to assess progress toward the objectives.

Such a set of objectives and ways to measure progress in achieving them is an essential management tool. At the same time, such a tool should not be used so rigidly that the program is inhibited from responding rapidly to new developments.

The following suggested set of objectives is keyed to the near-term, mid-term, and long-term. Near-term objectives are those that can be expected to be completed or well underway within roughly one year; mid-term objectives are those that can be expected to be completed or well underway in 2–4 years; and long-term objectives represent the desired end-state the program is striving to achieve.

Suggested objectives:

Near-term:

N1. Significantly improve security and accounting for the weapons-usable materials at all of the half-dozen highest-risk sites in Russia.

N2. Significantly improve security and accounting at (or remove material from) all sites in the non-Russian former Soviet states with separated plutonium or HEU.

N3. Work with Russia to establish a Russian program to identify the highest-priority MPC&A upgrades needed at all of its nuclear sites, and mechanisms to accomplish them.

N4. Work with Russia to establish a Russian program to take inventories at major Russian sites with substantial quantities of weapons-usable materials.

N5. Work with Russia to put into place a Russian system of MPC&A regulations, including appropriate incentives (e.g., backed up by realistic threats of fines or closure) for upgrading MPC&A.

N6. Initiate a program to work with Russia to improve MPC&A for stockpiles of highly-enriched naval and icebreaker fuel.

N7. Work with the former Soviet states to establish effective training programs for MPC&A implementers and regulators, and to foster a "safeguards culture."

N8. Work with Russia to establish a nationwide system of material accounting.

N9. Initiate mass production in Russia of key MPC&A equipment (effective portal monitors, particularly).

Mid-Term:

M1. Significantly improve security and accounting for the weapons-usable materials at all the major non-weapons bulk-handling facilities and large-scale fissile material storage facilities in the MINATOM complex (e.g. the reprocessing plants and associated storage facilities at Tomsk, Krasnoyarsk, and Chelyabinsk; HEU oxidation at Tomsk and HEU production and blending at Yekaterinburg; and HEU fabrication at Elektrostal, Novosibirsk, and Podolsk).

M2. Significantly improve security and accounting at (or remove materials from) all facilities outside of closed cities or military bases which handle kilogram-quantities or more of separated Pu or HEU (e.g., civilian institutes).

M3. Work with Russia to develop a comprehensive plan, with cost estimates, for longer-term MPC&A upgrade needs and material consolidation for all its nuclear sites, including specific staff, equipment, and training needs for specific sites.

M4. Work with Russia to ensure that effective portal monitors or equivalent capability to detect removal of nuclear material are installed and used effectively at all major Russian sites with substantial quantities of weapons-usable materials.

M5. Work with Russia to ensure that GAN acquires all the capabilities necessary to effectively regulate and inspect MPC&A.

Long-Term:

L1. Work with the former Soviet states to ensure that all facilities in the FSU with strategic quantities of HEU or Pu have effective MPC&A systems in place and in use.

L2. Work with the former Soviet states to ensure that effective MPC&A is established as an ongoing priority activity with requisite funding.

L3. Work with the former Soviet states to establish a sufficient and self-sustaining cadre of MPC&A implementers, designers, inspectors, and regulators in those states.

L4. Work with the regulatory agencies of the former Soviet states to establish effective overall programs of MPC&A regulation.

Once a set of objectives such as these has been defined, it is essential to develop an estimate of what is required (technically, politically, and administratively) to attain those objectives, including in particular the resources (money and people) that must be committed. In this case, not all of the resources should come from the United States; the recipient states and other donor states should make substantial contributions as well.

3. The Administration should continue to take a flexible, multi-pronged approach to improving MPC&A in the FSU, exploiting opportunities as they arise. All of the current MPC&A cooperative programs deserve strong support.

All three of the major current programs to cooperate with the states of the former Soviet Union—the government-to-government MPC&A effort (now transitioning from Nunn-Lugar to DOE), the lab-to-lab program, and the expanding cooperation with GAN—should be continued. Given the multitude of different actors on the Russian side (not to mention the non-Russian states), suggestions that the program be trimmed down to a single approach should be resisted. A strong U.S. management team will be needed to coordinate these programs and all the U.S. participants in them so that they remain focused on the key objectives and reinforce each other effectively.

