Post–Cold War Nuclear Dangers: Proliferation and Terrorism

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Warnings of "loose nukes," black market plutonium and uranium, and North Korean and Iraqi nuclear weapons development programs have focused attention on post–Cold War nuclear dangers. A National Academy of Sciences (NAS) study warned that vast quantities of surplus plutonium (Pu) and highly enriched uranium (HEU) resulting from the dismantlement of tens of thousands of weapons from Cold War nuclear arsenals pose a "clear and present danger to national and international security" requiring urgent actions in the former Soviet Union (FSU) (*1*). The World Trade Center bombing was a wake-up call alerting us to the dangers of terrorism on an unprecedented scale. In spite of favorable developments in South Africa, Argentina, Brazil, Ukraine, and North Korea (*?*), the long-range outlook for nuclear proliferation is troubling: Economic growth and the diffusion of advancing science and technology will provide more and more nations with the capability to develop nuclear weapons and post–Cold War turmoil will provide motivations. President Clinton addressed the growing dangers of nuclear, biological, and chemical weapons of mass destruction (WMD) in a speech to the United Nations (*2*). "If we do not stem the proliferation of the world's deadliest weapons, no democracy can feel secure." Senator Sam Nunn, recently chair of the Senate Armed Services Committee, stated that addressing the threat of WMD is likely to be "our top continuous national security challenge for the next ten to twenty years . . ." (*3*).

Four Nuclear Nightmares

During the next few decades, there are dangers of four nuclear nightmares: (i) Cold War II, resulting from a revanchist failure of Russian reform and possibly accompanied by internal disorder, unstable leadership, unreliable command and control, and inadequately trained military personnel. (ii) Escalation of conventional war to nuclear war, arising from the geopolitical instabilities that led to World War I and World War II. (iii) Proliferation epidemics (possibly leading to a third or more of the world's 192 nations being armed with nuclear weapons), with a disastrous launch-on-warning instability. (iv) Nuclear terrorism, that is, a "World Trade Center" destroyed by a nuclear explosion.

The best hope for avoiding these nuclear nightmares is through the combined forces of politics, defense, science and technology, and economics. The elements of the matrix formed by the four nightmares and the four forces are nonlinearly coupled, including multiple incompletely understood instabilities managed by fallible human beings. Dimensions involving biological and chemical WMD also exist and are coupled to the nuclear nightmare matrix (for example, use of biological weapons would stimulate nuclear proliferation and could escalate to use of nuclear weapons). The "enemy" is not yet any particular nation, it is the complex system of nation-states that includes coupled nonlinear instabilities and WMD. Here, I will focus on nuclear proliferation and terrorism and the role of science and technology.

Loose Nuclear Weapons, Materials, and Expertise

Loose nukes smuggled from the FSU could provide near-term access to nuclear weapons by rogue nations, subnational elements, and terrorist organizations. There is top-level U.S. government concern about loose Russian nuclear weapons such as artillery shells and land mines (*4*). In the present period of internal disorder, it is difficult if not impossible to ensure security; for instance, against corrupt insiders working with the Russian Mafia.

Limits on the acquisition of loose nukes, Pu, and HEU are the primary technical barriers to achieving a nuclear weapons capability. The NAS Committee on International Security and Arms Control (CISAC) recommended that Western countries provide necessary equipment and funds for a series of actions in the FSU, including immediate installation of portal monitoring systems to detect any theft of fissile materials; adequate armed guard forces; and improved economic conditions for personnel responsible for accounting for and security of weapons and fissile materials, in order to reduce incentives for corruption and insider theft (*1*).

If armed with nuclear weapons, Iraq, Iran, and other nations could serve as suppliers of nuclear weapons and materials. Before the recent agreement with the United States, North Korea's potential role as a supplier of nuclear weapons was addressed by Secretary of Defense William Perry: "A nuclear North Korea could be in a position to export nuclear technologies and weapons to terrorists or rogue regimes around the world, unleashing a nightmare spread of nuclear threat" (*5*).

