

An Arms Control Association Report



What Are Nuclear Weapons For?

RECOMMENDATIONS FOR RESTRUCTURING
U.S. STRATEGIC NUCLEAR FORCES

REVISED AND UPDATED OCTOBER 2007

Sidney D. Drell and James E. Goodby

An Arms Control Association Report

What Are Nuclear Weapons For?

RECOMMENDATIONS FOR RESTRUCTURING
U.S. STRATEGIC NUCLEAR FORCES

Revised and updated October 2007

Sidney D. Drell and James E. Goodby

About the Authors

Sidney D. Drell is professor of physics emeritus at Stanford University's Linear Accelerator Center and a senior fellow at its Hoover Institution. For many years he has been an advisor to the U.S. government on technical issues relating to international security and arms control, including membership on the President's Foreign Intelligence Advisory Board and Science Advisory Committee. Honors recognizing his contributions to both physics and international security include the Enrico Fermi Medal, the National Intelligence Distinguished Service Medal, and election to the National Academy of Sciences.

Ambassador James E. Goodby is a research fellow at the Hoover Institution and a nonresident senior fellow at the Brookings Institution. He has held several senior government positions dedicated to nuclear arms control and nonproliferation, including Deputy to the Special Advisor to the President and Secretary of State on the Comprehensive Test Ban Treaty (CTBT) from 2000–2001, Special Representative of President Clinton for the security and dismantlement of nuclear weapons from 1995–1996, chief negotiator for nuclear threat reduction agreements from 1993–1994, and vice-chair of the U.S. delegation to the Strategic Arms Limitation Treaty talks from 1982–1983.

Drell and Goodby are co-authors of *The Gravest Danger: Nuclear Weapons*, Hoover Institution Press, 2003.

Acknowledgements

The authors extend thanks to Daryl Kimball and Wade Boese of the Arms Control Association, who reviewed and commented on earlier drafts of the manuscript, and to the staff of the Arms Control Association and to Bonnie Rose who helped facilitate editing and production. Goodby extends his thanks to the Hoover Institution, the Center for International Security and Cooperation at Stanford and the Woodrow Wilson International Center for Scholars for their assistance.

The authors and the Arms Control Association also acknowledge the generous support of the Ploughshares Fund, without which the time and resources necessary to write, produce, and distribute *What Are Nuclear Weapons For?* would not have been available. We are also grateful to Sally James of Cutting Edge Design for layout and design of the report, and to Brian Allen for his copyediting skills.

Responsibility for the report's content and recommendations are solely those of the authors and do not necessarily reflect those of the staff, directors, or members of the Arms Control Association.

TABLE OF CONTENTS

v	Executive Summary
1	Introduction
3	Section 1: A New Strategic Paradigm and Its Implications
9	Section 2: Nuclear Deterrence in the 21st Century
14	Section 3: Implications for U.S. Strategic Nuclear Forces
19	Section 4: Are New U.S. Nuclear Weapons Needed?
23	Section 5: Including Other Nuclear-Weapon States
26	Section 6: Why the Urgency?
28	Appendix 1: Cold War Thinking About Nuclear Weapons
32	Appendix 2: U.S. and Russian Strategic Nuclear Forces

Executive Summary

The role of nuclear weapons in U.S. defense planning needs a fresh look. The United States and Russia have now officially adopted a policy of cooperation against the new threats, faced by both nations, of terrorists and unstable or irresponsible governments acquiring nuclear weapons. This replaces the former adversarial relationship of nuclear deterrence based on mutual assured destruction. As stated in the Joint Declaration of Presidents Bush and Putin of November 13, 2001: “The United States and Russia have overcome the legacy of the Cold War. Neither country regards the other as an enemy or threat.” What then are the anticipated missions and targets for the thousands of nuclear warheads remaining in their arsenals?

Based on an analysis of the present and prospective threats that define missions for U.S. nuclear weapons we conclude that the strategic arsenal required by the United States can be reduced to considerably lower numbers. We recommend a U.S. force structure of 500 operationally deployed nuclear warheads, plus 500 in a responsive force. The United States and Russia should cooperate to achieve this in the year 2012. We propose, as a specific suggestion for the individual components of a “500+500 in 2012” force for the United States, the following:

Operationally Deployed Force

- Three Trident submarines on station at sea, each loaded with 24 missiles and 96 warheads (a mix of low-yield W76s and high-yield W88s). Reducing the D5 missiles from their full complement of eight warheads to four per missile will substantially increase their maximum operating areas.

The same total numbers of missiles and warheads could be distributed on a larger number of Trident submarines in the interest of greater operational flexibility and survivability, albeit at higher operational costs.

- 100 Minuteman III ICBMs in hardened silos, each with a single W87.
- 20–25 B2 and B52H bombers configured for gravity bombs or air-launched cruise missiles.

Responsive Force

- Three Trident submarines, each loaded with 96 warheads, in transit or being replenished in port for their next missions as part of a Ready Responsive Force for a rapidly building crisis, plus two or three unarmed boats in overhaul.
- 50–100 additional Minuteman III missiles taken off alert and without warheads, and 20–25 bombers, unarmed, in maintenance and training, all of which would comprise a Strategic Responsive Force, for a more slowly building confrontation.

This force is composed of existing warheads and delivery systems and requires no new nuclear weapons. It retains the current diversity of systems as a hedge against common failure modes. We believe that, if other nuclear-armed nations cooperate, nuclear deter-

rence might be maintained entirely with a responsive force, with the responsive force consisting of no more than the 500 warheads that are initially postulated for the operationally deployed force. A world without nuclear weapons should be the ultimate goal.

We find no need for designing new nuclear weapons against potential new threats, believing that those weapons which the United States has already developed to counter the Soviet Union will be sufficient for new threats. To the contrary, we do

see important opportunities for the United States to seize that would improve its national security by strengthening the nonproliferation regime. To this end, timely initiatives by the nuclear-weapon states to significantly reduce their nuclear arsenals and to restrain the development of new nuclear weapons can play an important role by addressing increasingly voiced concerns of the non-nuclear-weapon nations about the discriminatory nature of the nuclear Nonproliferation Treaty.

What Are Nuclear Weapons For?

The role of nuclear weapons in U.S. defense planning needs a fresh look. Although the U.S.-Soviet superpower competition that gave rise to the building and deployment of tens of thousands of nuclear weapons ended more than a decade and a half ago, the thinking of that era dangerously persists. Yesterday's doctrines are no longer appropriate for today's realities. The traditional role of deterrence has diminished with Russia's ongoing transition from strategic foe to partner. The new threats faced by the international community do not present situations where the net effect of using nuclear weapons except in the most extreme circumstances would benefit U.S. interests. The U.S. nuclear weapons stockpile and attendant doctrines should be adjusted to minimize the salience of nuclear weapons and to ensure that they are truly weapons of last choice. Adopting such a posture would support the nation's highest national security priority: preventing the use of nuclear weapons and their proliferation to terrorists and to additional states.

Official U.S. thinking about nuclear weapons has changed many times since the first nuclear explosions in 1945. These changes reflected evolving assessments of what it would take to deter a well-armed adversary, the Soviet Union, from attacking the United States, its allies, or its vital interests. In turn, the reassessments resulted in changes in strategic planning, targeting, and the types and numbers of weapons in the U.S. stockpile, all of which are interrelated. The clarity of the bipolar U.S.-Soviet world has given way to the ambiguities and uncertainties of a world where international security is threatened by transnational terrorists, unstable and failed states, and regimes that scorn a world order based on broadly accepted principles. The dangers inherent in such a stew are magnified by easier access to nuclear technology, inadequately protected stockpiles of plutonium and highly enriched uranium—the two key fissile materials needed to build nuclear weapons—the growing availability of missiles worldwide, black market nuclear supply networks, and a trend toward acquisition of “latent”

nuclear weapons capabilities through the possession of the entire nuclear fuel cycle.

The history of the nuclear age shows that concepts of what it takes to have a sufficient nuclear weapons capability were far from immutable and that the unique character of nuclear weapons became ingrained in the nuclear-age culture. A sense of doom persists even today, but in an attenuated form. The first atomic bombs dropped on Hiroshima and Nagasaki in August 1945 had a destructive energy 10,000 times larger than previous explosive devices. Within a decade, the United States and the Soviet Union designed and built thermonuclear bombs, the so-called hydrogen bombs, a thousand times more powerful than fission bombs. Fearful for the fate of civilization and of humanity itself, a shocked world asked why these terrible weapons existed. Under what circumstances and for what purpose could the use of the world's most destructive mass-terror weapons ever be justified? Could or would civilized people actually use them again, causing the indiscriminate deaths of innocent civilians on an unprecedented scale?