4. The Administration should make a comprehensive effort to analyze and deal with recipient-state sensitivities and incentives, in order to achieve the maximum degree of cooperation.

As noted above, cooperative MPC&A efforts need to be supported by a detailed effort to understand the domestic sources of nuclear decision-making, including the multiple actors involved, the sensitivities of each of those actors, their incentives for cooperating or for blocking progress, and the leverage points in the system. In some cases, this will mean working hard to cooperate with former Soviet nuclear bureaucracies that are peopled with unreformed Cold War holdovers—an arduous, unpleasant, but essential task.

The four key areas to which the United States must be sensitive—confidentiality, focusing on cooperation, reciprocity, and use of indigenous equipment—were outlined above under lessons learned. The U.S. government should develop a conceptual framework and a detailed plan for working with each country, which responds to the differing sensitivities of the different countries and of the different actors within them. It is essential to analyze these sensitivities and determine the best ways to meet concerns at each step of the process, rather than waiting until well intentioned proposals have already encountered a buzz-saw of skepticism and opposition.

In particular, both lab-lab and government-government programs should be seen as "collaborative" efforts—not purely assistance—with reciprocal visits and evaluations, and genuine technical input from both sides. This is particularly important in cooperation with Russia.

5. The Administration should continue to design cooperative MPC&A programs with a focus on specific deliverables, to ensure that the money is spent for its intended purposes.

Clearly it is critical that the funds allocated to improving MPC&A in fact are spent for that purpose. Both the approach taken in the Nunn-Lugar program (purchasing nearly all equipment in the United States, and declining to pay Russian salaries) and the approach taken in DOE's programs (negotiating prices for specific deliverables to be delivered by specified deadlines) provide effective protection for the U.S. taxpayer when used appropriately. But the DOE approach offers substantially greater flexibility and better chances of fostering recipient-state cooperation.

In a fast-moving program—as these must be, if they are to achieve their goals in a timely fashion—it is impossible to ensure that every dollar is accounted for. But even a single well-publicized case of diversion of funds to purposes other than those intended could have a devastating impact on support for these programs. Therefore vigilance on this score should continue to be an important priority.

6. DOE should assign additional qualified personnel to manage and implement these programs.

The personnel managing and implementing these programs at DOE are already stretched thin. As these programs expand in scope and priority, they will need additional personnel to ensure effective management and implementation. Additional staff with safeguards expertise and international experience will also be needed. Training of this staff should begin now.

These programs require an effective organizational structure within DOE, with managers not burdened with a wide range of other responsibilities. The program management should include individuals with strong *domestic* safeguards experience,[14] including experience with implementation of MPC&A at operational DOE facilities, as well as experience in international cooperation. In particular, the program should make use of the expertise of DOE's Office of Safeguards and Security, which is in charge of implementing MPC&A at DOE nuclear facilities.

All MPC&A programs within DOE should be subject to continuing review, to ensure that they remain focused on accomplishing the key objectives in the least time at the lowest cost.

7. Additional efforts to coordinate U.S. cooperative MPC&A programs with those of other countries, and to encourage other countries to expand their contribution to this effort, should be pursued.

Given that the possibility of nuclear theft poses a global threat, other countries with MPC&A expertise, particularly those that also have denuclearization assistance programs in the former Soviet Union (such as Japan, Germany, and France), should be encouraged to make more substantial contributions to reducing the risk. U.S. efforts should be coordinated as closely as possible with those of other donor countries and with international organizations (such as the

[14]Domestic safeguards, operated unilaterally by a country having nuclear activities, focus on detecting and preventing nuclear materials theft, i.e., facility-level protection, accounting, and control with national coordination and oversight. International safeguards, implemented by international organizations such as the International Atomic Energy Agency, focus on detecting diversion by a state having nuclear activities.

International Atomic Energy Agency), to avoid duplication of effort and share information needed to focus priorities.

