

Report for Congress

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Nuclear Smuggling and International Terrorism: Issues and Options for U.S. Policy

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Summary

The collapse of the USSR and its framework of totalitarian control raised fears of rampant nuclear proliferation, fueled by leakages of fissile materials from increasingly insecure Russian stockpiles. A major U.S. concern is that such materials and even complete nuclear weapons could gravitate into dangerous hands, increasing the array of potentially lethal dangers to Western security and stability.

The dimensions of this threat have not been precisely calibrated. The amount of weapons-usable material leaking out of Russia has been small. Little visible evidence exists of participation by terrorists or rogue states in the black market for stolen highly-enriched uranium or plutonium. Indeed, terrorists and rogues may place a higher priority on other weapons of mass destruction (WMD) objectives or, in the case of states, on domestic manufacture of nuclear bomb ingredients. Nevertheless, the possibility can be considered that the observed market in the West does not reflect the true state of affairs, because many smuggling incidents might go undetected or unreported. Various worrisome scenarios can be contemplated, from a “shadow market” organized by professionals and brokered by criminals to outright “state-sponsored” proliferation by high-ranking Russian officials.

The United States is funding a broad range of activities in Russia and other newly independent states (NIS) of the former Soviet Union designed to stem outflows of nuclear material, weapons and weapons design intelligence. Such programs have been controversial: some believe that they have been underfunded and advocate major expansion, while others see the programs as intrinsically unworkable in the Russian context or – put bluntly, that “nothing much can be done.” Pervasive crime and corruption and Russia’s nuclear cooperation with Iran (which seemingly contradicts the goal of non-proliferation) are cited to support the latter position. Recent congressional budget decisions and bipartisan legislation currently before Congress, indicate a desire that investment in proliferation prevention in the NIS should be increased significantly.

Nevertheless, concerns remain that more investment by itself will not translate into increased effectiveness against serious proliferation episodes, especially those organized by well-placed nuclear insiders and corrupt officials in response to a lucrative offer from states or groups of concern. Technological and managerial improvements are being introduced in existing programs to address such contingencies: yet some experts argue that Washington should move beyond what is now a reactive and containment-oriented strategy to focus more on the demand-side of the proliferation equation. In particular, improved intelligence collection on potential adversaries – who they are, what they want and how they plan to obtain it—is seen as a vital tool for guiding resource allocation and project management decisions on proliferation prevention and in strengthening overall prospects for nuclear risk management in the NIS.

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How Much of a Threat?

Introduction

The demise of Soviet communism and the end of the Cold War provided welcome new opportunities for ending the arms race and advancing the cause of world peace. Yet political and economic upheavals associated with the Soviet collapse also sparked an array of new transnational concerns potentially as serious as those emanating from the bipolar confrontations of the previous 50 years. Perhaps foremost among these was the apparently diminished capacity of Russia and other newly-independent states (NIS) of the former Soviet Union to monitor and control their vast nuclear assets. The prospect of leaky nuclear stockpiles seemed compatible with worst-case proliferation scenarios. As a U.S. bipartisan task force reporting on U.S. nonproliferation prospects in Russia argued in a January 2001 report, “The most urgent unmet national security threat to the United States today is the danger that weapons of mass destruction or weapons-usable nuclear materials in Russia could be stolen and sold to terrorists or hostile nation-states and used against American troops abroad or citizens at home.”¹

The precise nature and implications of this threat and the adequacy of the U.S. response to it form the principal subject matter of this report. This report highlights two general problems: First, a penumbra of uncertainty exists regarding the extent of proliferation from Russian nuclear stockpiles and also regarding the nuclear procurement objectives of terrorists and “rogue states.” The extent of nuclear smuggling may be greater than what is recorded in seizure statistics but how much greater is unknown. Furthermore, information on the demand side—who the adversaries are, what they want, and how they are trying to obtain it—is severely lacking. Congress and the Administration might consider alternative ways of filling these intelligence gaps as part of a broader counter-terrorism and counter-proliferation effort.

Second, U.S. nuclear security programs in the NIS may not be sufficient to contain the potential proliferation threat. For instance, U.S. programs to improve protective regimens for fissile materials have not reached all facilities, signifying that sites housing hundreds of tons of Russian highly-enriched uranium (HEU) and

¹ Howard Baker and Lloyd Cutler. *A Report Card on the Department of Energy's Nonproliferation Programs with Russia*. U.S. Department of Energy: The Secretary of Energy Advisory Board, January 10, 2001, p. ii.

plutonium apart from weapons lack up-to-date safeguards against insider theft. More importantly, U.S. programs may not be calibrated to defend against sophisticated diversion scenarios—those involving a degree of connivance of senior managers and government officials and the services of professional smugglers, for example. Cases of deliberate “state-sponsored” proliferation certainly would be well beyond the capability of the new systems to detect, since they focus primarily on providing support to states presumably desirous of preventing the diversion of their own nuclear materials. Such concerns also tend to highlight the complementary significance of new intelligence missions and platforms to identify “shadow” market mechanisms and to disrupt nuclear deals in the making.

Identifying Conditions

Worries about nuclear smuggling from the newly-independent states of the former Soviet Union (NIS) reflect the sharp economic decline and wrenching societal changes resulting from the end of the Cold War and the disintegration of the USSR. To cite some revealing statistics, Russia’s gross national product in 1998 was only 71 percent of what it was in 1992, and Russian government orders for nuclear defense goods in that year were only one-seventh of what they were in 1990.² The economic downturn virtually destroyed the Soviet-era lifestyle of elite workers at nuclear enterprises; as of 1999, the average salary of the work force in Russia’s formerly secret nuclear cities was just \$43 per month, and most employees had to moonlight in other jobs to survive.³

Furthermore, the economic crisis “destroyed the foundations of the Soviet nuclear custodial system.” As a July 2001 Department of Energy (DOE) strategic plan observed, “Physical protective barriers have crumbled and the nuclear material accounting system is in disarray.”⁴ Visitors to nuclear facilities in the former Soviet Union in the 1990s reported various signs of deterioration: holes in perimeter fences, nonfunctioning alarm systems, and paper records that fail to match physical inventories of materials.

Overall conditions have improved in the nuclear complex since the late 1990s, thanks partly to an array of U.S. assistance programs and partly to growth in the Russian economy, which has averaged 5.3 percent since 1998. Salaries have increased somewhat and new U.S. physical protection and control measures have been initiated at some enterprises. Yet the strains of downsizing and defense conversion continue to weigh heavily on the well-being and morale of Russia’s

² (name redacted). “Russia’s Economic Performance Entering the 21st Century” in Soviet Economic Committee of the United States. *Russia’s Uncertain Economic Future*. Washington, D.C.: U.S. Government Printing Office, December 2001, p. 6; and Oleg Bukharin et. al. *Conversion and Job Creation in Russia’s Closed Nuclear Cities*. Based on workshop held in Obninsk, Russia, June 27-29, 2000, Princeton, N.J., Program on Nuclear Policy Alternatives of the Center for International Studies and the Center for Energy and Environmental Studies of Princeton University, November 2000, p. 10.

³ Valentin Tikhonov. *Russia’s Nuclear and Missile Complex: The Human Factor in Proliferation*. Washington, D.C.: Carnegie Institute of International Peace, 2001, pp. 27, 42.

⁴ U.S. Department of Energy (DOE) *MPC&A Program: Strategic Plan* Washington, D.C. July 2001 p. 1

nuclear workers. For example, the Ministry of Atomic Energy plans to dismiss some 35,000 nuclear workers, nearly half of the nuclear weapons work force, in the formerly closed nuclear cities by the year 2005.⁵ Whether new jobs can be created for this number of workers by U.S. and Russian efforts is uncertain. Altogether, the structure inside the Russian nuclear complex is still unstable and possibly conducive to nuclear theft.

The Appearance of the Nuclear Genie

The diminished economic circumstances of Russia's nuclear workers were in themselves a source of proliferation concern. In addition, the lifting of Communist political controls, the opening of borders and the ushering in of a market economy made the potential theft and sale of nuclear materials both thinkable and possible. The result was an emergent traffic in radioactive substances of various descriptions, some of which found their way into international smuggling channels. Yet surveys of confirmed thefts and smuggling from the early 1990s in the NIS indicate that nuclear leakages pose less of a security danger than anticipated. Though the NIS has been described as vast potential "supermarket" for nuclear goods, little material of direct military value (at least for a fission weapon) has surfaced in the black market.⁶ As will be detailed below, the amount of HEU reported seized internationally since the USSR's collapse was not enough to make a single fission bomb. This has been seen by some observers as cause for optimism. As one Los Alamos nuclear expert wrote recently, "As we look back on the decade since the collapse of the Soviet Union, the good news is that nothing terrible has happened in spite of the terrible times faced by the Russian people."⁷

Furthermore, as will be shown, evidence of interest by terrorists or nation-states in stolen nuclear materials is extremely slim. In fact, the market is almost entirely supplier-driven, consisting of chains of sellers (usually petty traders carrying the goods on consignment) stretching outward from the source enterprise in search of prospective customers. International demand for such items seems thin or nonexistent. This finding implies that terrorists and rogue states have other unconventional weapons priorities shaped in part by the technically simpler task of developing chemical and biological – or radiological – weapons; alternatively, terrorists might be content to wreak havoc on their victims with conventional explosives or fuel-laden aircraft.

Other explanations, though, view the apparently supply-driven and anemic traffic in nuclear materials in more ominous terms. For example, an analysis by the Center for Non-proliferation Research of Washington's National Defense University argued in 1996 that "current patterns of nuclear theft and smuggling may be a prelude to more serious episodes, including major covert exports of fissile material,

⁵ *Conversion and Job Creation*, p. 17.

⁶ Statement of Senator Sam Nunn in *Hearings on Global Proliferation and Weapons of Mass Destruction*. Permanent Subcommittee of the Senate Committee on Government Affairs, March 13, 1996. Washington, D.C.: U.S. Government Printing Office, 1996, p. 4.

⁷ Siegfried Hecker, "Thoughts About an Integrated Strategy for Nuclear Cooperation with Russia." *The Nonproliferation Review*, Summer 2001, p. 3.

weapons components, and even intact nuclear weapons.”⁸ At the very least, movement of radioactive material and successful interdiction by law enforcement might produce a learning curve of sorts for smugglers, allowing them opportunistically to shift methods and routes. Indeed, there is some evidence that this is the case, as will be detailed below. Furthermore, it is possible that, as with other illegally traded commodities, the totality of what is seized does not reflect what is stolen and pushed onto the black market. Still, the impression of a sellers’ market persists, raising questions about the severity and the immediacy of the proliferation threat.

