Center for the Study of Weapons of Mass Destruction

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The Future Nuclear Landscape

by Paul I. Bernstein,
John P. Caves, Jr., and
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occasional paper

Center for the Study of Weapons of Mass Destruction

National Defense University

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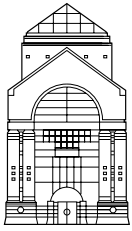

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Acknowledgments

This occasional paper of the National Defense University's Center for the Study of Weapons of Mass Destruction (WMD Center) examines aspects of the contemporary and emerging international security environment that the authors believe will define the future nuclear landscape and identifies some associated priorities for policymakers. The foundation for the paper is the presentations and discussions conducted during the WMD Center's sixth annual symposium, *The Future Nuclear Landscape: New Realities, New Responses*, held at the National Defense University on May 17–18, 2006. In several areas, the authors have expanded upon those discussions and examined broader issues and considerations shaping the nuclear landscape.

While all symposium sessions were off the record and all comments delivered on a nonattribution basis, the authors wish to thank the many speakers and panelists for their contributions to that event and, hence, to this paper. In particular, the WMD Center thanks Ambassador Jack D. Crouch, II, Assistant to the President and Deputy National Security Advisor, and Dr. John J. Hamre, President and Chief Executive Officer, Center for Strategic and International Studies, and former Deputy Secretary of Defense, for delivering the symposium's keynote addresses.

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The Future Nuclear Landscape

A Complex and Dynamic Nuclear Landscape

In important ways, the world is at a nuclear crossroads. The complex and dynamic nuclear landscape presents us with challenges along at least four axes: regional nuclear proliferation, nuclear terrorism, great power nuclear relations, and the security implications of increased interest in nuclear energy. These problems are interrelated in ways that the national security community does not fully understand. Strategy and policy frameworks do not address them in sufficiently integrated fashion. New conceptual thinking is required to develop a more unified understanding of and approach to managing the risks and opportunities posed by these 21st-century nuclear challenges.

Today, more than at any other time in the nuclear era, nuclear capacity and potential (knowledge, technology, and materials) are accessible to a growing number of actors with more ambitious goals. The result is a high degree of *nuclear latency* that challenges traditional thinking about nuclear threats. Whereas 30 or 40 years ago, only a handful of countries were assumed to know how to acquire nuclear weapons, as many as 35 or 40 nations currently are believed to be in the know, and many more could become so based on their participation in civilian nuclear energy programs.[1]

In a world characterized by high nuclear latency, a number of risks stand out. One is simply that there may be multiple ways for states to be considered nuclear-capable. While robust nuclear weapons programs remain the most serious proliferation danger, a range of possibilities below this threshold or level of capability must be of concern as well. So must be models of weapons development enabled by technologies and processes that might be easier to conceal and harder to detect (for example, laser enrichment). A nuclear-latent world also challenges our thinking about warning, suggesting the possibility of a significant mismatch between lead times and reaction times. Finally, careful attention must be paid to the catalytic or transformative events that could push a latent nuclear actor toward a more active or accelerated posture. Japan often is cited as a possibility in this regard, but also of concern are so-called rollback states that could, with varying degrees of ease, reconstitute their nuclear weapons programs in response to changed conditions.

These considerations have significant implications for political and technical intelligence, not least of which is the need for a sharper focus on intentions. More broadly, there needs to be a way to measure latency that is meaningful to decisionmakers and planners. Metrics may be qualitative and/or quantitative and should strive to enable policies that can influence

both intentions (for example, through incentives) and capabilities (for example, through barriers).

The latency challenge will grow as more states gain access to either basic or more advanced levels of nuclear technology. Consider the countries that recently have expressed interest in or intent to initiate or expand nuclear energy activities, including in some cases developing an indigenous capability to enrich uranium: Algeria, Argentina, Australia, Brazil, Egypt, Morocco, South Africa, Turkey, Ukraine, and Venezuela.[2] Driving these decisions is a dynamic mix of motivations shaped by security, energy, and science. Anxiety about North Korea and Iran likely is fueling proliferation pressures in East Asia and the Middle East as threat perceptions evolve and concerns grow about the fraying of the international nonproliferation regime. Others may look at these cases and conclude that possessing or seeking nuclear weapons results in enhanced leverage and influence. Energy security is an increasingly salient factor in the appeal of nuclear technology, given the economics of oil and what may become increasing pressures to find alternatives to fossil fuels in light of global warming. Additionally, many countries associate *nuclear* not just with security or energy, but with modernity as well. That is, access to nuclear science and technology is seen by those who consider themselves behind as a powerful means to join the community of advanced nations.

The problem is not limited to states. Small groups or individuals operating outside traditional political boundaries may be capable of assisting states or terror groups in developing or acquiring nuclear capability. In this sense, the A.Q. Khan clandestine nuclear procurement network—to cite only the most prominent nuclear black market activity—is a concrete manifestation of globalization in the security arena. In the future, we may look back at the Khan phenomenon not as an anomaly but as the harbinger of a period in which literally anything could be bought or sold. Certainly, this is a problem that the framers of the Nuclear Non-Proliferation Treaty (NPT), 40 years ago, could not have anticipated.

It is no surprise, then, that the nuclear nonproliferation regime is under great stress. The regime overall has been effective in containing the spread of nuclear weapons, not least by giving governments confidence that restraint is in their self-interest. But the progress of determined, hostile proliferators poses a major threat to the integrity of the regime and the norms that it embodies. Failure to resolve these challenges and delegitimize various models of creeping proliferation could lead to a broad-based loss of faith in the regime and its effectiveness as a security alternative to possessing nuclear weapons. Increasing global energy demand is

a complicating factor not only because nuclear energy is becoming more appealing but also because of the geopolitics of oil. In a time of higher oil prices, it will be difficult to impose the type of hard sanctions that may be necessary to induce states such as Iran—a major oil exporter that also has the capability to interfere with other exporters' oil shipments—to limit their nuclear ambitions. China's rapidly growing need for imported energy is of particular concern here, as Beijing seeks to establish strategic relationships with major oil exporters such as Iran.

Indeed, it is not possible to separate regional nuclear proliferation challenges fully from the dynamics of great power strategic relations. While the United States has been highly proactive in developing innovative approaches to the weapons of mass destruction (WMD) problem, it needs the help of Russia and China to work the hardest cases, such as North Korea and Iran. Washington, Moscow, and Beijing clearly have some common interest in managing these problems, but there are also pressures working against cooperation, including differing assessments of the importance and urgency of the North Korean and Iranian nuclear challenges and uncertainty in each capital about where the others are headed in terms of nuclear and other strategic force capabilities. Strategic dialogue to address these uncertainties and forge a more common perspective on the nuclear future may make it easier to bridge some of the differences evident in addressing the WMD challenge. Exploring linkages across these dimensions of security may yield new opportunities for great power cooperation.

Potential "Game Changers"

An Openly Nuclear North Korea

North Korea's nuclear test of October 9, 2006, ended any doubt as to whether Pyongyang has developed nuclear weapons. The test was a logical progression of the North's nuclear policy, the overall thrust of which in recent years has been to convince the world—and the United States in particular—of its nuclear capability. While the technical aspects of the test suggest North Korea has only a rudimentary weapons capability, there is no longer any uncertainty about the North's ability to achieve a nuclear yield. North Korea must now be considered a de facto nuclear weapons state.[3]

In response to the test, the United States was successful in crafting a sanctions resolution that was approved unanimously by the United Nations (UN) Security Council. The sanctions are less than comprehensive,

however, and there are indications that China interprets its obligations under the sanctions resolution differently than does the United States. Moreover, South Korea has expressed reluctance to jeopardize a number of high-profile bilateral economic development projects with the North. These fault lines in the sanctions regime notwithstanding, diplomacy appears to have been given a fresh impetus in the immediate post-test period. Three-way talks brokered by Beijing involving U.S., North Korean, and Chinese officials resulted in an agreement to resume the six-party disarmament talks. According to press accounts, U.S. willingness to shift its stance on direct talks with North Korea and to discuss financial penalties imposed in 2005 on Asian banks accused of aiding North Korean counterfeiting operations were important factors in bringing Pyongyang back to the negotiating table.[4]

Whether the six-party talks have any realistic prospect of success is now openly debated. After taking actions—missile and nuclear tests—publicly deemed unacceptable to the United States and escaping the harshest penalties, North Korea may believe it can bargain from a position of strength. The United States hopes the opposite is true: that the UN sanctions will motivate Pyongyang and enhance Washington's leverage. Even as diplomacy continues, however, the practical focus has already begun to shift toward containing a nuclear-armed North Korea, particularly preventing and deterring nuclear use and nuclear transfers to third parties, and reassuring anxious regional allies. As the region begins adjusting to life with an openly nuclear North Korea, what are the possible repercussions?

One possibility is that having gained membership in what remains a fairly exclusive international club, Kim Jong-Il will feel more secure and perhaps become easier to deal with. More likely is that the increased confidence derived from possessing a demonstrated nuclear capability will embolden Kim to continue aggressive and risk-taking behavior. A number of significant dangers stand out: increased pressure on South Korea and Japan for purposes of extracting concessions and aid; accelerated efforts to build nuclear weapons capable of being delivered on long-range missiles; and, as nuclear fuel and weapons production increase, possible sales to terror groups or states seeking nuclear capability, both for financial gain and as a means to heighten the risks facing the United States. This last danger may lead the United States to consider additional and more explicit actions designed to limit North Korea's ability to transfer nuclear materials (for example, a blockade of goods leaving the North, or a tailored declaratory policy), as suggested by the sanctions resolution tabled by Washington shortly after the nuclear test.

Additionally, the United States and South Korea must consider the possibility that North Korea, if it develops more than a token arsenal, will integrate nuclear weapons into its war planning. It may be that Pyongyang views these weapons principally as instruments of extortion, coercion, and regime survival, but some analysts and planners believe that early North Korean use of nuclear weapons in a major war is plausible. Such early use conceivably could advance a number of possible objectives: raise the stakes of U.S. and Japanese involvement, deter attacks directly on the regime, avoid a "use it or lose it" situation, and galvanize loyalty among its own people. If it is possible that war on the peninsula could go nuclear early, there is no separating deterrence of North Korean nuclear use from deterrence or prevention of conflict altogether. This will require a deterrence strategy that combines threats of severe punishment with credible denial capabilities.

But whether a sustained effort to enhance deterrence will even be possible is unclear. Much will depend on whether the U.S.–South Korean alliance emerges stronger or weaker in the post-test period. While Seoul shows no sign of abandoning its efforts at forging closer ties to the North, some South Korean officials have pressed the United States to reaffirm, and even strengthen, existing security guarantees. China's diplomatic stature and its ambition to be seen as a responsible global power could suffer depending on the outcome of the six-party talks. While Beijing has facilitated the resumption of talks following North Korea's nuclear test, it has also been unable—or unwilling—to dissuade Pyongyang from taking the provocative actions that have created a crisis atmosphere in Northeast Asia. As talks resume with perhaps one last chance to achieve success, the stakes for China in encouraging restraint in North Korea's behavior and compromise at the negotiating table would appear to be high. Not least, failure in the six-party talks, followed by further steps on Pyongyang's part to strengthen its nuclear status, could create significant strains in U.S.-China relations.