Iran was identified by former Central Intelligence Agency director James Woolsey as "the world's leading state sponsor of terrorism." Woolsey stated that "Iran is also looking to purchase fully fabricated nuclear weapons . . ." (*6*).

Countries that provide the market demand for nuclear and other WMD and their corresponding motivations were summarized by Senator Nunn: "First of all those who use terrorism as a tool of national policy, countries like Libya and Iran; second, those who harbor expansionist ambition like Iraq; third, those who both fear an invasion and threaten an invasion of others . . . like North Korea; fourth, those who are armed to the teeth because they fear their neighbors in the region, like India and Pakistan" (*3*).

Senator Nunn also noted the desperate state of Russian weapons personnel. "This is the first time in history that literally thousands of scientists who know how to make nuclear weapons . . . ballistic missiles, and . . . chemical and biological weapons . . . don't know where their next paycheck is coming from and how their families are going to be fed" (*3*).

Nuclear weapons experts could greatly amplify nuclear dangers by assisting terrorists to bypass weapons security systems, accelerating proliferant weapons development programs, providing confidence that an untested weapon would work, reducing the amounts of Pu or HEU required, and facilitating use of reactor-grade Pu to make nuclear weapons (for example, Pu from commercial power reactors in Iran or North Korea).

The diffusion of advancing science and technology and compounding economic growth are providing more and more nations with capabilities for developing nuclear weapons. The scientific principles of nuclear weapons are widely known. The computing power of the 1950s supercomputers used to design early U.S. nuclear weapons is far exceeded by that of modern PCs. Iraq used electromagnetic and centrifuge technologies for isotopic enrichment of uranium, and North Korea used nuclear reactors to create Pu. Averaged over several decades, gross domestic product doubling times are roughly 30 years for many developing nations. In the 100-year period from the 1940s (when the United States developed nuclear weapons) to the 2040s, nuclear weapons will have become 10 times more affordable in relative terms.

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Once acquired, nuclear weapons capabilities may be used accidentally or intentionally. Although national intentions may be postulated, a terrorist group that revealed nuclear intentions would undermine its cause and endanger itself and its patron states. Nevertheless, terrorist and subnational nuclear dangers cannot safely be ignored until nuclear intentions are detected. Capabilities and intentions may change suddenly, for example, if loose nukes unexpectedly become available in desperate situations. Would Hamas or the Chechens employ available nuclear weapons as a last resort?

U.S. Programs

U.S. government initiatives to reduce the smuggling of nuclear weapons and materials from the FSU include the $900 million Nunn-Lugar Cooperative Threat Reduction Program, the purchase of 500 tons of HEU from dismantled Russian weapons, and an agreement by Russia to stop producing weapons-grade Pu by the year 2000. A substantial amount of HEU was also purchased recently from Kazakhstan.

The FY1994 Defense Authorization Act established a multiagency Nonproliferation Program Review Committee (NPRC). The committee report (7) issued to Congress by NPRC chair John Deutch, Deputy Secretary of Defense, noted proliferation programs funded at about $1 billion in FY1995 and strongly related activities funded at about $3 billion. (A substantial intelligence community effort including the Nonproliferation Center is not included in these numbers.) A Department of Defense (DOD) counterproliferation program has been initiated. The Deutch report recommends the creation of a Counterproliferation Technology Working Group within the National Security Council (NSC) structure charged with reviewing all federal government proliferation technology efforts.

The DOD Nuclear Posture Review (NPR) (8) advanced a U.S. strategy to reduce the role of nuclear weapons [through the Strategic Arms Reduction Treaty (START) and advanced conventional weapons] while stemming proliferation [through the Nuclear Nonproliferation Treaty (NPT) and the Comprehensive Test Ban] and hedging against the failure of reform in Russia. The United States projects a continuing national security requirement for a post-START nuclear deterrent.

U.S. Options

The United States must develop capabilities to deal effectively with a broad spectrum of scenarios. It is useful to consider difficult terrorism and proliferation scenarios.