The Nuclear Black Market

The Visible Market: Contents and Trends

An extensive black market in nuclear materials and other radioactive isotopes developed in the aftermath of the Soviet collapse. Nuclear crime was almost unknown in the Soviet period – systemic constraints such as closed borders, restrictions on population movement, and the pervasive presence of the Committee of State Security (KGB) virtually excluded opportunities and incentives for privatized nuclear deals. Yet literally hundreds of thefts of radioactive substances have occurred at nuclear enterprises and industrial installations across the former Soviet Union since the early 1990s. Traffickers in such materials have looked for buyers abroad – mostly in Europe, where radioactive seizures are commonplace. The scope of the proliferation threat from this traffic and its potential for affecting international security and relationships, though, are a matter of controversy among policymakers and analysts. For example, no clear evidence exists of participation in the market by terrorists, rogue states, or major transnational crime formations (likely brokers between would-be sellers and interested buyers of nuclear goods). Some observers believe that the current level of nuclear smuggling might help open new trade channels and potential opportunities for proliferation of weapons of mass destruction, as traffickers refine their tactics to exploit gaps in border defenses. Yet it is not clear that sellers and buyers have been able to connect in ways that could pose a serious danger to U.S. and Western security interests.

Various U.S. and international institutions maintain databases on nuclear theft and smuggling incidents.⁹ Perhaps the most widely-referenced one (though it is in certain respects incomplete) is that compiled by the International Atomic Energy Agency (IAEA) in Vienna. The IAEA data (and other data sets based on it) suggest that nuclear trafficking, in its visible manifestations at least, is more a minor international nuisance than a major proliferation threat. The Agency recorded a total of 426 cases of nuclear trafficking worldwide between January 1, 1993, and

⁸ James L. Ford and C. Richard Schuller. *Controlling Threats to Nuclear Security: A Holistic Perspective*. Washington, D.C.: National Defense University, 1997 p. 7.

⁹ Unclassified databases are maintained by the IAEA, the Monterey Institute of International Studies, the University of Pittsburgh’s Ridgway Center for International Studies, the Institute for International Studies at Stanford University, the U.S. Department of Energy, and the Russian-American Nuclear Security Advisory Council.

December 31, 2001. However, nearly all of these cases involved radioactive junk (contaminated scrap metal, low-enriched or depleted uranium, cesium-137, and the like) which may pose environmental hazards but which is useless in making fission weapons. Only 17 of the incidents, or 4 percent, concerned thefts or seizures of more than microscopic quantities of weapons-usable uranium or plutonium. Some of them were the product of sting operations by the German police and intelligence services. The U.S. General Accounting Office (GAO) has compiled a list of 20 such cases from 1992 and, based on information mostly from the IAEA list and from U.S. government sources¹⁰, Russia is known or suspected to be the source of the material in at least 15 of the cases. Significantly, the substance seized was not traceable to weapons plants or stockpiles, but rather to naval fuel depots, fuel production plants, and nuclear research institutions. Taken together, the amount of seized material added up to only 16.7 kilograms. This quantity included 8.7 kilograms of uranium-235 equivalent and 400-plus grams of plutonium—not enough to build a nuclear bomb. Also, more than 80 percent of the gross weight of the material was seized in the 1992-1995 period, suggesting a declining theft rate, perceptions of a weak market (or of a market created by the authorities) for stolen wares, and (less certainly) an improving nuclear security situation in Russia.

Table 1. Trends in Radioactive Smuggling Incidents

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
All Incidents (IAEA Database)	NA	56	91	40	24	30	38	50	53	54
Weapons-usable Material (GAO Database)	1	3	6	3	0	0	0	2	2	2

Source: IAEA, GAO.

Other characteristics of the nuclear black market also bear mentioning. This market, such as it is, appears to be largely supplier-driven. Few actual cases of money changing hands for nuclear materials have been recorded by Western and Russian authorities. Bona-fide buyers are conspicuously absent, even in the handful of cases where weapons-grade materials are proffered. According to GAO, none of the 20 incidents mentioned appeared to be “part of an organized criminal or terrorist activity or organization.” Moreover, nuclear trafficking seems to be a relatively disorganized and fragmented business, dominated by loosely-linked groups of amateur criminals, petty traders, and scam artists. Established Russian and international crime syndicates reportedly have largely stayed out of the business. The reason may have less to do with gang taboos or patriotic self-restraint than with simple cost-benefit calculations: Organized crime core enterprises such as narcotics, explosives, bank fraud, and raw materials smuggling—offer relatively less risk and more secure profits. Also, the absence of interested buyers, and the difficulty of

¹⁰ GAO. *Nuclear Nonproliferation: U.S. Efforts to Help Other Countries Combat Nuclear Smuggling Need to Strengthen Coordination and Planning*. GAO-02-426, Washington, D.C., GAO, May 2002, pp. 31-34.

finding buyers, would deter a serious criminal organization from participating in the market.

The IAEA and GAO data sets show a fairly noticeable pattern: a surge of incidents in the 1993 to 1995 period, a decline between 1996 and 1998 (when no weapons-usable material was observed in the black market) and an increase again between 1999 and 2001. (See Table 1.) Economic deprivation alone does not seem to explain this pattern, since nuclear smuggling has shown an upward trend even as the Russian economy has begun to show positive growth. The IAEA also shows a shift in the geographical direction of smuggling. Between 1993 and 1995, Central Europe, comprising Germany, Poland, the Czech Republic, Slovakia, and Hungary, accounted for 45 percent of the interdicted cases; this slowed dramatically to 18 percent between 1999 and 2001. At the same time, the share attributable to Bulgaria, Turkey, and the countries along Russia's southern tier jumped from 7 percent to 52 percent between the two periods. Conceivably, the relatively high vigilance of police and border control authorities in Central Europe has induced smugglers to ply their wares along more accommodating pathways.

A Shadow Market

Thus, little nuclear material of significance and no nuclear warheads seem to circulate in smuggling channels, and the market as a whole is seller-dominated. In the view of some experts, however, the observed reality of the nuclear traffic may not reflect the pattern of the traffic as a whole. A February 2002 report to Congress by the National Intelligence Council (part of the U.S. intelligence community) notes, "We assess that undetected smuggling has occurred, although we do not know the context or magnitude of such thefts." Some analysts have drawn an analogy to the traffic in other illicit commodities, notably drugs.¹¹ According to the U.S. Drug Enforcement Administration, U.S. federal authorities are able to confiscate only 20 to 25 percent of the 500-plus tons of South American cocaine estimated to be in transit to the United States in a given year.¹² While fissile materials are not mass market items like drugs; it is possible that what is captured represents a relatively small percentage of what is stolen and delivered to smugglers.

A second and related problem is that many trafficking incidents simply go unreported, or sufficient details about them are not made available. The NIS is a particular offender in this regard. As William Potter of the Center for Nonproliferation Studies of the Monterey Institute of International Studies noted in a recent paper, "Challenges in U.S.-Russian Cooperation,"

... to date there has been little if any meaningful cooperation between Russia and the United States on illicit nuclear trafficking incidents. There is also cause to question the reliability and scope of the reports Russia and other NIS states have

¹¹ See for example George Bunn and Lyudmila Zaitseva, "Efforts to Improve Nuclear Material and Facility Security." Stockholm: Swedish International Peace Research Institute, Yearbook 2002. Appendix 10D, p. 6. See also National Intelligence Council *Annual Report to Congress on the Safety and Security of Russian Nuclear Facilities and Security Forces* Washington, D.C., February 2002, p. 2.

¹² Telephone interview, U.S. Drug Enforcement Agency, Washington, D.C., July 17, 2002.

provided the IAEA for its illicit trafficking database.... As a consequence, we cannot exclude the possibility—I would say probability—that additional diversions incidents have occurred but have been concealed by NIS authorities.¹³

For instance, Russian customs documented more than 500 attempts to smuggle radioactive materials across Russian national frontiers in the year 2000, yet only one such case was reported to the IAEA.¹⁴ Also, even incidents widely reported in the Russian media, such as two multikilogram thefts of HEU from submarine fuel depots in Murmansk in 1993, never became part of the official record maintained in Vienna.

Opinions differ about the extent of leakage from Russian nuclear stockpiles. In a 1998 incident suggestive of a volatile security environment, Russia's Federal Security Service (FSB) foiled an attempt by staff members of a nuclear facility in Chelyabinsk province to steal some 18.5 kilograms of "radioactive materials" that "might have been used for the production of components for nuclear weapons." Subsequently, a U.S. academic reported being told in a visit to Russia that the material in question was HEU.¹⁵ Where this material was headed and who the customers were, if any, is not clear from published accounts. Also unclear is the extent of outflow that might have occurred before FSB clamped down on the conspiracy. On the other hand, accounts of the incident do not indicate whether or not the conspiracy went beyond the planning stage – whether the participants actually got their hands on the material in question.

Additional questions concern the overall shape of the nuclear black market and the relationships of actors within it. The stereotype of the visible market, as noted, consists of myriad sellers searching, usually vainly, for prospective customers. It is conceivable, though, that purveyors of strategic nuclear wares could converge with end-users or their representatives in ways that are not readily apparent to Western intelligence or law enforcement agencies. Such a "shadow market" or clandestine supply chain could be organized by would-be suppliers, potential customers, or third-party brokers (such as organized crime groups or quasi-legitimate trading firms) with the appropriate contacts. Doubtless it would require the connivance of senior nuclear managers and others in authority. The degree of official cover might vary. Some U.S. intelligence analysts, for example, believe that—under the umbrella of Russia's technical cooperation agreements with Iran—ranking officials of a certain government ministry facilitated transfers of nuclear-related materials and weapons technology to the Iranian government.¹⁶ The nature and extent of such transfers cannot be confirmed. Nevertheless, the Russian-Iranian relationship allows Iran to maintain

¹³ William Potter, "Challenges in U.S.-Russian Cooperation." Paper presented at the Conference on Cooperative Threat Reduction in the 21st Century. Oslo, June 1, 2002, p. 5.

¹⁴ Matthew Bunn, "Anecdotes of Nuclear Insecurity." January 31, 2002 (unpublished paper), p. 4.

¹⁵ Yevgeny Tkachenko, "FSB Agents Prevent Theft of Nuclear Materials." *ITAR-TASS*, December 18, 1998; "MINATOM Says 1998 Theft Involved HEU." Center for Nonproliferation Studies, NIS Nuclear Trafficking Data Base. October 30, 2000.

¹⁶ Interview, U.S. official familiar with Russian nuclear programs, Washington, D.C., July 8, 2002.

wide-ranging contacts with Russia's nuclear entities. and in the view of some U.S. officials, to exploit these relationships to advance its nuclear weapons objectives.

