

“A small but dedicated and resourceful terrorist group could very plausibly design and build at least a crude nuclear bomb. And the danger that they could get the nuclear material needed to do so is very real.”

The Seven Myths of Nuclear Terrorism

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In early 2003, Osama bin Laden sought and received from a radical Saudi cleric a religious ruling, or *fatwa*, that the use of a nuclear bomb against US civilians would be permissible under Islamic law—indeed mandatory—if it were the only means to stop US actions against Muslims. “If a bomb that killed 10 million of them and burned as much of their land as they have burned Muslims’ land were dropped on them, it would be permissible,” the ruling held. Also in 2003, proceedings in a Russian criminal case revealed that a Russian businessman had been offering \$750,000 for stolen weapon-grade plutonium and had made contact with residents of the closed city of Sarov, home of one of Russia’s premier nuclear weapons laboratories, to try to arrange a deal.

The terrorists are racing to get a nuclear bomb—and the removal of their sanctuary in Afghanistan has not stopped their efforts. What is needed now is a fast-paced global effort to lock down every nuclear weapon and every kilogram of plutonium and highly enriched uranium (HEU) before terrorists and criminals can get to them. The agreement on securing nuclear stockpiles reached at the Bush-Putin summit in February 2005 represents a promising first step—but sustained and energetic follow-through from the highest levels will be needed for President George W. Bush and Russian President Vladimir Putin to seize the opportunity to leave, as a lasting legacy, a world with a greatly reduced danger of nuclear terrorism.

The use of an actual nuclear bomb would be among the most difficult types of attack for terrorists to accomplish. Getting a nuclear bomb or the nuclear material to make one—particularly making the connection with people with access to such

material and the ability to steal it—is difficult. Even after acquiring nuclear material, building a nuclear bomb, or setting off a stolen bomb, would be a great challenge.

Many policy makers and analysts appear to believe that these difficulties are so great that the danger of terrorists carrying out a nuclear attack is vanishingly small—unless, perhaps, they were sponsored by a state with nuclear capabilities. As Karl-Heinz Kamp, a noted European security analyst put it, “religious zealots or political extremists may present many dangers, but wielding nuclear bombs and killing hundreds of thousands of innocent people is not one of them.”

Unfortunately, this view is profoundly wrong. While a nuclear attack would by no means be easy for terrorists to carry out, the probability that terrorists could succeed in doing so is large enough to justify doing “everything in our power,” in President Bush’s words, to prevent it.

If world leaders were convinced that the risk of a terrorist nuclear attack on a major city is substantial, and that there are actions they could take that would dramatically reduce that risk, they presumably would act, and act swiftly, to diminish this deadly threat. Therefore, dispelling the key myths that lead officials and policy elites to downplay the danger is crucial to building momentum for an effective response. Each of these myths, like all myths, contains an element of truth, but each is a dangerously weak proposition on which to rest the world’s security against nuclear attack.

WHAT TERRORISTS WANT

The first myth is that terrorists are not especially interested in staging a nuclear catastrophe. Before the 9-11 attacks, it was often said that “terrorists want a lot of people watching, but not a lot of people dead.” Many argued that terrorists would remain focused on violence at relatively modest scales, and would be highly unlikely to pursue the

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incineration of an entire city in a nuclear blast. A large number of security experts outside the United States still appear to believe that a serious terrorist effort to inflict destruction far beyond the scale of the World Trade Center or Pentagon attacks is highly unlikely.

This conclusion is correct for the vast majority of the world's terrorist groups. But Al Qaeda and the global jihadist network it has spawned are different. They are focused on a global struggle, for which the immense power of nuclear weapons might be seen as necessary, not a local battle for which such weapons are unneeded. They have gone to considerable lengths to justify to their supporters and audiences the use of mass violence, including the mass killing of innocent civilians. And they have explicitly set inflicting the maximum possible damage on the United States and its allies as one of their organizational goals.

Al Qaeda's followers believe that they, in effect, brought down the Soviet Union—that the mujahideen's success in forcing the Soviet Union from Afghanistan was a key factor leading to the Soviet collapse. And they appear to believe that the United States, too, is a "paper tiger" that can be driven to collapse—that the 9-11 attacks inflicted grievous damage on US economic power, and that still larger blows are needed to bring the United States down. As bin Laden put it in a message to his followers in December 2001, "America is in retreat by the grace of God Almighty and economic attrition is continuing up to today. But it needs further blows. The young men need to seek out the nodes of the American economy and strike the enemy's nodes." The notion that major blows could cause the collapse of the United States is, in essence, Al Qaeda's idea of how it will achieve victory. A nuclear blast incinerating an American city would be exactly the kind of blow Al Qaeda wants.