The stakes may be even greater for the United States. Its stature and credibility would suffer in the wake of a major nonproliferation failure, especially one likely to result in intensified proliferation pressures throughout the region. The reverberations would be felt beyond the region as well. Iran, in particular, will be watching how the United States, other regional powers, and the international community respond to an openly nuclear North Korea. So will other states—both those contemplating the nuclear option and those who see their security as tied to the strength of the international nonproliferation regime. U.S. policymakers

must formulate a comprehensive strategy today in order to put in place political and military firewalls to contain the proliferation pressures that could be unleashed by an openly nuclear North Korea and to prevent or deter Pyongyang from using nuclear weapons and transferring nuclear capabilities to other states or terrorists.

A Nuclear Iran

Iran's pursuit of a nuclear capability is already a complex challenge for the United States and its allies, even though many Western analysts believe Iran is 5 to 10—and perhaps as many as 15—years away from being able to produce a weapon.[5] Iran remains on a sharp learning curve in its uranium enrichment efforts and may be experiencing technical difficulties that will slow the pace of producing bombmaking materials.[6] This means that significant time may remain both to pursue diplomatic solutions under which Iran would forego nuclear weapons and to impose delays on Iran's program in the hope that the current domestic consensus supporting it will weaken or collapse. Whether extra time can make a difference remains to be seen, but some government officials and experts outside government believe that Iran is intent on achieving some type of nuclear weapons capability and that negotiations or even coercive measures are unlikely to prevent that outcome. In this view, Tehran will accept isolation rather than concede on the nuclear issue, but it probably believes it can become a nuclear power at an acceptable price and leverage its nuclear status for enhanced power and influence.

A number of recent developments underscore a pessimistic outlook: the ascendance of Iranian rulers, including President Mahmoud Ahmadinejad, with possible messianic convictions; the strengthened position in Iran of the pro-nuclear Iranian Revolutionary Guard Corps (IRGC); the significant spike in global oil prices; and efforts by the Iranian government to make the regime more resistant to economic sanctions.[7] These developments are reinforced by fundamental Iranian mistrust of American intentions, a weakened U.S. position in the region, perceived divisions among the major powers, and, in all likelihood, a sense in Tehran that the "correlation of forces" is in its favor. Taken together, in the words of one analyst, "the thrust of these developments is that Iran appears to have committed itself fully—in terms of absolutist regime rhetoric, the investment of 'face' and material resources, and anticipation of penalties—to the completion of an indigenous nuclear fuel cycle as the basis for a nuclear weapons capability."[8]

Others argue that this kind of proliferation fatalism is dangerous in light of where Iran stands in the weapons development process, the very significant risks posed by a nuclear Iran, and uncertainty about whether

deterrence strategies can work.[9] But how might a nuclear Iran behave, and what are the implications? In the event that Iran goes nuclear, will everything in the region change at once, or will the effects unfold slowly and incrementally?

Answers to these questions are inherently speculative, and there is no consensus among experts. Some believe a nuclear Iran—whether overtly nuclear or capable of assembling weapons rapidly—will present an even greater challenge to Western interests and regional stability, more openly asserting its hegemonic ambitions, intimidating its neighbors, exporting its brand of Islamic revolution, and leveraging its position in the global oil economy. Nuclear capability will lead Iran to take more risks, much as Pakistan was emboldened by its 1998 nuclear tests to confront India in Khargil, and much as Saddam Hussein's adventurism appears to have been fueled by progress in chemical and biological weapons in the late 1980s. Others wonder whether Iranian nuclear weapons would remain under centralized control, or who would control the details of nuclear operations. The possible role of the IRGC is especially problematic here, given its contacts with known terror groups. Iran could also decide to become a supplier of nuclear technology to other problem states.

An alternative view posits that a nuclear Iran will feel more secure and pursue a more moderate course in the region, adopt a deterrence strategy, and rather than brandish its nuclear weapons, treat them as weapons of last resort and regime survival. But even if nuclear weapons do not moderate Tehran's behavior, some analysts believe that Iran can be deterred and contained, even from transferring nuclear capabilities to terrorists.[10] Is there a basis for deterrence optimism in the case of Iran other than a general belief that states are rational actors and perforce constrained by fear of retaliation? Deterrence remains a guessing game to a significant degree, but some analysts suggest that the United States faces an enormous challenge making deterrence threats credible to Iran's leaders—and convincing them that we will not act on these threats if Tehran conciliates. Fundamentally, the Iranian leadership views the United States as inherently hostile, and there is little basis to assume how they would respond to U.S. threats or pledges of restraint. The emergence of national leaders with possible messianic convictions who may seek confrontation is a potentially significant complicating factor. Still, elements of the leadership, while perhaps overestimating U.S. hostility, seem to understand the substance of U.S. declarations and appear capable of conciliating if compelled. Thus, deterrence appears viable in principle, but it will require gaining a far greater degree of situational awareness than we currently

possess, and a very careful calibration of the variables that would shape deterrence dynamics in an actual crisis.

How would others in the region react to a nuclear Iran? Will Arab states that have learned to live with a nuclear-armed Israel (particularly Egypt and Syria) find themselves unable to live with a nuclear-armed Iran? Not necessarily. Neither of these states reacted in kind to Iraq's pursuit of nuclear weapons. These states might choose instead to improve selected conventional or chemical capabilities. States such as Turkey, Saudi Arabia, and a future Iraq may feel compelled to react in some way, though it may be possible to influence their responses through their security ties to the United States and others. The groundswell of anxiety emerging in the region as a result of Iran's growing power and influence conceivably could lead to stronger collective security arrangements in the Gulf. Alternatively, it could lead to greatly heightened proliferation pressures in response to which countries such as Egypt, Turkey, and Saudi Arabia decide to pursue an independent nuclear capability. The first two have recently announced plans to expand nuclear energy activities; the latter two have ties to nuclear powers that could provide assistance (Israel and Pakistan, respectively).[11] None of them may wait until Iran crosses the finish line. How Egypt and Saudi Arabia react may also be shaped in part by Israel's actions. In an effort to buttress deterrence of Iran and reassure its own public, Israel might choose to declare its nuclear status openly, while exploring further options to enhance the survivability of its forces and protection of its cities. Such a development could reinforce Cairo's and Riyadh's interest in the nuclear option.

Finally, the United States, confronted with a nuclear-armed Iran, will need to consider a broad range of actions to manage a new and complex set of risks and challenges. Even as political and coercive strategies to prevent Iran from going nuclear continue to unfold, it is not too early to consider contingency planning focused on:

- reassuring regional friends and allies and trying to contain proliferation pressures through enhanced security cooperation
- assessing the prospects for coercive disarmament through political or military means
- enhancing U.S. military capabilities in the region, including those for power projection, missile defense, and nuclear, biological, and chemical protection for forces and populations
- developing a tailored deterrence strategy
- preventing Iran from transferring nuclear capabilities to terrorists.

Fallout from the U.S.-India Deal

In July 2005, the United States and India announced the creation of a global partnership that would include civil nuclear cooperation, ending a nearly 30-year embargo on U.S. nuclear trade with India. In March 2006, the two governments reached agreement on the details of the U.S.-India Civil Nuclear Cooperation Initiative, under which India will separate its civilian and military nuclear facilities, and place some of the civilian sites under International Atomic Energy Agency (IAEA) safeguards. Additionally, India has committed to adhere to the IAEA's Additional Protocol, continue its unilateral nuclear test moratorium, not transfer enrichment or reprocessing technologies to states that do not have them, adopt national export control laws in harmony with the Nuclear Suppliers Group and Missile Technology Control Regime, and work with the United States to conclude a Fissile Material Cutoff Treaty.[12] The George W. Bush administration has committed to seek changes to U.S. nonproliferation laws and international nuclear commerce rules in order to accommodate the agreement, supply nuclear fuel to India, and enable Indian participation in international research activities exploring advanced nuclear energy concepts.[13]

For the United States, the impetus for reversing almost three decades of nonproliferation policy is fundamentally political: to transform the relationship with India by ushering in a new era of cooperation that will strengthen India's position and thereby promote a more stable order in Asia. U.S. and Indian interests are converging, and a democratic, economically dynamic, and politically moderate India is seen as a natural ally of the United States in a strategically important region. Not least, an India with enhanced international legitimacy, growing power, and energy security can serve as a de facto counterweight to an increasingly powerful China, although administration officials insist this is not the principal purpose of reconfiguring relations with New Delhi.

Washington sees bilateral nuclear cooperation as enabling this transformation. This requires remedying India's anomalous position in the nuclear nonproliferation regime, bringing it closer to the mainstream of global nonproliferation efforts. India will no longer be treated as a nonproliferation outlier or be subject to sanctions for being a nuclear power outside the NPT. In return, India will bring at least some of its nuclear activities and national laws into compliance with longstanding rules governing safeguards and nuclear commerce. Principally, India will place an additional eight power reactors under safeguards by 2014, and will do

the same for future reactors it declares to be civilian. Additional facilities associated with fuel fabrication will also be made available for safeguards. Excluded from the separation plan are eight operational or planned power reactors, breeder reactors under construction, heavy water plants, uranium enrichment facilities, spent fuel reprocessing facilities, and selected research reactors.[14]

The agreement has generated strong criticism among some Members of Congress and in the nonproliferation community. The critique of the agreement falls along the following main lines:

- It excludes too many Indian facilities from safeguards and fails to place meaningful limits on India's ability to produce fissile materials for weapons. Indeed, U.S. fuel supplies to India could facilitate expansion of its nuclear arsenal.[15]
- It undermines the NPT regime by rewarding a nonmember with nuclear technology and undermining the standard of full-scope safeguards as the criterion for receiving nuclear assistance (affirmed at the 1995 and 2000 NPT Review Conferences).
- It creates a double standard and sets a bad precedent at a time when the international community is struggling to deal with North Korean and Iranian nuclear activities. In fact, it is not clear how much support the United States can expect from India on the Iran case, given the growing strategic relationship between New Delhi and Tehran.
- It will not bring India into the nonproliferation mainstream because India remains outside the NPT, has not signed the Comprehensive Test Ban Treaty, and continues to produce fissile material for weapons.
- It will not lead India to become a counterweight to China. India may compete with China for regional influence, but there are also important elements of political, economic, and military cooperation in the relationship. Moreover, India has a strong tradition of foreign policy independence.

Administration officials characterize the agreement, despite its limitations, as advancing nonproliferation objectives by enlisting India more fully and explicitly in global efforts to limit nuclear proliferation, without adding to India's military capabilities. While India remains outside the NPT, it is viewed by Washington as having a good record on nonproliferation and technology transfer and as a responsible steward of its civilian and nuclear enterprises. The agreement with India may represent a nonproliferation double standard, but the circumstances are sufficiently unique that it should not set a harmful precedent. The payoff is promising enough to make the benefits outweigh the risks, which can be managed. In any case, the punitive policies of the past are clearly obsolete.

