

# Nuclear Deterrence in the Age of Nuclear Terrorism

By GRAHAM ALLISON

AN ATTACK ON ONE OF THE GREAT CITIES OF THE WORLD IS ALMOST INEVITABLE. BUT WITH BETTER DETECTION TECHNOLOGIES, A NEW INTERNATIONAL ALLIANCE COULD STILL PREVENT CATASTROPHE.

On October 11, 2001, one month after the terrorist assault on the World Trade Center and the Pentagon, President George W. Bush faced a terrifying prospect. At that morning's daily presidential intelligence briefing, George Tenet, the director of central intelligence, informed the president of reports from a CIA agent code-named Dragonfire that al-Qaeda terrorists possessed a 10-kiloton nuclear bomb, evidently stolen from the Russian arsenal. According to Dragonfire, the weapon was in New York City.

The government dispatched a nuclear-emergency support team. Under a cloak of secrecy that excluded even Mayor Rudolph Giuliani, these experts searched for the bomb. On a normal workday, half a million people crowd the area within a half-mile radius of Times Square. A noon detonation in midtown Manhattan would kill them all. The wounded would overwhelm hospitals and emergency services. Firemen would fight a ring of uncontrolled blazes for days afterward.

In the hours that followed, Condoleezza Rice, then the national security advisor, analyzed what strategists call the "problem from hell." During the Cold War, the United States and the Soviet Union each knew that an attack against the other would elicit a retaliatory strike of commensurate or greater measure; but al-Qaeda had no such fear of reprisal.

Concerned that al-Qaeda could have smuggled a nuclear weapon into Washington as well, the president ordered Vice President Dick Cheney to leave the capital for an "undisclosed location," where he would remain for weeks. Several hundred federal employees from more than a dozen government agencies joined the vice president at this secret site—the core of an alternative government.

Six months earlier, the CIA's Counterterrorism Center had picked up chatter in al-Qaeda channels about an "American

Hiroshima." The CIA knew that Osama bin Laden's fascination with nuclear weapons went back at least to 1993, when he attempted to buy highly enriched uranium of South African origin. Al-Qaeda operatives were alleged to have negotiated with Chechen separatists in Russia to buy a nuclear warhead, which the Chechen warlord Shamil Basayev claimed to have acquired from Russian arsenals. The CIA's special task force on al-Qaeda had noted the terrorist group's emphasis on thorough planning, intensive training, and repetition of successful tactics. The task force highlighted al-Qaeda's preference for symbolic targets and spectacular attacks.

As CIA analysts examined Dragonfire's report and compared it with other bits of information, they noted that the September attack on the World Trade Center had set the bar higher for future terrorist acts. Psychologically, a nuclear attack would stagger the world's imagination. New York was, in the jargon of national-security experts, "target rich."

As it turned out, of course, Dragonfire's report was a false alarm. But what the case teaches us is this: the U.S. government was unable to dismiss the possibility of such an attack on any scientific or logical grounds.

## PREVENTING NUCLEAR CATASTROPHE

Given current policies and practices, a nuclear terrorist attack that devastates one of the great cities of the world is inevitable. In my judgment, if governments do no more and no less than they are doing today, the odds of such an event within a decade are more than 50 percent.

This estimate is, in effect, my best guess, since there is no methodology for predicting an unpredictable catastrophe. But my judgment is informed by having analyzed issues of nuclear danger for more than three decades, during which I served as a special advisor to U.S. secretary of defense Caspar Weinberger



in the Reagan administration and as assistant secretary of defense for policy and plans in the Clinton administration.

Others have offered more conservative but still dire assessments. My Harvard colleague Matthew Bunn has created a model that estimates the probability of a nuclear terrorist attack over a 10-year period to be 29 percent—identical to the average estimate from a poll of security experts commissioned by Senator Richard Lugar in 2005.