International Terrorism's Search for Nuclear Weapons

Introduction

Firm evidence that terrorist and rogue states are participating in the market is sparse. To be sure, terrorists have demonstrated interest in nuclear weapons. Osama bin Laden, for example, in a famous interview published in *Time* magazine in 1999 stated, in answer to a question about nuclear and chemical weapons: "Acquiring weapons for the defense of Muslims is a religious duty."¹⁷ Yet al Qaeda's efforts to acquire nuclear capability seem sporadic and unsophisticated. Only a single well-documented case – involving negotiations for purchase of what was purported to be enriched uranium in the Sudan in 1993 or 1994 – can be cited from available sources. A Central Intelligence Agency (CIA) report to Congress in 2001 concluded: "Although the potential devastation from nuclear terrorism is high, we have no credible reporting of terrorists acquiring nuclear weapons or sufficient material to make them."¹⁸

In the case of nation-states, the picture is also unclear. As signatories to the Nuclear Nonproliferation Treaty, Iran, Iraq, and North Korea are likely to use extreme circumspection in their nuclear weapons acquisition programs. An Iraqi defector familiar with Iraq's nuclear weapon development, Khiddir Hamza, claims that Iraq tried unsuccessfully to buy fissile material in the 1980s and early 1990s but was scammed by black marketeers. They "came to Baghdad with bags of samples and left with bags of money and we never got any serious nuclear materials," Hamza told NBC's Geraldo Rivera in a January 2001 interview.¹⁹ A senior Iraqi official in 1996 offered a somewhat different version of events, stating that in the previous 10 years Iraq had received more than 200 offers of everything from "red mercury" to fissile materials to complete nuclear weapons but had turned them all down.²⁰ The above-mentioned CIA report expresses concern that Baghdad "may be attempting to acquire materials that could be used in resuscitating its nuclear weapons program" but offers no details. Similarly, the report cites Iran's interest in "acquiring foreign fissile material for nuclear weapons development," yet no cases of smuggling of weapons-grade materials by Iranian nationals or agents have been recorded to date.

¹⁷ "Conversations with Terror." *Time*, January 11, 1999, p. 39.

¹⁸ CIA, "Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions." Washington, D.C., January 1-July 30, 2001, p. 8.

¹⁹ James Kitfield. "Nuclear Nightmare." *The National Journal*, December 15, 2001, p. 3836.

²⁰ David Albright and Khiddir Hamza. "Iraq's Reconstitution of Its Nuclear Weapons Program." *Arms Control Today*, October 1998, p. 7.

Also, the case can be made that aspiring nuclear states prefer to manufacture fissile ingredients of atomic weapons independently rather than pursuing the risky and difficult course of acquiring them abroad. Hence, their purchasing strategies focus on the means of production. For instance, Iran's attempts to obtain gas centrifuge enrichment and laser isotope separation technologies from Russia have been well-publicized. Iraq's nuclear program was set back as a result of the Gulf War. Yet recent intelligence reports suggest that Iraq has tried to acquire spare parts for flow forming machines used to produce components for uranium enrichment systems.²¹ And North Korea has recently revealed the existence of a clandestine program to produce enriched uranium for use in a nuclear bomb.

In the Iran case, though, concerns have been raised that clandestine transfers of nuclear materials could occur under official cover. Iran's various nuclear agreements with Russia are constant sources of worry in this regard. For example, a U.S. State Department official in October 2000 articulated U.S. concern that Iran would exploit their Russian reactor project to develop "wide-ranging contacts with Russia's nuclear entities" and to engage in "more sensitive forms of cooperation with direct applicability to nuclear weapons programs."²²

Aum Shinrikyo and Al Qaeda

Confirmed smuggling incidents show little or no evidence of a terrorist connection. Nevertheless, some other types of information—media accounts, court records, official statements, and the like—indicate that terrorists may have joined the nuclear procurement game, though their seriousness and consistency of purpose can be debated. Principal players in the game appear to be the al Qaeda network and the Japanese apocalyptic cult Aum Shinrikyo.²³ Aum—the architect of the deadly sarin gas attack in the Tokyo subway in March 1995—had cultivated extensive contacts with Russia's military, political, and scientific elite to promote its WMD objectives. Some money apparently was paid out in bribes. According to various accounts, the

²¹ Michael Evans and Richard Watson. "Iraq Building Up Deadly Arsenal, Say Defectors." *The Times* (London), July 11, 2002. Reportedly the conspirators were being smuggled on return flights from Syria, to which Iraq had sent 24 planes carrying humanitarian aid to help victims of a dam collapse.

²² Quoted in Brenda Shaffer. *Partners in Need: The Strategic Relationship of Russia and Iran*. Policy Paper no. 57, Institute for Near East Policy, 2001, p. 70.

²³ Other reported terrorist activity includes: In 1993, a Moscow news source reported that the Islamic Jihad Organization, shortly after the collapse of the USSR, faxed a letter written in English to the Federal Nuclear Research Center at Arzamas-16, offering to buy a single nuclear warhead and specifying "the parameters, the sum of the transaction, and the mode of shipment." Whether the incident was an elaborate hoax, intended perhaps to cause consternation in the West, or an incredibly obtuse solicitation by genuine terrorists cannot be determined with certainty. Another case reported by the Institute of Science and International Security (ISIS) concerns Ramzi Yousef, who was convicted of masterminding the 1993 World Trade Center bombing. Yousef, who may have had ties to al Qaeda, reportedly had made an attempt to buy uranium in Kazakhstan in 1994, months before a U.S. operation ("Operation Sapphire") which funded the transfer of 600 kilograms of weapons-grade uranium out of that country. See Kirill Belyaninov, "Utechka." *Literaturnaya Gazeta*, January 20, 1993, p. 3; and ISIS personal communication, June 25, 2002.

cult's "construction minister," Kiyohidi Hayakawa, had visited Russia extensively on weapons-buying expeditions in the early 1990s, during which time he explored the possibility of buying a nuclear bomb. Hayakawa's diary, seized by police after the Tokyo sarin attack, contained the notation "how much is a nuclear warhead" and listed several prices (underlining one figure of \$15 million). Where and from whom the prices were derived is unclear.

Aum had other nuclear plans as well; it bought a half-million-acre sheep ranch in Western Australia that contained uranium deposits, planning to mine and enrich the uranium. The cult investigated laser technology for uranium enrichment and reportedly sought the help of Russian scientists for its nuclear program. These various projects, though, seem to have borne little fruit; they were overshadowed or superseded by the cult's chemical weapons acquisition program.²⁴

Al Qaeda's forays into the nuclear marketplace also began in the early 1990s, according to U.S. federal authorities. A complaint filed by the Federal Bureau of Investigation (FBI) in September 1998 against an al Qaeda aide, Mamdouh Mahmud Salim, refers to attempts by al Qaeda "in the Sudan and elsewhere" to procure "enriched uranium for the purpose of developing nuclear weapons." Similarly, a subsequent U.S. federal indictment against Osama bin Laden the following November charged that "at various times but at least as early as 1993 Osama bin Laden and others known and unknown made efforts to acquire the components of nuclear weapons."²⁵ Court testimony by another al Qaeda member, Jamal Ahmed al-Fadl, provided details about the Sudan uranium deal. Al-Fadl said he was asked by his superiors to meet with intermediaries in Khartoum concerning the purchase of the uranium, the asking price for which was \$1.5 million. One of the sellers was a Sudanese army officer, one Moqadem Salah Abdul al Mobruk, who at one time had served in Sudan's cabinet. Al-Fadl reports being shown an engraved cylinder 2 to 3 feet tall and a paper in English saying "South Africa and serial number and quality something." Evidently arrangements were made to test the consignment, but whether the transaction actually went through is not clear.²⁶ However, some U.S. government sources believe that the offer was a scam. A DOE source, for instance, reports that the cylinder was likely a radioisotopic source holder, similar to other source holders being peddled on the Sudanese black market in the early 1990s.²⁷

Al Qaeda is said to have made other efforts to acquire nuclear materials in the 1990s, but these cannot be documented. A widespread consensus exists, though, that

²⁴ The best source on Aum's WMD procurement efforts is David Kaplan and Andrew Marshall, *The Cult at the End of the World: The Terrifying Story of the Aum Doomsday Cult*. London: Arrow, 1996, p. 126-134, 190-192. The ranch in Australia was also used for the group's sarin gas experiments on sheep.

²⁵ U.S. District Court, Southern District of New York. *United States of America v. Mamdouh Mahmud Salim*, September 14, 1998, pp. 2, 6; John Goldman and Ronald Ostrow, "U.S. Indicts Terror Suspect Bin Laden." *Los Angeles Times*, November 5, 1998, p. A1.

²⁶ U.S. District Court, Southern District of New York. *United States of America v. Osama bin Laden et. al.*, February 7, 2001, pp. 357-366.

²⁷ DOE. *Illicit Trafficking in Nuclear Materials*. Monthly Status Report, Special Section. October 2001, p. 3.

bin Laden's agents were nuclear novices, lacking fundamental knowledge about the materials they sought to purchase; thus they likely "became targets of nuclear scams of the sort that have victimized others for many years."²⁸ For instance, some published reports suggest that bin Laden and his associates were offered "red mercury," a substance touted as a component of miniaturized nuclear weapons but which U.S. nuclear experts declare is a "mythical, non-existent material." Whether bin Laden et al. actually bought "red mercury," which was offered on the black market for \$100,000 to \$400,000 per kilogram, cannot be determined from the reports.²⁹

The search for fissile materials by al Qaeda seemed low-key and comparatively innocuous – at least there is little to suggest otherwise. There are also media accounts that bin Laden has sought – and successfully obtained – tactical or portable nuclear weapons from the former Soviet Union. For instance, a lurid story appearing in the Paris-based Arabic newspaper, *Al-Watan al Arabi*, in November 1998 asserts that bin Laden's emissaries concluded a deal with members of the "Chechen mafia" to buy 20 tactical nuclear warheads for \$30 million and 2 tons of Afghan opium (said to be worth \$70 million). According to the source, the warheads originated from different arsenals in several republics "such as Ukraine, Turkmenistan, and even Russia."³⁰

Whether such contacts led to al Qaeda representatives' making offers for nuclear warheads is conjectural. It is true that contacts between al Qaeda and the Chechen resistance appear to have been extensive; Chechen fighters have trained in al Qaeda training camps in Afghanistan and at least one al Qaeda camp where Chechen rebels and others trained functioned at one time in the former Soviet republic of Georgia, according to an April 2002 FBI affidavit. Also, according to the affidavit, a U.S.-based charity with ties to al Qaeda, the Benevolence International Foundation, is said to have diverted substantial funds to support the Chechen cause, including \$685,000 delivered to a Chechen-controlled relief organization in Georgia.³¹ Whether the Chechens had any nuclear weapons to sell, however, is unlikely. Gaps in intelligence reporting and the evident common hatred of both sides toward the West may tend to inflate commentary on the issue.

Nuclear Terrorism – A Plausible Threat?

A number of observers have expressed skepticism about al Qaeda's nuclear procurement efforts, citing – among other things – the group's pariah status and its technical inexperience in nuclear matters. Generally, terrorists, unlike states, are

²⁸ Stefan H. Leader, "Osama bin Laden and the Search for Weapons of Mass Destruction." *Jane's Intelligence Review*, June 1999, p. 36.

²⁹ DOE. Special Report: Scams in the World of Nuclear Smuggling. Livermore, CA: Lawrence Livermore National Laboratory, May 1997, p. 3; also Leader *op. cit.*

³⁰ Riyadh 'Alam-al-Din et. al., "Report Links Bin Laden, Nuclear Weapons." *Al-Watan Al-Arabi*, November 13, 1998, pp. 20-21.