From long before the 2003 *fatwa*, bin Laden and the global jihadist network have made their desire for nuclear weapons for use against the United States and its allies explicit, by both word and deed. Bin Laden has called the acquisition of weapons of mass destruction (WMD) a "religious duty." Intercepted Al Qaeda communications reportedly have referred to inflicting a "Hiroshima" on the United States. Al Qaeda operatives have made repeated attempts to buy stolen nuclear material from which to make a nuclear bomb. They have tried to recruit nuclear weapon scientists to help them. The extensive downloaded materials on nuclear weapons (and crude bomb design drawings) found in Al

Qaeda camps in Afghanistan make clear the group's continuing desire for a nuclear capability.

GETTING THE BOMB

A second myth, apparently believed by many officials, is that the nuclear materials required to make a bomb are nearly impossible for terrorists to obtain. Former Undersecretary of State John Bolton, for example, told the *Washington Post* that there had been no "significant risk of a Russian nuclear weapon getting into terrorist hands" for "some number of years," because of both Russia's own efforts to upgrade nuclear security and US assistance. Similarly, in December 2003, Russian Deputy Minister of Atomic Energy Sergei Antipov argued that "the nuclear thief does not stand a chance in Russia: it is nearly impossible to steal nuclear materials, let alone of weapons grade, such as plutonium or enriched uranium."

The reality, however, is that not only do nuclear thieves stand a chance in Russia (and elsewhere), they have repeatedly been successful, stealing weapons-usable nuclear material without setting off any alarm or detector. The International Atomic Energy Agency database of illicit trafficking incidents includes 18 cases of seizure of stolen HEU or plutonium confirmed by the states involved, and more cases are known to have occurred that the relevant states have not been willing to confirm. In one case in 1992, for example, a worker at a facility manufacturing fuel from 90 percent-enriched uranium exploited an accounting system designed to write off missing material as normal waste, stealing 1.5 kilograms (3.3 pounds) of HEU in a series of small, unnoticed thefts.

Unfortunately, around the world stocks of potential bomb material are dangerously insecure. In Russia, security for the many thousands of nuclear weapons and hundreds of tons of potential bomb material left over from the cold war has improved significantly, but tight budgets still mean broken alarms that do not get fixed and security forces without adequate body armor and communications equipment. Security culture remains a difficult problem, not only in Russia but around the world, with employees propping open security doors for convenience, and guards patrolling without ammunition in their guns to avoid accidental firing incidents. Yet these systems must defeat outsider and insider threats that are frighteningly high.

Elsewhere, some 130 civilian research reactors in more than 40 countries still use HEU as their fuel. Many have no more security than a night watch-

man and a chain-link fence. The nuclear stockpile in Pakistan is heavily guarded, but faces deadly threats from armed remnants of Al Qaeda in the country and senior nuclear insiders who have marketed nuclear bomb technology around the globe. In short, the problem of insecure nuclear stockpiles is not just a Russia problem, it is a global problem.

Making connections between the terrorists or hostile states that might want stolen nuclear materials and the insiders in a position to steal them—or to provide information that would help outsiders steal them—seems to have been difficult in the past. Thieves who have stolen nuclear material have often had no particular buyer in mind, and have been caught as a result of their clumsy efforts to find a buyer. But the world cannot rely on criminals and terrorists failing to figure out how to make these connections. Given the case of the Russian businessman offering hundreds of thousands of dollars to anyone who could steal weapons-grade plutonium for sale to a foreign client, as well as cases of terrorist scouts succeeding in finding out where Russian nuclear warhead storage sites were and where and when nuclear warhead transport trains were moving, critical linkages already appear to be occurring.

Moreover, substantial smuggling networks are shipping a wide variety of contraband back and forth across Russia's borders to the Central Asian states and beyond; for example, much of the burgeoning Afghan heroin crop is believed to be shipped through Central Asia and Russia to markets in Europe. If even one of the cross-border criminal connections made by such means were successfully used to market stolen nuclear material to the terrorists seeking to get it, the world could face a devastating catastrophe.