Beyond stating the obvious—that the U.S.-India nuclear deal is a watershed development whose consequences are likely to be significant—it is difficult to predict how the agreement will shape proliferation dynamics or the politics of nonproliferation. The double-standard issue should not be casually dismissed. In the assessment of one analyst:

> In the past 10 years, virtually all states agreed to strengthen the nonproliferation regime, sacrificing some sovereignty by allowing additional, intrusive inspections under the Additional Protocol. In the wake of the revelations in 2004 about Pakistani scientist A.Q. Khan's nuclear black market sales, non-nuclear weapon states under the NPT are also being asked to consider further restrictions on their sovereignty by voluntarily restricting their access to sensitive nuclear technologies like uranium enrichment and reprocessing. If some states view the U.S.-Indian nuclear cooperation agreement as a breach of faith in the basic bargain of the NPT, they might be less inclined to accept additional sacrifices, to the detriment of the nonproliferation regime.[16]

Moreover, nuclear powers whose help we need to deal with Iran, in particular China and Russia, are quick to point out what they view as double standards in U.S. nonproliferation policy. This is one type of consequence to be concerned about. Another is the possibility that the agreement could contribute to pressures to expand nuclear arsenals in the region. The agreement may or may not lead India to enlarge its stockpile, but it is likely to fuel Pakistani anxiety about its own capability to produce sufficient fissile materials and weapons and about the implications of greater U.S.-India cooperation for the conventional balance on the subcontinent as well. Chinese opposition to the agreement has become more vocal, and from Beijing's vantage, the potential for growth in Indian fissile material stocks and weapons production, especially in the context of developments in longer-range missiles, heightens the threat facing China. While a major nuclear buildup in the region may not be inevitable, the risk of an arms race cannot be dismissed. Much will depend on India's behavior in the period ahead. The United States should be paying attention now to the ways in which regional nuclear dynamics could be reshaped by civil nuclear cooperation with India—dynamics that include the United States, India, Pakistan, China, and possibly Japan.

Nuclear "Next Use"

The next use of a nuclear weapon will shock the international system with potentially far-reaching consequences, especially if it is deemed successful in achieving the user's objectives. In considering the prospects

for nuclear next use, three critical questions present themselves: Is nuclear use becoming more likely? How will the next use of nuclear weapons shape attitudes about the utility of nuclear weapons and incentives to possess them? What are the implications for U.S. policies, forces, and planning? While exploration of these questions is inherently speculative, it can nonetheless yield insights useful to policy development.

More Likely? Use of nuclear weapons in the foreseeable future is conceivable in a number of potential regional conflicts where such use may appear to one or more actors as the best of a set of bad alternatives. Highly motivated terrorist groups are another concern. Prudent policy planning should assume that a next use of nuclear weapons is becoming more likely. But what could such use look like? Although the specific circumstances are impossible to know, the key variables surrounding nuclear use can be defined. These include the user (state or nonstate); timing in the context of a crisis or war; type of weapon; point of attack; objectives; effects; and net operational/strategic result. Using these variables, scenarios can be generated to develop and test hypotheses about nuclear use.

Looking at a significant number of illustrative scenarios, state use of nuclear weapons can be envisioned in all phases of conflict. It is difficult to define a moment of maximum danger; nuclear use may occur at any point along a continuum from "out of the blue" through the escalating phases of a crisis-conflict and even in a postconflict phase. Terrorist use of a nuclear weapon is likely to be unexpected—although it might not truly be a surprise, given documented terrorist interest in nuclear capability—and from today's vantage is most plausibly associated with al Qaeda and its affiliated jihadist organizations.

Characteristics of a nuclear next use also could vary widely. Under some conditions, a nuclear test could qualify as a next use, undertaken for political rather than technical reasons. Detonation of a nuclear weapon to achieve electromagnetic pulse (EMP) effects could be seen as an attractive option for some nuclear-armed states. Nuclear use could support objectives ranging from coercion to military operations, war termination, regime preservation, and revenge. Western analysts often view regional nuclear capabilities as weapons of last resort, or closely tied to regime survival. This may well be the case in many circumstances. In other circumstances, though, states may see the use of nuclear weapons as the only viable means to change the status quo or remedy a deteriorating regional security situation. In contrast to some Western thinking about nuclear weapons at least since the 1960s, next nuclear uses could be intended to dominate the battlefield and make possible a military victory in an ongoing regional conflict. Particularly in the case of

India and Pakistan, either country also could view nuclear use as a means of preempting anticipated nuclear use by the other side. Finally, the purpose of nuclear next use could be to catalyze action by an outside party—that is, to create pressures for other countries to become involved in a conflict.

For states contemplating use of nuclear weapons, there are two critical thresholds to be managed: a lower threshold of expected success in achieving its objectives, and a higher threshold of triggering decisive counterescalation by the country attacked or its allies. The next user will want to be above the first threshold and below the second. What is especially dangerous is that neither threshold is likely to be well defined or well understood—and both are subject to change as a crisis or war unfolds. This is but one example of how misperception could contribute to a nuclear next use.

What Impact? The impact of next nuclear use on the perceived utility of nuclear weapons and incentives to acquire them will hinge most critically on how successful the use is seen by various leaderships. Success or failure is likely to be measured in immediate results, near-term consequences, and longer-term spillovers. How other countries, including the United States, respond after next use could have an important influence on how perceptions form and take hold.

Any next use will erode the longstanding taboo against nuclear use, though to what extent will depend on many factors, including the degree to which the use is seen as justified by the international community. A failed use, a test, or a use with grave and graphic destruction might result in less erosion of the nuclear taboo. By contrast, a successful use that advanced political and military goals and did not result in decisive counterescalation could result in greater erosion. The impact of terrorist nuclear use seems even more uncertain, but if seen not as an isolated event but as part of a larger campaign or a harbinger of more to come, it could well serve to erode the nuclear taboo that has heretofore constrained state actors.

Any nuclear use is likely to influence state incentives to acquire nuclear weapons or strengthen their nuclear security in some other way. Here, too, the perceived success or failure of nuclear use would be the most important variable. Failed use that led to the virtual destruction of the next user would graphically demonstrate the dangers of nuclear weapons and probably help bolster nonproliferation efforts. By contrast, a next use that undermined the perceived credibility of American nuclear security guarantees could compel many countries to rethink their posture of nuclear abstinence.

Implications. While nuclear terrorism understandably remains a dominant focus of policymakers, it is also important to take seriously the possibility of next use by a state. Policy, military, and intelligence planning should focus on gaining an improved understanding of the conditions under which different nuclear states might employ their weapons, as well as the full set of U.S. interests that would be engaged by such an event. Preventing and deterring nuclear next use are clearly the preferred outcomes, but should these fail, U.S interests will include deterring follow-on use, reassuring allies and friends, shaping perceptions of nuclear weapons utility, defusing ill-considered demands for nuclear disarmament, and crafting responses that will leverage the shock to shape the post-use security environment (for example, restoring the nuclear taboo and strengthening nonproliferation efforts).

Where U.S. interests are directly targeted or threatened by a nuclear attack, it will be especially important not only to ensure adequate crisis and consequence management, but also to take steps to enhance defenses, restore deterrence, and convey to the adversary the great risks associated with nuclear use against the United States or its allies. Regardless of U.S. stakes in a region prior to nuclear use, they are likely to be transformed by the very act. Above all, the United States should put in place policies, plans, and capabilities to ensure that any next use against the United States or an American ally will fail—and to make it known that U.S. policy is committed to that outcome.

New Approaches to the Nuclear Fuel Cycle

The nuclear proliferation crises of the last decade have compelled policymakers to consider how to close the most serious loophole in the NPT bargain: the ability of nuclear aspirants to build the means to manufacture weapons under the cover of civilian nuclear programs. This is now widely appreciated as the center of gravity of the proliferation problem. As nuclear technologies continue to spread, especially to meet energy demands, the building blocks for a weapons capability will unavoidably spread as well, and spent fuel stocks could grow significantly. But even without a major expansion in global nuclear energy, this problem now demands urgent attention, and serious proposals have been put forth in recent years.

Two basic approaches have been articulated. One emphasizes enhanced export controls to limit the spread of nuclear technologies. Speaking at the National Defense University in February 2004, President Bush called on the Nuclear Suppliers Group to deny the transfer of enrichment and reprocessing technologies to states that do not already

possess them, even if these states are nonnuclear members of the NPT. He further asked these states to renounce enrichment and reprocessing in exchange for reliable access to nuclear fuel at a reasonable price.[17]

An alternative approach proposed by Dr. Mohamed ElBaradei, IAEA director general, goes further by challenging the very idea that states should even possess the most sensitive nuclear technologies. Acknowledging that "the margin of security under the current non-proliferation regime is becoming too slim for comfort," ElBaradei proposed to restrict enrichment and reprocessing exclusively to facilities under multinational control; adopt nuclear energy systems that by design avoid the use of materials that may be applied directly to making nuclear weapons or are otherwise proliferation-resistant; and develop multinational approaches to manage and dispose of spent fuel and radioactive waste.[18]

Both these approaches promise to toughen the nonproliferation regime, but neither is easy to implement or problem-free. Both are likely to be viewed by nonweapons states as discriminatory and inconsistent with their basic right under Article IV of the NPT to acquire nuclear technology for peaceful purposes. A strategy of denial based on informal, nonbinding arrangements may provide only a limited or temporary barrier to the further spread of key technologies, especially if demand for nuclear energy continues to grow. Furthermore, it may encourage the emergence of additional clandestine nuclear supply networks.[19] Multinational approaches to the nuclear fuel cycle are hardly a new idea and date back to the beginning of the nuclear age and the Baruch Plan of 1946. Despite many subsequent efforts, little progress has been made, as nations have been reluctant to give up national control over these technologies and processes for reasons of sovereignty, concerns about the assurance of supply, and economics. For these same reasons, near-term prospects for a multinational solution seem limited.[20] Nonetheless, both the Bush and ElBaradei initiatives recognize that the nuclear nonproliferation regime is at an important historical juncture that requires new ideas.

There is also a common belief that technology is part of the solution. ElBaradei speaks explicitly in his proposal about proliferation-resistant fuel cycle technologies. In the United States, the Department of Energy (DOE) in February 2006 announced the Global Nuclear Energy Partnership (GNEP), an initiative to develop new technologies for reprocessing and recycling spent fuel from nuclear power reactors that minimize waste and reduce proliferation concerns. If they can be developed, these technologies, it is argued, will be more proliferation-resistant than current methods

because they will not separate out pure plutonium as part of the recycling process; rather, plutonium would be combined with other materials that render it significantly less dangerous as a proliferation concern.[21] This material would be destroyed in accelerators or fast reactors. Uranium and other elements that are chemically removed from spent fuel would be recycled, thereby extracting more energy and reducing the volume and heat load of waste requiring permanent geologic disposal. Based on international and private sector response, DOE believes there are suitable advanced technologies available that may be ready for demonstration and possibly commercial scale operation. Under GNEP, the United States also envisions working with other advanced nuclear nations to develop a fuel services program to provide fresh fuel and recovery of used fuel to nations that forego the development of enrichment and reprocessing technologies.