Still others are more pessimistic than I. Former secretary of defense William Perry, for one, has suggested that my work underestimates the risk. Richard Garwin, a designer of the hydrogen bomb (whom the Nobel laureate physicist Enrico Fermi called “the only true genius I had ever met”), told Congress in March 2007 that he estimated a “20 percent per year probability” of a nuclear explosion in an American or European city. And Warren Buffett, the world’s most successful investor and a legendary oddsmaker in pricing insurance policies for unlikely but catastrophic events, concludes that nuclear terrorism is “inevitable.” He has said, “I don’t see any way that it won’t happen.”

But there is some good news: nuclear terrorism is nonetheless preventable. There are feasible, affordable measures that, if taken, would reduce the likelihood of a successful nuclear terrorist attack to nearly zero.

The centerpiece of a strategy to prevent nuclear terrorism must be to deny terrorists access to nuclear weapons or materials. To this end, my 2004 book, *Nuclear Terrorism: The Ultimate Preventable Catastrophe*, proposes a strategy for shaping a new international security order according to a doctrine of “Three No’s”:

- No loose nukes: all nuclear weapons and weapons-usable material must be secured, on the fastest possible timetable, as tightly as the gold in Fort Knox.
- No new nascent nukes: no nation must develop new capabilities to enrich uranium or reprocess plutonium.
- No new nuclear-weapons states: we must draw a line under the current eight and a half nuclear powers and say unambiguously, “Stop. No more.”

In the last 17 years, efforts have been made to address the threat. The danger of “loose nukes” came into focus in 1991, during the Soviet Union’s collapse. After the failed coup attempt against Mikhail Gorbachev in August 1991, I composed a private memo to the chairman of the Joint Chiefs of Staff, Colin Powell, titled “Sounding the Alarm.” “Soviet disunion could create additional nuclear states, provoke struggles for control of Soviet nuclear weapons, and lead to a loss of control of strategic or nonstrategic nuclear weapons,” I wrote.

In the weeks that followed, President George H. W. Bush and Gorbachev agreed to what was later called the “unilateral declarations.” The United States removed all tactical nuclear weapons from its operational forces and challenged the Soviet Union to do likewise.

Gorbachev’s response was encouraging. With the aid of U.S. funding, secured through the Cooperative Threat Reduction Program sponsored by Lugar and his Senate colleague Sam Nunn, thousands of the Soviet Union’s 21,700 tactical nuclear weapons stationed in 14 of the Soviet Union’s 15 constituent republics were returned to Russia. Moreover, 3,200 strategic nuclear weapons stationed in Belarus, Kazakhstan, and Ukraine, most atop missiles that targeted American cities, were eliminated. Today, there are no nuclear weapons in any of the former Soviet states except Russia.

By now, U.S.-sponsored security upgrades have been completed for 80 percent of Russia’s nuclear material and warhead sites. As of June 2008, 7,292 strategic nuclear warheads had been deactivated (79 percent of the Nunn-Lugar target for 2012), and 708 intercontinental ballistic missiles had been destroyed (65 percent of the 2012 target), along with 30 nuclear submarines capable of launching ballistic missiles (86 percent of the 2012 target). Several of the 2012 targets have already been met, and 25 classified sites on 12 Russian bases have been secured two years ahead of schedule.

During the 2004 presidential campaign, in the first televised debate between President George Bush and Senator John Kerry, the moderator asked each candidate, “What is the single most serious threat to the national security of the United States?” In rare agreement, Kerry and Bush both cited nuclear terrorism. As the president said, “I agree with my opponent that the biggest threat facing the country is weapons of mass destruction in the hands of a terrorist network.” During the 2005 Bratislava summit, President Bush and Russian president Vladimir Putin for the first time accepted responsibility for addressing the threat and for ensuring that their governments secure loose nuclear material in their countries as quickly as possible. They assigned responsibility for securing nuclear materials to individuals (U.S. energy secretary Samuel W. Bodman and his Russian counterpart, the head of the Russian Federal Atomic Energy Agency) and held them accountable by requiring regular progress reports.