MAKING THE BOMB

Kamp, the European security analyst, has argued that “actually building [a crude nuclear weapon] is extremely difficult. A number of countries with vast resources and expertise, such as Iraq, have struggled unsuccessfully to produce one. It is difficult to imagine that a small terrorist group would find bomb-building any easier.” This third myth about nuclear terrorism conflates the difficulty of producing the nuclear material needed for a bomb—the key area on which Iraq spent billions of dollars—with the dif-

ficulty of making a bomb once the material is in hand. (The CIA, for example, has estimated that obtaining stolen nuclear material from abroad would have cut the time Iraq required to make a bomb from years to months.)

The argument also misses the crucial distinction between making a safe, reliable, and efficient nuclear weapon suitable for delivery by a missile or a fighter aircraft—that is, the kind of nuclear weapon that a typical state would want for its arsenal, the design and construction of which would require substantial scientific and technical expertise—and the far simpler task of making a crude, unsafe, unreliable terrorist nuclear explosive that might be delivered by truck or boat.

If enough HEU is gathered in the same place at the same time, a nuclear chain reaction will occur. Indeed, considerable care has to be taken to prevent this from happening accidentally. The only trick to

making this nuclear chain reaction a nuclear explosion is getting the material together fast enough.

The atomic bomb

that obliterated the Japanese city of Hiroshima at the end of World War II was a cannon that fired a projectile of HEU into rings of HEU—a “gun-type” bomb. The basic principles that need to be understood to make this kind of bomb are widely available in the open literature.

It is impossible to make an effective gun-type bomb with plutonium. Hence, if the terrorists had plutonium, or if the amount of HEU they had available was too small for a gun-type weapon, they would have to build an “implosion type” weapon. An implosion weapon uses a set of precisely shaped explosives arranged around a less-than-critical mass of HEU or plutonium to crush the atoms of material closer together, thereby setting off the nuclear chain reaction.

Designing and building an implosion bomb would be a significantly greater challenge for a terrorist group. But the possibility that terrorists could make at least a crude implosion bomb is very real—particularly if they obtained knowledgeable help, which they have been actively trying to do.

Repeated examinations of the question, “Could resourceful terrorists design and build a crude nuclear bomb if they had the needed nuclear material?” by nuclear weapons experts in the United States and elsewhere have concluded that the answer

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is “yes”—for either type of nuclear bomb. These conclusions were drawn before the 9-11 attacks demonstrated the sophistication and careful planning and intelligence gathering of which Al Qaeda is capable.

A detailed examination in 1977 by the US Office of Technology Assessment, drawing on all the relevant classified information, summed up the situation: “A small group of people, none of whom have ever had access to the classified literature, could possibly design and build a crude nuclear explosive device. They would not necessarily require a great deal of technological equipment or have to undertake any experiments. Only modest machine-shop facilities that could be contracted for without arousing suspicion would be required. The financial resources for the acquisition of necessary equipment on open markets need not exceed a fraction of a million dollars. The group would have to include, at a minimum, a person capable of researching and understanding the literature in several fields and a jack-of-all trades technician.”

Given the importance of the question of whether terrorists could design and make a nuclear explosive, the answer has not been left to analysis alone, but has been subjected to “experiment” as well. In the 1960s, in an experiment sponsored by the Atomic Energy Commission, three recent physics graduates with no prior knowledge of nuclear weapons, nuclear materials, or explosives, and no access to classified information, successfully designed a workable implosion bomb. More recently, Senator Joseph Biden (D-DE), when serving as chairman of the Senate Foreign Relations Committee, asked the three US nuclear weapons laboratories whether terrorists, if they had the nuclear material, could make a crude but workable nuclear bomb. They answered “yes.” Senator Biden reports that within a few months after he asked the question, the laboratories had actually built a gun-type device, using only components that, except for the nuclear material itself, were off the shelf and commercially available without breaking any laws. The device was brought into a secure Senate hearing room to demonstrate the gravity of the threat.