Questions about GNEP concern both its policy and technical aspects. Some experts believe that ending the de facto U.S. moratorium on reprocessing will damage the nonproliferation regime and contribute to proliferation dangers. In this view, actively promoting reprocessing makes it attractive to others and makes it more difficult to argue that the technology should be restricted. Moreover, reprocessing facilities anywhere are potential sources for terrorists seeking nuclear materials. Others question whether the technologies being advanced are truly more proliferation-resistant as they would still produce a material that could be used to make a nuclear weapon and may be only marginally more resistant to theft than separated plutonium. Still others believe that no advanced fuel cycle technology can be as cost-effective in minimizing proliferation risks as storing unreprocessed spent fuel in a geologic depository. Finally, some observers question the wisdom of moving rapidly toward commercial-scale reprocessing facilities under GNEP, preferring to see a broad, balanced research and development (R&D) effort to identify new fuel cycle technologies for the longer term.[22]

Challenges in Shaping the Nuclear Landscape

Impact of the War in Iraq on U.S. Nonproliferation Efforts

Many governments feel alienated from Washington because the public rationale for the Iraq war is widely viewed as either illegitimate or based on a massive intelligence failure. The damage to U.S. credibility has been serious, making it more difficult to marshal others to confront new proliferation threats vigorously (or support U.S. objectives more broadly).

Forging a common approach to Iran within a coalition that divided bitterly over Iraq has compelled the United States to make significant adjustments to its strategy. The war also has deepened political divisions at home, making the search for bipartisan approaches more difficult. These domestic political constraints and the strain on U.S. forces resulting from the war are recognized by Iran and North Korea, whose leaderships likely now see the United States as less willing or able to pursue coercive strategies that implicitly or explicitly threaten military action in response to their proliferation activities. As a result, these countries are emboldened to resist international pressure to dismantle their nuclear programs or capabilities.

Limited Help from Russia and China

Moscow and Beijing care about containing the spread of nuclear weapons, just not as deeply or intensely as does Washington. While Russia and China do not wish to see unchecked proliferation, neither are they prepared to make major political or economic sacrifices to support a nonproliferation agenda that is viewed at least by some officials as preserving American advantage. Strategic economic considerations increasingly reinforce this: nuclear technology is one of the few technologies that Russia can market competitively, and China's aggressive effort to secure energy sources colors its posture toward proliferation problems, such as that of Iran. Whereas in the past it may have been possible to treat the proliferation problem as a more or less stand-alone issue in great power relations, it is no longer possible to separate it from broader economic, energy, and regional security considerations. Any effort by the United States to forge a more common or cooperative great power approach to managing WMD challenges will require recognizing and addressing Russian and Chinese equities.

Chinese officials and commentators increasingly suggest that U.S. nonproliferation policy is self-serving and based on double standards. Whereas China is pressed on cases such as Pakistan, Iran, and North Korea, the United States expects others to support preserving the special status of Israel, rewarding India despite its refusal to join the NPT, and accepting the creeping nuclearization of Japan. Russia, for its part, has recently issued an official document on nonproliferation policy that accuses the United States of politicizing nonproliferation and opposes key elements of U.S. strategy (although without mentioning the United States).[23] On the other hand, neither country likely would allow differences over proliferation to cause a fundamental breach in their relationships with Washington, and there are cooperative activities that are potentially significant. The ongoing strategic dialogue with China provides an opportunity to seek stronger common

ground on countering WMD. Presidents Bush and Vladimir Putin recently launched the Global Initiative to Combat Nuclear Terrorism, designed to expand and accelerate efforts and capacity among like-minded nations to control nuclear materials, stop illicit trafficking, respond to acts of nuclear terror, deny safe haven, and strengthen national legal frameworks.[24]

Gaps in Knowledge and Understanding of Suspect Programs and Activities

Limitations in WMD intelligence are by now a well-studied problem. Even before the serious questions raised by the Iraq war, there were efforts to assess the capabilities of the Intelligence Community with respect to WMD and identify required reforms.[25] The WMD intelligence track record is mixed. There have been major successes (not always publicly acknowledged), and there are recognized oases of excellence in the community with respect to WMD intelligence collection and analysis. There have also been some significant failures and chronic dysfunctions stemming from a broad range of organizational, operational, and analytical shortfalls.[26] In the aftermath of Iraq and in the face of continuing uncertainties vis-à-vis the nuclear intentions and capabilities of North Korea, Iran, al Qaeda, and others, it is not surprising to hear the question asked: Are our intelligence capabilities good enough to understand this threat properly and anticipate the range of challenges that may emerge?

While there is vast room for improvement, it is essential to have realistic expectations. Determined, adaptive proliferators skilled at deception and denial will find ways to conceal at least some of their activities from even a greatly improved WMD intelligence enterprise. To some degree, therefore, uncertainty will always outweigh certainty, and policymakers must accept that there are inherent limits to WMD intelligence. But much can be done to reduce uncertainty and the ambiguity associated with clandestine WMD programs. Emphasis should be placed on minimizing the prospects for significant strategic surprise and providing decisionmakers with more robust and timely actionable intelligence. Reforms to enable this must encompass organization, methodology, and technology. Compensating for inevitable intelligence gaps also requires the military to emphasize a capabilities-based approach to planning and investing.

Organizationally, a fundamental problem has been the lack of aggressive Intelligence Community ownership of all aspects of the combating WMD intelligence mission. Creating the Office of the Director for National Intelligence (ODNI) and a supporting National Counterproliferation Center (NCPC) is intended to remedy this problem. Among the

greatest challenges facing the ODNI and NCPC are improving horizontal integration across the WMD Intelligence Community and coordinating collection and analysis efforts around specific high-priority targets.[27] With respect to methodology and technology, new sources and methods are required that are less well known to adversaries and more tailored to discovering concealed WMD activities. These methods overall must focus more on the earliest stages of the proliferation process, and they require a sharper focus on intentions, people, transactions, and critical nodes, enabled by improved human intelligence, information processing, and exploitation of persistent intrusive sensing technologies.

Cultural and Organizational Obstacles to Effective Responses

Strategy and policy analysts often do not understand science and technology well. Nuclear functionalists tend to lack in-depth regional expertise, while regional or country specialists are not always well versed in strategic force issues (China is a good example). There also is a gap between nuclear analysts and those working on other military issues. These cultural problems both reflect and perpetuate divergent vocabularies and frames of reference, and contribute to stovepipes, turf battles, and weak integration of activities. In the combating WMD arena, stovepiped organizations and processes have been a persistent problem dating back many years. There are signs, however, that the community is moving toward greater unity of effort.

In the last 2 years, the Department of Defense (DOD) has established an organizational and planning framework to define and execute the combating WMD mission. The National Military Strategy to Combat WMD provides an "ends-ways-means" approach to planning, executing, and resourcing to guide the activities of combatant commanders, Services, and support agencies. It defines core military strategic objectives, guiding principles for developing concepts of operations and plans, and eight critical missions for the Armed Forces.[28] The designation of U.S. Strategic Command (USSTRATCOM) as lead command for combating WMD has laid the foundation for a more integrated, synchronized effort across the combatant commands and DOD as a whole to implement this strategy. For the first time, there is a single focal point for the Armed Forces, an important step toward further institutionalizing combating WMD in DOD.

To execute on a day-to-day basis, the commander, USSTRATCOM, has established the USSTRATCOM Center for Combating WMD, a component-like organization closely linked to the Defense Threat Reduction

Agency. The test of these new command and organizational arrangements will be the degree to which they can assist regional commands to define, plan and resource for, and execute rigorously all aspects of the combating WMD mission. One key focus today is the development of Concept Plan 8099, the global concept for the combating WMD mission that will provide the planning template for all regional commands. Another is the set of joint concepts and capabilities-based assessments that are being conducted to support the definition of warfighter requirements and enable the USSTRATCOM commander to be an effective advocate in the requirements process.

In the Department of State, the Office of the Under Secretary for Arms Control and International Security has reorganized to align its activities with national combating WMD priorities, to include nuclear detection activities, nuclear information-sharing, consequence management, and the development of country- and region-specific plans that can be synchronized with DOD plans. In the Intelligence Community, the aforementioned National Counterproliferation Center will integrate intelligence, coordinate planning, and conduct strategic operational planning at the national level.

Indicators of greater intra- and interagency jointness are encouraging, as are signs that the WMD terror threat has brought the counterproliferation and counterterrorism communities closer together. But a strong push is needed to ensure that interagency structures and processes are capable of effectively managing complex contingencies involving WMD from start to finish—from policy formulation to coordination and execution of operations. Policymakers a decade ago recognized that WMD could be a complicating factor in managing complex contingencies.[29] This is no less true today, and indeed has been brought into even sharper relief by intervening events. So the question remains: How can the government institutionalize a collaborative process to plan, execute, and assess combating WMD activities and operations, utilizing all the tools of statecraft? Especially as the combating WMD playing field becomes more crowded, as the toolkit becomes more diverse and sophisticated, and as multiple national and international efforts become more interdependent, the requirement for timely and effective interagency coordination will only grow. This will require more than refining national strategy and preparing decisions for the President; it must include putting in place mechanisms to create and sustain long-term plans for combating WMD that develop integrated courses of action and enable their execution across multiple agencies, including DOD. This capability, if it can be achieved, will create

new opportunities for defeating the threat, in some cases reducing pressures for military action.

Practical steps toward strengthening interagency capabilities for combating WMD include developing an overarching interagency concept of operations; clarifying DOD's relationship to other agencies for both war plan execution and response to domestic events, and the associated requirements for interagency support; creating the capacity for rapid interagency crisis action planning and mission execution; and increasing capacity in civilian agencies to better support operations.

Progress in Addressing Nuclear Threats

A range of programs is now in place to enhance capabilities to deny terrorists access to WMD materials, technologies, and expertise. These include initiatives that target the spectrum of chemical, biological, radiological, and nuclear threats, such as the Proliferation Security Initiative, and efforts managed by the Department of the Treasury to disrupt terrorist financing. In the nuclear area specifically, additional effort has been focused on a number of important challenges, such as the security of nuclear facilities in Russia, detecting the movement of nuclear or radiological materials, attributing nuclear attacks in the United States, and meeting the information needs of first responders.

Security of Russian Nuclear Facilities

Terrorists may acquire nuclear capability in a number of ways, including an outright purchase or gift from a nuclear weapons state, or through the theft of materials that could be used to construct a nuclear or radiological weapon. Theft, in fact, is our greatest concern with respect to the security of nuclear facilities in Russia. Efforts to date to improve nuclear security in Russia have been effective: today, 80 percent of the sites where materials are stored have been secured, and current programs are on a pace to complete this process by 2008. There has been some progress as well in instilling a security culture, a best practices approach, and an emphasis on emergency management capabilities.

But there are troubling trends as well. The growing influence of the security services has created obstacles to accessing some sensitive sites, though Russian authorities have said that they will upgrade security at these sites on their own. It is also clear that Russian standards for physical security are less robust. Moreover, a culture of corruption persists in Russia, underscoring the risks associated with the insider threat. Many

small-scale incidents demonstrate this, and while it is a problem the Russian military seems to appreciate, it is less clear that officials of the Federal Agency on Atomic Energy have a similar appreciation. Of equal or greater concern are questions about whether the Russian leadership is willing to commit the resources needed to sustain security improvements over time. If they are not, much of the progress that has been made under bilateral threat reduction programs could be at risk.