As nuclear arsenals grew larger and the “secret” technologies behind them became more widely available, a deeper understanding of the horrors of a nuclear conflict spread throughout the world.

This awareness was sharpened by repeated tests of hydrogen bombs that could destroy all life and structures within a distance of approximately ten kilometers around a single bomb’s detonation point. That scale of potential destruction was unprecedented in human history, and it became obvious that such weapons could not be treated simply as more effective and efficient tools for waging war. Instead, the value of such weapons began to be seen by U.S. political leaders almost from the outset as a means of deterring a Soviet attack on the United States or its allies. Soviet political leaders eventually accepted the same view, in reverse.

Perversely, the two adversaries’ arsenals grew rapidly to senseless numbers in the name of deterrence, which was defined as requiring nuclear forces that could survive an adversary’s all-out first strike and respond with an attack capable of delivering massive destruction on the initial attacker. Over time, the United States and the Soviet Union

both expanded their forces to numbers exceeding tens of thousands of warheads on several thousand launchers capable of delivering several thousand megatons of destructive energy. This was done despite

a greater understanding and fear of the devastating consequences of using nuclear explosives in combat, even at a much lower level. The evolution of the deterrence concept and the highlights of the nuclear age are discussed in Appendix 1.

Despite the excessive numbers, not because of them, policy choices of governments and a good measure of luck brought the world through the danger years without a nuclear

conflict and with broad agreement on the need to limit the spread of materials and advanced technology necessary for building nuclear arsenals. The two superpower rivals averted a direct clash, in part because the existence of nuclear weapons had the effect of imposing prudence on a Cold War confrontation that had the potential for erupting into World War III. This prudential effect surely would have been achieved at far lower levels of nuclear stockpiles and could be achieved with a very different force structure than that currently planned by the United States for a wholly different era and set of security challenges.

The U.S. nuclear weapons stockpile and attendant doctrines should be adjusted to minimize the salience of nuclear weapons and to ensure that they are truly weapons of last choice.

A New Strategic Paradigm and Its Implications

The stage had been set for a fundamental transition in U.S.-Russian strategic nuclear relations as early as the end of the Reagan administration in 1988, but Presidents George H. W. Bush and Bill Clinton failed to fully realize the opportunity presented by the winding down and eventual end of the Cold War. Bush, Ronald Reagan's vice president and successor, chose to remain within the Cold War arms control paradigm of retaining nuclear forces sufficient to respond to an all-out Soviet nuclear attack by inflicting complete annihilation on that country, its military forces, and its people if necessary. Bush stayed with this inherited course partly because of his uncertainty about the irreversibility of political changes taking place in Russia. Still, he signed two major strategic nuclear arms reduction agreements, START I and START II, and initiated reciprocal U.S.-Soviet withdrawals of tactical, or "battlefield," nuclear weapons.

Clinton, who became president in 1993, made essentially the same decision to remain within the Cold War arms control paradigm, although his freedom of action during his last years in office was significantly constrained by a hostile Congress. Yet, he enlarged and modified the arms control agenda with his strong support for the Nunn-Lugar Cooperative Threat Reduction program to help Russia and other former Soviet states secure and dispose of their surplus nuclear forces and materials following the 1991 collapse of the Soviet Union. Although accomplishing much, more remains to be done in this area.

Clinton also sought to devise a framework for a START III to reduce U.S. and Russian nuclear forces dramatically. Russian President Boris Yeltsin accepted in principle the notion of a START III at a 1997 meeting in Helsinki, but Russia at the same time remained staunchly opposed to U.S. missile defense plans and any tinkering with the 1972 Anti-Ballistic Missile (ABM) Treaty banning nationwide ballistic missile defenses. This Russian opposition combined with congressional pressure to advance a national missile defense system ultimately stalled START

III and frustrated further progress in U.S.-Russian strategic nuclear reductions. In October 1999, the Senate even rejected Clinton's prize achievement, the 1996 Comprehensive Test Ban Treaty.

President George W. Bush took office in January 2001, halfway through the sixth decade of the nuclear era, with a new vision for America's foreign policy. In part, his thinking embraced ideas long advocated by a group of policy entrepreneurs known as the neoconservatives, who had been highly suspicious of U.S. arms limitations agreements involving nations that could not be trusted, in their view, to keep their promises. They adapted their ideology rapidly to post-Cold War circumstances by arguing that formal bilateral arms control agreements with a friendly Russia were no longer appropriate to the changed relationship. Global arms control agreements were a snare and a delusion because they equated the "good guys" with the "bad guys" and unduly constrained U.S. freedom of action. Bush essentially accepted that point of view.

Bush also quickly initiated steps to impose his own vision on the U.S.-Russian strategic nuclear relationship. His new paradigm was overdue in the



White House

On July 31, 1991, President George H. W. Bush and Soviet President Mikhail Gorbachev sign the Strategic Arms Reduction Treaty (START).

sense that his father and Clinton might have been able to act more rapidly to move out of the shadow of mutual U.S.-Russian nuclear deterrence had political circumstances at home and abroad been more favorable. They were not able to do so, but George W. Bush made a major effort during his first year in office to define a new relationship between Russia and the United States. Bush and Russian President Vladimir Putin on November 13, 2001, released a document, “Joint Statement on a New Relationship Between the United States and Russia,” announcing an alliance-like relationship between the two countries. The two presidents bluntly stated that “[t]he United States and Russia have overcome the legacy of the Cold War. Neither country regards the other as an enemy or threat.” They called for “the creation of a new strategic framework to ensure the mutual security of the United States and Russia, and the world community.” They asserted, as a fact, not merely an aspiration, “that the members of NATO and Russia are increasingly allied against terrorism, regional instability and other contemporary threats.”

Having reinforced the proposition that Russia and the United States were partners in mutual security facing adversaries bent on acquiring nuclear weapons, Bush felt able to achieve one of his major goals: U.S. withdrawal from the ABM Treaty. The president announced this act in a December 13, 2001, Diplomatic Note, which gave notice to the governments of Russia, Belarus, Kazakhstan, and Ukraine—the recognized successor parties to the treaty after the Soviet Union’s breakup—that the United States intended to withdraw from the agreement at the end of the six-month waiting period as allowed in the treaty. That note describes

the changed threat environment that the U.S. administration saw at that time:

A number of state and non-state entities have acquired or are actively seeking to acquire weapons of mass destruction. It is clear, and has recently been demonstrated, that some of these entities are prepared to employ these weapons against the United States. Moreover, a number of states are developing ballistic missiles, including long-range ballistic missiles, as a means of delivering weapons of mass destruction. These events pose a direct threat to the territory and security of the United States and jeopardize its supreme interests.

As to the Russian nuclear threat posed to the United States, the U.S. note stated, “We have entered into a new strategic relationship with Russia that is cooperative rather than adversarial.”

Taken at face value, the two statements would seem to mark the formal end of the era of mutual nuclear deterrence between Russia and the United States. Yet, concerns persist that these two declarations by Bush did not reflect objective reality and were primarily connected to the impending abrogation of a treaty that he and his supporters had long disliked. Either way, a valid question remains: Has mutual nuclear deterrence between the United States and Russia really ended? The ABM Treaty, which had been the cornerstone of the mutual deterrence relationship between the Soviet Union and the United States, was no longer necessary, in the judgment of the Bush administration. Putin obviously did not share that view, describing the U.S. action as a “mistake.” Furthermore, a Pentagon report submitted December 31, 2001, to Congress showed how far the two countries still had to travel

to truly erase nuclear deterrence from their national memories.

In this congressionally mandated report, known as the Nuclear Posture Review, then-Secretary of Defense Donald Rumsfeld laid out the direction for U.S. nuclear forces over the following five to 10 years. In a larger sense, the document began connecting what Bush had been saying about the U.S.-Russian relationship with what the U.S. defense establishment actually did. The previous review, conducted by the Clinton administration in 1994, had concluded that the capabilities of the former Soviet Union remained a major concern in assessing the military requirement for U.S. strategic nuclear forces. The authors of the earlier report argued that the United States must be prepared for the possible emergence of a hostile Russian government or the failure of the arms control process in the former Soviet Union.