Having help from someone familiar with nuclear weapon design and construction would certainly be useful to terrorists trying to build a bomb—as would having actual bomb blueprints—though neither would be essential. Al Qaeda and its allies have

actively attempted to recruit such help. For example, bin Laden and his deputy, Ayman al-Zawahiri, met at length with two senior Pakistani nuclear weapons experts, Sultan Bashiruddin Mahmood and Chaudari Abdul Majeed—both Taliban sympathizers with extreme Islamic views—and pressed them for information on making nuclear weapons. Similarly, in 2000, an official of Russia’s National Security Council reported that the Taliban regime had attempted to recruit a nuclear expert from a Russian facility.

The world has also seen confirmed an extraordinary leakage of nuclear technology from Pakistan, including designs for uranium-enrichment centrifuges, components for such centrifuges, complete centrifuges apparently taken from Pakistan’s own enrichment plant, consulting services for any problems the buyers might have, and even actual nuclear weapon blueprints. The leakers were apparently motivated both by money and by Islamic fervor.

Extreme Islamic views, including sympathy for Al Qaeda and the Taliban, appear to be commonplace in Pakistan’s military and nuclear establishment, as they are in broader Pakistani

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society. Abdul Qadeer Khan, the former head of Pakistan’s nuclear weapons program who confessed to leading this clandestine nuclear network, is a strident nationalist prone to harsh Islamic rhetoric. In 1984, Khan spoke of his opposition to “all the Western countries” as “enemies of Islam.” He discussed the possibility that nuclear technology might be shared among Islamic countries, specifically mentioning Iraq, Libya, and Iran.

The possibility that Al Qaeda has access to complete blueprints for an implosion-type nuclear explosive—or may soon obtain such access—is very real. Of course, even with a working design, and even if the nuclear material could be acquired, manufacturing a weapon to the specifications called for in the design would not be a trivial task. But the potential availability of a nuclear bomb recipe reinforces the urgency of keeping the ingredients needed to make that recipe out of terrorist hands.

STEALING THE BOMB

A terrorist group that gained receipt of a stolen nuclear weapon would face somewhat different challenges. The difficulty of setting off a stolen weapon would depend substantially on the specifics of the weapon’s design. Many US nuclear weapons are

equipped with “permissive action links” (PALs), which are effectively electronic locks, intended to make it difficult to detonate the weapon without first inserting an authorized code. Modern versions also have “limited try” features that will permanently disable the weapon if the wrong code is entered too many times, or if attempts are made to tamper with or bypass the lock. Older versions do not have all of these features, and therefore would provide somewhat less of an obstacle to a terrorist group attempting to detonate a stolen weapon it had acquired.

Unfortunately, what little information is publicly available suggests that earlier Soviet-designed weapons, especially older tactical weapons, may not be equipped with modern versions of safeguards against unauthorized use. In both the United States and Russia, thousands of nuclear weapons, particularly older varieties, have been dismantled in recent years, and it is likely that the bulk of the most dangerous weapons lacking modern safeguards have been destroyed. But neither country has made any commitment to destroy all of these weapons. Nuclear powers such as Pakistan, India, and China are not believed to incorporate equivalents to modern PALs in their weapons, although many of these weapons are probably stored in partly disassembled form.

Perhaps even more than in building a crude nuclear device of their own, terrorists seeking to detonate a stolen weapon would benefit greatly from the help of a knowledgeable insider, if such help could be procured. It may well be that an insider willing to help in stealing a weapon in the first place might also be willing to help in providing important information related to setting the weapon off. In the case of a weapon equipped with a modern PAL, without the actual use codes most insiders, too, would not be able to provide ready means to overcome the lock and use the weapon.

But if they could not figure out how to detonate a stolen weapon, terrorists might still remove the nuclear material from it and seek to fashion it into a bomb. If the weapon were a modern, highly efficient design using a modest amount of nuclear material, the material contained in it might not be enough for a crude, inefficient terrorist bomb. In any case, terrorists who had a stolen nuclear weapon would be in a position to make fearsome threats—for no one would know for sure whether they could set it off or not. The bottom line is that if a sophisticated terrorist group gained control of a stolen nuclear bomb or enough nuclear material to make one, there would be little grounds for confidence that they would be unable to use it.

THE SEARCH FOR SPONSORS

A fourth myth is that the only plausible way that terrorists could get a nuclear bomb or the ability to make one is from a state. Richard Butler, the Australian diplomat who once headed the United Nations inspectors in Iraq, put this belief simply: “It is virtually certain that any acquisition by a terrorist group of nuclear explosive capability could be achieved only through the assistance of a state in possession of that capability—either given directly or provided by individuals within that state who have slipped out of its legal control.”