But the missteps, missed opportunities, and wrong turns of the past two decades are weightier than the successes. The nuclear superpowers failed to take advantage of the end of the Cold War to dramatically reduce and restructure nuclear arsenals—or, at least, to honor their commitments under the 1968 Non-Proliferation Treaty (NPT) rigorously enough to

persuade other states to honor theirs. India and Pakistan tested nuclear bombs and began deploying active nuclear arsenals. North Korea withdrew from the NPT, used technologies acquired under the treaty to produce plutonium for an estimated eight nuclear bombs, and tested a nuclear weapon. In 2005, an NPT review conference collapsed amid general intransigence. Most recently, Iran has defied three U.N. Security Council resolutions demanding that it suspend its nuclear enrichment activity.

Of everything on this list, the most worrying is nuclear proliferation in North Korea. That country is among the most dangerous potential sources of a nuclear bomb that Osama bin Laden, or someone like him, could use to destroy the heart of New York or Washington, DC. In 2004, Pyongyang had two bombs' worth of plutonium. It has since developed an arsenal of around 10 bombs.

Consider the consequences if just one nuclear bomb exploded in just one U.S. city. The immediate reaction would be to block all entry points to prevent another bomb from reaching its target, disrupting the global flow of raw materials and manufactured goods. Vital markets for international products would disappear, and financial markets would crash. Researchers at Rand, a think tank funded by the U.S. government, have estimated that a nuclear explosion at the Port of Long Beach, CA, would cause immediate indirect costs of more than \$1 trillion worldwide and that shutting down U.S. ports would cut world trade by 7.5 percent.

The total, long-term economic effects would be much worse, however, and would reverberate well beyond the developed world. As former U.N. secretary-general Kofi Annan has warned, a nuclear terrorist attack would not only "cause widespread death and destruction" but "thrust tens of millions of

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As the 2004 U.N. High-Level Panel on Threats, Challenges, and Change concluded, "We are approaching a point at which the erosion of the non-proliferation regime could become irreversible and result in a cascade of proliferation."

After the United States invaded Afghanistan in the aftermath of 9/11, the Taliban government was toppled and al-Qaeda's headquarters and leadership, including Osama bin Laden and his deputy Ayman al-Zawahiri, were evicted from the country. But note the supreme irony: having entered office with a bearded madman in medieval Afghanistan plotting and training foot soldiers for a massive terrorist attack on the United States, President Bush will probably hand the reins to his successor as this same bearded madman plots even deadlier attacks on our country—but now he will be plotting them from training camps in Pakistan, a nuclear state.

No one who has examined the evidence has any doubt that al-Qaeda is deadly serious about exploding a nuclear bomb. As former CIA director George Tenet reveals in his memoir, "The most senior leaders of al Qaeda are still singularly focused on acquiring WMD. ... The main threat is the nuclear one. I am convinced that this is where Osama bin Laden and his operatives desperately want to go."

people into dire poverty." This would, he observed, create "a second death toll throughout the developing world."

Preventing such a calamity will require policy leadership, institutional innovation, international cooperation, and hard work. The prospects for success can be enhanced by capitalizing on a competitive advantage of the United States: technology. Al-Qaeda and other global terrorists are technologically challenged, and technologically advanced countries must exploit this asymmetry. If we do, our ability to secure, trace, and dismantle weapons of mass destruction will exceed terrorist organizations' abilities to procure them.

### NUCLEAR CSI: UNAMBIGUOUS ATTRIBUTION

Could states be held as accountable for the nuclear weapons they create (and the material from which such weapons could be made) as they are for the nuclear warheads their governments choose to deploy? The U.S. government considered this question during the Cold War—and answered it, though the answer offers cold comfort. Recall the most dangerous moment of the Cold War, the Cuban Missile Crisis of October 1962. The United States discovered the Soviet Union attempting to sneak nuclear-tipped missiles into Cuba. President John F.

Kennedy confronted his Soviet counterpart, Nikita Khrushchev, and demanded that the missiles be withdrawn. As the crisis unfolded, American strategists worried that Khrushchev might transfer control of the nuclear arsenal in Cuba to a young, hot-headed revolutionary named Fidel Castro.

After conducting careful deliberations, Kennedy issued an unambiguous warning to Khrushchev and the Soviet Union: “It shall be the policy of this nation to regard any nuclear missile launched from Cuba against any nation in the Western Hemisphere as an attack by the Soviet Union on the United States, requiring a full retaliatory response upon the Soviet Union.” Khrushchev well understood what Kennedy was talking about: the certain prospect of a full-scale nuclear war.