In contrast, Rumsfeld wrote in his foreword to Congress that the United States “will no longer plan, size, or sustain its forces as though Russia presented merely a smaller version of the threat posed by the former Soviet Union.” Yet, in the report’s body, the Department of Defense hedged, asserting, “Russia’s nuclear forces and programs nevertheless remain a concern...in the event that U.S. relations with Russia significantly worsen in the future, the U.S. may have to revise its nuclear force levels and posture.” The Pentagon planned to accomplish this by drawing on what it called a Responsive Force, essentially a reserve force, which could be available “in weeks, months, or even years.” The report stated that “operationally deployed forces” are sized “to meet the U.S. defense goals in the context of immediate, and unexpected contingencies.” As the report explained, “[A]

contingency involving Russia, while plausible, is not expected.”

Presumably driven by these concerns, the report concluded that 1,700–2,200 nuclear warheads in the operationally deployed strategic force by 2012 would support U.S. deterrence policy and thus meet U.S. security needs. The Responsive Force, those weapons not operationally deployed, would contain several thousand more nuclear warheads, while U.S. strategic bombers and missiles would be retained rather than being destroyed. Later, in June 2004 the Bush administration announced that total holdings of nuclear warheads would be cut almost in half, leading to estimates that there will be approximately 6,000 warheads in the total U.S. stockpile (i.e., warheads operationally deployed plus those in reserve) in 2012 after those reductions have been made. (Some more recent estimates quote numbers close to 5,000.) Planning and budgeting functions in the U.S. defense establishment for the nuclear forces obviously still assign a heavier weight to Russia’s nuclear capabilities than should be the case given the changed relationship formalized by Bush and Putin.

Legally binding codification of the U.S. nuclear planning recommendations came in the form of the Strategic Offensive Reductions Treaty (SORT), also known as the Moscow Treaty, signed by Bush and Putin in Moscow on May 24, 2002. The treaty commits the two countries to having no more than 1,700–2,200 operationally deployed strategic nuclear warheads each by December 31, 2012, although there was no agreed definition of what was to be counted in that aggregate and after that date there would be no numerical limits. The November 13, 2001, Joint Statement was cited in justifying the commitment. The two countries agreed that compliance with the treaty’s provisions would be verified by the procedures and systems agreed to in the 1991 START, which will expire in 2009 unless extended or modified by the two states.

More interesting and potentially more important than SORT was a Joint Declaration issued by the two presidents the same day. That declaration, reinforcing the ones made several months earlier, affirmed that “the era in which the United States and Russia saw each other as an enemy or strategic threat has ended.” It outlined several topics for further discussion, including:

- Joint research and development of missile defense technologies;
- Cooperation on missile defense for Europe;
- Strategic offensive reductions to the lowest levels consistent with their national security requirements and alliance obligations, reflecting the new nature of their strategic relations; and



White House

Russian President Vladimir Putin and U.S. President George W. Bush sign the Strategic Offensive Reductions Treaty (SORT) on May 24, 2002. SORT commits the United States and Russia to operationally deploy less than 2,200 strategic warheads each by December 31, 2012, after which the limit expires.

- Measures, including transparency, to supplement further strategic offensive reductions.

A vigorous implementation of these programs would have helped consolidate the changed relationship in practical ways, but too little has been done to implement the joint declaration.

Furthermore, Russia's harsh reaction to the Bush administration's proposal for strategic ballistic missile defense systems in Poland and the Czech Republic demonstrate that U.S. offensive and defensive missile capabilities still preoccupy Moscow. Clearly, the task of escaping from the mutual assured destruction trap has not been completed, nor is it fully reflected in the Defense Department's budgeting and planning or in the sizing of the operationally deployed and reserve nuclear forces. The challenge to change the remaining missions of these forces to conform to Bush's policy statements still remains unmet.

Even so, the Bush administration has emphatically asserted that nuclear deterrence should be erased from the relationship with Russia. Particularly striking was Bush's December 13, 2001, statement that "the greatest threats to both our countries come not from each other, or from other big powers in the world, but from terrorists who strike without warning, or rogue states who seek weapons of mass destruction." This implies that the size and characteristics of U.S. nuclear deterrent forces should be determined by the terrorist or rogue state threat, not by Russia or other major nations. The Bush administration also has accepted as a planning principle the idea that the appearance of unanticipated threats in the strategic environment can be accommodated by activating elements of what it calls the Responsive Force. An important component of this planning concept, which is a contemporary version of "reconstitution," is the infrastructure for nuclear weaponry, as discussed in the Nuclear Posture Review.

Rethinking Deterrence

Planning for U.S. nuclear forces will inevitably take into account plausible scenarios in which the use of nuclear weapons by the United States might seem to decision-makers of the future to be a necessary option, although a thoroughly unattractive one. Our thesis is that, even if one accepted the validity of these scenarios, some of which we describe below, the requirements for nuclear weapons do not add up to anything like the Bush administration's projected numbers. Our view is that most of the potential military tasks we cite could be accomplished with modern conventional weapons.

An example of "well recognized current dangers" in the Nuclear Posture Review is "a military confrontation over the status of Taiwan" with

China. Tensions in the Taiwan Strait eased somewhat following the 2004 Taiwanese elections, which tended to reaffirm the "one China" doctrine supported by the United States and China. They rose again with the passage of the anti-secession law in Beijing in March 2005, but the Nuclear Posture Review had longer-range reasons for worrying about China in its discussion of sizing the nuclear force. It called attention to "China's still-developing strategic objectives and its ongoing modernization of its nuclear and non-nuclear forces."

China's long-range strategic nuclear forces (i.e., those capable of striking U.S. territory) have held steady at about two dozen single-warhead missiles for many years. China's military modernization has emphasized survivability of their nuclear forces and a non-nuclear buildup, including aircraft and missiles based opposite Taiwan. Thus far, the evidence is not clear as to whether its nuclear modernization plans include a major increase in force levels. As a rapidly rising economic power, however, China has the long-run potential to be a formidable military power. So, in addition to the role of U.S. nuclear forces in assuring allies such as Japan and South Korea and encouraging prudent behavior on all sides, the Bush administration's notion of dissuading any future military competition with the United States comes into play.

This concept of dissuasion broadens the definition of how nuclear weapons can play a part in today's diplomacy. It warrants careful examination because the Bush administration emphasizes its importance as a different concept from deterrence. In fact, the distinction between them depends on individual circumstances. Against a major nuclear power such as Russia, the distinction between deterrence and dissuasion is somewhat artificial. When the Bush administration's September 2002 National Security Strategy of the United States speaks of dissuading potential adversaries from pursuing a military buildup, the idea amounts to deterring a peacetime activity from occurring that could present a future threat to peace and security. There are ways to accomplish this that do not rely on an instantly useable force, for example, the threat of a U.S. military buildup, but the idea also has been applied to would-be "peer competitors" in the hope of dissuading such nations from even thinking of competing with U.S. military forces. Thus, the National Security Strategy states that "[o]ur forces will be strong enough to dissuade potential adversaries from pursuing a military build-up in hopes of surpassing, or equaling, the power of the United States."

Overwhelming destructive force is a convincing deterrent to the use of force against U.S. interests, but it has its limits. History does not support the notion

that superior force in itself is sufficient to dissuade a weaker state from strengthening its defenses. Recent experiences in Korea, the Middle East, and South Asia does not support it either. Instead of encouraging restraint, an arms race is the typical result. It would not make sense to indulge in nuclear overkill in the attempt to persuade China not to try to surpass U.S. power. Many other factors, especially economic ones, will help determine that decision. Increasing U.S. operationally deployed forces to dissuade China from building the kinds of forces that it thinks are necessary to achieve its regional goals would probably have an effect opposite to the one intended.

To be effective, a dissuasive posture must be accompanied by explicit incentives. Otherwise, it is merely another variant of assured destruction—useful in deterring attack, less useful in dissuading an adversary from improving his military position.

New Goals for Deterrence?

For the foreseeable future, there are no other “big powers” that U.S. nuclear forces need to deter, dissuade, or defeat. France, Israel, India, Pakistan, and the United Kingdom have nuclear weapons but are not currently adversaries, and their nuclear forces are much smaller than those of the United States. Hence, the remainder of this discussion can turn to the implications of the new strategic paradigm for what Bush has called the “crossroads of radicalism and technology”: rogue states and terrorist groups that try to acquire nuclear weapons and who, if successful, might then think of using them against their enemies, including the United States.