³¹ Robert Walker, FBI agent, "Affidavit in Support of Complaint Against Benevolence International Foundation and Enaam Arnaout." State of Illinois, County of Cook, April 28, 2002, p. 28.

unable to leverage official contacts and exchanges in the nuclear realm to advance military procurement objectives. Aum Shinrikyo was an example of sorts – the group had connections to the Russian government and a wide (estimated at 35,000) membership in Russia, including members in a major nuclear research facility (the Kurchatov Institute in northwest Moscow). But Aum failed in its attempts to buy a nuclear weapon. As a target of international opprobrium, al Qaeda would have little room to maneuver in Russia, especially if it maintained ties with separatist elements in the Caucasus. A possible strategy for the group would be to use sympathetic underworld elements – Chechen or other Islamic criminals might fit that description – as intermediaries, but if the proposed transaction involved a nuclear weapon the probability of being swindled is high.

Even if al Qaeda were successful in obtaining nuclear materials or a weapon, major obstacles would remain. In the case of a finished weapon, the problem would be to operate or bypass its multiple arming and fail-safe codes (though how elaborate these are would depend on the type and origin of the weapon). Building a weapon from scratch would be even more difficult. All experts agree that a “gun-type device using HEU would be a substantially simpler project than an implosive device involving HEU or plutonium. Yet a large amount of HEU might be required—some 40 to 50 kilograms for an unsophisticated device.”³² Also, as one source observes, “Although the basic principles are well-known and described at length on the Internet, the devil is in the details.”³³ A cadre of bomb-designers would need to be assembled, and there is no evidence that al Qaeda succeeded in doing this, although perhaps not for lack of trying. Osama bin Laden did apparently manage to cultivate contacts with a Pakistani nuclear scientist—Sultan Bashiruddin Mahmood—who had, in his retirement, managed Pakistani programs to produce enriched uranium and weapons-grade plutonium. However, Mahmood lacked the specialized knowledge necessary to make a weapon. Apparently the scientist had established a charitable organization that operated in Afghanistan and, in the context of visits to that country, met with bin Laden twice. It is not clear whether nuclear secrets of value were passed, but according to one account, Mahmood told bin Laden, “You can’t just build a bomb – you need a big institution. You can forget it.”³⁴

Bin Laden may or may not have heeded this advice. In any case, al Qaeda appears to have explored other WMD options, including development of chemical and biological weapons. Al Qaeda also contemplated building so-called “dirty bombs,” radiological dispersal devices (RDDs). These do not produce a nuclear yield but rather a conventional explosion designed to spread radioactive contamination and to cause panic. RDDs present substantially fewer problems in manufacture than do fission weapons. Also, the requisite materials (spent reactor fuel and industrial or medical isotopes such as cobalt-60 or cesium-137) are widely

³² This is a widely-accepted figure. For a good layman’s discussion of the technical constraints, see Carson Mark et. al., “Can Terrorists Build Nuclear Weapons?” Washington, D.C.: The Nuclear Control Institute, undated, pp. 1-10.

³³ Leader, *op. cit.*

³⁴ Peter Baker, “Pakistan’s Scientist Who Met with Bin Laden Failed Polygraph, Renewing Suspicions.” *The Washington Post*, March 3, 2002, p. A1.

available; they are present in more than 100 nations and often are poorly guarded.³⁵ Even in the United States, some 200 cases of “orphaned” radiation sources—those deemed to be missing, stolen, or abandoned—are recorded each year.

For this reason, RDDs are not preeminently a nuclear smuggling problem – requisite materials can be readily obtained from inside most countries that are likely to be targets of terrorist attacks. Al Qaeda’s interest in such weapons is well-documented. An al Qaeda leader captured in Pakistan in March 2002 told U.S. interrogators that the organization had planned on developing RDDs. Another member of the organization, who was captured in Chicago last May, was accused of “exploring a plan” to build and detonate RDDs in the United States.³⁶ Terrorists have some history of deploying such devices. In a solitary if widely reported 1995 case, Chechen terrorists buried containers holding cesium-137 wrapped in the explosive TNT in a Moscow park and threatened to turn Moscow into an “eternal desert” if Russia did not cease combat operations in Chechnya. The threat was not carried out.³⁷

RDDs, most experts agree, are not mass casualty weapons, because radioactive particles disperse rapidly. The lethal zone is approximately identical to the blast area. Khiddir Hamza reports that RDDs were tested one or more times in Iraq but that the results were disappointing militarily and the project was dropped.³⁸ The psychological impact of detonating a “dirty bomb” admittedly would be considerable. Yet fission weapons have vastly greater destructive power. Terrorists efforts to procure these should not be ruled out but neither should the ease of doing so be exaggerated.

So far, little indication exists that al Qaeda efforts to acquire ingredients of either a nuclear bomb or radiological device were successful. In the wake of successive U.S. military operations in Afghanistan, more than 110 government buildings, military compounds, terrorist camps, safe houses, and caves have been searched for clues about al Qaeda’s WMD plans. Investigators came across some rudimentary designs for nuclear weapons inside a suspected al Qaeda safe house in Kabul, which depicted essential components—HEU and explosives—common to such weapons. Documents containing the terms “nuclear fission,” “nuclear fusion,” and “isotopes” also were unearthed.³⁹ Several containers were found that apparently

³⁵ U.S. Department of State, International Information Programs. “Text: IAEA Cites Inadequate Control of the World’s Radioactive Materials.” *Washington File*, June 26, 2002, pp. 1-2; “Weapons of Mass Destruction.” *The Economist*, June 15, 2002, p. 28.

³⁶ James Risen and Philip Shenon, “Traces of Terror: The Investigation. U.S. Says It Halted Plot to Use Radioactive Bomb.” *The New York Times*, June 10, 2002, p. A1.

³⁷ See for example Foreign Broadcast Information Services, “Basesev’s Recent Remarks Cited.” *Daily Report: Central Eurasia*, FRIS-SOV-95-226, November 24, 1995, p. 23.

³⁸ Khiddir Hamza, “The Dirty Secret of ‘Dirty Bombs.’” *The Wall Street Journal*, June 12, 2002, p. A18.

³⁹ CIA, “Unclassified Report,” op. cit. CNN News was able to obtain some of the documents. See CNN.com, “Live From Afghanistan—Was al Qaeda Working on a Super Bomb?” Aired January 24, 2002.

(continued...)

contained insignificant amounts of radioactive material, but “their value for weapons was zero,” says a U.S. government official.⁴⁰ The discoveries themselves reflect little more than a superficial interest by al Qaeda in nuclear weapons, yet the full scope and extent of the group’s acquisition activities has yet to be ascertained.

States Supporting Terrorism

Major gaps in reporting also exist regarding nation-states’ nuclear procurement and smuggling agendas. In all likelihood, most place a premium on self-reliance in their nuclear weapons programs. This does not preclude occasional shopping for fissile material to accelerate their efforts.⁴¹ For states, though, the consequences of exposure are higher than for terrorists. The threat of international sanctions or actions to defeat their ambitions looms larger, since terrorists are not bound by international control regimes for nuclear goods. Hence, states’ procurement operations, where they exist are likely to be especially circuitous and well-concealed. Significantly, no known agent of Iran, Iraq, or North Korea has been implicated, at least publicly, in trafficking in nuclear explosives. Anecdotes of illegal transactions involving these countries are unconvincing or lack corroborating detail.

Military representatives of these countries maintain a presence inside the former Soviet Union, possibly with malign intent. Russia’s FSB reportedly distributed watch lists of several Iranian, North Korean, Libyan, and Palestinian companies “reported to be involved in military WMD programs”; whether these companies have made overtures to Russian nuclear suppliers and with what result is not clear or not known at all. Other companies may operate in Russia under various disguises and pretexts. According to Iraqi defector Khiddir Hamza, Iraq maintains “hundreds” of commercial fronts in Russia, seeking opportunistically to pick up WMD components

³⁹ (...continued)

[<http://www.isis-online-org/publications/terrorism/transcript.html>]

⁴⁰ Thom Shanker, “U.S. Analysts Find No Sign Bin Laden Had Nuclear Arms.” *The New York Times*, February 21, 2002, p. 1.

⁴¹ States may differ in their priorities, however. Some experts believe that Baghdad’s preeminent concern is to reconstitute and improve upon its pre-Gulf War programs for uranium enrichment. The current effort is thought to focus on gas centrifuge and gaseous diffusion processes. According to Khiddir Hamza, Iraq mastered the technology for gaseous diffusion in the early 1990s and has at least an experimental facility in place. Iraq also is said to have some three tons of 3 to 4 percent enriched uranium to work with. Iran’s efforts to acquire enrichment technology abroad reputedly have failed, as noted; hence, for Tehran, buying foreign fissile material would be a potentially attractive shortcut to making a bomb. In the case of North Korea—which possibly has the most advanced program of the three—the DPRK is believed to have enriched enough plutonium in the early 1990s to make one or two bombs. The DPRK is rumored to have bought 56 kilograms from Russia in the early 1990s, but this cannot be confirmed. See, for example, author interview with Khiddir Hamza, Washington, D.C., June 28, 2002 (hereafter Hamza interview); David Albright and Khiddir Hamza, “Iraq’s Reconstitution of Its Nuclear Weapons Program,” *Arms Control Today*, October 1998, p. 9-15; Larry Nicksch, *North Korea’s Nuclear Weapons Program*, CRS Issue Brief IB91141, April 5, 2002, pp. 5-6.

(not necessarily for nuclear weapons, he says) but these are managed by “Arabs with different passports, not Iraqis.”⁴²

In theory, a covert nuclear deal might involve various stratagems—chains of intermediaries, fictitious commercial deals, smuggling arrangements to circumvent or defeat border defenses, and multiple staging areas outside the NIS. Some level of official protection would be required, especially if the transfer involved significant quantities of HEU or plutonium. Iran’s nuclear agreements with Russia might lay the groundwork for such a clandestine chain – as noted, some U.S. intelligence officials believe this to be the case – but definitive evidence is lacking or has not surfaced publicly.

How states might conceivably go about smuggling nuclear weapons is suggested by a report by an alleged defector from Iraq’s intelligence service, the Muhkabarāt, published in the magazine *Vanity Fair*. The defector recounts that he, a Muhkabarāt colleague, and a scientist traveled on a nuclear buying expedition from Iraq to Dar es Salaam, Tanzania, in 1994. The route led by way of Amman, Khartoum, Rome, and Algiers. The group changed passports at the first four destinations. In Dar es Salaam, the conspirators, joined by other Iraqis, met at an “isolated house” with five Eastern Europeans – Russians or possibly Ukrainians. The defector said the Europeans carried a tube of heavy metal, inside of which was “what looked like pieces of black rock, glittery.” The Iraqis paid cash (a briefcase with “neat stacks of \$100 bills”) for the consignment. The defector recounts being told later that the merchandise had reached Baghdad safely. The conspirators returned by way of Tunis, Brussels, Rome, Khartoum, and Amman, changing passports again in Amman. The contents of the tube were never ascertained, although experts interviewed by *Vanity Fair* believe that they might have been spent reactor fuel cut into sections, possibly destined to be used in a dirty bomb. An alternative explanation is that the Iraqis were less interested in acquiring the radioactive material itself than in the process of obtaining it—that the elaborate machinations of the conspirators were a dry run of sorts for a planned nuclear smuggling event of greater proliferation significance. The defector’s account may mix fact with fiction, and it may or may not be revealing about possible permutations of the nuclear smuggling game that are not readily visible to Western observers.⁴³

Secondary Proliferation

A widely-debated issue concerns the possibility that hostile nation-states such as Iran, Iraq or North Korea might deliberately transfer nuclear arms to terrorists for use against the West. To date no credible published information has surfaced indicating that state sponsors have deliberately supplied terrorists with weapons of mass destruction or the means to make them. State support seems to have been limited to providing shelter, financial aid, training, and (especially in the case of Iran) conventional arms transfers to anti-Israel terrorist groups. No clear evidence

⁴² Hamza interview.