Nuclear Detection

The U.S. organizational focal point for this mission is the Domestic Nuclear Detection Office (DNDO), which is a jointly staffed national office established to improve capabilities to detect and report unauthorized attempts to import, possess, store, develop, or transport nuclear or radiological material for use against the United States. Managed by the Department of Homeland Security (DHS), the DNDO has formulated a global nuclear detection architecture with multiple geographic layers and multiple opportunities for detection, including materials protection, control, and accountability, overseas border security, port of departure screening, overseas interdiction, Coast Guard inspections, and U.S. border protection. A systematic assessment has been performed of these layers and associated capabilities to encounter, detect, identify, and interdict the threat. Plans to close capability gaps have been put in place.

Currently, two programs provide the majority of detection assets to foreign ports of departure: the DOE Megaports initiative and the DHS Container Security Initiative (CSI), which operates at 50 ports worldwide. In 2005, CSI ports processed 73 percent of all containers destined for the United States prior to lading.[30] Secondary screening measures are executed on containers that trigger existing detectors. Future emphasis will be placed on increasing the volume of U.S.-bound cargo scanned for nuclear and radiological material, using both passive detection and automated radiography, and transmitting all collected data to appropriate government authorities. An important R&D thrust is to develop next-generation passive sensors to enable 100 percent passive coverage of all official ports of entry, with relocatable assets for other locations. There is also substantial investment in handheld and portable systems to support the Border Patrol and Coast Guard, commercial vehicle inspection, expanded surveillance for high-risk cities, and Federal surge capacity.

Nuclear Attribution

Developing a robust forensics and attribution capability for covert nuclear attacks presents major technical, organizational, and policy challenges. The national-level effort in this area, known as the Domestic Nuclear Event Attribution (DNEA) program, has only recently been acknowledged publicly. Managed by the Defense Threat Reduction Agency, the DNEA program (as the DNDO) is an interagency activity. The focus is on post-detonation technical nuclear forensics that can support a determination of attribution that would also be informed by intelligence and law enforcement findings. An initial operational capability has been achieved for improvised nuclear devices, and government authorities have expressed a high degree of confidence that this mission can be accomplished in a timely way.[31] Attention has now turned to radiological dispersal devices, for which many more potential sources exist.

From a technical standpoint, the forensic requirement is to determine materials and design, and from there identify the source. For the former, capabilities such as robotic technologies and deployable field laboratories are being developed. For the latter, there must be a known source against which to compare debris, and our database of sources needs to be as comprehensive as possible. Whether the goal is to support legal prosecution or to respond politically and militarily to an attack (or both), it is essential to maintain a chain of evidence and to exercise the decision process with decisionmakers. Ultimately, attribution is a political process that will require senior leaders to determine how much and what kind of information to make available to allies, adversaries, the international community, and the public. An effective attribution capability contributes importantly to deterrence.

Nuclear Consequence Management

With the increased concern today about the likelihood of nuclear use, especially by terrorists, greater attention is being paid to the Nation's preparedness to respond to the effects of one or more low-yield nuclear detonations in a major urban area. In a series of workshops, the Center for the Study of Weapons of Mass Destruction (WMD Center) undertook to identify the key questions about such effects that responders would need answered in the immediate aftermath of an event and to determine whether the answers would be available to them in a timely way.

In identifying the key questions that would need to be answered, the WMD Center found that one or more low-yield nuclear detonations in a major U.S. urban area would directly engage to varying degrees almost

all U.S. Federal agencies as well as those of affected states, localities, and private sector entities. These entities would turn to U.S. nuclear experts, particularly at the Federal level, to provide fast, accurate, and actionable responses to a large and diverse set of questions about nuclear effects and response. The most important questions that U.S. nuclear experts would be looked upon to field in the immediate aftermath of the detonations would concern:

- impacts on key infrastructure, especially communications, transportation, and power
- government capacity for response, especially the availability of response personnel and medical resources
- who is in charge of the response
- timely guidance on how to respond, especially evacuation versus shelter-in-place, triage, and movement from the hot zone to a clean zone
- rapid delineation of radiation hazard zones, especially their perimeter and variability, and whether responders can safely enter.

In examining the Nation's preparedness to answer those questions in a timely way, the WMD Center concluded that important, actionable gaps exist in U.S. preparedness. Most gaps arise from a failure to communicate existing knowledge effectively about nuclear effects and the most appropriate responses thereto from national sources of expertise to responders at state and local levels. Responders need greater education about nuclear weapons effects and response, especially regarding radiation. National standards for nuclear response need to be established and/or harmonized across all levels of government. Nuclear response standards and guidance need to be made available to responders in readily accessible, field-useable form. Closing some gaps may require new knowledge, which may be obtainable through modeling/simulation, technological R&D, surveys/inventories, and other research.[32]

Improving U.S. preparedness to respond to low-yield nuclear detonations in a major urban area does not necessarily require a new, high-profile government initiative; it should be possible to accomplish via existing Federal interagency and Federal/state/local government information-sharing and cooperation mechanisms. However, it will require sustained, active leadership and oversight by a national entity with the requisite mission and authorities, such as the U.S. Homeland Security Council or Department of Homeland Security.

Nuclear Modernization in Russia, China, and the United States

Russia: Modernized Weapons Central to Security

The discussion of nuclear weapons in Russia is vastly different from what occurs in the West. Political and military leaders in the United States and Europe generally seek to avoid open discussion of national or alliance nuclear weapons issues. In part, this is because these issues are a point of sharp contention among national security elites and certain segments of public opinion. It also reflects a widespread belief among military leaders that our nuclear weapons are decreasingly relevant to the dominant security challenges we now confront. By contrast, Russian leaders speak frequently about the central role of nuclear weapons in national strategy, acknowledge that Russia's status as a world power is based largely on its nuclear arsenal, and tout new developments in Russian nuclear forces.[33] This is intended to remind the world that Russia remains a nuclear superpower and to strengthen deterrence at a time when conventional forces remain inadequate and potential adversaries could question Russia's resolve or capabilities. These imperatives are reflected most notably in the continued priority Russia affords nuclear forces in allocating defense resources.

Strategic nuclear systems are a budgetary priority for the Kremlin, even at the expense of needed improvements to conventional forces.[34] Moscow seems intent on maintaining a full range of weapon types, and modernization efforts include the silo-based and road-mobile Topol-M (SS–27); new ballistic missile submarines armed with the Bulava submarine-launched ballistic missiles (SLBMs); new long-range cruise missiles; maneuverable warheads to penetrate missile defenses; and possible new intercontinental ballistic missile and SLBM systems.[35] However, fiscal constraints mean that Russia will not be able to field new systems in large numbers. In his May 10, 2006, state of the nation speech, President Putin stated:

> We must take into account the plans and development vectors of other countries' armed forces, and we must keep ourselves informed on promising developments, but we should not go after quantity and simply throw our money to the wind. Our responses must be based on intellectual superiority. They will be asymmetrical, not as costly, but they will unquestionably make our nuclear triad more reliable and effective.[36]

The reference to asymmetrical responses would appear to apply most directly to the Igla maneuverable warhead, which has been tested at least twice since November 2005, and to a reported hypersonic delivery vehicle, both of which are intended to penetrate U.S. ballistic missile defenses. It also reflects the need to do more with less in order to maintain a nuclear balance with the United States. By most accounts, Russian strategic forces will decrease in the period ahead for budgetary reasons and aging to a level below that established by the Moscow Treaty (1,700–2,200 operationally deployed strategic nuclear warheads). Some assessments, it should be noted, contend that by 2020, Russia will be able to deploy at least 2,000 nuclear warheads on modernized land- and sea-based systems, and will be able to sustain this level for 30 years or more.[37]

Moscow would like to use the arms control process to mitigate some of the challenges in maintaining a sufficient and affordable strategic nuclear force. President Putin has made clear his interest in a new treaty that would supersede the Strategic Arms Reduction Treaty I (START I), which expires in 2009, and possibly also the Moscow Treaty, which expires in 2012. His overall objective is to achieve greater flexibility in managing Russia's forces while simplifying START I provisions for verification and transparency.[38] The prospects and possible contours of a new agreement are one topic of discussion in a high-level U.S.-Russia strategic dialogue that has been initiated in recent months. It is worth noting as well that prominent Russian strategic analysts have been proposing far more ambitious ideas for transforming the U.S.-Russian nuclear relationship into a fundamentally cooperative one. Most notably, Alexei Arbatov and Vladimir Dvorkin urge the two sides to move "beyond deterrence" based on deeper agreed reductions (1,000–1,200 warheads), more extensive data exchanges, joint de-alerting of strategic nuclear forces, operational constraints on deployed forces, integrated missile early warning, and cooperative missile defense.[39]

Press accounts and statements by government officials also suggest that Russia is engaged in R&D on fourth-generation nuclear weapons capabilities—for example, precision low-yield nuclear weapons (possibly with yields as low as a few tens of tons), clean nuclear weapons (including earth penetrators and neutron weapons), and weapons tailored to create special effects (such as electromagnetic pulse). Press reports also refer to more advanced or even exotic research into weapons based on pure fusion and nuclear isomers. The degree of investment and technical progress in these areas is uncertain, at least based on open sources, although some analysts suggest such capabilities would be highly consistent with

official Russian doctrine, which emphasizes the role of nuclear weapons in deterring and prevailing in a broad range of nuclear and nonnuclear contingencies. If, as Russian doctrine proclaims, a lower nuclear threshold is required to deter conflict even down to the local level, then acquiring more usable nuclear weapons that could deliver decisive effects with presumably manageable escalation risk would be a logical development.

Some analysts go further, seeing in Russia's investigation of tailored nuclear weapons a response to Moscow's inability to influence important developments in what it considers its traditional sphere of influence (for example, the Balkan wars, the Iraq war, North Atlantic Treaty Organization [NATO] expansion). In this view, such weapons confer a capability to apply "nuclear pressure" as an instrument of policy to achieve Russian objectives in a way not possible with higher-yield weapons. Exactly how is not clear, but presumably this logic holds that armed with such weapons, Moscow could credibly threaten to intervene in regional conflicts involving outside powers and thus protect Russia's interests and maximize Russia's political influence.[40]

China: Modernized Forces for Deterrence, Not Supremacy

While we are learning more about China's nuclear capabilities, plans, and thinking, there is still insufficient transparency on these issues. In part, China seeks to cast a nuclear shadow over East Asia by developing usable forms of coercive power to advance its regional security interests. This is one reason it places great importance on improvements to its regional missile forces. Short-range missiles in particular appear central to Beijing's strategy should war erupt over Taiwan. The force of short-range missiles now deployed facing Taiwan has grown dramatically over the last decade to approximately 700. Some reports suggest these missiles are dual-capable. In a war over Taiwan involving the United States—which, if not nuclear, would be conducted under a nuclear shadow—this missile force could be employed to demonstrate resolve and maintain strategic initiative as a counter to U.S. deterrence and coercion efforts. Indeed, many Chinese strategists see the burden of nuclear escalation in a Taiwan conflict as falling on the United States, and believe Washington can be restrained, given asymmetric interests and asymmetric willingness to absorb punishment. One question currently being debated in China's strategic community is whether there are ways to use nuclear weapons that fall beneath the threshold of U.S. nuclear retaliation.[41]

China is also motivated to maintain a modern nuclear force in order to avoid nuclear coercion or blackmail by other major powers; this is an

enduring legacy from the 1950s and, for Beijing, an essential condition for proper political relations among the major powers. This requires a viable nuclear deterrent based on longstanding principles of mutual vulnerability. Thus, at the strategic level, the current modernization process was triggered by the 1996 Taiwan Straits episode, from which China concluded that it needed to close key gaps in its strategic nuclear forces in order to maintain an assured retaliatory capability. Chinese strategists couch this in the language of *active deterrence*, *effectiveness*, *sufficiency*, *counterdeterrence*, and *countercoercion*, and these concepts have motivated a modernization effort that has resulted in a more diverse force with greater range, mobility, and survivability. The number of deployed long-range missiles has not grown much but likely will in the period ahead. Likewise, while estimates have not changed of the number of warheads in its arsenal, China stands at a threshold for potentially significant stockpile growth. At least publicly, U.S. estimates reflect a great deal of uncertainty regarding how large the coming buildup may be. It may be quite limited but could also encompass thousands of new weapons. Judgments that China reaches about U.S. intentions will be a key factor in the direction Beijing chooses.