This belief appears to be widespread within the Bush administration, and it determines the policy prescription: if the principal danger of terrorists’ acquiring weapons of mass destruction is that hostile states might provide them, then the key element of the solution is to take on those hostile states and make sure that they do not provide them. This is the idea that animates the preemptive doctrine laid out in the administration’s *National Security Strategy*, and it was fundamental to the argument for going to war with Iraq.

Indeed, although the president has warned again and again of the danger that terrorists might get weapons of mass destruction, the key policy prescription he draws in speech after speech is that the United States must take on hostile states before they provide such weapons to terrorists. It is this myth—the supposed need of state sponsorship—that above all others has led many of the most senior officials of the US government to place only modest priority on securing the world’s stockpiles of nuclear weapons and materials.

In fact, the belief that terrorists would need the help of a state to gain a nuclear capability is simply wrong. As has been shown, even without any help from a state, without access to the classified literature, and potentially without any detailed knowledge of the relevant technical fields before they began their research, a small but dedicated and resourceful terrorist group could very plausibly design and build at least a crude nuclear bomb. And the danger that they could get the nuclear material needed to do so is very real.

Whatever measures are taken to reduce the already low chance that hostile states will actively decide to give nuclear weapons or the materials and expertise to make them to terrorists, such steps will do nothing to address the dozens of other terrorist pathways to the bomb around the world. These other pathways are opened by inadvertence rather than by conscious hostile acts by foreign powers—

and they can only be successfully addressed by cooperation on a global scale. Wherever there is a cache of unsecured nuclear material, there is a vulnerability that an effective war on catastrophic terrorism must address—and quickly.

THE DEFENSE OF BORDERS

A fifth mistaken belief is that it is possible to put in place around the United States and other major countries a security cordon that can reduce to a low level the risk that nuclear weapons and materials might be smuggled in. Customs and Border Protection Commissioner Robert C. Bonner, for example, was already arguing in mid-2002 that the measures the US Customs Service had taken since the 9-11 attacks had made it “much, much, much less likely” that “an international terrorist organization could smuggle in . . . any kind of radiological material or any kind of nuclear device.”

Putting radiation detectors in place at US ports and airports, and at facilities that ship to the United States, has been the subject of substantial investment since 9-11 (though far less investment than would be needed to have a good chance of detecting even those things brought in by the most obvious routes). The millions of cargo containers that carry a large fraction of US imports every year have been a particular focus of such efforts.

While some investment in improving border detection capabilities is certainly worthwhile, this last line of defense will always be a very porous one. The physics of nuclear materials and nuclear weapons, the geography of the huge and complex American borders, and the economics of the global flow of people and goods conspire to make the terrorists' job easy and the defenders' job very difficult. Once stolen, the nuclear material for a bomb could be anywhere, and it is very difficult to detect, especially if shielding is used to limit radiation emissions.

Typical nuclear weapons are not large, and could readily be smuggled across America's or other nations' borders. The nuclear material needed for a bomb could easily fit in a suitcase. Even an assembled bomb could fit in a van, a cargo container, or a yacht sailed into a US harbor. Or the materials could be smuggled in and the bomb built at the site of its intended use. Terrorists have routinely used truck bombs that were physically larger than even a crude terrorist nuclear bomb would need to be.

America's borders stretch for thousands of miles, and millions of trucks, trains, ships, and airplanes in which nuclear material might be hidden cross them every year. Hundreds of thousands of illegal immigrants and thousands of tons of illegal drugs cross US borders every year, despite billions of dollars of investment in trying to stop them. (Some have said that the easiest way to bring nuclear material into the United States would be to hide it in a bale of marijuana.) Every nation's border is vulnerable to various types of illicit movement, be it drugs, terrorists, or the material needed to unleash nuclear terror.

The radiation from plutonium, and especially from HEU, is weak and difficult to detect at any significant distance, particularly if the material is surrounded with shielding. Technology does exist, and is being further developed, to make it possible to detect HEU or plutonium in objects right in front of the detectors (as might be possible at controlled border crossings), including finding hidden nuclear material in everything from airline baggage to cargo containers. Programs are now under way to put these kinds of detection capabilities into place at an increasing number of sites.