⁴³ David Rose, “Iraq’s Arsenal of Terror.” *Vanity Fair*, May 2002, pp. 126-127.

of Saddam Hussein's ties to al Qaeda has been discerned, and – compared to Iran – Iraq's support for other international terrorist groups has been modest. Moreover, significant terrorist organizations such as al Qaeda, HAMAS, and Hezbollah boast independent funding sources and political agendas, decreasing the likelihood that a state would want to furnish them with WMD. (The risks that WMD in terrorists' hands could be turned against the sponsoring state or that the use of such weapons would bring retaliatory strikes against the sponsor obviously have to be considered.)

A more immediate problem is state sponsors' own pursuit of a nuclear capability. Iraq reputedly is resurrecting its nuclear weapons program, including stepping up its international search for materials and components to make an atomic bomb. North Korea now claims to have a nuclear weapons program centered on production of enriched uranium. Iran's wide-ranging nuclear relations with Russia provide a possible conduit and cover for acquiring materials and technology relevant to its WMD ambitions. All of these states' initiatives are ominous in and of themselves. However, the probability that they would share with terrorists nuclear design intelligence and weaponry obtained with great national cost and effort seems very low. Secondary proliferation scenarios might seem more conceivable, though, if the state's survival is threatened by outside attack: in that case, all possible instrument of warfare might be used, including use of terrorist agents to carry a lethal weapon to the intended target.

The U.S. Response

Overview of U.S. Programs

The United States supports a variety of cooperative nonproliferation programs with the NIS. In fiscal year (FY) 2002, Congress allocated \$1.014 billion for such efforts, approximately one-third more than the Bush administration's original budget request for 2002 and 16 percent above FY2001 funding. Of the \$1.014 billion, approximately 44 percent is allocated for programs aimed directly at preventing illegal transactions in nuclear goods.⁴⁴ One of these is a DOE effort to provide materials protection, control, and accounting (MPC&A) upgrades for nearly 600 tons of weapons-usable material contained in several hundred buildings at 95 separate storage locations in the NIS. The MPC&A program also includes security upgrades for some 4,000 nuclear warheads belonging to the Russian navy. A second program, managed by the Department of Defense (DOD), seeks to improve security at 123 nuclear weapons storage sites controlled by the Main Department of the Russian Ministry of Defense. DOD also runs a smaller program to help the Russian military secure warheads in transit. A third major thrust of U.S. nuclear nonproliferation

⁴⁴ Matthew Bunn et. al. *Securing Nuclear Weapons and Materials: Seven Steps for Immediate Action*. Harvard University, Belfer Center for Science and International Affairs. May 2002, pp. 18-19. CRS Report 97-1027, *Nunn-Lugar Cooperative Threat Reduction Programs: Issues for Congress*, by Amy Woolf, March 6, 2002, pp.1-8. The programs identified here are part of a broader Cooperative Threat Reduction effort that includes disarmament and destruction of nuclear weapons, plutonium storage and disposition, safeguarding of nuclear warheads and materials, and conversion of military activities to peaceful purposes.

activities in the NIS is to strengthen defense against cross-border smuggling of strategic nuclear materials; several U.S. agencies, including DOE, the State Department, and DOD provide funding for border security and related export control programs. How the funding breaks down for these different areas is shown in Table 2.

**Table 2. Preventing Nuclear Theft and Smuggling in the NIS:
Core U.S. Programs**
(in millions U.S. dollars)

	FY2001 Funding	FY2002 Request	FY2002 Appropriation	FY2003 Request
DOE: MPC&A	170.5	138.8	267.9	209.1
DOD: Warhead Storage and Transportation Security	103.7	65.5	64.5	59.7
Export Control and Border Security				
DOE	1.9	4.0	24.0	24.0
State	44.0	40.7	82.9	35.4
DOD	2.1	9.1	8.4	49.0
Total	48.0	53.8	115.3	108.4
All Programs	322.2	258.1	447.7	377.2

Source: Securing Nuclear Materials, p. 19. DOE's border control effort is administered under the MPC&A program.

Bipartisan support exists in both houses of Congress for accelerating all proliferation prevention efforts in the NIS (this sentiment is reflected in the Russian Debt Reduction for Nonproliferation Act contained in S. 1803 and H.R. 3836). Yet some critics have observed that the programs suffer from weaknesses both in coverage and in concept. Key issues are whether expanding current activities will keep nuclear material and weaponry out of the hands of terrorists and their supporters or whether distinctly new tools and approaches are needed. These issues are discussed in the following sections of the report.

Stopping Proliferation at the Source

MPC&A. DOE defines MPC&A as “the nation’s first line of defense against the threat of theft or diversion of unsecured Russian nuclear weapons or weapons-usable material.”⁴⁵ The fact that U.S. nuclear experts have been able to gain access to nuclear facilities of a former rival is itself remarkable. Yet for various reasons—such as funding levels and difficulties in negotiating agreements—progress of the program, underway since 1993, has been slow. As of year-end 2001, 10 years after the USSR’s collapse, only about half of the 600 tons of material seen as potentially at risk was protected in some fashion by the new systems (see Table 3). DOE

⁴⁵ MPC&A *Strategic Plan*, p. i.

projections call for fully safeguarding all of the material by 2008; however, as one commentator notes, “intelligent potential thieves will target the material that is not yet secured.”⁴⁶ The sluggishness of the progress to date is attributable to “bureaucratic inertia, bolstered by mistrust and misperceptions on both sides,” say two experts familiar with U.S.-Russian security cooperation.⁴⁷ A contrast can be drawn with efforts to safeguard the Russian Navy’s warheads (see Table 4). These have proceeded relatively quickly because the technical issues involved are substantially less complex and also because the Russian partners (the Navy and its regulatory oversight authority) are “highly motivated, constructive, and flexible participants in the program.”⁴⁸

⁴⁶ Oleg Bukharin et. al., *Renewing the Partnership: Recommendations for Accelerated Action to Secure Nuclear Material in the Former Soviet Union*. Princeton, N.J.: Russian-American Nuclear Security Agency (RANSAC), 2000, p. 10. With respect to the \$900 million figure, funding for MPC&A totaled \$1.065 billion through FY 2002, of which 169 million was for warhead control. RANSAC personal communication, July 25, 2002.

⁴⁷ Graham Allison and Andrei Kokoshin, “Bush and Putin Must Confront Nuclear Terror: A Comprehensive Strategy Is Crucial.” *Los Angeles Times*, May 20, 2002, p. 11.

⁴⁸ The fissile material part of the program has been hampered by MINATOM’s long-standing refusal to allow DOE personnel access to most buildings with nuclear weapons laboratories and assembly sites. Since September 11, 2001, some progress has been made in opening up these sites. DOD’s relations with the Russian Navy have been generally healthier. The technical problems of securing 4,000 warheads pale beside those of securing innumerable containers of material in a system where accurate physical inventories hardly exist. See, for example, GAO, *Nuclear Proliferation: Security of Russia’s Nuclear Material Improving; Further Enhancements Needed*. GAO-01-312. Washington, D.C., February 2001, pp. 14-15. *Renewing the Partnership*, p. 60.

Table 3. Progress of MPC&A Program Percentage of Former Soviet Fissile Material (600 Metric Tons) Covered, by Year

	1996	1997	1998	1999	2000	2001	2002	2008 (Projection)
Rapid Upgrades Only^a	7	11	14	19	25	35	40	—
Comprehensive Upgrades^a	0	0	5	6	12	16	17	100

Sources: DOE, MPC&A Scorecard, April 2002. GAO. *Nuclear Nonproliferation: Security of Russia's Nuclear Material Inventory—Further Enhancements Needed*. GAO-01-312, Washington, D.C., February 2001, p. 7.

Note: Program began in 1993.

^a According to DOE, “rapid” upgrades consist of such things as bricking up windows in storage buildings, installing metal doors, electronic locks, and nuclear container seals, establishing controlled access to areas around nuclear material, and implementing procedures requiring two persons to be present when nuclear material is handled. “Comprehensive” upgrades include in addition such components as sensors, motion detectors, closed circuit television, central stations where guards can monitor cameras and alarms, and computerized inventory systems.

Table 4. Progress of MPC&A Program Percentage of Russian Naval Warheads (4000) Covered, by Year

	1999	2000	2001	2002	2006 (Projected)
Rapid Only	14	26	82	60	—
Comprehensive	0	0	18	40	100

Note: Program began in 1998.

Source: DOE, MPC&A Scorecard, April 1992.

Second, and possibly more fundamental, MPC&A’s technological reach and deterrent capacity are limited. The new safeguards will not necessarily stop insider theft even at the facilities where they have been introduced. Most of the new safeguards fall into the rapid or partially completed category (see Table 3). DOE and other sources affirm that the design-based threat against which initial upgrades would be effective is a “snatch and grab” theft event by a solitary employee working with several criminals on the outside.⁴⁹ Admittedly, this was a fairly common pattern in the 1990s. Nevertheless, more sophisticated threat scenarios can be envisioned—for example, ones involving collusion among well-placed insiders (those able to shut down alarm systems, bribe guards, and alter relevant paperwork, for example).

⁴⁹ Author interviews, DOE, Washington, D.C., June 11, 2002; Steven Miller and Matthew Bunn. Harvard University, Cambridge, Mass. June 3, 2002; DOE. *Guidance for Material Protection Control and Accounting Upgrades at Russian Facilities*. Washington, D.C.: November 1998, p. 8.

Comprehensive MPC&A regimes might increase the critical mass of conspirators required to orchestrate the theft; yet, a well-organized conspiracy might still defeat the system, especially if senior management were involved. A consensual “company” decision by top management to sell off fissile material stocks “is simply beyond the capacity of the system being installed to effectively address,” says a detailed 2000 study by the Russian-American Nuclear Security Advisory Council.⁵⁰ Other observers such as Los Alamos’ Siegfried Hecker also see a significant danger of diversion by the leadership of nuclear plants.⁵¹ The issue of insider corruption has received relatively little attention—although the Chelyabinsk theft mentioned earlier is an apparent case in point. Whether MPC&A systems can be improved qualitatively to address this threat, or whether other lines of defense should receive more emphasis, are issues that can be addressed by nuclear policymakers.