It is not out of the question that a war could yet develop from one or the other of the two most pressing proliferation situations, Iran and North Korea, but what role could U.S. nuclear weapons play? Nuclear weapons might be thought to be necessary if a conventional war got out of hand. Some analysts suggest that a nuclear weapon might be used against a stockpile of biological agents, for example, as a means of pre-emptively eliminating a developing threat before it matures. Deep underground, hardened shelters have been mentioned as possible targets for nuclear weapons because non-nuclear weapons might not be powerful enough. Yet, the potential targets for nuclear weapons appear to be very small, as the following analysis suggests.

U.S. nuclear weapons have not been useful in preventing the acquisition of nuclear weapons by states determined to have them and will clearly not dissuade al Qaeda from attempting to make or steal

them. As to the notion that new nuclear weapons are needed because existing ones cannot reach deep underground bunkers where weapons of mass destruction may be stored, it is doubtful that having new nuclear bunker busters in the U.S. inventory would dissuade an adversary convinced of the need

History does not support the notion that superior force in itself is sufficient to dissuade a weaker state from strengthening its defenses.

for a nuclear deterrent. (See Section IV for further discussion of this issue.) Neither the vast nuclear superiority of the United States, nor the prospect of a U.S. ballistic missile defense system, succeeded in stopping North Korea’s drive to build and test a nuclear weapon of its own. Iran has continued its

pursuit of ballistic missiles and uranium enrichment. With respect to Iran, unlike North Korea, the United States has been reluctant to offer any substantial upfront incentives, relying more on pressure and threats. As noted above, the dissuasive effect of nuclear weapons is likely to be most effective when coupled with measures that meet the adversary’s security and economic requirements.

As to deterring the use of nuclear weapons, the administration and most independent experts acknowledge that nuclear deterrence has little effect on suicidal, fanatical terrorists. Otherwise, no role for U.S. nuclear weapons in any mode is very likely in the case of terrorists. The best way of blocking nuclear-armed terrorism is to prevent nuclear weapons or materials from escaping the control of responsible governments.

What about the rogue states of the world? They surely have something of value to lose if a nuclear attack were launched against them. Nuclear deterrence probably would work to prevent the use of nuclear weapons by Iran, for example, against the United States or its allies. North Korea is already a small-scale nuclear-weapon state, but powerful neighbors all around North Korea contain it. The first use of nuclear weapons by North Korea cannot be excluded under some unlikely circumstances, but a credible U.S. nuclear deterrent can be had at very low levels of forces and certainly without acquiring new nuclear weapons. For example, a last-ditch suicidal gesture by North Korea’s leadership in the endgame of a losing war cannot be ruled out, but the levels and types of U.S. nuclear forces are irrelevant to this situation.

U.S. military and intelligence documents also identify Syria as a potential nuclear proliferant. Then-CIA director George Tenet told the Senate that Syrian nuclear intentions were being “closely monitored.” He reported that Syria was developing longer-range missile programs, such as Scud D. There is no indication that U.S. nuclear weapons would come into play in this situation any more than they did in Iraq.

As to other “generic” rogue states, it may be that, if substantial U.S. conventional forces could not be brought to bear in a war launched by a rogue state against a U.S. friend or ally, nuclear weapons might be seen as the only answer, especially if the aggressor had used biological or chemical weapons. This worst-case scenario, of course, is what has caused the Bush administration to declare that it will use military force, not excluding nuclear weapons, to anticipate an emerging threat posed by such weapons. This was the administration’s case for war against Iraq. Such a decision would have very serious adverse consequences, as will be discussed in Section II

Is it likely that there will be many instances where an anticipatory action against a rogue state to prevent a nuclear weapons capability could be prosecuted? Probably not, as we elaborated in more detail in *The Gravest Danger: Nuclear Weapons*.¹ In fact, the 2002 National Security Strategy stipulates that force, non-nuclear as well as nuclear, would not be used in all

cases to pre-empt emerging threats. The two cases of Iran and North Korea already show that military force has its limitations. Using nuclear weapons would be very unlikely and not only because the regional political and human costs would be very high. Most decisions to initiate preventive action have to be taken under conditions of huge uncertainty. There will inevitably be gaps and incorrect information about essential facts. This is the very nature of intelligence information and is one of the reasons for exhausting all possible avenues of diplomacy before relying on force.

To sum up, even without ruling out a possibility, however unlikely it may seem today, of circumstances that would lead the United States to resort to first use of nuclear weapons, the numerical requirements for U.S. warheads to prevent nuclear use by rogue states or terrorists are very low. It is not nuclear deterrence but activities such as the Cooperative Threat Reduction program that are key to preventing nuclear terrorism.

1. Sidney Drell and James Goodby, *The Gravest Danger: Nuclear Weapons* (Hoover Institution Press, 2003).

Nuclear Deterrence in the 21st Century

Nuclear deterrence theory and practice were developed and implemented in a unique historical era, one in which the protagonists competed in a highly focused bipolar mode in the arena of nuclear weaponry. (See Appendix 1.) The United States and the Soviet Union came to share many beliefs about nuclear weapons and they cooperated, both formally and tacitly, through much of the Cold War to make sure that their nuclear weapons were not used against each other. Nevertheless, it was an imperfect way, at best, of managing nuclear competition. By the 1980s, both governments were convinced that deterrence required them to maintain nuclear forces that could survive a first strike and then launch a retaliatory strike capable of delivering assured destruction against the other. It was a prescription for overkill on a scale unique in history.

Illustrative of this thinking was an article written by Paul Nitze in *Foreign Policy* in the winter of 1976–77.² Nitze tried to answer the question “How much is enough?” He argued that, “to keep the Soviet population hostage to a countervalue attack,” the United States needed “something of the order of 3,000 deliverable megatons remaining in reserve after a counterforce exchange.” A counterforce attack is limited to targets of military value, such as actual weapons systems and command posts, whereas a countervalue strike targets an adversary’s population, society, and economy. Nitze’s prescription translated into a strategic nuclear force of several thousand missiles and bombers capable of delivering many thousands of warheads. This effort was required, Nitze believed, because the Soviets were bent on “detering the deterrent.” They wanted to be able, after a counterforce attack on the United States, to have sufficient reserve megatonnage to hold the U.S. population and industry hostages.

Analyses of this type were a direct outgrowth of Secretary of Defense Robert McNamara’s early 1960s conclusion that “assured destruction is the very

essence of the whole deterrence concept.” He was one of the first to try to answer the question “How much is enough?” Nitze had adapted the assured destruction idea to the technology of succeeding decades and had made the case that U.S. presidents should have options other than an all-out attack on Soviet population and industry even after a Soviet attack aimed at U.S. nuclear strike forces. It is unlikely that the combination of circumstances that made such an extravagant version of nuclear deterrence almost inevitable will appear again.

In the present era, what is being said about the case where dissuasion and deterrence both fail and a confrontation should come with a big power armed with nuclear weapons? The February 2004 report of the Defense Science Board Task Force on Future Strategic Strike Forces suggested that the United States should try first to transform relations through dissuasion and assurance. If that failed, the objectives should be:

- “To dissuade, to deter, and to prevail, while minimizing the prospects of unwanted escalation and damage to allies; and

2. Nitze, Paul H., “Deterring Our Deterrent,” *Foreign Policy*, no. 25 (Winter 1976–1977) pp. 195–210.

- To terminate the conflict as quickly as possible on terms consistent with U.S. values and objectives.”

There is nothing here about protracted nuclear war. Rather, the emphasis is on avoiding escalation and ending the conflict.

The task before us now is to analyze how deterrence/dissuasion works in present circumstances and what are the implications for the size of the U.S. nuclear arsenal:

- in the case of former adversaries (i.e., Russia)
- in the case of present adversaries
- in the case of potential adversaries
- in regional conflicts, for example, the Middle East
- in the special cases of the threatened use of biological and chemical weapons, where the Bush administration has reserved the right to use nuclear weapons if attacked with such weapons.

The connection between nuclear deterrence and other forms of military deterrence exercised by the United States should also be considered in relation to the objective of preventing both nuclear proliferation and the use of nuclear weapons.

Russia

The bipolar nuclear competition of the Cold War era has largely been liquidated, but the legacy of those days still exists in a lingering mistrust between Moscow and Washington. Excessive nuclear force deployments furnish evidence of this enduring mistrust, as do Russian reactions to U.S. proposals for ballistic missile defense deployments in Poland and the Czech Republic.