Indeed, developments in U.S. strategic forces have strongly reinforced the urgency attached to China's nuclear modernization. In particular, Beijing widely viewed itself as the target of the 2001 U.S. Nuclear Posture Review (NPR), adding a degree of complexity and uncertainty to China's nuclear security environment. From Beijing's vantage, the logic is clear: the United States dominates "rogue" states and no longer considers Russia an enemy. The "China threat," however, is routinely promoted by elements of the U.S. strategic community. In this light, Beijing's concern is that the New Triad, especially placed in the context of the 2002 National Security Strategy, signals U.S. intent to "escape the nuclear balance" and the concept of mutual vulnerability in favor of "absolute security" and preemption. In particular, China fears the United States may tailor the New Triad, as well as emerging space capabilities, to negate China's strategic nuclear deterrent force, increasing the possibility of nuclear coercion in a crisis.[42]

China seems to be following a wait-and-see attitude on how much of a challenge the New Triad presents, and how to respond. From Beijing's perspective, the nuclear modernization program presumably needs to keep pace with developments in the New Triad, in particular missile defense. But what if it cannot? Might China then turn to operational fixes such as launch on warning or even preemptive strategies? This is one of a

number of open questions as China contemplates its emerging strategic posture. Another major area of debate concerns the continuing validity of China's no-first-use (NFU) doctrine, a debate that has been driven to some degree by concerns generated by the NPR. The question of whether NFU should be eliminated or made conditional reflects concerns about new nonnuclear strike capabilities that could hold at risk Chinese nuclear forces or important centers of gravity. It also reflects a view that U.S. rejection of NFU is consistent with the NPR and U.S. efforts to lower the nuclear threshold.[43] However, it does not appear that any policy change is forthcoming. The NFU debate may suggest a growing willingness to allow open discussion of nuclear policy and doctrine questions—and thus could be seen as evidence of increased openness and transparency—but the traditional arguments for a no-first-use policy remain compelling for Beijing. These arguments are political, moral, and strategic and are believed to yield significant political benefits for China in the international community, especially as it seeks to signal its "peaceful rise" as a major global power.[44]

To date, China's nuclear modernization has had no real impact on the strategic nuclear balance with the United States. Nothing currently envisioned by the Chinese leadership appears to portend a competition for supremacy. The key questions then become how to avoid stumbling into a more intense strategic competition than either side wants, and how to manage respective force modernization strategies in a way that does not poison the larger political relationship. Both official and unofficial dialogue are essential to achieve greater transparency regarding capabilities, doctrine, and plans; better understand Chinese debates and perceptions; and explore policy approaches and the prospects for exchanges, initiatives, and agreements that could contribute to stability and restraint in the U.S.-China strategic relationship. As part of this process, the United States needs to build intellectual capacity to address the range of political-military issues shaping the relationship. This means investing to build a community of specialists with the requisite functional and regional expertise to contribute in sustained fashion to both focused analysis and enhanced dialogue.[45]

The United States: Declining Interest and Expertise, Weak Consensus on Future

While interest in nuclear weapons is rising in the rest of the world, the United States since the end of the Cold War has experienced an erosion of institutional interest and expertise in U.S. nuclear capabilities. A smaller, less diverse nuclear force has had an impact on Service nuclear career paths.

Senior DOD civilian leaders seem less engaged and informed than their predecessors. In Congress, only a small group of legislators can be considered expert or well versed in nuclear weapons issues. For some, it appears, nuclear weapons are a Cold War tax that no longer needs to be paid. One result is that there is no meaningful political consensus today on the future direction for U.S. nuclear weapons. The 2001 Nuclear Posture Review outlined a vision for a transformed strategic posture in which nuclear weapons would continue to play an important role, albeit one that could be reduced over time. But while the NPR has generated significant effort in the Departments of Defense and Energy to take practical steps to advance the New Triad concept, it did not generate the kind of public debate on the role of nuclear weapons in U.S. strategy required to develop a sustainable long-term consensus on policy, R&D, and investment needs. Indeed, 5 years after the NPR was issued, we are still hearing calls for *starting* such a debate.[46]

There is certainly no lack of strong feeling on these matters, but opinion is generally polarized between those seeking to adapt the nuclear posture to the emerging security environment and those who believe that innovation in nuclear capabilities beyond the requirements of reliability and safety is both unnecessary and damaging to U.S. nonproliferation objectives. One camp seeks a more flexible range of nuclear capabilities to cope with threat uncertainty and enhance deterrence credibility. This camp rejects *existential deterrence* and believes that the types of weapons in the U.S. arsenal make a big difference in the ability to deter. Relying on the Cold War arsenal built to deter the Soviet Union carries a significant risk of self-deterrence in regional conflicts where there may be an asymmetry of stakes. New capabilities are required, and underground testing may be needed to validate these capabilities. By contrast, the other camp believes the historical imperative of the post–Cold War era is to reduce steadily the number of nuclear weapons and our reliance on them, and to occupy the moral high ground in the battle against nuclear proliferation by foregoing force modernization and nuclear testing. It is morally wrong and strategically unwise to produce new weapons that are more usable and thereby lower the nuclear threshold. The current stockpile is adequate to the requirements of deterrence, which is not as prone to failure as is often argued.

In the policy arena, this clash of perspectives has been most pronounced in congressional consideration of funding for nuclear weapons R&D. Efforts by the Bush administration to obtain funding to study enhanced nuclear capabilities (Robust Nuclear Earth Penetrator, Advanced Concepts Initiative) ultimately fell victim to arguments made by both Democrats and Republicans that these initiatives were provocative, would

undermine U.S. nonproliferation strategy, and represented too high a budget priority for the administration in relation to threat reduction activities. For the moment at least, no political consensus exists to introduce new kinds of military capabilities into the nuclear force.

Achieving such a consensus will require narrowing what today appears to be an unbridgeable gap. It will probably require a changed set of circumstances—perhaps the next use of nuclear weapons or a regional nuclear war; perhaps generational change in the Congress; perhaps new leadership in the executive branch. Fundamentally, however, creating a sustainable political consensus on type and quantity will require a willingness to reexamine first principles and consider with fresh eyes the role of nuclear weapons in U.S. security. Hard questions will need to be answered:

- What roles do we want nuclear weapons to play?
- If high-yield legacy weapons are not responsive to the threats we face, why retain them in high numbers; why not eliminate them?
- What confidence do we have that a new generation of more discriminate nuclear weapons (with greater accuracy and lower yield) will actually be a more effective deterrent against the kinds of adversaries we now confront?
- If new types of nuclear capabilities are essential to deter effectively, how do we reconcile this with our nonproliferation objectives and our exhortations to others to forswear the nuclear option?
- Does not morality compel us to provide our leaders with military options that are more acceptable morally as well as more rational strategically?
- Do we not need to keep pace with advances in nuclear weapons technology being pursued by Russia (and perhaps China), with whom our strategic relationships over the long term remain uncertain?

What, then, is the basis for action today? The little common ground that exists between the two opposing nuclear camps concerns the importance of maintaining a nuclear stockpile that can be certified as reliable and safe, and finding a way to reduce the stockpile over time by making the DOE production complex more responsive to new requirements that could emerge. There seems to be agreement that investing in costly life extensions for most aging weapons does not make much sense and ultimately could be unaffordable. A sounder course is to retire reserve warheads, replace others with simpler, more reliable versions, and establish a "warm" scientific and production infrastructure in the event that future military requirements demand a new type of capability. This, in essence,

is what is now being pursued under the banner of *responsive infrastructure* (one leg of the New Triad) and *stockpile transformation*, the central element of which is the reliable replacement warhead (RRW). This initiative represents the political art of the possible with respect to U.S. nuclear weapons today.

The RRW program will provide replacement warheads for legacy U.S. nuclear weapons. By relaxing Cold War–era design constraints, replacement warheads can be designed that are easier to manufacture, use fewer hazardous materials, and incorporate enhanced safety, security, and use control features. These replacement warheads will reduce the likelihood that nuclear testing will be needed to resolve technical problems, and thus allow the capabilities of the current nuclear stockpile to be extended well into the future with a high degree of confidence. Successfully implemented, the RRW concept will also help revitalize the nuclear weapons design community and preserve the critical skills necessary for the next generation of scientists and engineers to certify the stockpile without nuclear testing and, if necessary, adapt existing weapons and develop new ones.

Ambassador Linton Brooks, while Administrator of the National Nuclear Security Administration, recently offered the following vision for a responsive infrastructure enabled by the RRW program to be achieved around 2030:

> The deployed stockpile—almost certainly considerably smaller than today's plans call for—has largely been transformed. Reliable Replacement Warheads . . . are more easily manufactured at fewer facilities with safer and more environmentally benign materials. These modified warheads have the same military characteristics, are carried on the same delivery systems, and hold at risk the same targets as the variants they replaced, but they have been re-designed for reliability, security, and ease of maintenance. Because of this, even though there is almost no one left in the complex who remembers a nuclear test, let alone has conducted one, confidence in the stockpile is high. . . . The deployed stockpile is backed up by a much smaller non-deployed stockpile than today. . . .The elimination of dangerous and environmentally difficult materials has made this possible and obviated the need for large numbers of spare warheads to hedge against reliability problems. . . . We still worry about a hedge against geopolitical changes and attempts by others to instigate an arms race. But that hedge is no longer in aging and obsolete spare warheads but in the Responsive Infrastructure . . . . Our Responsive Infrastructure

> can also produce weapons with different or modified military capabilities if required. The weapons design community that was revitalized by the RRW program can adapt an existing weapon within 18 months and design, develop, and begin production of a new design within 3–4 years of a decision to enter engineering development . . . new, intrinsic features built into the growing number of Reliable Replacement Warheads have improved both safety and security.[47]

Realizing this ambitious vision is a major undertaking for the Departments of Energy and Defense. Over time, it seems clear that the program's success will be measured by the degree to which it yields a capability to respond to new military requirements should they emerge, thereby enabling meaningful stockpile reductions. Less clear is when a political consensus supporting the development of new nuclear capabilities may emerge.