Warhead Security. Little has been published about DOD’s warhead security programs in Russia; much of the relevant information is classified. The Web site of the Defense Threat Reduction Agency (DTRA) mentions projects to upgrade perimeter security at “123 nuclear weapons storage sites, including 50 12th Main Directorate national stockpile sites, 25 strategic rocket force sites, and 48 12th Main Directorate sites located at Air Force and Navy bases.” Personnel training and safety enhancements are part of the package.⁵² DOD also funds a Warhead Transport Program, which helps its Russian counterpart transport warheads from operational sites to secure storage facilities. The results of the storage program have been described as mixed. While DOD has succeeded in establishing a presence in Russia’s nuclear weapons complex the pace of the effort has disappointed some observers. As Harvard’s Matthew Bunn, an expert in the cooperative programs, notes, “because of disputes over access, little progress has been made in improving security for the sites where most of Russia’s nuclear warheads are stored.” Another report states that more than half of the sites “still lack basic modern security measures.”⁵³ (Bunn notes that performance has been better in improving in security for nuclear transport, “the most vulnerable part of the nuclear life-cycle.”)⁵⁴

Other critics believe that DOD’s programs are not addressing the right threat. At least 7,000 tactical nuclear weapons (TNWs) scattered at various locations across Russia fall outside the scope of arms control treaties and are not covered under the cooperative programs. Such weapons, designed to be fitted on short-range missiles, aircraft bombs, land mines, and artillery shells, are thought to be the nuclear weapons of choice for terrorists. As former Senator Sam Nunn states, TNWs are “even more valuable to them than fissile material and much more portable than strategic

⁵⁰ *Renewing the Partnership*, p. 11.

⁵¹ Telephone interview, Siegfried Hecker, Washington, D.C., June 18, 2002.

⁵² DTRA. “Nuclear Weapons Storage Security Project.” May 16, 2002, [http://www.dtra.mil/ctr/project/projrus/ctr_nuclearweapons_proj.html].

⁵³ Tom Collins and Jon Wolfsthal, “Nuclear Terrorism and Arms Control in Russia.” *Arms Control Today*, April 1, 2000, pp. 15-19.

⁵⁴ *Securing Nuclear Weapons and Materials*, p. 36.

warheads.”⁵⁵ Also, such devices may lack the elaborate safety devices of strategic warheads. Media reports of Osama bin Laden’s attempts to acquire “suitcase” bombs from former Soviet arsenals, if uncorroborated, seem to add urgency to their concerns. However, a general consensus exists among U.S. nuclear specialists and intelligence experts that Russian nuclear weapons are substantially more secure than are their fissile material components, for which no national inventory yet exists, and that no weapons, including TNWs, have been stolen.⁵⁶ How vulnerable the TNWs are to theft in theory would depend on how many there are, where they are stored, and under what conditions—information that Russian authorities reportedly have not chosen to make available.

“The Second Line of Defense”. Possibly because of the slow implementation of MPC&A and corresponding fears of leakages from nuclear enterprises, U.S. border control programs in Russia and the NIS have been a growth industry of sorts. For instance, DOE’s funding increased from \$1.9 million in FY2001 to \$24 million in FY 2002 and the State Department’s from \$8 million in FY1998 to \$82.9 million in FY 2002 (2002 figures include the supplemental). In FY2002 export control and border security funding was 43 percent of that allocated for the MPC&A fissile material and naval warhead security program. For the entire period 1993 through 2001, the equivalent proportion was 11 percent.⁵⁷

Currently, the border programs in the NIS encompass eight countries: Kazakhstan, Uzbekistan, Kyrgyzstan, Turkmenistan, Azerbaijan, Armenia, Georgia, and Russia. DOE has installed sophisticated portal monitors to detect gamma radiation and neutron emissions at 11 sites in Russia, including the major airports in St. Petersburg and Moscow and plans to outfit 12 additional sites by the end of FY 2002. The U.S. Customs Service, using mostly State Department funds, is training and equipping customs officers in the other above-mentioned states but the equipment is less sensitive than DOE’s and less useful in detecting strategic nuclear material.⁵⁸

An important issue concerns the technological capabilities and limitations of the equipment being introduced at NIS frontier points. DOE at present is active only in Russia. In the other NIS countries, the hand-held radiation pagers and monitors being supplied to border officials can detect “contaminations” levels of radioactivity but are ineffective against shielded HEU or plutonium—materials of consequence for making a fissile weapon. Virtually all of what is detected, therefore, would fall into the radioactive junk category. DOE’s more advanced equipment includes a “plaster scintillator” to record gamma radiation and a helium-3 tube that can pick up neutron emissions from lead-shielded plutonium. Importantly, though, HEU—which basically

⁵⁵ David Filipov, “Russia’s Scattered Tactical Arms a Temptation for Terrorists.” *The Boston Globe*, June 18, 2002, p. A1.

⁵⁶ “Challenges in U.S.-Russia Cooperation,” pp. 3-4; Author interview, U.S. intelligence expert. Washington, D.C., March 8, 2002.

⁵⁷ Data from *Nuclear Nonproliferation*, pp. 9-10 and *Securing Nuclear Weapons and Materials* p. 19.

⁵⁸ *Nuclear Materials* pp. 23-24.

has a weak neutron signature – cannot be detected easily if properly shielded.⁵⁹ At the same time, many analysts believe that HEU is the material most likely to be sought by terrorists because a gun-type device, using substantial quantities of that material, would require less engineering expertise to construct than an implosion-type device using either uranium or plutonium.

Such realities suggest that U.S. border activities in the NIS might be more effective in measuring general patterns and trends in nuclear smuggling than in intercepting serious smugglers with the requisite technological expertise and knowledge of the terrain to move their wares covertly. In any case, catching smugglers of nuclear materials, drugs, or any contraband is at best a hit-or-miss proposition, dependent substantially on prior intelligence information available to law enforcement officials. As Harvard University expert Matthew Bunn argues, “once nuclear materials are removed from the enterprise, much of the battle is already lost...finding stolen material within a country or detecting and interdicting its passage across borders are Herculean tasks, in most cases only practicable if good intelligence and police work tells officials where to look..”⁶⁰

Measuring Effectiveness. Difficulties arise in trying to monitor the effectiveness of U.S. programs in deterring or stopping nuclear smuggling from the NIS. The GAO has noted, with respect to the MPC&A programs, that “DOE has not established a means to systematically measure the effectiveness of the security systems that it has installed at Russian nuclear sites.” Measures of effectiveness are not the same as measures of performance. The latter would enumerate, for example, the number of locks and alarms installed or windows bricked up within a specified timeframe. The former might look at rates of attempted theft before and after installation of MPC&A safeguards at a given enterprise or compare them at secured and unsecured enterprises. Apparently, such comparisons have not yet been made and they might be tough to implement in any event. Conceivably, the cases where thieves have been stopped before leaving the grounds of a facility owe more to the vigilance of law enforcement or security officials than to the capabilities of the installed safeguards. The above-mentioned Chelyabinsk incident that FSB authorities decided (for whatever reason) to publicize could be a case in point (although it is possible that no MPC&A upgrades had been introduced in the facility where the theft occurred).

With respect to the border control programs, apparent successes have been recorded, at least in Russia. According to Russian Customs, in 2001 there occurred approximately 400 attempts to smuggle radioactive materials out of Russia. Some 95 percent of these were detected by portal monitors, most of them built in Russia according to U.S. technical design. Twenty-eight percent of the monitors were actually installed by DOE, and this 28 percent accounted for 55 percent of the “hits”

⁵⁹ Author telephone interview, DOE, Washington, D.C., July 25, 2002; Author interview, DOE, Washington, D.C., June 6, 2002.

⁶⁰ Matthew Bunn. *The Next Wave: Urgently Needed New Steps to Control Warheads and Fissile Material*. A Joint Publication of Harvard University’s Project on Managing the Atom and the Non-proliferation Project of the Carnegie Endowment for International Peace. Cambridge, Mass. and Washington, D.C. April, 2000 p. 39

(machine detections) recorded by Russian authorities.⁶¹ Such data offers a gross measure of effectiveness of DOE's activity, but a key indicator—the relative percentages of special nuclear materials and non-nuclear radioactive isotopes in the trafficking mix—has not been divulged by DOE's Russian counterparts.

Uncertainties also abound concerning the underlying U.S. expectations for proliferation prevention in the NIS, including the design-based threats that the various programs are intended to counter. U.S. officials interviewed for this project view the intent of the counter-smuggling efforts (including MPC&A, warhead protection, and border control) as building a multilayered defense against serious proliferation events. At this point, however, they seem less likely to be effective against lower-probability but possibly high-consequence diversion scenarios — especially those involving large nuclear consignments with management participation in sophisticated procurement operations by determined outsiders.

Parallel Concerns: Knowledge Smuggling and Brain Drain

The U.S. nonproliferation work in the NIS includes creating alternative income opportunities for excess nuclear personnel as Russia downsizes its nuclear complex. In contrast to the counter-smuggling programs discussed above, the principal aim of these initiatives is to prevent outflows of weapons design intelligence—to keep such knowledge out of the hands of states and groups attempting to develop weapons of mass destruction.

The United States is spending \$108 million in FY2002 on various economic lifeline projects for unemployed or underemployed weapons scientists in the NIS (a percentage of those helped work in missile design and chemical or biological fields).⁶² Types of projects range from short-term grants and subsidies to weapons-program personnel, to collaborative research with U.S. weapons labs, to partnerships with private industry to develop commercially viable technologies. The Russian Transition Initiatives, which is funded at \$57 million, includes a component focused on business development and civilian job creation in three of the 10 nuclear cities in Russia (Sarov, Snezhinsk, and Zheleznogorsk).⁶³ Results have been modest so far. As of mid-July 2002, 565 jobs had been created, which compares to the 35,000

⁶¹ Author telephone interview, DOE, Washington, D.C., July 25, 2002.

⁶² The United States also provides certain economic assistance to employees of nuclear enterprises through labor contracts under the MPC&A program. The contracts pay up to \$125 per month for work in installing the new safeguards, a fairly significant addendum to government salaries paid at nuclear enterprises. How many employees actually receive this benefit and for how long is unclear.