But these capabilities should not be exaggerated. While US Customs officers have been equipped with “radiation pagers,” these would have essentially no chance of detecting HEU with even minor shielding, even if it were in a bag directly in front of the inspector. More sophisticated equipment that can detect both HEU and plutonium is being purchased—but it will be years before such equipment is installed and in use at all the major ports and border crossings into the United States.

Two points are crucial to understand. First, inspecting cargo as it arrives in the United States is not good enough: if a bomb were on a boat sailing into a major US harbor, it could wreak horrible devastation before the ship ever pulled up to the dock to be inspected. That is why many of the new initiatives after the 9-11 attacks involve putting detectors in place at foreign ports that ship to the United States. But it will take an immense and continuing effort to ensure that detection at these ports is effective, that there are no ready possibilities for bribing a customs official to let a container through uninspected and that already inspected containers cannot be tampered with.

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Second, and more fundamentally, the number of possible pathways to smuggle a nuclear bomb or its ingredients into the United States is immense, and intelligent adversaries will choose whichever pathway remains undefended. If an effective system were put in place to make it very difficult to get nuclear material into the country in a cargo container without detection—and the country is a long way from that point today—then terrorists would bring their bomb in on a yacht, a fishing boat, or by some other means.

None of this is to say that the United States and other countries should not invest in attempting to make the nuclear smuggler's job as difficult as possible; they should. But it will never be possible to be confident in this last-ditch line of defense: the length of borders, the diversity of means of transport, and the ease of shielding radiation from plutonium or HEU all improve the odds too much for the terrorists. All that realistically can be hoped for is to make the easiest paths for terrorists more difficult. Primary reliance will still have to be placed on the first line of defense: keeping nuclear weapons and materials from being stolen in the first place.

THE MILITARY OPTION

President Bush and the senior officials of his administration repeatedly focus on maintaining the offensive against terrorist groups with global reach as the key to preventing catastrophic terrorism. As the president put it in his 2004 State of the Union address: "America is on the offensive against the terrorists. . . . As part of the offensive against terror, we are also confronting the regimes that harbor and support terrorists, and could supply them with nuclear, chemical, or biological weapons. The United States and our allies are determined: We refuse to live in the shadow of this ultimate danger."

The notion that such an offensive alone will be able to dispel this shadow of danger is the sixth myth of nuclear terrorism. Certainly it is crucial for the United States and its allies to do everything they can to destroy terrorist groups that have nuclear ambitions. A successful offensive, keeping these groups constantly on the run and off balance, can greatly reduce the likelihood that they would succeed in carrying out a nuclear attack. Indeed, the war on these groups launched since 9-11 has undoubtedly led to substantial disruptions in their ability to manage and carry out large and complex operations.

But as attack after attack around the world has demonstrated, Al Qaeda and a range of loosely affiliated groups retain the ability to carry out deadly

strikes. There is little prospect that US intelligence on terrorist cells and their operations will ever be good enough to be confident that the terrorist operation required to assemble a crude nuclear device—perhaps only a cell of a few resourceful people, a machine shop, and off-the-shelf parts, other than the nuclear material itself—would be detected and destroyed before it could finish its deadly work.

A strong offense against terrorist groups with nuclear ambitions must be a critical part of the world's toolbox in reducing the danger of nuclear terrorism. But without a greatly increased effort to keep nuclear weapons and materials out of terrorists' hands in the first place, offensive action cannot reduce the threat to an acceptable level.

WHAT STATES WANT

The seventh myth applies to states, rather than terrorist groups. A number of analysts argue that states would not be especially interested in a stolen nuclear weapon or stolen material to make one, because what they want is an indigenous capability to produce the material for as many nuclear weapons as they think they need. Like the other myths, this myth leads those who believe it to downplay the importance of securing nuclear weapons and materials so that they cannot be stolen.

There is little doubt that states would *prefer* to have indigenous nuclear material production capabilities. But such capabilities are expensive and difficult to acquire. History demonstrates that states do indeed consider buying a bomb or the materials to make one if they believe they can avoid the cost and difficulty of putting together their own nuclear material production facilities; if they see an urgent need to establish a nuclear deterrent before their own nuclear material production succeeds; or if they face an international nonproliferation effort that is making it very difficult to establish their own production facilities.