If the Bush-Putin statements are taken literally, it should suffice to have a responsive force to hedge against renewed hostility in the U.S.-Russian relationship. Ready-to-launch, operationally deployed nuclear forces should not be required between two countries that mutually declared in November 2001 that they do not regard each other as an enemy or threat. Deterrence/dissuasion, in the case of Russia, now should be seen logically as applying to peacetime behavior, not to the existential act of launching a strategic nuclear attack. Thus, the threat of activating a “responsive force” of the type described in the Nuclear Posture Review should dissuade or deter Russia from embarking on a renewed nuclear arms race. Further verifiable U.S.-Russian nuclear weapons reductions would also decrease the possibility that either side could quickly rearm in a way that would

upset strategic stability. In Section III, we will discuss appropriate and much smaller transitional force deployments, taking into account the historical baggage that acts as a brake on more rapid reductions, as well as other deterrent tasks.

Present Adversaries

The cases of present adversaries, such as North Korea and Iran, are more complex. The five permanent members of the UN Security Council (China, France, Russia, the United Kingdom, and the United States) plus Germany and others are engaged in an effort to persuade Iran to comply with Security Council Resolutions that call upon it to answer the International Atomic Energy Agency’s outstanding questions about its past nuclear activities and to suspend its uranium enrichment program and other sensitive nuclear fuel cycle activities. Iran claims its uranium enrichment program is meant to support peaceful nuclear activities, but such a capability can also allow for the production of highly enriched uranium for weapons purposes. The current strategy, which involves targeted sanctions and diplomatic isolation and calls for tougher international inspections, has not slowed Iran’s enrichment program. Direct negotiations between leading states and Iran are not currently underway.

Earlier efforts at dissuasion failed to prevent North Korea from resuming plutonium production in 2003 and testing a nuclear device in 2006. However, diplomatic efforts through six party talks involving China, Japan, North Korea, Russia, South Korea, and the United States have recently produced limited, but important and promising breakthroughs. On February 13, the six parties agreed to a step-by-step process for halting and eventually disabling North Korea’s nuclear facilities and for moving towards a normalized relationship. Since then, the International Atomic Energy Agency has verified that North Korea has shut down its main nuclear complex at Yongbyon and North Korea has committed to disable key facilities and make a full declaration of its nuclear program by the end of 2007. In the two cases of Iran and North Korea, what does it mean for dissuasion to fail, and what should the United States do if North Korea or Iran openly deploys nuclear forces and engages in threatening policies or actions?

An anticipatory U.S. attack might be expected as the next step, according to the theoretical deterrence ladder constructed by the Bush administration. The administration has said, however, that military action is not always appropriate, and so far, the option of preventive war has not been exercised in the case of North Korea, the more advanced of the two potential new nuclear-weapon states and the only one to claim it already has nuclear weapons. In fact, Bush

has emphasized that the circumstances in this case demand a diplomatic approach. The administration reiterated this position even after the North Korean test of 2006. With respect to Iran, U.S. officials have suggested that “all options are on the table.” However, if diplomacy and targeted sanctions are to be pursued with any reasonable hope for success, the North Korean case illustrates that incentives and direct diplomacy must be included among the tools used. Unadorned threats of assured destruction of targets in Iran may stiffen the position of hardliners in Iran who believe the country should keep the nuclear weapon option open in order to help deter such an attack. Actual attacks, particularly if they involve nuclear weapons, that produce massive destruction would be perceived to be out of proportion with the potential threat that Iran might acquire uranium enrichment capabilities. Such a response would pose a risk of a wider war in an already volatile region. Such an attack may not succeed in destroying all of Iran’s nuclear-related assets and may only set back Iran’s program temporarily.

Deterrence with respect to Iran may be forced to return to its more limited Cold War-era function of preventing an Iranian attack on the United States or Iran’s neighbors in the region. Containment, the other component of U.S. Cold War strategy, also seems relevant with respect to Iran if current efforts to dissuade and deter Iran from improving its nuclear capabilities continue to fall short. The familiar options of countervalue and counterforce will be available for deterrence, although on a scale that is miniscule as compared with U.S.-Soviet competition.

Potential Adversaries

Like Russia, China presents a special case. The United States and China are working fairly closely together on security issues and are strongly linked by trade and financial interests. Nevertheless, it is understood that China’s long-range retaliatory capability has the United States in its crosshairs in some way. Similarly, the target list for U.S. nuclear forces presumably includes a growing number of Chinese targets. Taiwan, of course, could become a major flashpoint in the bilateral relationship at any moment. China remains a potential adversary. The adversarial relationship and the concomitant threat of nuclear attack have not been formally excluded from the U.S.-Chinese relationship as they have from the U.S.-Russian relationship, but U.S. policymakers have not invoked the threat of nuclear retaliation as a response to potential Chinese incursions in the Taiwan Strait since President Dwight Eisenhower’s administration.

As the Nuclear Posture Review states, nuclear weapons can assure allies, and this is particularly the case with Japan, a country that has set great store

by the U.S. “nuclear umbrella.” The presence of that umbrella has made it easier for the Japanese and other allies to continue their renunciation of nuclear weapons. There now are pressures coming from some quarters in Japan to amend Japan’s constitution with regard to the renunciation of war. Japan’s non-nuclear-weapon status has also been questioned. The role of the U.S. nuclear umbrella may still be useful in thwarting a nuclear arms race between China and Japan, but the form of that umbrella need not be like the one that exists today.

If deterrence of a Chinese attack on Taiwan were to fail, the U.S. response would very likely be a move to defend Taiwan. U.S. use of nuclear weapons would almost certainly not be the first step in an attempt to convince China to stop military action, but one cannot totally rule out that there could be certain narrow circumstances in which a limited nuclear response might be considered. A credible U.S. deterrent against potential Chinese threats can be managed while reducing the number of warheads. The United States certainly does not need additional nuclear weapons to achieve some dissuasive effect.

What should the United States do if China began a buildup of the type that the Soviet Union began after the 1962 Cuban missile crisis? For quite a while, present or even greatly reduced U.S. nuclear force levels would suffice to maintain the direct deterrent effect against a Chinese attack on Taiwan. Present U.S. superiority is such that a number of years would pass before the buildup of China’s nuclear forces would require adjustments to the allocation of U.S. warheads to target the new threat or reinforce the deterrent against any imprudent behavior. There is no doubt that, in the present situation where peace is conditional, the U.S. government would see a need for maintaining the capability for an appropriate nuclear response. Further, that course of events would have repercussions in the U.S.-Russian relationship. The U.S. nuclear force structure is only one of the factors influencing China’s force posture decisions, but deeper reductions in U.S. operationally deployed nuclear forces than presently contemplated might contribute to dissuading China from a major buildup. This point is discussed further in Section V.

Regional Conflicts

Europe, where the nuclear confrontation was most intense during the Cold War, is not likely to be the scene of conflict or disputes that would rise to the threshold where nuclear deterrence would become a consideration. The North Atlantic Treaty Organization (NATO) commits each of its 26 members to regard the security of other members as its own. A response to an attack on any one of them could include the counter-use of U.S. nuclear weapons according to

NATO doctrine, but as a practical matter, nuclear deterrence has essentially disappeared from NATO's missions. No doubt the attraction of NATO for eastern European countries lies in the connection it affords to overall U.S. military strength. Attractive power is not to be lightly dismissed, but this is as far as it goes, as far as the present-day role of nuclear deterrence is concerned. Reportedly, the United States maintains a stockpile of tactical nuclear weapons in Europe. No need exists for them under present circumstances, and they, like similar Russian nuclear systems, should be consolidated in rear areas in the United States and Russia, and ultimately eliminated.

Three other regions where simmering disputes have boiled over into open conflict and could do so again are the Middle East, South Asia, and Northeast Asia. In the Middle East, the United States has been and remains an active player in regional security issues. In 1973, President Richard Nixon put U.S. nuclear forces on alert to send a warning signal to the Soviets that they should not intervene in the Middle Eastern war of that year. Prior to the 1991 Persian Gulf War, Secretary of State James Baker hinted at the use of nuclear weapons if Saddam Hussein used chemical or biological weapons. A stated if unsubstantiated reason for the U.S. invasion of Iraq in March 2003 was to eliminate the possibility that Iraq would build nuclear weapons. The dispute with Iran over its nuclear programs has evoked some media and even official discussion of air attacks on Iranian nuclear facilities, like the 1981 Israeli attack that destroyed Iraq's Osirak reactor.