In the years after the crisis, nuclear strategists considered the array of scenarios in which one or a small number of Soviet nuclear weapons might explode on American soil. In one such scenario, a single missile is launched against an American city in an attack the Soviet leader claims is “accidental” or “unauthorized.” For example, a Soviet leader calls the American president on the hotline to inform him that a Soviet missile commander has gone insane and, without authorization, launched a single missile with a nuclear warhead against an American city. How should the president respond?

Grisly though the logic was, the canonical answer was a strategy of “an eye for an eye.” Herman Kahn, author of the controversial 1960 work *On Thermonuclear War*, described this approach as “graduated, or controlled deterrence ... of provocative actions by a counteraction which is expected to be so effective that the net effect of the ‘aggressor’s’ action is to cause him to lose in position.” The U.S. plan was to retaliate by delivering a nuclear warhead capable of destroying a counterpart Russian city. Pentagon planners developed lists of such unfortunately twinned cities in support of that policy.

Who knows whether an American president would have responded to the accidental destruction of Minneapolis by destroying Minsk. But Soviet leaders’ belief that a president *might* do so undoubtedly reinforced their determination that no accidental launches occur.

#### MODERN DETERRENCE

As one moves beyond Cold War logic to the crueler, more complex logic of nuclear terrorism, the question is whether personal accountability for terrorist use of a nuclear weapon manufactured by a given state can deter the state’s leader from selling weapons to terrorists. What’s more, the question of accountability applies equally well in cases where proliferation is not willful. If leaders believe that they will be held accountable for their nuclear weapons even if those weapons are stolen, will they be better motivated to prevent theft?

The answer depends on two further questions. First, can we attribute the weapon to its source? Second, how will accountability be defined politically, and how can it be enforced?

As I wrote in *Technology Review* in the summer of 2005 (see “Nuclear Accountability,” July 2005 and at [technologyreview.com](http://technologyreview.com)), “The technological prerequisite for rethinking the unthinkable is nuclear forensics: the ability to identify a bomb’s source from radioactive debris left after it explodes.” A credible capacity to identify nuclear material definitively and quickly is essential. If the leader of a government—say, Kim Jong Il of North Korea—knew that the United States would be able to identify his “fingerprints” on a nuclear weapon he sold to terrorists, it should be a useful deterrent. Similarly, nuclear custodians, scientists, and others whose main motivation for helping terrorists is financial, not ideological, would probably be more hesitant to do so if they could be found out.

A post-9/11 study by the National Research Council (NRC), *Making the Nation Safer: The Role of Science and Technology in Countering Terrorism*, concludes that such detection is technically feasible: “The technology for developing [post-explosion nuclear attribution] exists but needs to be assembled, an effort that is expected to take several years.”

*Nuclear Forensics: Role, State of the Art, Program Needs*, a 2008 study by the Joint Working Group of the American Physical Society (APS) and the American Association for the Advancement of Science (AAAS) that is the best recent public report on the subject, concurs with the NRC’s judgment: “The underlying scientific disciplines ... are understood adequately for the purpose of forensics.” Nevertheless, the report concludes that the current state of the art will not yield maximally effective deterrence. We lack a central global database of unique material signatures that countries can promptly access in the event of a nuclear detonation. Even if such a database existed, states would not be fully prepared to take advantage of it in a day-after scenario. The APS and AAAS report that “neither equipment nor people are at the level needed to provide as prompt and accurate information for decision makers as is possible.”

The report suggests that two separate technological initiatives are critical to improving U.S. forensic capability. The first is the development of equipment that can provide immediate, rough assessments in the field—portable instruments capable of what the APS and AAAS call “all-weather, all-scenario rapid response.” The second is improvement of equipment for performing more detailed analysis of forensic samples. According to the report, the equipment in the U.S. Department of Energy’s labs must be upgraded to “world standards.”

Assuming that there is an attack and we have identified the source, we come to the much more difficult question. What response is appropriate?