8. Additional U.S. and FSU personnel with expertise in security and accounting for nuclear materials should be trained.

As cooperative MPC&A programs expand, additional personnel with MPC&A expertise will be needed. The need is particularly acute in the states of the former Soviet Union. The establishment of an MPC&A training center in Russia (currently slated to be established at Obninsk) should be a high priority. The current focus on "training the trainers"—that is, training individuals who could serve as instructors for training courses at other facilities—is a useful approach. It is essential to ensure that training is available for both MPC&A implementers and regulators. Consideration should be given to establishing similar training centers in the other former Soviet states (or perhaps a small number of regional training centers). This effort will require detailed planning and the compilation of materials from a number of sources (e.g., the DOE Office of Safeguards and Security Central Training Academy, Los Alamos courses on nuclear material measurements, Sandia training on physical security, and Brookhaven courses on safeguards systems, principles, bulk measurements, and statistics.)

At the same time, the number of qualified personnel available in the United States to implement these programs also needs to be increased. All those in the United States with expertise relevant to these issues should be identified. People with expertise may be located at national labs, at nuclear weapons complex sites (such as major former reprocessing facilities, for example), in academia, and elsewhere. Opportunities should be created for national laboratory personnel working in other areas to be retrained as MPC&A specialists (in line with the previous recommendation to make enhanced safeguards a central mission of the laboratories).

Recommended Specific Near-Term Actions

Achieving the ambitious set of near-term, mid-term, and long-term objectives outlined above will require a broad range of specific actions. Some of these are already occurring, but need acceleration. For example, it is critical to take action to accelerate the government-to-government program to a pace more closely approximating that of the lab-to-lab program—so that MPC&A upgrades at the key, high-risk facilities identified for cooperation in the government-to-government program can be accomplished as rapidly as possible. Other actions are implied in the statement of objectives, but work on them remains to be undertaken. For example, it is important to begin as soon as possible to reduce the proliferation risks posed by the almost completely unprotected material at the many small civilian research institutes, not located in closed cities, that exist in the FSU. While these sites represent a small fraction of the total material, they may represent a large fraction of the proliferation risk.

The following represent important near-term actions that require further comment:

1. The United States should work with Russia to establish Russian MPC&A assessment and improvement teams, which could rapidly assess what upgrades are needed.

For Russia's own MPC&A upgrade program to be effective, it needs to be based on an assessment of what the most urgent needs are throughout Russia's nuclear facilities. While some assessments have been conducted at particular sites, no consistent program to identify and prioritize the most urgent requirements throughout the Russian nuclear complex exists. Given the many institutional interests involved, establishing such a program would require tough top-level leadership on the Russian side. There are some indications that the Russian leadership is focusing increased attention on this area. Indeed, in the lab-to-lab program, the possibility of the Russian laboratories undertaking such an assessment for those facilities within MINATOM's nuclear weapons complex is already being discussed.

The United States has considerable expertise to offer in this area. For many years, DOE has had teams which visit U.S. sites, assess MPC&A there, and make recommendations for needed upgrades. At one time, DOE conducted a rapid-assessment program and carried out large-scale upgrades based on the assessment's recommendations.

The United States, therefore, should offer to help establish and train the Russian teams that could conduct such an assessment, and to contribute to defraying the costs. Once the assessment had been accomplished, the United States could contribute to the most urgent of the upgrades identified, as agreed between the two sides. This would represent, in a sense, a revival of the earlier "quick fix" approach.

2. The United States should work with Russia to establish nuclear-material inventory teams.

There is a pressing and immediate need for the states of the former Soviet Union to take a measured, physical inventory of the weapons-usable nuclear materials on their territories. (EURATOM has also targeted measured, physical inventory as a high priority.) This is the only way to know how much nuclear material exists, where, and in what form.

The United States should work with Russia and the other states to develop a cooperative process to produce measured nuclear material inventories—applied first to all weapons-usable material. This is a labor-intensive, time-consuming process: equipment has to be identified, supplied, and installed; measurement controls have to be put in place; nuclear materials have to be handled; the measurements themselves have to be made; and the data must be recorded, analyzed, and updated as necessary. Once the inventories have been established, appropriate material controls (tags, seals, surveillance, and the like) and continuing material accounting must be instituted. Current rules may have to be modified to accomplish such an inventory: at present, a physical inventory that varied from the book inventory could subject the plant managers to sanctions.

To expedite this effort, the United States should help train, equip and certify Russian inventory-taking teams.

3. The United States should undertake a new initiative to help Russia improve MPC&A for stockpiles of highly-enriched fuel for naval vessels and icebreakers.