⁶³ The Russian Transition Initiatives represent a consolidation, effective in FY 2002, of earlier U.S. programs, the Initiatives for Proliferation Prevention and the Nuclear Cities Initiative. Both programs had focused on nuclear downsizing and transitioning weapons experts to alternative jobs.

employees that MINATOM has scheduled to cut from nuclear weapons-related production, mostly in the 10 cities, over the next few years.⁶⁴

Russia has been mounting its own defense conversion efforts, also supported by U.S. funding, which appear to have a wider impact. The bulk of these efforts apparently are financed by a 1993 U.S.-Russian HEU purchase agreement. According to the agreement, the United States is spending \$12 billion over 20 years for 500 tons of Russian HEU blended down to an enrichment level of 4-5 percent (the enrichment product is resold by the United States as fuel for nuclear power plants in the United States.) According to a 2000 Princeton University conference report, MINATOM allocated \$50 million in 1999 to support 26 conversion projects, creating, by its own estimate (not confirmed from other sources), 2,500 non-weapons jobs in 1999 and the first half of 2000; most of the \$50 million derived from HEU agreement funds.⁶⁵

The overall impact of the U.S. and Russian efforts remains to be seen. Some proliferation events already may have occurred. Reflecting the economic hardships of the 1990s, some nuclear specialists seeking greener pastures already have left Russia, mostly for Western Europe, the United States, and Israel, although not necessarily to share nuclear knowledge. This flow includes about 9 percent of specialists working in enterprises in closed cities, according to a Carnegie Endowment study.⁶⁶ Whether any of the emigrants have settled in the three main countries of proliferation concern, Iran, Iraq, and North Korea, also cannot be determined from available data. Yet some U.S. experts have argued that Russia's transfer of nuclear technology to such nations as Iran and India, which may require temporary assignment of Russia's specialists to these countries, are accelerating the drain of WMD expertise and risks undercutting the cooperative nonproliferation effort.⁶⁷

Furthermore, as various U.S. observers have pointed out, scientists that remain in their home bases in Russia could supply nuclear or ballistic missile designs to foreign clients via the Internet, facsimile transmission, or various covert channels. Military-scientific knowledge is universally difficult to contain within national boundaries. Reports indicate that America could not prevent its own closely-held atomic secrets from gravitating to the Soviet Union in the 1940s. Supply-side leakages of nuclear intelligence or material may reflect complex motivations. Economic uncertainty and the need to make ends meet may play a role (this is the assumption driving U.S. economic assistance to NIS weapons scientists), but greed, resentment, or ideological conviction also can be factors. (An ideological case in point was the British nuclear physicist Klaus Fuchs, who provided atomic data of great military significance to the Soviet Union in the 1940s. Fuchs, one among many

⁶⁴ Personal communication from Steve Mladineo, Pacific Northwest Laboratories, Washington, D.C., July 12, 2002.

⁶⁵ *Conversion and Job Creation*, pp. 4-17.

⁶⁶ Whether any of those who left possessed direct knowledge of nuclear bomb-making is not clear. The destination countries mentioned included Israel, Germany, the United States, France, Sweden, Finland, and India. See *Russia's Nuclear and Missile Complex*, pp. 66-67.

⁶⁷ See, for instance, "Challenges in Nuclear Cooperation," p. 1.

who had worked in the Manhattan Project and later at Los Alamos, seemingly did not fit the profile of an unemployed or economically desperate scientist.)

U.S. experts frequently cite the professionalism and dedication of Russia's nuclear elite as barriers to proliferation. Siegfried Hecker, for example, says that "most of the credit for avoiding disaster in the Russian nuclear complex must go to the Russians – most importantly to the loyalty and patriotism of the Russian nuclear workers."⁶⁸ No direct evidence has surfaced that Russia's scientists have tried to sell secrets of nuclear bomb construction abroad. Concerns remain, nevertheless. For example, in December 1998, an employee of the Federal Nuclear Research Center at Sarov reportedly was arrested for espionage by the FSB, ostensibly for attempting to sell documents on new conventional weapons designs to agents of Iraq and Afghanistan for \$3 million.⁶⁹

Issues for Congress

Adequacy of Funding for U.S.-Russian Programs

In the years following the Soviet collapse, the threat of loose nukes and the apparent proliferation danger posed by Russia's large and poorly-secured stock of fissile material have emerged as major national security issues for the United States. Various cooperative U.S.-Russian programs aimed at securing nuclear material, weapons, and experts against theft and diversion have been mounted since the early 1990s. Yet a widespread perception has existed that these programs were inadequately financed. The DOE Secretary of Energy Advisory Board, for example, noted in its task force report of January 2001 that "current nonproliferation programs in the Department of Energy, the Department of Defense, and related agencies have achieved impressive results thus far but their limited mandate and funding fell short of what is required to address adequately the threats."

The report advocated spending of \$30 billion over the next eight to 10 years for proliferation prevention in the NIS, including \$5 billion for MPC&A – a 300 to 400 percent increase over the \$170.5 million that was allocated to MPC&A in FY 2001. (The report contained the caveat that the United States would not be the sole provider of funds for such a program.)⁷⁰ The recommendation apparently carried some weight. The Bush administration's budget request for former Soviet non-proliferation programs for FY 2002 actually had proposed a 13 percent decrease from FY 2001, from \$876.1 million to \$759.6 million, including a 19 percent cut in MPC&A, from \$170.5 million to \$138.8 million. Yet Congress restored most of the funding in its regular FY 2002 appropriation (\$808.1 million). After September 11,

⁶⁸ Siegfried Hecker, testimony before Senate Foreign Relations Committee Hearing on "Increasing Our Nonproliferation Efforts in the Former Soviet Union," April 23, 2002, p. 3.

⁶⁹ "Anecdotes of Nuclear Insecurity," Matthew Bunn, Harvard University, Cambridge, Mass., January 31, 2002, p. 11. From "Nuclear Center Worker Caught Selling Secrets," Russian NTV, Moscow, 16:00 Greenwich Mean Time, December 18, 1998. Translated in BBC Summary of World Broadcasts. December 21, 1998.

⁷⁰ *Report Card*, pp. iii-iv.

Congress substantially boosted programs aimed at keeping weapons of mass destruction out of the hands of terrorists, including those focused on nonproliferation activities in the NIS, which received additional funding of more than 25 percent of the regular FY 2002 appropriation (\$206.2 million).

The Administration's budget request for 2003 represents a slight decrease from the final FY 2002 allocation (\$956.9 million compared to \$1,014.3 million) for all Cooperative Threat Reduction programs. However, the Senate and the House currently are considering legislation in companion bills (S. 1803 and H.R. 3836) that could add significant funds to the nuclear non-proliferation budget in coming years. The money would come from transfers of principal and interest currently paid on the \$2.7 billion Soviet-era debt owed by the Russian Federation to the United States.

In contemplating funding decisions for nuclear security in Russia Congress and the administration may wish to consider several major issues. One is simply whether the overall threat of proliferation to hostile states and groups is overstated—of particular concern is whether evidence of demand for strategic nuclear items by such adversaries is sufficiently compelling to justify significant increases in current programs. A second is whether increases in funding for existing programs are likely to translate into increases in their effectiveness against major diversion threats. The essentially reactive nature of U.S. programs, their supply-side focus, and technological limitations, and what some view as Russia's ambiguous commitment to nonproliferation are points to be considered. A third issue is related to the role of intelligence in proliferation prevention—how this role should be defined and shaped to improve overall U.S. nuclear security policy in the NIS. These issues will be considered below.

An Exaggerated Threat?

As was noted earlier, overt evidence of proliferation pressures on the demand side is sparse. There is virtually no evidence of participation by terrorists, rogue states, or organized crime formations in the market. The amount (calculated in weight) of weapon-usable material being offered for sale, never voluminous, appears to have diminished drastically since the early to mid-1990s. While this may reflect improved security at Russian facilities, it may also suggest the absence of demand for these items. Whether such groups as Aum and al Qaeda have made a sustained effort to acquire a nuclear capability can be questioned. As one Harvard University researcher observed, "Al Qaeda has a superficial and unsophisticated interest in nuclear weapons, but nothing on the scale that would be required for a nuclear weapons program."⁷¹ Adequate documentation exists (from court testimony) of only a single attempt by al Qaeda to acquire enriched uranium, which occurred in the Sudan circa 1993. U.S. DOE officials suspect that al Qaeda was taken in by Sudanese scam artists in that transaction. Media accounts of al Qaeda's efforts to acquire nuclear warheads from former Soviet arsenals lack supporting detail and remain unconfirmed. Also, U.S. intelligence experts reportedly believe Russia's

⁷¹ Dr Jim Walsh. "Multilateral Non-proliferation Regimes, Weapons of Mass Destruction Technologies and the War on Terrorism." Testimony before the Subcommittee on International Security, Proliferation and Federal Services of the Senate Committee on Governmental Affairs. February 12, 2002 p. 30.

contention that no Russian nuclear weapons are missing. General Igor Valynkin, head of the 12th Department of the Defense Ministry, stated categorically in August 2000 that there had been no incidents of attempted theft, seizure, or unauthorized action involving nuclear weapons.⁷²

Firm evidence of nation-states' efforts to obtain nuclear materials or weapons also is largely lacking. What President George Bush calls the "axis of evil" states all appear to have nuclear weapons programs, but emphasis has been on trying to produce special nuclear materials indigenously, rather than procuring such materials from foreign sources. Concern about the variable quality of material proffered on the black market, much of which is below the standard used in weapons, and about the substantial risks of being caught trying to buy such material doubtless affect states' procurement programs.⁷³

Counterarguments also may be advanced, and some of these have been introduced in this report. One related to gaps in reporting relating to the nuclear smuggling business and the actors engaged in it. Should the traffic in fissile materials conform to the pattern of certain other illegal enterprises, what is seized by the authorities might represent a small portion of what has been detected and seized. Furthermore, evidence suggests that many theft and smuggling incidents from Russia have gone unreported. (The pattern of dissimulation or denial goes back years; in 1994, Russian authorities were asserting that "not a single gram of plutonium" had been stolen, even as 363 grams of plutonium from a Russian research institute was seized in Munich – the result of a German sting operation.)⁷⁴ In addition, mention can be made of the large resources available to aspiring nuclear states and groups (Osama bin Laden's personal fortune has been estimated at \$200 to \$400 million)⁷⁵ and of the difficult economic situation prevailing at many Russian nuclear enterprises. Efforts of nation-states to procure nuclear weapons material are likely to be painstakingly devious and well-concealed, as previously noted. The hypothetical possibility can be advanced of a shadow market in which the interests of would-be sellers and prospective buyers have converged in ways undetected by Western authorities. A variant of this scenario frequently mentioned by U.S. officials is that the Russian nuclear relationship with Iran creates channels for a flow of technology, components, and possibly materials that could directly benefit Iran's nuclear weapons program.⁷⁶

⁷² Author interview, U.S. intelligence expert, March 8, 2002; National Intelligence Council, *Annual Report to Congress on the Safety and Security of Russian Nuclear Facilities and Military Forces*. Washington, D.C., February 2, pp. 6-7.

⁷³ Weapons-usable material is defined as uranium with a 20 percent or higher uranium-235 content, or any plutonium containing less than 80 percent of the isotope plutonium-238. Weapons-grade material is defined as uranium enriched to more than 90 percent uranium-235 or plutonium-239 with less than 6 percent of the isotope plutonium-240. See *Annual Report to Congress*, p. 8.

⁷⁴ R.W. Lee III. *Smuggling Armageddon: The Nuclear Black Market in the Former Soviet Union and Europe*. New York: St. Martin's Press, 1999, pp. 73-103.

⁷⁵ "Holy Warrior," *op. cit.*

⁷⁶ For a restatement of this concern, see Dana Priest, "Iran's Emerging Nuclear Plant Poses (continued...)"