#### A GLOBAL ALLIANCE AGAINST NUCLEAR TERRORISM

Establishing an accepted principle of nuclear accountability will be a major international undertaking. It should begin with the United States and Russia, each of which has a special obligation to address this challenge, since they created it—and since they still own 95 percent of all nuclear weapons. They should take the lead in establishing a new global alliance against nuclear terrorism. The mission of the alliance should be to minimize the risk of such terrorism anywhere by taking every action physically, technically, and diplomatically possible to prevent nuclear weapons or materials from falling into the hands of terrorists.

Membership in the alliance would require an unambiguous commitment to the principle of assured nuclear security. States would have to guarantee that all nuclear weapons and materials in their territories were beyond the reach of terrorists or thieves. And states' means of securing these materials would have to be sufficiently transparent that leaders of all member states could reassure their own citizens that terrorists would never get a nuclear bomb from another alliance member.

U.N. Security Council Resolution 1540 already obligates all member states to develop and maintain "appropriate, effective" measures to secure weapons and materials, but this obligation has unfortunately not been reinforced by specific, mandatory standards. However, the Nunn-Lugar Expansion Act, adopted by Congress in 2003, authorized the Nunn-Lugar program to operate outside the former Soviet Union to address proliferation threats. Moreover, the Bush administration has reportedly provided \$100 million in technology and related assistance to help Pakistan secure its vulnerable nuclear arsenal.

The Global Initiative to Combat Nuclear Terrorism announced by Presidents Bush and Putin at the St. Petersburg G8 summit in July 2006 was another step in the right direction. But the alliance against nuclear terrorism that I am proposing would go beyond declarations; it would require specific actions in exchange for specific benefits. The actions would include defining the security levels of weapons and weapons-usable materials, as well as assuring others that these levels of security had been achieved. Leaders of complying states would participate in an annual summit, and full alliance members would also be entitled to intelligence sharing, assistance with security technology, participation in interdiction exercises, and postdetonation medical and cleanup aid.


The leader of a country that joined the alliance would have to take responsibility for the country's doing everything technically possible, as fast as possible, to prevent nuclear terrorism. Meanwhile, member states would be required to deposit samples of nuclear materials in an international library that would be available for use in identifying the source of any weapon or material that found its way into terrorists' hands.

Members of the alliance would together clarify the practical meaning of accountability in the event that a weapon or material was used by terrorists against another state. If nuclear weapons or materials should be stolen, states that had satisfied the requirements for assured nuclear security, met the new standards in securing their materials, and made their safeguards sufficiently transparent to the other members would be judged less negligent. States that were unwilling to participate fully in the alliance would automatically raise suspicions.

Members of the alliance would also undertake to clarify the consequences of knowingly allowing nuclear materials to fall into terrorist hands. Those consequences would not necessarily involve military retaliation; alternatives such as exacting financial reparations would certainly be explored and might prove more realistic. Consequences would also be different for different violators, since threatening nuclear retaliation against Russia would not be credible.

Currently, the only state that could plausibly choose to sell a nuclear bomb to terrorists is North Korea. Since it may have 10 weapons, the sale of one or two would make little difference to its deterrent posture. An economically desperate mafioso state, North Korea has demonstrated a willingness to sell whatever it makes to whoever will pay.

To deter Kim Jong Il from selling a nuclear weapon to terrorists, the U.S. government should act now to convince him that North Korea will be held accountable for every weapon of North Korean origin. Ideally, the United States would act in concert with Russia and China in taking a page from John F. Kennedy's playbook during the Cuban Missile Crisis. The announced policy of nuclear accountability would warn Kim unambiguously that the explosion of any nuclear weapon of North Korean origin on the territory of alliance states or their allies would be met with a full retaliatory response ensuring that it could never happen again.

Success in the war on terrorism will require a combination of policy imagination and technological inventiveness. Visualizing the alternative—a world of nuclear anarchy—should stimulate us to rethink nuclear unthinkable. 

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Watch an interview with Graham Allison on the threat of nuclear terrorism: [technologyreview.com/essay](http://technologyreview.com/essay)

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