To date, MPC&A cooperation has focused on MINATOM, GAN, and individual laboratories and facilities. That leaves out an entire sector of the Russian nuclear complex—naval and icebreaker fuel, much of it enriched to up to 90% U-235. At least one well-publicized theft of over 4 kilograms of naval fuel has already occurred, from the naval base at Murmansk. As noted earlier, the ease with which that theft succeeded suggests that security for naval fuel in Russia is in urgent need of improvement. The United States should initiate a fast-paced program directed toward that goal. Cooperation in this area is likely to be particularly sensitive. The Agreement for Cooperation being negotiated in the context of stockpile transparency, which will provide a legal basis for exchanging classified nuclear information, may be very useful in furthering Russian openness in this area.

4. The United States should begin discussing with the former Soviet states, and Russia in particular, the need to consolidate nuclear materials in a smaller number of areas within specific sites, and at a smaller number of sites overall.

Currently, weapons-usable nuclear materials exist at scores of sites in Russia alone, and often at many separate locations within a single one of these sites. Reducing the number of locations that must be protected has the potential to greatly reduce the costs of ensuring adequate safeguards and security. With the end of the Cold War, a contraction of the Russian nuclear weapons complex is inevitable in the long run, and consolidation of nuclear materials should be a key part of that contraction—as it has been in the United States. DOE should prepare a detailed briefing for the Russian side on the U.S. experience, including the very large reductions in safeguards and security costs that have been achieved at some sites through consolidating materials, and the reduction in the number of research reactors using HEU over the last several decades. Both in work at individual sites and in discussions of the overall program, the United States should use every opportunity to encourage Russia to undertake consolidation.

5. One or more "quick response teams" should be established to respond quickly to fast-breaking events.

This issue is important enough and explosive enough that the United States should form one or more permanent "quick response teams," with the expertise and resources needed to respond rapidly and effectively to requirements such as Project Sapphire. It is quite possible, for example, that an urgent need to rapidly secure or remove material at a particular site could arise (for example if the material is newly discovered, or is in an area where armed conflict is breaking out). A mechanism should be set up within the government to support these teams. Procedures for expediting the teams' response, and flexible sources for funding the required operations and transactions should be established. The team should train and practice for various kinds of operations, including securing sensitive materials in place or removal to a safe area. Special communications capabilities should be provided, designed for secure communications in remote areas of concern. Consideration should also be given to helping Russia establish such teams to deal with such situations on its own territory, as in many cases U.S. quick-response efforts may be too sensitive.

6. A small cadre of personnel should be stationed in Moscow on a full-time basis to facilitate and support these programs.

The Embassy science and technology staff plays an essential role in supporting negotiations and implementation missions, monitoring events within the Russian government, and determining the attitudes and priorities of the wide array of Russian actors involved in MPC&A-related activities. This staff is stretched thin, however, and additional personnel devoted to this effort full-time will be required as the cooperative MPC&A program expands in priority and scope.

7. To address Russian sensitivities, the Administration should prepare a frank and detailed briefing on past MPC&A problems in the U.S. nuclear complex, and rapid upgrade steps that were taken to address them.

Being open and frank in revealing that the United States has also had MPC&A problems in its weapon complex could help serve to improve the sense of reciprocity and mutual cooperation in the program. Such a discussion could also focus on the very rapid steps the United States took at certain points to assess and remedy deficiencies.

Managing Fissile Materials: A Spectrum of Related Efforts

The Clinton Administration has undertaken a wide array of initiatives related to cooperating with the former Soviet states in managing weapons-usable fissile materials, falling into four broad categories:

- Securing nuclear materials (including MPC&A);
- Building confidence through openness;
- Halting accumulation of excess stocks; and
- Disposition, transforming these materials into forms that pose greatly reduced security risks.

This report has focused on the first of these categories. Here, we offer a few remarks on those aspects of other initiatives that bear directly on the objective of reducing the risk of theft of these nuclear materials.

Securing Nuclear Materials

A few programs in this area have not been discussed in this report, but are nonetheless important:

The Nunn-Lugar Storage Facility. Under the Nunn-Lugar program, a safe and secure storage facility for plutonium and HEU from dismantled weapons is being built with U.S. assistance at Chelyabinsk. While Russia already has considerable storage space available—if Ministry of Defense warhead storage facilities are included—the new facility would offer greatly improved security and accounting compared to the locations where these materials are currently being stored, and the United States would be offered transparency measures in return for its assistance. Despite the many delays that have plagued this program, we believe the establishment of a modern facility with a highly effective MPC&A system and some degree of U.S. oversight is important, and that this program should continue—assuming that MINATOM demonstrates a good-faith commitment to cooperation, and to investing its own resources in the project as well.