The case of Iraq is illustrative. Baghdad repeatedly sought to purchase weapons-usable nuclear material from sources with connections in the former Soviet Union. When Iraq realized, after its invasion of Kuwait, that the United States and an international coalition would respond, it launched a "crash program" to build one bomb quickly, using the HEU it already had from its research reactors; it certainly would have been desperately eager to receive stolen HEU at that time.

Iran, too, has sought to purchase nuclear material. Iran put together a substantial procurement network to acquire a wide range of technologies

and materials related to weapons of mass destruction, including from the former Soviet Union. Unclassified US intelligence assessments have repeatedly reported that Iran was also seeking to purchase stolen fissile material for a nuclear bomb.

Nor were these unique cases. Australia wanted to purchase a nuclear bomb when it was considering the nuclear weapons option. Egypt explored the possibility of a purchase when it was pursuing a nuclear weapons program. Libya, realizing the weakness of its own indigenous science and technology base, reportedly made repeated attempts to buy a nuclear weapon, including an unsuccessful approach to China. The more that nonproliferation efforts focus on limiting states' ability to build their own enrichment and reprocessing facilities, the more likely it is that additional states will pursue the purchase alternative.

Ultimately, if worldwide efforts to secure nuclear weapons and the materials needed to make them fail—creating a situation in which any dictator or terrorist who wanted a nuclear bomb could buy its essential ingredients on a nuclear black market—nothing else the world does to stem the spread of nuclear weapons is likely to work.

REDUCING THE THREAT

The good news is that nuclear terrorism is a largely solvable problem. Plutonium and HEU—the essential ingredients of nuclear bombs—do not exist in nature, and are too difficult for terrorist groups to plausibly produce themselves. Hence, if nuclear bombs and bomb materials can be kept out of terrorist hands, nuclear terrorism can be reliably prevented: no material, no bomb.

A comprehensive, multifaceted approach is needed to block the terrorist pathway to the bomb. Offensive action against terrorist groups and defensive steps such as nuclear material detection at borders have their place in such an effort, but because nuclear materials and the activities needed to turn them into a bomb may be difficult to detect, both are weak reeds to rely on. The greatest leverage in reducing this threat is in preventing nuclear material from leaving the sites where it is supposed to be in the first place. Once it is out the door, the difficulty of finding and recovering it increases enormously.

The United States, other countries, and the International Atomic Energy Agency have a wide range of efforts under way to secure, monitor, and reduce stockpiles of nuclear weapons and materials in the former Soviet Union and around the world. These efforts have had real, demonstrable successes, representing an excellent investment in American and

world security. Enough material for thousands of nuclear weapons has been permanently destroyed. Security for scores of vulnerable nuclear sites has been demonstrably improved. At least temporary civilian employment has been provided for thousands of nuclear weapons scientists and workers who might otherwise have been driven by desperation to seek to sell their knowledge or the materials to which they had access.

Yet, in virtually every aspect of these efforts, much more remains to be done. While US-funded security upgrades have been completed at some 70 percent of the sites where potential nuclear bomb material is located in the former Soviet Union, most of that material is in the remaining buildings where even the first round of initial upgrades has not yet been completed. Less than a fifth of Russia's stockpile of bomb uranium has been destroyed, and the process of destroying excess bomb plutonium has not even begun. Only a tiny fraction of Russia's excess nuclear weapons experts have yet received self-supporting civilian jobs (as opposed to short-term subsidized grants). Beyond the former Soviet Union, cooperative security upgrades are only just beginning, leaving many sites dangerously vulnerable.

Current US spending on all cooperative programs to secure and dismantle stockpiles of weapons of mass destruction around the world is in the range of \$1 billion per year, supplemented to some degree by contributions from Europe and Japan. While that amounts to less than one-quarter of one percent of the US defense budget, the current obstacles to faster progress are more political and bureaucratic than budgetary. Disputes over access to sensitive sites, tax exemptions for threat reduction assistance, who pays in the event of an accident, and a number of other issues have been allowed to fester unresolved. As a result, dozens of sets of equipment for a "quick fix" of security at Russia's nuclear warhead bunkers are still sitting in warehouses, uninstalled, more than four years after the United States delivered them.