In such a volatile region, where nuclear weapons have figured in several disputes, it is reasonable to think that U.S. nuclear weapons must exercise some deterrent effect. If a war with Iran were to occur, for example, U.S. nuclear weapons looming in the background might suggest to Tehran that the war should be limited and terminated as soon as possible. In other cases, their deterrent effect is probably negligible as compared with Israel's own nuclear deterrent and other actions that the United States is capable of taking. Their deterrent effect against use of biological or chemical weapons by Hussein in the Persian Gulf War is far from clear. George H. W. Bush apparently believed that the threat of regime change would be a more effective deterrent than the use of nuclear weapons, and perhaps it was. The most likely result, if deterrence failed in the Middle East, would be a war fought with conventional weapons and, as is being demonstrated in Iraq, by asymmetric warfare on the part of U.S. adversaries.

South Asia presents even fewer scenarios where U.S. nuclear weapons would deter or dissuade a protagonist from taking actions that the United States wanted to prevent. Would Washington authorize the use of U.S. nuclear weapons against India to stop an Indian attack against Pakistan? Would it consider an

attack on Pakistan to stop a war that Pakistan had started? The answer is no in both cases; it is simply inconceivable. The only plausible situations in which U.S. nuclear deterrence might come into play in South Asia is in the context of a radical Islamist government in Pakistan gaining control of its nuclear program or reassurance to India in the event of a serious dispute with China. These contingencies are not out of the question, but the effect of U.S. nuclear deterrence is apt to be marginal in either case.

A crisis in Northeast Asia has more potential for erupting into a conflict. As already discussed, the assured destruction/containment type of deterrence is essentially where things stand now. The three U.S. goals are to deter North Korea from invading South Korea, to deter North Korea from launching missile attacks against Japan or South Korea, and to deter North Korea from using nuclear weapons under any circumstances. Actual U.S. use of nuclear weapons would probably be constrained by the opinions of all of North Korea's neighbors, but that should not diminish their deterrent effect against Pyongyang's use of nuclear weapons, except perhaps as a last desperate act of a defeated regime.

Biological and Chemical Weapons

In many of the cases discussed so far, preventing an adversary's use of biological or chemical weapons would be a key U.S. goal, as it was in the Persian Gulf War and the 2003 invasion of Iraq. In neither case was a threat to use nuclear weapons made explicit. War crimes trials against any Iraqi commanders who authorized the use of "weapons of mass destruction" were explicitly guaranteed by the United States. Other countries with biological or chemical weapons could give rise to similar challenges in the future. Deterrence, not necessarily nuclear, would have two components in each situation: to dissuade development, deployment, and plans for use of biological or chemical weapons and to deter the actual use of such weapons. The first objective, one of those that seems to be included in the Bush administration's strategy, is important but will be difficult to accomplish in practice. Biological and chemical weapons can be manufactured covertly and relatively easily. More than 15 countries, several of which are hostile to the United States, are believed to be pursuing or already to possess such arms, of which perhaps up to one-third are "states of concern." They see these as their own deterrents and will be reluctant to give them up. Once again, this type of dissuasion, which is aimed at influencing other countries' force structure decisions, cannot be carried out effectively, if at all, without accompanying incentives. One of the most important incentives would be to improve

the security situation for the countries concerned by settling regional disputes.

The other goal of preventing biological or chemical weapons use in combat may be easier to achieve, although the record of the Iran-Iraq War waged in the 1980s is not very encouraging on this score. Of course, the United States was not directly involved, aside from providing Hussein intelligence information, but no effort was made to punish Iraq for initiating chemical weapons attacks. In a case where U.S. or allied forces might be involved in the future, an explicit U.S. threat to use nuclear weapons in retaliation for use of chemical or biological weapons might be considered. Before voicing that threat, however, it must be weighed against other very troubling considerations, including the issue of whether nuclear weapons should be used against non-nuclear-weapon states, the advisability of ending 60 years of non-use of nuclear weapons in combat, and whether a nuclear response is proportional to a biological or chemical weapons attack. Nuclear weapons are unique in their terrifying potential for massive destruction on an unprecedented scale. Their capability for widespread destruction vastly exceeds that of chemical weapons. For now, this also holds true for biological weapons, which should be feared primarily for their terror-creating potential, although ultimately they may come to rival nuclear weapons as a threat to populations on a global scale. A policy of “calculated ambiguity” regarding the U.S. response to an adversary’s use of chemical or biological weapons is preferable to a more explicit threat. Unrivaled in conventional military power, the United States only diminishes its own advantages and strengths by pursuing nuclear weapons policies that boost the perceived value of biological and chemical weapons in the eyes of others.

Nuclear Deterrence in Context

This discussion underscores the point that nuclear deterrence cannot be considered in a vacuum, nor can it be seen as the only or even the most powerful

deterrent available to the United States in every case. Experts spend a great deal of their time wondering whether a threat to use nuclear weapons is credible. A weapon that has not been used in combat for 60 years is not a weapon that is used lightly, and the consequences of its possible use are so dire that even the most irresponsible of rogues probably is impressed. To make the consequences less dire by making them “more useable” by lowering their yields is probably not going to do much to influence such people. Here, the subject is deterrence, and images in the minds of dictators are what count.

What is credible beyond doubt is that the United States has built the world’s most effective and powerful war-fighting force, excluding its nuclear weapons. In fact, to the extent that the United States depends on nuclear weapons to make a point,

the more this will encourage asymmetric warfare and biological and chemical weapons use on the part of U.S. enemies and the less effective future U.S. fighting forces will be.

The Nuclear Posture Review treats nuclear weapons as an embedded element in U.S. offensive forces. Of course, in the real world nuclear weapons are not treated simply as an extension of the most powerful conventional forces.

They are treated separately. Their use would require exceptional circumstances, and no president has seen such exceptional circumstances, even in the midst of two otherwise unwinnable wars, Korea and Vietnam. Wisely, U.S. military leaders think of nuclear weapons as the ultimate deterrent and not just as another weapon. Former Chairman of the Joint Chiefs of Staff and future Secretary of State Colin Powell expressed this perspective clearly in his 1995 autobiography. “No matter how small these nuclear payloads were, we would be crossing a threshold. Using nukes at this point would mark one of the most significant political and military decisions since Hiroshima,” Powell wrote.³ An assessment about whether nuclear weapons should be used always takes place in the context of whether there is some non-nuclear weapon that could do the job. In short, nuclear weapons are not weapons of first choice, but of last choice.

The United States only diminishes its own advantages and strengths by pursuing nuclear weapons policies that boost the perceived value of biological and chemical weapons in the eyes of others.

3. Powell, Colin L. and Joseph Persico, *My American Journey*, Random House. 1995, pg. 324.

Implications for U.S. Strategic Nuclear Forces

U.S. Nuclear Force Size

In his foreword to the Nuclear Posture Review, Rumsfeld supported “a credible deterrent at the lowest level of nuclear weapons consistent with U.S. and allied security.” Based on the analysis in the preceding sections, the Nuclear Posture Review’s conclusions should be updated and reversed. It appears to be entirely possible and feasible to maintain a credible U.S. deterrent at much lower levels of nuclear weapons than were recommended in that report. It may have been reasonable to err on the high side at that time. The report implied that, stating, “[I]n a fluid security environment, the precise nuclear force level necessary for the future cannot be predicted with certainty.... [T]he range of between 1,700 and 2,200 warheads provides a degree of flexibility.” It is very difficult to escape from the mutual deterrence mindset, even after conditions have changed very considerably, but we think the United States and Russia, the two nations that possess more than 90 percent of the world’s nuclear weapons, can do better than they have.

As the preceding analysis pointed out, the Russia contingency, which is the danger of a hostile government taking power in the future, can be met through greater reliance on a smaller responsive force than currently planned and which need not be available in a matter of days or weeks, but months or even years. If operationally deployed nuclear warheads are not the prime deterrent against possible Russian actions, then they can be reduced to lower levels earlier than the date of 2012 prescribed both in the Nuclear Posture Review and in SORT. Certainly, the number could be much lower than the 3,696 operationally deployed U.S. warhead level announced by the U.S. government in 2007.