Adapting Declaratory Policy to Evolving Threats and Capabilities

Despite significant, even dramatic, changes in U.S. strategy and security policies in response to new concerns about weapons of mass destruction and terrorism, there has been little debate about or innovation in declaratory policy in recent years. Some senior policymakers have suggested that declaratory policy is an underutilized tool in the fight against proliferation and WMD terrorism and requires more systematic thought—and not simply in terms of managing crises or the run-up to conflict, but as an integral element of ongoing efforts to dissuade and deter new kinds of adversaries and reassure allies. Declaratory policy can be considered at a number of levels. In part, the challenge is to determine how best, if at all, to leverage U.S. nuclear capabilities to deter extreme outcomes, such as WMD use. In part, it is to determine how the United States can marshal all instruments of national power to underwrite declaratory policies directed at a broader range of problems, from deterring nuclear transfers to communicating attribution capabilities.

Role of Nuclear Threats in Deterring WMD Use

The longstanding U.S. policy of calculated ambiguity has eschewed explicit statements concerning how the United States would respond to WMD attacks in order to avoid both limiting the President's freedom of action and placing too high a value on nuclear weapons as an instrument

of policy. In some actual crises (such as the first Gulf War), the United States sought to lessen the degree of ambiguity perceived by adversaries by making sharper—if still implicit—threats of nuclear retaliation in response to egregious acts.[48] In this way, U.S. declaratory policy has attempted to maintain a balance between the requirements of deterrence, on the one hand, and nonproliferation objectives, on the other.

The benefits and risks of this declaratory posture are well understood; less clear is whether new security concerns argue for adaptations or changes to declaratory policy. Alternative policies would either make the threat of nuclear response more explicit, or eliminate it entirely through some type of no-first-use pledge. Specific alternative policies and their general rationale include but are not limited to the following.

A More Explicit Threat of Nuclear Response. In an era of more salient WMD threats, it is necessary to communicate more directly the risks associated with WMD use against American interests. A policy of assured nuclear response will induce caution and restraint, as WMD-armed adversaries will be less inclined to believe they could conduct a WMD attack and escape the most severe U.S. retaliation.

Retain Nuclear Response Option, but Pledge No First Use. Because the consequences of chemical or, in particular, biological weapons use could be so devastating, it is unwise to forego the added increment of deterrence that even an implicit nuclear threat can provide. But the normative restraint against WMD could be strengthened were the United States to pledge not to initiate the use of such weapons. While stopping short of renouncing any use of nuclear weapons, such a pledge, in combination with a record of strict U.S. compliance with the Chemical Weapons Convention and the Biological Weapons Convention, could nonetheless enhance the moral legitimacy of U.S. policy by making clear that the sole purpose of U.S. nuclear weapons is to deter and, if necessary, respond to the use of WMD. A variant on this concept is to establish an enforceable international consensus, led by the recognized nuclear weapons states, against the first use of WMD by a state or subnational group.[49]

A No-Nuclear-First-Use Policy. Such a policy would go further, in the belief that adopting roles for nuclear weapons beyond deterrence of nuclear attack enhances their legitimacy and fuels proliferation pressures while providing no greater degree of deterrence than already assured by the mere existence of U.S. nuclear capabilities. Moreover, U.S. conventional military power is sufficient to deter nonnuclear WMD threats. A no-nuclear-first-use policy would allow the United States to seize the moral high ground while still protecting its interests.

A careful exploration of the merits of a shift toward any of these alternative declaratory policies will need to address a number of considerations:

- Credibility. Will an explicit nuclear threat be credible, or have WMD-armed adversaries come to believe that the United States lacks the will to use nuclear weapons in response to nonnuclear attacks? Does the character of the U.S. nuclear arsenal make a difference? Similarly, will anyone believe an explicit U.S. pledge not to use nuclear weapons first in any circumstance?
- Freedom of action. Would alternative declaratory policies unduly constrain Presidential freedom of action in a crisis or conflict, or could they be formulated in a way that preserves flexibility in pursuing political and military courses of action?
- Nonproliferation. What impact would alternative declaratory policies have on nuclear proliferation dynamics? For instance, would an assured nuclear response policy enhance the perceived value and utility of nuclear weapons and thereby encourage greater proliferation, or are proliferation incentives largely unaffected by U.S. declaratory policy?
- Reassurance. Are policy alternatives likely to enhance or weaken reassurance of allies regarding U.S. commitments to their security, to deterrence generally, and to nonproliferation objectives?
- Nonlethal attacks. Should declaratory policy explicitly make provisions for the possibility of nuclear attacks against U.S. interests intended to avoid large-scale casualties—for example, an EMP attack?
- WMD terror attacks. How should declaratory policy treat the threat posed by WMD terror groups and, by extension, possible state sponsors or facilitators of this threat? The President has said that we will not distinguish between terrorists and their state sponsors, but a more specific declaratory statement directed at state support for WMD terrorism potentially could influence the calculus of state actors who might contemplate aiding terrorists' search for WMD or abetting an actual attack.[50]

Deterring and Dissuading the Transfer of Nuclear Capabilities

New concerns about the spread of nuclear capabilities raise new challenges for declaratory policy. To what degree, and how, should U.S. declaratory policy address the possible transfer by a state of nuclear capabilities (materials, technology, expertise, components, design/weaponization data, warheads) to hostile third parties (states or terror groups)? One could argue that developments in this arena, including documented terrorist interest in nuclear weapons and the extensive covert nuclear procurement network operated by A.Q. Khan, point to gaps in declaratory policy that should be filled as part of a comprehensive combating-WMD

strategy that also emphasizes prevention and interdiction. Declaratory policy can help reinforce the risks associated with nuclear transfers, in part by indicating some of the specific consequences that would follow exposure of such activities. This is an area where nonnuclear responses are likely to figure prominently and where focused concept development should be undertaken.

Communicating U.S. Attribution Capabilities

As the technical means to attribute nuclear attacks improve, policymakers will need to decide how to communicate this capability to potential adversaries in order to maximize its deterrent value. In doing so, it will be essential to strike a balance between conveying a credible capability to identify the source of an attack and protecting intelligence and scientific techniques which, if known to adversaries, could provide the means to complicate the process of forensic investigation and possibly escape attribution.

New Triad Capabilities

Finally, it is worth asking whether the anticipated maturation of nonnuclear capabilities as part of the New Triad raises issues or new requirements with respect to declaratory policy. In particular, as missile defenses and conventional strike systems (both kinetic and nonkinetic) become more advanced and assume a more prominent role as strategic-level force assets, there may be value in crafting some specific messages regarding these capabilities (including their relationship to nuclear forces) for the consumption of both allies and adversaries.

Notes

[1] Mohamed ElBaradei, "Towards a Safer World," *The Economist*, October 16, 2003.

[2] Additionally, the Secretary General of the Gulf Cooperation Council recently urged the Arab world to pursue nuclear technology more aggressively. See Nicole Stracke, "GCC Countries Reopen Arab Nuclear Technology Debate," Gulf Research Center, September 14, 2006.

[3] North Korea completed the nuclear fuel cycle for plutonium some time in the late 1980s or early 1990s, and nongovernmental experts estimate that it has produced 43 to 61 kilograms of plutonium, of which 20 to 53 kilograms are in separated form and usable for weapons manufacture. This stock of separated plutonium is sufficient to produce from 4 to 13 nuclear weapons. Unconstrained, North Korea is projected to possess enough separated plutonium by mid-2008 to build 8 to 17 weapons. See David Albright and Paul Brannan, "The North Korean Plutonium Stock Mid 2006," Institute for Science and International Security, June 26, 2006. Plutonium stocks refer to material produced by North Korea's 5-megawatt reactor. A 50-megawatt reactor is under construction, though recent satellite photographs indicate a lack of activity at the site. Completion of this reactor could take several years; when operational, it would have the potential to produce enough plutonium annually for roughly 10 nuclear weapons. North Korea is also believed to maintain a concealed uranium enrichment capability, based on information gained from investigations of the A.Q. Khan nuclear procurement network. It is unclear how extensive or mature this capability is.

[4] Helene Cooper, "U.S. Debates Value of North Korea Talks," *The New York Times*, November 2, 2006.

[5] William J. Broad, Nazila Fathi, and Joel Brinkley, "Analysts Say a Nuclear Iran Is Years Away," *The New York Times*, April 13, 2006. Testifying before the Senate Intelligence Committee in February 2006, Director of National Intelligence John D. Negroponte stated that if Iran continues on its current pace, it will likely have the capability to produce a nuclear weapon "within the next decade."

[6] David Ignatius, "Iran's Uranium Glitch," *The Washington Post*, September 29, 2006, A21.

[7] See Gregory F. Giles et al., "Iranian Weapons of Mass Destruction: Building Situational Awareness," final report prepared for Defense Threat Reduction Agency Advanced Systems and Concepts Office, August 11, 2006.

[8] Ibid., IV–5.

[9] For example, see Scott D. Sagan, "How to Keep the Bomb from Iran," *Foreign Affairs* 85, no. 5 (September/October 2006), 45–59.

[10] For an articulation of some of these views, see David E. Sanger, "Suppose We Just Let Iran Have the Bomb," *The New York Times*, March 19, 2006.

[11] There are longstanding rumors of Saudi efforts to secure nuclear technology from Pakistan. Publicly, Saudi officials deny any nuclear ambitions and emphasize the Kingdom's policy of establishing a regional WMD-free zone. Some Saudi analysts have suggested that faced with a nuclear-armed Iran, Riyadh would choose to seek protection under a U.S. nuclear umbrella. See Riad Kahwaji, "Saudi Arabia Braces for a Nuclear Iran," *Defense News*, May 22, 2006, 1. Other press accounts allege Saudi Arabia–Pakistani nuclear collaboration. See Sammy Salama and Gina Cabrera-Farraj, "Report Alleges Saudi Arabia Working on 'Secret Nuclear Program' with Pakistani Assistance," *WMD Insights*, issue 5 (May 2006), available at <www.wmdinsights.com/PDF/FP_MayIssue.pdf>.

[12] On May 18, 2006, the United States tabled drafts of a negotiating mandate and text for a fissile material cutoff treaty (FMCT) in the Conference on Disarmament. While India's official position on FMCT is at odds with elements of the U.S. proposal (in particular with respect to verification provisions), New Delhi has stated its willingness to work with the U.S. draft. See Peter Crail, "U.S. Fissile Material Proposals Stir Cautious Optimism," *WMD Insights*, issue 7 (July/August 2006), available at <www.wmdinsights.com/PDF/FP_July_AugIssue.pdf>.

[13] The Atomic Energy Act and the Nuclear Nonproliferation Act require that nonnuclear weapons states receiving nuclear cooperation from the United States have comprehensive safeguards in place. Under the terms of the Nuclear Nonproliferation Treaty, India is considered a nonnuclear weapons state. The pact also requires the agreement of the 45-member Nuclear Suppliers Group (NSG) that governs international nuclear commerce. The NSG, which operates by consensus, has indicated that it will not take up possible amendments to its guidelines until the U.S. Congress enacts related legislative changes. Advanced research activities include the International Thermonuclear Experimental Reactor experiment in fusion technology and the Generation IV International Forum on future reactor concepts.