Combating Nuclear Smuggling. If MPC&A systems fail and material is stolen, anti-smuggling efforts form the next line of defense. Additional efforts to train and equip police, investigators, customs officials, and border guards in the relevant states—and to coordinate intelligence and sharing of analyses and samples of seized material—are needed. This is a global problem requiring intensive international cooperation.

Securing Nuclear Weapons. Under current circumstances, it appears that security for assembled nuclear weapons in the former Soviet Union is substantially better than security and accounting for nuclear materials outside of weapons. Nevertheless, given the grave consequences that could result if a nuclear weapon were actually diverted, it is important to continue pursuing the recently expanded dialog between the U.S. Department of Defense and the Russian Ministry of Defense regarding upgrades to security for nuclear weapons. This effort may offer spin-off benefits for MPC&A: if the principle of genuine cooperation at nuclear weapon sites can be established, it will become more difficult for MINATOM to argue that its military materials are too sensitive for cooperation to be possible.

Building Confidence Through Openness

Reciprocal Stockpile Declarations. The agreement reached between President Clinton and President Yeltsin at their September, 1994 summit to exchange data regarding stockpiles of nuclear weapons and fissile materials, "and on their safety and security," could have important benefits for MPC&A. A good-faith Russian declaration would require the Russian central government to get a good handle on the inventories that exist at Russian sites. The initial declarations should be seen as the beginning of a process heading toward ever-increasing levels of detail. The more information that can be exchanged regarding the specific locations, amounts, and forms of materials, the greater the potential synergistic benefit for MPC&A cooperation. Additional consideration is needed of what information can and should be provided under the rubric of exchanging data on the "safety and security" of nuclear weapons and fissile materials.

Transparency and Irreversibility. The reciprocal visits to nearly all plutonium and HEU storage sites envisioned in the U.S. proposal tabled in December 1994, if agreed to and implemented, could have enormous spin-off benefit for MPC&A. There is no substitute, in judging what MPC&A improvements are needed, for actual visits to the relevant sites by MPC&A experts. The U.S. approaches to such reciprocal visits should be configured to take maximum advantage of this potential synergy between transparency and MPC&A. The reciprocal nature of these visits will be an essential (but not sufficient) condition for Russian acceptance of them.

IAEA Safeguards on Excess Stocks. The United States has begun placing weapons materials excess to its defense needs under international safeguards, and is urging Russia to do the same, as well as to make its civilian nuclear facilities eligible for IAEA safeguards.* Similarly, IAEA safeguards may be the verification method chosen for the fissile cutoff convention under discussion in Geneva, which would mean putting U.S. and Russian reprocessing and enrichment plants under safeguards. Preparing a site for IAEA safeguards requires that an effective material control and accounting system be in place, so there is a potential synergy with MPC&A efforts here, as well.

Halting Accumulation of Excess Stocks

Plutonium Cutoff Agreement. Under the current approach to monitoring this accord, reprocessing plants would not be monitored, and therefore there would not be an opportunity to upgrade MPC&A at those facilities as part of the monitoring arrangements. If the monitoring measures discussed to date are implemented, however, the sites where the separated plutonium would be stored after leaving the reprocessing plant would have significantly better material control and accounting than most other Russian sites.

RERTR. The United States and Russia are cooperating to develop non-weapons-usable low-enriched fuel for research reactors. The U.S. program in this area is known as Reduced Enrichment for Research and Test Reactors (RERTR). This program may offer a high potential for eliminating stockpiles of HEU fuel, and requirements for additional deliveries of such fuel, at a large number of poorly-protected civilian research facilities in the former Soviet Union. (Soviet supplied research reactors fueled by HEU also exist in Libya and North Korea.)