At their February 2005 summit, Presidents Bush and Putin issued a promising statement calling for expanded and accelerated cooperation to secure nuclear stockpiles, warning that nuclear terrorism was "one of the gravest threats our two countries face." As the leaders of the two countries that possess the vast majority of the world's nuclear weapons and weapons-usable nuclear material, Bush and Putin have a historic opportunity, building on the February 2005 accord, to lead a global partnership to lock down the world's nuclear stock-

piles, a step that would dramatically reduce the danger of nuclear terrorism. But because the summit statement did not resolve any of the key impediments to progress, sustained and energetic presidential leadership on both sides will be needed to translate the statement's words into effective action. Many of the needed programs are already in place, and the necessary technology largely already exists. The key is mustering the political will to overcome the obstacles to progress.

Three steps are urgently needed if the world is to win the race to lock down these stockpiles before the terrorists and criminals get to them. First, the administration's new Global Threat Reduction Initiative (GTRI), focused on removing potential bomb material entirely from facilities around the world, must be implemented as quickly, flexibly, and comprehensively as possible. It should have as its target the removal of potential bomb material from the world's highest-risk facilities within four years. In the fall of 2004, the US Congress gave the administration both explicit, flexible authority and some additional funding for the GTRI to offer targeted incentives to convince facilities around the world to give up their weapons-usable material. The administration must now apply these tools quickly and creatively. At the same time, Congress should act to broaden the authority provided in 2004, and further boost the available funds.

Second, the United States and Russia must accelerate and strengthen their efforts to secure Russia's stockpiles. Putin should offer expanded access to all but the most sensitive areas of nuclear facilities to allow this cooperation to proceed, and Bush should offer reciprocal access to comparable areas of US facilities, as he pledged to do in his end-of-year press conference in 2004. The two sides should also quickly agree on approaches to carry out needed security upgrades for those areas that genuinely are too sensitive for either side to allow the other's experts to visit, such as using photographs and videotapes to confirm that work has been done as agreed. The two countries need to compromise on the problem of liability in the event of an accident (the United States has been insisting that Russia accept 100 percent of the liability even in the event of intentional sabotage by US personnel). The liability issue has already delayed efforts to destroy thousands of bombs' worth of plutonium by several years, and could bring the entire edifice of cooperation to secure and dismantle cold war stockpiles crashing down if not resolved soon: the overall agreement that governs this work expires in June 2006, and will not be extended unless a compromise is reached.

Putin needs to allocate the necessary resources to ensure strong security for Russia's nuclear stockpiles; give his nuclear agencies the mission, authority, and resources to set and enforce effective nuclear security rules; direct that nuclear weapons and materials be consolidated in far fewer buildings and sites, which will achieve more security at lower cost; and pledge to sustain effective security and accounting for all of Russia's nuclear stockpiles after international assistance comes to an end. The high-level US-Russian group established at the February 2005 summit should provide a venue for pursuing all these critical steps.

Third, the United States, Russia, and other countries must lead a global effort to lock down all the vulnerable nuclear caches worldwide that cannot simply be removed or eliminated, as quickly as possible—and to secure it to standards that ensure that these caches are safeguarded against the threats that terrorists and criminals have demonstrated they can pose. Considerable creativity and perseverance will be required to ensure that effective security measures are taken in countries such as Pakistan, India, Israel, or even China, where it is not likely that foreign experts will be allowed to visit the key facilities to review security or help to improve it.

Making all this happen will require sustained White House leadership. A full-time senior official is needed, with the president's ear, to lead the myriad efforts in the many agencies that are working on pieces of the job of blocking the terrorist pathway to the bomb, and to keep this issue on the front burner at the White House day-in and day-out.

THE DAY AFTER

In hearings held after a terrorist nuclear attack to determine who was responsible for allowing this event to occur and what should be done to prevent it from happening again, what would government officials and policy makers want to be able to say they had done to forestall such a horrible catastrophe?

The terrorists have made clear that they want nuclear weapons, and are working to get them. A continuing stream of attacks and intelligence analyses makes clear that Al Qaeda is regrouping, recruiting and training new operatives, and still seeking to carry out catastrophic attacks on the United States and other countries. President Bush has eloquently warned that "history will judge harshly those who saw this coming danger but failed to act." The question remains: on the day after a terrorist nuclear attack, what will we wish we had done to prevent it? And why are we not doing that now? ■