Lower warhead levels reached more rapidly would be consistent with the Bush-Putin November 13, 2001, statement that “neither country regards the other as an enemy or threat.” It also would be consistent with the 2002 Moscow Declaration in which Bush and Putin stated their intentions “to carry out strategic offensive reductions to the

lowest possible levels consistent with their national security requirements and alliance obligations, and reflecting the new nature of their strategic relations.” That declaration described SORT as “a major step in this direction.” A straightforward reading of this passage implies that the two presidents did not see the treaty as the last word in strategic offensive reductions. Furthermore, the treaty itself included a clause that it could be “superseded earlier [than 2012] by a subsequent agreement.” The Consultative Group for Strategic Security, which was established by the Moscow Declaration, could determine how to accomplish this revision. Chaired by the foreign and defense ministers of each country, this group has not yet proved effective or developed an agenda for addressing important issues such as this.

We believe that SORT should be amended to set a ceiling of 500 operationally deployed strategic warheads. This would be accomplished during a transition period that might last five years. Another 500 warheads could be held for the Responsive Force.

Deeper reductions could be considered and possibly implemented during the five-year transition period, taking into account developments in China, among other things. The rationale for this conclusion follows.

First, as to the number of potential targets, we assume that Russian nuclear forces will decrease in numbers comparable to what we are proposing for the U.S. force. For reasons having as much to do with historical and political baggage as with military requirements, this assumption will be a major determinant of the size of the U.S. operationally deployed force, as it appears to be today. Even given the history, however, the numbers assigned to deterrence are much too high. In addition, the United States should, as we have argued, maintain a Responsive Force to counter the possibility of a resurgent and hostile Russia. Under these assumptions and taking into account the new relationship with Russia that Bush has proclaimed, we estimate that a U.S. strategic force of some 500 operationally deployed warheads would be more than adequate for deterrence. Borrowing the notion of the Nuclear Posture Review, this force level would be enough to provide a degree of flexibility in a fluid security environment.

This number is large enough to deal with the targets described generically in the Nuclear Posture Review as “instruments of political control and military power...leadership and military capabilities, particularly weapons of mass destruction, military command facilities and other centers of control and infrastructure that support military forces.” We estimate these military targets, under the conditions we postulate, to number between 200 and 300, and we have sized the operationally deployed force of strategic warheads at a larger number of 500 for reasons of operational conservatism.⁴ The excess allows for force readiness concerns, multiple targeting where needed, and the possibility of very sudden and unexpected surprises from Russia, for example, a breakdown in its military command and control caused by technical failures or a takeover by renegades. As Russia and the United States move farther away from the nuclear deterrent trap in which they are still ensnared, the sizing of their stockpiles would depend on other concerns and could be further reduced.

The 500 operationally deployed warheads would be augmented by those from the Responsive Force, which would be configured in two parts, the first able to respond to a rapidly building crisis—a Ready Responsive Force—and a second able to respond to



U.S. Navy. Gene Royer

The U.S. Navy currently has 14 Trident nuclear-powered submarines for delivering nuclear weapons.

strategic warning signals on a timescale of a year or more—a Strategic Responsive Force. This use of the Responsive Force underscores the need for sustaining an infrastructure for supporting it as well as the need to provide this force with appropriate hardening and concealment. As we look ahead a few years into the future, the total Responsive Force should have 400–500 warheads, a number comparable to the operationally deployed one. This number would be adequate to target roughly 200 additional Russian sites, for example, those affecting industrial recovery—the major nodes in the electric power grid and air, ground, and rail transportation systems, as well as major industrial sites. These targets and the forces to attack them may be viewed, we hope, as only temporary remnants of the Cold War policy of assured destruction that may be discarded before long in the dustbin of history.

4. Pavel Podvig at Stanford’s Center for International Security and Cooperation has suggested a notional Russian strategic nuclear force structure in the future. His analysis, based on their current production programs for a total force size of 1,500 warheads, suggests their strategic rocket forces sized to 600 warheads on 150 launchers and 500 warheads on their submarine force. These numbers will presumably decrease by agreement in proportion to the lowered ceilings proposed for the U.S. forces. See <http://russianforces.org/podvig/eng/publicationsforces/20050100asp.shtml>

See also: *The Nuclear Turning Point*, Harold A. Feiveson, editor, Brookings Institution Press, 1999; *The Future of U.S. Nuclear Weapons Policy*, National Academies of Science Committee on International Security and Arms Control, National Academies Press, 1997; and Deutch, John, “A Nuclear Posture for Today,” *Foreign Affairs* (Jan./Feb. 2005).

Eventually we may hope to escape the nuclear deterrence trap and get rid of all nuclear weapons. That was the vision that President Reagan and General Secretary Gorbachev brought to their Reykjavik Summit in 1986. The challenge to rekindle that vision and to develop a strategy to realize it was addressed at a conference at Stanford University's Hoover Institution in 2006 and work toward that goal is continuing with growing interest. (See article by George Shultz, William Perry, Henry Kissinger, and Sam Nunn in *The Wall Street Journal* on January 4, 2007.)

In time, given the cooperation of other nations, nuclear deterrence might be maintained entirely with a Responsive Force without an operationally deployed force. That Responsive Force could consist of considerably fewer than 1,000 warheads, perhaps no more than the 500 that we postulate would initially be in the operationally deployed force.

Operationally Deployed Force

- Three Trident submarines on station at sea, each loaded with 24 missiles and 96 warheads (a mix of low-yield W76s and high-yield W88s). Reducing the D5 missiles' full complement of eight warheads to four per missile will substantially increase their maximum operating areas.

The same numbers of missiles and warheads could be distributed on a larger number of Trident submarines in the interest of greater operational flexibility and survivability, albeit at higher operational costs.

- 100 Minuteman III ICBMs in hardened silos, each with a single W87 warhead.
- 20–25 B2 and B52H bombers configured for gravity bombs or air-launched cruise missiles.

Responsive Force

- Three Trident submarines, each loaded with 96 warheads, in transit or being replenished in port⁵ for their next missions as part of a Ready Responsive Force for a rapidly building crisis, plus two or three unarmed boats in overhaul.

5. With reduced numbers of warheads below their current loadings, the Trident SLBMs will have significantly larger maximum flight ranges. For example, decreasing the modern Trident D5 loading from the current 8 warheads to 4 as proposed here translates into a 50 percent increase in the missile's maximum range from 4,100 nautical miles to 6,200 nautical miles. This in turn means substantial target coverage while the boats are in port as well as during transit. (See: John R. Harvey and Stefan Michalowski, "Nuclear Weapons Safety: The Case of Trident," *Science and Global Security*, 1994, vol. 4). In the event of further force reductions, to say a total of 500 warheads, there would most likely be a further reduction in the number of warheads carried by each individual boat in order to sustain a flexible on-station and in-port refurbishing cycle. This could be accomplished either by sealing off some of the 24 launch tubes on each Trident, or further downloading the number of warheads per missile, thereby further increasing their maximum range.



U.S. Air Force

The United States currently deploys 500 Minuteman III intercontinental ballistic missiles.

- 50–100 additional Minuteman III missiles taken off alert and without warheads, and 20–25 bombers, unarmed, in maintenance and training, all of which would comprise a Strategic Responsive Force, for a more slowly building confrontation.

Throughout the Cold War the United States insisted on maintaining a triad of strategic nuclear delivery systems—bombers plus land-based and sea-based ballistic missiles—to avoid common failure modes and vulnerabilities. There is value in retaining this diversity as the total stockpile is decreased to 1,000 warheads, as a way of preserving flexibility and confidence in reliability so long as operational costs do not exceed their perceived value.

The structure of the notional force of 1,000 warheads we are proposing is based on the existing

elements of the U.S. nuclear arsenal and its delivery systems: ballistic missile-armed submarines; land-based ICBMs; and cruise missiles and strategic bombers. It is designed specifically to meet in a timely manner today's urgent challenge to take advantage of the opportunity opened by the new U.S.-Russian strategic relationship. We believe that moving out of the deterrence trap more expeditiously would help Russia and the United States work more cooperatively against the looming threat of nuclear weapons proliferation into dangerous hands. Bold actions by the two powers that still possess more than 90 percent of the world's nuclear warheads would be a powerful stimulus toward preserving and further strengthening a nonproliferation regime that is under severe strain. Meeting their commitments under Article VI of the 1968 nuclear Nonproliferation Treaty (NPT) to reduce their nuclear arsenals and work toward an eventual, no matter how distant goal of eliminating them would be good for the nonproliferation regime. Moreover, it would also be good for their bilateral relationship.