Disposition

HEU Purchase Agreement. Oxidation and blending of HEU for the HEU purchase agreement will involve large-scale bulk handling of HEU, raising potential opportunities for theft. Even a single documented case of theft of HEU from this effort could have a devastating political impact on the entire cooperative effort to deal with fissile material, in addition to the serious security risks that any HEU theft would pose. Therefore it is critically important that both the site at Tomsk where the HEU weapons components will be converted to HEU oxide, and the site at Sverdlovsk-44 where the material will be blended to low-enriched uranium, be provided with effective MPC&A systems. The apparent lab-to-lab agreement to establish such a system at the Tomsk oxidation facility should be vigorously pursued, as should efforts to reach agreement on MPC&A upgrades at Sverdlovsk-44, being pursued under the umbrella of transparency arrangements for the HEU deal.

Plutonium Disposition. Given the very different attitudes toward plutonium fuel cycles in Russia and the United States, the two countries may not agree to pursue identical plutonium disposition options, and specific decisions are likely to take time. But the two sides should agree now that whatever options are chosen, an agreed and stringent standard of safety, security, and international accountability will be maintained throughout the process.

* The list of facilities eligible for safeguards under the former Soviet Union's "voluntary offer" agreement with the IAEA was minimal by comparison to the U.S. list, which makes all civilian facilities eligible for safeguards, though because of resource constraints these safeguards have not actually been implemented in recent years.

APPENDIX A

List of Principal Briefings

Washington, D.C.

E.O. 12958 1.4(c), 3.5c

Safeguards and Security in the FSU: Conclusions of the JAEIC Study
Stephen Mladineo, DOE, Pacific Northwest Laboratory.

Material Control and Accounting in the FSU
Mark Mullen, Los Alamos National Laboratory

Physical Protection in the FSU
John Kane and Byron Gardner, Sandia National Laboratory

On the Ground in Russia: The Politics and Problems of MPC&A Cooperation
Ken Fairfax, U.S. Embassy, Moscow

Overview of MPC&A Cooperation
Ken Luongo, Director, DOE Office of Arms Control and Nonproliferation

Government-to-Government MPC&A Programs
Ken Sanders, chief, International Safeguards Division, DOE

The Lab-to-Lab MPC&A Program
Mark Mullen, Los Alamos National Laboratory

NRC MPC&A Support to the States of the Former Soviet Union
Ted Sherr, chief, Regulatory and International Safeguards Branch,
Nuclear Regulatory Commission

Securing Nuclear Materials: A DoD Perspective
Gloria Duffy, Special Coordinator,
Cooperative Threat Reduction, Office of the Secretary of Defense

Purchases of FSU Materials: Sapphire and After
Jeffrey Starr, Principal Director, Threat Reduction Policy
Office of the Secretary of Defense; head, Sapphire "Tiger Team"

Stopping Nuclear Smuggling
Joseph DeThomas, Director, Office of Regional Nonproliferation
Department of State

Overview of Outstanding Issues
James Goodby, chief negotiator, Safe, Secure Dismantlement
Department of State

Next Steps In MPC&A Cooperation
Frank von Hippel, Federation of American Scientists, former Assistant Director for National Security, Office of Science and Technology Policy

U.S. Assistance to Improve Physical Security and Accounting of Fissile Material in Russia
Thomas B. Cochran, Natural Resources Defense Council

Cooperation Between the U.S. and MINATOM in the Area of Fissile Material Safeguards
Oleg Bukharin, Princeton University and Moscow Physical-Technical Institute

Securing Nuclear Materials in the Former Soviet Union
William Potter, Center for Nonproliferation Studies, Monterey Institute of International Studies

Overview of Fissile Material Initiatives and Interagency Process
Steve Aoki, Director, Nuclear Nonproliferation, National Security Council

Moscow

Ken Fairfax, Science and Technology Officer, U.S. Embassy Moscow

Victor Gubanov, head, Committee on Emergency Situations, Ministry of Atomic Energy (MINATOM); Lead Negotiator, Government-to-Government MPC&A Cooperation, and others.

Yuri Zubkov, Deputy Chairman for Fuel Cycle and Safeguards, Federal Nuclear and Radiation Safety Authority (GAN), and others.

Yuri Dyomin, chief, International Relations, Federal Counterintelligence Service, and others

Yuri Ilkaev, Deputy Scientific Director, All-Russia Institute of Experimental Physics (Arzamas-16).

Nikolai Ponomarev-Stepnoi, Deputy Director, Kurchatov Institute, and others. (Including review of MPC&A system at Building 116).