In a terrorism scenario, terrorists detonate nuclear explosions in major cities. Such acts of nuclear terrorism would trigger the implementation of emergency controls to prevent smuggling of nuclear weapons and materials. Unsuccessful attempts to prevent smuggling of drugs suggest that extreme police state controls would be required to be effective. These self-imposed controls and mass public reactions (such as, perhaps, de facto abandonment of population centers) would paralyze commerce and strangle the freedom and openness that are fundamental elements of democracy. Democracy and nuclear terrorism cannot coexist.

Evaluation of capabilities to prevent terrorist attacks triggers a sequence of questions about countering terrorist organizations; preventing leakage of nuclear weapons, materials, and experts; ensuring adequate warning; detecting nuclear materials and explosives being smuggled across national boundaries; ensuring that a terrorist nuclear explosive located in a city can be disarmed without accidentally creating a nuclear explosion; and ensuring attribution, that is, ensuring that the origin of a captured or exploded nuclear weapon and the identity of the terrorists responsible can be determined.

Effective intelligence is a powerful deterrent to unconventional delivery of nuclear weapons by nation states. Intelligence can enable preemption and retaliation and make a major difference in the effectiveness of defense, including detection, weapon disablement, and attribution. Without intelligence, defense against unconventional delivery is extremely expensive, if not impractical. The development of the required intelligence capabilities must have a top national priority.

Strong action is needed to accelerate development of improved technologies to ensure weapon detection, disablement, and attribution when intelligence is successful. These technologies are currently under development at the DOE weapons labs. Addressing proliferation and terrorism (as well as the other nuclear nightmares) should be a high-priority mission of the weapons laboratories.

The NAS CISAC's principal recommendations should be implemented, including improved safeguards and security for all forms of Pu and HEU worldwide and strengthening of the International Atomic Energy Agency (IAEA). Iraq's large-scale nuclear weapons development program revealed major weaknesses in IAEA safeguards. With the increasing availability of nuclear weapons expertise and growing stockpiles of reactor-grade Pu, security concerns must be addressed.

Concerning nuclear weapons security, the NPR recommends that the United States set a world standard by equipping our nuclear systems with the most modern control devices (8). Even though nuclear weapons are heavily guarded, human error is unpredictable and unavoidable. Insider threats in nuclear-armed societies in rapid transformation pose a grave threat to international security. Nuclear weapons should be made "inherently secure," that is, they should contain security technologies such that if the weapon is stolen, it will self-destruct. Security technologies in some automobiles are more effective than those in many nuclear weapons.

A hot line to the Russian nuclear labs should be established so that Russian weapons experts can be consulted effectively about the safing of any of their nuclear weapons intercepted outside the FSU.

To identify vulnerabilities of population centers and other possible targets of nuclear terrorism without revealing those vulnerabilities, specialized Red Teams should be used. Results of these Red Team exercises should be used to inform top-level decision makers of potential disasters and to evaluate countermeasures.

In a proliferation scenario, the acquisition of nuclear weapons by a few rogue nations could initiate a chain reaction of proliferation leading to the creation of dozens of nuclear forces in a period of a single decade. (It is estimated that 10 years are required to develop nuclear weapons.) Sooner or later, some of these nuclear forces would be commanded by power-hungry, irrational, or even truly "mad" leaders—unpredictable and undeterrable—and used in local or regional nuclear wars. With inadequate intelligence and response times on the order of 10 minutes for ballistic missile attack, a highly proliferated world would be unstable to a launch-on-warning chain reaction.

Evaluation of options to strengthen U.S. capabilities to respond to proliferation scenarios leads to questions about the effectiveness of intelligence, defense, and deterrence.

In a highly proliferated world, a large-scale intelligence capability would be required to ensure adequate warning of nuclear threats to the United States, our allies, and other nations. The failure of intelligence to detect the massive Iraqi nuclear weapons program emphasizes the difficulty of this challenge.