[14] For details on India's separation plan, see Sharon Squassoni, "U.S. Nuclear Cooperation with India: Issues for Congress," Congressional Research Service, March 28, 2006, available at <www.fas.org/sgp/crs/nuke/RL33016.pdf>; and "India's Nuclear Separation Plan: Issues and Views," Congressional Research Service, March 10, 2006, available at <www.fas.org/sgp/crs/nuke/RL33292.pdf>.

[15] A counterpoint is offered by Ashley J. Tellis of the Carnegie Endowment for International Peace, who argues that India does not suffer from a strategically significant shortage of natural uranium and is currently separating far less weapons-grade plutonium than it has the capability to produce. See Tellis, "Atoms for War? U.S.-Indian Civilian Nuclear Cooperation and India's Nuclear Arsenal," Carnegie Endowment for International Peace, 2006, available at <www.carnegieendowment.org/publications/index.cfm?fa=view&id=18443&prog=zgp&proj=zsa>. Administration officials make the same argument.

[16] Squassoni, 12. On the point referencing the Additional Protocol, it should be noted that more than half of NPT member states have not yet brought it into force.

[17] "President Announces New Measures to Counter the Threat of WMD," White House press release, February 11, 2004. The President also called on the Nuclear Suppliers Group to deny nuclear technology to states that have not ratified the International Atomic Energy Agency Additional Protocol, which grants the agency expanded inspection rights. To date, these proposals have not been adopted by the group.

[18] ElBaradei. Dr. ElBaradei has also expressed support for stronger controls on nuclear trade.

[19] See Tariq Rauf and Fiona Simpson, "The Nuclear Fuel Cycle: Is It Time for a Multinational Approach?" *Arms Control Today* 34, no. 10 (December 2004), 17–21.

[20] Jon B. Wolfstahl, "The Nuclear Third Rail: Can Fuel Cycle Capabilities Be Limited," *Arms Control Today* 34, no. 10 (December 2004), 11–16.

[21] Clay Sell and Robert Joseph, "Global Nuclear Energy Partnership," State Department briefing, February 16, 2006, available at <http://fpc.state.gov/fpc/61808.htm>.

[22] See Matthew Bunn, statement before the Committee on Senate Appropriations Subcommittee on Energy and Water Development, September 14, 2006; Richard K. Lester, "New Nukes," *Issues in Science and Technology* (Summer 2006), 39–46; Edwin S. Lyman, "The Global Nuclear Energy Partnership: Will It Advance Nonproliferation or Undermine It?" Union of Concerned Scientists, undated; and Union of Concerned Scientists, "U.S. Nuclear Fuel Reprocessing Initiative," April 10, 2006.

[23] See Nikolai Sokov and Leonard S. Spector, "Russian Government White Paper on WMD Nonproliferation Reveals Both Differences and Similarities with U.S. Approach," *WMD Insights*, issue 8 (September 2006), available at <www.wmdinsights.com/PDF/FP_SeptIssue.pdf>. On the positive side, the white paper endorses the Proliferation Security Initiative and acknowledges the contribution of the United States (among others) in enhancing WMD security in Russia.

[24] "The Global Initiative to Combat Nuclear Terrorism," Fact Sheet, Office of the Press Secretary, The White House, July 15, 2006; and "U.S.-Russia Joint Fact Sheet on the Global Initiative To Combat Nuclear Terrorism," Office of the Spokesman, Department of State, July 15, 2006.

[25] These include the Commission to Assess the Organization of the Federal Government to Combat the Proliferation of Weapons of Mass Destruction (the Deutch-Specter Commission) of 1999, as well as multiple internal Intelligence Community reviews.

[26] These are discussed in the report of the Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction (Silberman-Robb Commission), March 31, 2005.

[27] Ibid., 317–319.

[28] The six guiding principles are active, layered defense; situational awareness and integrated command and control; global force management; capabilities-based planning; effects-based operations; and assurance. The military missions are offensive operations, elimination operations, interdiction operations, active defense, passive defense, WMD consequence management, security cooperation and partner activities, and threat reduction cooperation.

[29] See Presidential Decision Directive 56, "Managing Complex Contingency Operations," May 1997, which states: "We must also be prepared to manage the humanitarian, economic and political consequences of a technological crisis where chemical, biological, and/or radiological hazards may be present. The occurrence of any one of these dimensions could significantly increase the sensitivity and complexity of a U.S. response to a technological crisis."

[30] U.S. Customs and Border Protection, *Container Security Initiative* 2006–2011 Strategic Plan, August 2006, 34, available at <www.cbp.gov/linkhandler/cgov/border_security/international_activities/csi/csi_strategic_plan.ctt/csi_strategic_plan.pdf>.

[31] The final analytic or technical judgment on the findings of a forensic investigation would be made by the Joint Atomic Energy Intelligence Committee.

[32] There is a wealth of information on nuclear effects based on atmospheric testing that occurred until 1963, and a good deal of data on responding to nuclear attacks as well. But many first responders are unaware of this information. Additionally, available data are not adequately adapted to the needs of contemporary first responders. Some efforts are under way to address this, such as the Department of Homeland Security Protective Action Guides for Radiological Dispersal Devices and Improvised Nuclear Devices.

[33] See Vladimir Putin's state of the nation address in May 2006, in which he stated that it was "too early to speak of an end to the arms race," claimed a "new spiral" of the arms race has begun, and called for strengthening Russia's nuclear forces. Text available at <www.kremlin.ru/eng/text/speeches/2006/05/10/1823_type70029type82912_105566.shtml>.

[34] See Nabi Abdullaev, "Critics Question Russia's Priorities," *Defense News*, September 11, 2006, 14. The $186 billion State Arms Procurement Program for 2007–2015 was adopted in June 2006 and provides for modernization of all elements of strategic nuclear forces. Precise figures are not available in open sources. As a point of reference, in 2000, the Chief of Armaments of the Russian Armed Forces stated that in the next several years, 28 percent of arms procurement funding would support modernization of strategic nuclear forces. Cited in Mark Schneider, "The Nuclear Forces and Doctrine of the Russian Federation" (Washington, DC: United States Nuclear Strategy Forum, 2006), 10.

[35] For more on the maneuverable warhead (known as Igla) and possible deployment timelines for some new strategic systems, see "Russia to Deploy Defense-Penetrating System," *WMD Insights*, issue 1 (December 2005/January 2006), available at <www.wmdinsights.com/PDF/WMDInsights_Issue1.pdf>; and Nikolai Sokov, "Vladimir Putin: 'No Future' in Arms Race; Russia Acts to Ensure Defense Through Asymmetric Nuclear Force," *WMD Insights*, issue 6 (June 2006), available at <www.wmdinsights.com/PDF/FP_JuneIssue.pdf>.

[36] Putin, 9.

[37] See "Institute Director Solomonov: Upgraded Nuclear Force Good Through 2045," Moscow *Izvestiya* (Moscow Edition), April 14, 2006, 1–2, cited in OpenSource.gov CEP20060414019008. Yuri Solomonov is general designer of the Moscow Institute of Thermal Technology (MITT), developer of the Topol-M and Bulava missile systems. It is possible that his remarks, coming soon after the publication of Kier A. Lieber and Daryll G. Press, "The Rise of U.S. Nuclear Primacy," *Foreign Affairs* 85, no. 2 (March/April 2006), were intended principally to respond to the assertion that Russia's strategic nuclear capabilities are in an advanced state of decline.

[38] See Nikolai Sokov, "Putin Seeks to 'Replace' START I Treaty," *WMD Insights*, issue 8 (September 2006), available at <www.wmdinsights.com/PDF/FP_SeptIssue.pdf>.

[39] Alexei Arbatov and Vladimir Dvorkin, *Beyond Nuclear Deterrence: Transforming the U.S.-Russian Equation* (Washington, DC: Carnegie Endowment for International Peace, 2006).

[40] See Schneider, 24–25, for a more detailed articulation of this argument by Russian analysts. Schneider's paper provides a critical assessment of official Russian attitudes toward nuclear weapons and the evolution of official doctrine. For a rebuttal to Schneider's analysis, see Vladimir Dworkin, "On Strategic Relations Between Russia and the U.S.," Center for International Security, Institute of World Economy and International Relations, Russian Academy of Sciences, September 2006.

[41] Some close observers believe that Chinese experts have done little thinking about the dynamics of nuclear escalation and de-escalation in the context of a Taiwan war. See Bonnie Glaser, Evan Medeiros, and Brad Roberts, "China-U.S. Strategic Nuclear Relations: A Conference Summary," July 2006.

[42] For recent assessments of how Chinese media are treating the question of U.S. strategic capabilities, see Jing-Dong Yuan, "Chinese Media Discusses U.S. Nuclear Superiority," in *WMD Insights*, issue 5 (May 2006), available at <www.wmdinsights.com/PDF/FP_MayIssue.pdf>; and Jing-Dong Yuan, "China Eyes U.S. Space Weapons," *WMD Insights*, issue 3 (March 2006), available at <www.wmdinsights.com/PDF/FP_MarIssue.pdf>.

[43] Glaser, Medeiros, and Roberts, 7–8. These analysts contend that Chinese strategists believe mistakenly that the United States has a "first use" policy, rather than a policy of "calculated ambiguity" that actually envisions nuclear use only *in extremis*.

[44] For a discussion of the no-first-use debate in China, see Jing-Dong Yuan, "Beyond No-First-Use: Recent Chinese Discussions of Nuclear Strategy," *WMD Insights*, issue 8 (September 2006), available at <www.wmdinsights.com/PDF/FP_SeptIssue.pdf>.

[45] Glaser, Medeiros, and Roberts, 12, 14.

[46] Certainly a critical factor in this has been the dominant focus of policymakers in DOD and elsewhere on the war on terror and related initiatives following the attacks of September 11, 2001, and the subsequent anthrax attacks.

[47] Ambassador Linton F. Brooks, "The Future of the U.S. Nuclear Weapons Stockpile," 2006 Arms Control Association Panel Discussion, January 25, 2006. See also statement of Thomas P. D'Agostino, Deputy Administrator for Defense Programs, National Nuclear Security Administration, before the House Armed Services Committee, Subcommittee on Strategic Forces, April 5, 2006.

[48] Then-U.S. Secretary of State James Baker would later recount of his meeting with Iraqi Foreign Minister Tariq Aziz in January 1991, shortly before the launch of Operation *Desert Storm*: "In hopes of persuading them [the Iraqi leadership] to consider more soberly the folly of war, I purposely left the impression that the use of chemical or biological agents by Iraq could invite tactical nuclear retaliation." See James A. Baker, III, *The Politics of Diplomacy* (New York: G.P. Putnam's Sons, 1995), 395.

[49] See Lewis A. Dunn, "The Case for an Enforceable Consensus Against NBC First Use," *The Nonproliferation Review* 9, no. 3 (Fall/Winter 2002), 82–88.

[50] The recent revision to France's official nuclear doctrine emphasizes that state sponsors of terrorism are at risk of nuclear retaliation. See speech by Jacques Chirac, during his visit to the Strategic Forces, January 19, 2006, available at <www.elysee.fr>.

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