Risky Environment

Intensive Improvements. Nuclear security in Russia has improved in recent years, but risks remain. As noted, clever adversaries might find ways to defeat the new protection systems being installed at nuclear enterprises and along NIS borders. Certainly economic uncertainties and the relatively low (if improving) pay of nuclear workers add to the proliferation danger.⁷⁷ Containing the spread of nuclear intelligence is an intrinsically difficult objective – given the A-bomb’s long history and the broad array of channels through which military secrets can be disseminated. Some U.S. and Russian observers have noted that efforts to open up the nuclear cities for business development ironically could allow hostile elements to gain greater proximity to centers of nuclear activity – actually widening the “pipeline” for leakages of fissile materials and weapons expertise.⁷⁸

Concerns also are raised about the Russian government’s level of commitment to the goal of nonproliferation. Certainly the picture here appears to be mixed. U.S. personnel within Russia report positively on the spirit of cooperation and sense of shared objectives in relations with their Russian counterparts. U.S. customs officials are enthusiastic about the professionalism and performance of Russia’s customs services in interdicting flows of radioactive material. The FSB, though not part of this cooperative activity, appears to have stopped a number of thefts. Since September 11, 2001, Russia and the United States have showed signs of forging a common strategy to fight terrorism, which could have positive connotations for nonproliferation. Yet factors can be noted in the negative side: These include limitations on U.S. access to much of the Russian nuclear weapons complex (which has slowed implementation of MPC&A), lack of transparency in Russia’s reporting of nuclear smuggling incidents (creating the impression of a large underlying problem), and above all, Russia’s extensive nuclear relations with Iran and its possible implications for covert state-sponsored proliferation. U.S. Energy Secretary Spencer Abraham stated in Moscow in August 2002 that “we consistently urge Russia to cease all nuclear cooperation with Iran, including its assistance to the reactor in Bushehr.”⁷⁹ Within Russia, forces appear to be pulling in different directions on proliferation issues.

⁷⁶ (...continued)

Test for U.S.” *The Washington Post*, July 29, 2002, pp. A1, A16.

⁷⁷ For instance, low and high base salaries at the Federal Nuclear Research enter in Snezhinsk were respectively \$30 and \$150 in 2002, 25 percent above the level in 2001. Employees receive some additional compensation, but this varies from month to month. By comparison, the national average salary was said to be \$135 per month in 2002. Communication from the Foundation for Russian-American Economic Cooperation, July 15, 2002.

⁷⁸ Hecker testimony, p. 3; Yuri A. Yadin. *Significance of the Russian Federation Legislation for Manufacture and Strengthening of the Nonproliferation Program*. Moscow: International Science and Technology Center project no. 1763, 2001, p. 29.

⁷⁹ Dmitri Zhdannikov “U.S. deeply worried by Russia-Iran nuclear deals.” Moscow, Reuters August 1, 2002.

A majoritarian view, though, holds that stakes in the nonproliferation game are much higher than for other international programs – and that consequences of failures can be catastrophic for regional and global stability, and even for life on the planet. Within Congress, the tendency has been in recent years to increase spending for proliferation prevention – even beyond the level requested by the Bush Administration. The apparent threat of nuclear terrorism, however defined, has added urgency and legitimacy to U.S. nuclear containment efforts. In the NIS, and indeed worldwide, given Congress' evident desire to support such efforts, a critical issue is how the overall U.S. nuclear security position in the NIS might be strengthened. One possible course is to introduce qualitative improvements in existing programs, for instance making MPC&A more resistant to insider corruption and introducing better radiation detection equipment on NIS borders. To some extent, steps are already being taken in this direction. A second approach is to move beyond the generally reactive and supply-side orientation of U.S. nuclear security policy to focus more attention on the demand side of the proliferation equation – that is, on the machinations of the adversaries themselves. The preeminent need here is for a greatly enhanced intelligence collection effort – what Harvard University expert Graham Allison calls the “long pole in the tent” where U.S. nuclear security and nonproliferation interests are concerned.⁸⁰

Pushing the Technology Frontier. Qualitative improvements for U.S. nuclear security programs appear to be in the works. For instance, both DOE and DOD reportedly have plans to improve “human reliability” systems for nuclear custodians. These include providing breathalysers and drug testing equipment. DOD reportedly also has provided polygraphs to its Russian military counterparts, and DOE is also contemplating such steps as part of the MPC&A program.⁸¹ DOE is initiating a new phase in MPC&A – the MPC&A Operations Monitoring project (MOM) – that potentially could help deter or defeat insider nuclear conspiracies. The basis of MOM is the introduction of motion-detection cameras for untended visual surveillance at nuclear material storage vaults and guard posts. The data recorded by the cameras would be transmitted to review stations inside the enterprise (for example, the Office of the Chief Engineer of the Vice President for Administrative Security). Importantly, the data flow also would be reviewed beyond the enterprise, at the regional and national level, by representatives of different agencies—for example, GAN, MINATOM, the Ministry of Internal Affairs, and the Ministry of Defense. MOM even contemplates review of the take of the cameras at the “bilateral” level—that is, by U.S. government personnel.⁸²

Such technological solutions, if not fail-safe, offer some promise. Aspects of MOM and of “human reliability” systems, though, might be perceived as excessively intrusive by the Russian counterparts, so how extensively or effectively such innovations will be introduced remains to be seen.

⁸⁰ Author interview, Graham Allison, Cambridge, Mass., July 3, 2002.

⁸¹ Author telephone interview, DOE, Washington, D.C., July 30, 2002; “Nuclear Weapons Storage Security Programs,” *op. cit.*

⁸² *DOE MPC&A Operation Monitoring Project*. Washington, D.C.: DOE Office of International Material Cooperation, pp. 1-11.

With respect to border control, recommended directions for improvements include creating a uniform requirement for radiation monitoring equipment throughout the NIS. As noted, equipment deployed by DOE in Russia is of a higher standard than that being introduced under U.S. State Department auspices in the other NIS states.⁸³ A corollary step might be to grant DOE responsibility for managing all U.S. border security programs in the NIS. Gaps in sensor technology will inevitably remain; for instance, prototype technology exists (“active neutron interrogation”)⁸⁴ for detection of HEU behind lead shielding, but commercial introduction is years away by most reckonings and systems based on the technology would be expensive to install. Nevertheless, it can be argued that state-of-the-art equipment, more extensively deployed at NIS border crossings, can enhance the deterrent value of current systems.

Intelligence: The Long Pole in the Tent. Much attention has been given to the failure to anticipate the apparently well-planned and coordinated terrorist attacks on the World Trade Center and the Pentagon. A major concern of Congress has been whether existing U.S. intelligence capabilities – especially in the sphere of human collection – are adequate to detect and prevent further terrorist episodes. The report of the House of Representatives on the *Intelligence Authorization Act for the Fiscal Year 2003*, for example, notes,

Of all the lessons that should be learned in the wake of September 11, the importance of having reliable and timely human intelligence is among the most important. The information most important to the nation’s national security is identifying and understanding the plans of and intentions of those who would harm our interests. Some of that information is available only through HUMINT.⁸⁵

The lesson seems highly relevant to the nuclear proliferation field as well. Here, gaps in intelligence collection and reporting appear particularly striking, as noted throughout this report. While all-source intelligence is required to cover these gaps, the role of HUMINT operations appears critical because of the clandestine and idiosyncratic nature of nuclear smuggling activities and because of the high-level collusion required to orchestrate significant nuclear deals.

The importance of intelligence in proliferation prevention is essentially three-fold. One task is simply to clarify the nature of the threat. This means collecting information about the adversaries – who they are, what material and weapons they seek, and where and how they intend to obtain these items. While broad assumptions have been made about the nuclear intention of certain states and non-state actors, their precise targets and plans remain unclear. A second objective is to assist in preemption – to identify and disrupt adversaries’ WMD procurement operations or demand-side chains within the former USSR. Not enough is known about such activities, to the extent that they exist—how they are organized and financed, what front companies, criminal groups, and other intermediaries are used, who the inside

⁸³ *Nuclear Nonproliferation*, pp. 13-14.

⁸⁴ Author telephone interview, DOE, Washington, D.C., July 30, 2002.

⁸⁵ Permanent Select Committee on Intelligence. *Intelligence Authorization Act for Fiscal Year 2003*. Committee Report, July 18, 2002, p. 18.

collaborators are, and so on. Better intelligence could be assembled as a dynamic component of nuclear defense, complementing the essentially reactive and stationary “risk management” systems that the U.S. currently is introducing in the NIS.

A third objective is damage control. Where leakages of nuclear materials or weaponry already have occurred, intelligence is potentially a key to identifying the perpetrators and the recipients. Intelligence can guide such preparations or sting operations against suspected targets as well as what one nuclear expert calls “joint emergency response exercises” that run the gamut from disabling an adversary’s nuclear capability to “mitigating the consequences of nuclear attacks.”⁸⁶

An issue for Congress and for the U.S. intelligence community itself is how an enhanced collaboration effort in the NIS would be organized and implemented. One possible mechanism is an increase in formal information sharing with intelligence and law enforcement counterparts and nuclear security officials in the NIS. (Relevant agencies would include the Ministry of Internal Affairs, the FSB, Russian Customs and GAN, among others.) These authorities harbor a wealth of information on nuclear smuggling incidents, actors, and trends that could be of great value in configuring U.S. nonproliferation prevention programs in those countries. A vehicle for advancing such sharing might be the newly-formed U.S.-Russian Working Group on Terrorism, which recently issued a statement stressing the importance of cooperation against “threats posed by nuclear, biological, and chemical terrorism.”⁸⁷ Nevertheless, it can be argued that the liaison partners – Russia and other NIS countries – have different interests from the United States as well as different assessments of the nuclear proliferation threat.⁸⁸ For this reason, according to some observers, maintaining and expanding a unilateral U.S. capability may be of central importance. The clear differences between the United States and Russia or the latter’s nuclear relations with Iran are obvious cases in point. Ideally, a well-designed effort would provide advance warning of covert nuclear deals; failing that, it might pick up clues (such as sudden displays of wealth by low-salaried nuclear employees) that a smuggling conspiracy already was afoot and aid in subsequent damage control operations. In any event, intelligence about adversaries’ activities can usefully be factored into project design and resource allocation decisions affecting the overall U.S.-Russian cooperative security effort, as a complement to enhanced cooperation.

⁸⁶ Hecker testimony, p. 6.

⁸⁷ “Joint Press Statement by the U.S.-Russia Working Group on Counterterrorism” Office of the Spokesman, Annapolis Md. July 27, 2002

⁸⁸ Another report from the Subcommittee on Terrorism and Homeland Security of the Permanent Select Committee on Intelligence discusses the issue: “Using both unilateral and liaison resources will be necessary. Recognizing that liaison partners may have different interests maintaining a unilateral capability is of key importance.” See Subcommittee on Terrorism and Homeland Security, House Permanent Select Committee on Intelligence, “Counterterrorism Intelligence Capabilities and Performance Prior to 9/11.” A Report to the Speaker of the House of Representatives and the Minority Leader. July 2002, p. ii.

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