Global defenses against limited attacks by ballistic missiles would reduce incentives for proliferation and provide protection should attack occur. The U.S. program to develop theater defenses against ballistic missile threats merits strong support. Cruise missile defenses will also be needed. However, to reduce incentives to proliferate and provide protection against accidental and surprise attack, there is no substitute for a

deployed global defense in space. The United States and the international community should accelerate research and development on space-based defenses against limited attacks. Joint U.S.–Russian programs would bypass the continuing debate over amending the Anti-Ballistic Missile Treaty.

Effective deterrent forces reduce incentives for the proliferation of nuclear weapons and inhibit their use. A credible U.S. nuclear umbrella is essential to minimize proliferation. Without a security guarantee, sovereign nations will develop nuclear weapons if they believe such weapons are required to ensure national security. Nonnuclear deterrent forces are being developed that exploit real-time intelligence from space as well as precision weapons delivery and stealth. These advanced weapons will reduce the role of nuclear weapons. Major challenges include hard underground targets and large conventional forces that could rapidly create tens to hundreds of thousands of casualties (as in Korea). Hard underground facilities can protect WMD, and the threat of a large number of casualties can deter U.S. and United Nations action.

Global Options

From the beginning of the nuclear age, proposals have been made to reduce nuclear dangers, including the international control of nuclear weapons (such as the Baruch Plan). The NPT now under review includes a long-range commitment to worldwide nuclear disarmament. The current moratorium on nuclear testing is expected to lead to a comprehensive test ban. Openness has also been a major force in reducing the nuclear danger.

International agreements and test bans can inhibit proliferation, but cannot uninvent or verifiably eliminate nuclear weapons. An untested nuclear weapon was used at Hiroshima. South Africa, Pakistan, and other nations have developed first-generation nuclear arsenals without nuclear testing.

Under the START agreements, a major part of the vast Cold War nuclear forces of the United States and the FSU is being dismantled. U.S. long-range strategic nuclear forces have been reduced to START I levels, and our active stockpile of nonstrategic nuclear weapons has been reduced 90%. Russia has about 25,000 nuclear weapons (8). Apparently there is currently a major (up to two to one) gap between the numbers of Russian and U.S. nuclear weapons. There are large uncertainties in our reliable knowledge of the size of the Russian stockpile, the rate of dismantlement, and the rate of construction of new nuclear weapons. Given the possible emergence of a hostile, authoritarian Russian empire or the fragmentation of Russia, with accompanying loss of control of nuclear weapons, the large Russian stockpile is a serious concern.

As we approach the 50th anniversary of the founding of the United Nations, it is struggling with limited success to address difficult global problems and violent local conflicts. Post–Cold War nuclear dangers provide strong incentives for building more effective regional and global institutions. These strengthened institutions should foster cooperative security, democracy, and openness, which are stabilizing factors in a dangerously unstable system of sovereign nation-states.

The 20th-century revolution in communication technologies has created a far more open world—a key factor in the end of the Cold War and the demise of the Soviet empire. Driven by powerful economic incentives, the extension of the communication revolution throughout the world may foster the transition to market economies and democratic governments.

Priority Actions

High priority should be given to the following actions:

1) Ensure the effectiveness of nuclear intelligence and support a major intelligence mission to address WMD.

2) Form high-level Red Teams to find vulnerabilities and evaluate countermeasures to nuclear terrorism.

3) Accelerate development of advanced technologies to detect and disarm terrorist nuclear weapons; focus the nuclear weapons labs on the nuclear dangers.

4) Implement urgent CISAC recommendations on management of nuclear weapons materials in the FSU and install inherent security technologies in nuclear weapons and in containers of enough Pu or HEU to make a nuclear weapon.

5) Accelerate research and development on a space-based global missile defense.

6) Ensure the continuing credibility of the nuclear deterrent and umbrella.

7) Accelerate the development of advanced conventional weapons that reduce the role of nuclear weapons.

The challenge is to contain post–Cold War nuclear dangers and prepare to defend democracy in a nuclear nightmare world, should containment fail.

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