In sum, we propose an appropriate U.S. force structure of 500 operationally deployed warheads, plus 288 warheads in a Rapid Responsive Force, and delivery systems in a Strategic Responsive Force capable of deploying up to 212 additional warheads. The United States and Russia should cooperate toward achieving this over the next five years, leading to forces of "500 plus 500 by 2012." It is a practical and timely step en route to the ultimate goal of eliminating nuclear weapons. We recognize that achieving that vision would require a world fundamentally different from today's world, but the first steps can lead to changed circumstances and changed political and security relationships. This initiative can help pave a path toward realizing a vision that has been embraced by many world leaders and U.S. presidents since 1945.

To Sustain This Force

Several existing defense programs will have to be carried forward with the appropriate priority in order to sustain a credible deterrent at lower levels. The first is stewardship of the Responsive Force. The current Defense Department plan is to achieve reductions to 1,700–2,200 operationally deployed warheads in the later stages of the process by downloading warheads from missiles and bombers and putting them into

storage. As the Nuclear Posture Review states, "[D]elivery systems will not be retired following initial reductions and downloaded warheads will be retained as needed for the responsive force." If the Responsive Force is to serve as insurance against the need for a buildup, the Departments of Defense and

Energy will have to treat it as such, including assigning resources to the upkeep of the delivery systems and warheads and contingency plans for reactivating the force.

The U.S. nuclear warhead infrastructure must also be maintained and updated as required if more reliance is to be placed on the Responsive Force to sustain and back up a credible nuclear deterrent. Planning to maintain a nuclear force structure of a given size must include an infrastructure able to refurbish or remanufacture

the limited-lifetime components of a nuclear warhead as required. These components include, for example, a gas boost system that contains tritium with a half-life for radioactive decay of 12.3 years and the plutonium that constitutes the fission fuel.

The radiation environment created by the plutonium in the so-called pit of a nuclear weapon can lead to changes in its crystal structure that may affect its explosive performance, resulting in warhead failure. The stockpile stewardship program at the national weapons laboratories in the United States is increasing the understanding on which to base confidence in the lifetime of existing pits and in calculating the number of new ones that will have to be manufactured annually to maintain an arsenal. For example, in 2003, the Department of Energy estimated that a 1,000-warhead arsenal with pits that can age to 45 years before they need replacement requires an annual production rate, on average, of fewer than 23 certified pits.⁶ This is well within currently envisaged U.S. production capacity and would remain true for a force double the size we recommend. In 2006, Department of Energy studies on plutonium aging found that most U.S. warhead types will not be affected by aging for 85 years or longer, further reducing pit remanufacture rate requirements. Such issues illustrate the necessity of maintaining a nuclear warhead production infrastructure for as long as the United States retains a nuclear force, but the requirements are quite modest compared to Cold War levels, with their much larger numbers of warheads and shorter anticipated pit lifetimes. The nuclear

Bold actions by the two powers that still possess more than 90 percent of the world's nuclear warheads would be a powerful stimulus toward preserving and further strengthening a nonproliferation regime that is under severe strain.

6. "Modern Pit Facility Draft Environmental Impact Statement," National Nuclear Security Administration, January 4, 2003. See <<http://www.mpfefs.com>>.

infrastructure must also sustain confidence in the long-term reliability of U.S. nuclear weapons as the United States works to reduce the size of its arsenal drastically. Currently, a comprehensive and rigorous science-based stockpile stewardship program is being successfully pursued at the Los Alamos, Lawrence Livermore, and Sandia National Laboratories. This program gives strong assurance that the current U.S. nuclear stockpile is reliable and will remain so for the foreseeable future.

More emphasis on adaptive planning also will be required to meet the contingencies discussed in preceding sections of this paper. As the Nuclear Posture Review explains, “[A]daptive planning is used to generate war plans quickly in time-critical situations.” This will probably require an upgrading of U.S. command and control capabilities.

There are three final comments to be made on force size. First, the warhead numbers we discuss here are for the strategic nuclear forces and do not include the tactical nuclear arsenal. Reductions in the numbers of tactical weapons will have to be included in implementing the strategic force reductions. The force structure we have outlined is a very conservative one in terms of target coverage, allowing for the fact that the door is closing too slowly on the Cold War orthodoxy of assured destruction thinking by the United States and Russia. After a transition stage of surely less than a decade, a further halving of the total warhead levels should follow, with all remaining warheads being assigned to a Responsive Force.

Second, this number of warheads would also cover for deterrence purposes all the other potential targets in other countries, assuming nuclear restraint elsewhere in the world. It is not necessary to have a separate deterrent force for each potential or present adversary because two or more nuclear conflicts at the same time is a very unlikely scenario. Pre-planning and adaptive planning can make use of deployed warheads for a variety of contingencies. Massive pre-planned attack options are relics of the past and should be left in that status.

Third, in order to insure against the possibility of negotiated force reductions being rapidly reversed and to provide confidence to the rest of the world, the United States and Russia should negotiate verifiable procedures for destroying excess warheads and

delivery systems beyond those now slated for the operationally deployed and responsive forces.

The United States should encourage other nuclear-armed states to adopt similar procedures as a step toward bringing them into a global nuclear arms reduction program.

Contingencies Involving Other Nations

As we noted earlier, future contingency planners are likely to consider whether nuclear weapons are needed to deal with conceivable wartime scenarios. Our view, to repeat, is that modern non-nuclear weapons almost certainly would be able to handle most foreseeable military challenges. Even if one assumes otherwise, the target list would not generate requirements for large numbers of nuclear warheads. Potential Chinese targets are likely to cover the same generic list as for Russia, cited above, including their strategic strike forces, command and control centers, major military bases, and ports in the vicinity of Taiwan. With China’s long-range nuclear forces remaining at anything like their present levels, we do not believe this should generate U.S. force requirements in addition to the numbers we have proposed for hypothetical emergencies involving Russia. The same warhead can be targeted against multiple designated ground zeros. Yet, if there were drastic changes in the worldwide strategic picture that led the United States to simultaneous major nuclear confrontations against Russia and China, the United States would evidently begin a major buildup of its own. This would take time, but so would a major Chinese buildup. The interim force configuration of “500+500” that we propose provides a ready basis for such U.S. action. The warhead delivery capacity of the Trident force can be doubled above the level to which we have proposed downloading it, and as we have described earlier, the United States would maintain a functioning nuclear infrastructure.

Regarding potential targets in North Korea or Iran, the list would be much shorter because the territories are smaller, and the numbers of defense-related installations are much fewer than in Russia and China. That list would very likely be limited to single digits in each country.

Are New U.S. Nuclear Weapons Needed?

Although the systems we propose for the “500+500” force were designed against a very different Cold War threat, they can readily be adapted to meet today’s challenges to U.S. national security. Here, we will discuss potential benefits as well as problems with undertaking some of the technical changes that may be considered for adapting U.S. forces to the new post-Cold War strategic environment. In some cases, the changes would be straightforward and valuable to implement and are already underway. Others of questionable military value might prove more harmful than helpful to U.S. national security due to their potential, even likely negative impact on efforts to sustain and strengthen the nonproliferation regime. They should be rejected.

The United States has built and currently maintains a nuclear arsenal that is robust and reliable and should remain so for the foreseeable future. Congressional pressure during George H. W. Bush’s presidency led the U.S. government to recognize that there was no need to develop and test new nuclear warhead designs. This helped lead to the U.S. moratorium on underground nuclear tests that is still in effect. As a consequence, existing warheads are remaining in the arsenal for more years than originally anticipated and longer than had been the case during the first five decades of the nuclear era, during which the arsenal was being regularly modernized with new designs based on technological advances. An enhanced, multifaceted, science-based program of stockpile stewardship was established in 1994 to provide confidence to the U.S. weapons community and, through it, to the government that the health of the stockpile and the way in which special bomb materials age is well understood. This strong technical and scientific program at the national weapons laboratories is providing a deeper understanding of the performance of these weapons. Maintaining and refurbishing the warheads, as well as sustaining the competence of the weapons scientists,

is proceeding, relying on comprehensive surveillance, forensics, diagnostics, extensive simulations with new computers, and experiments with advanced facilities. In fact, it has served to enhance confidence in the arsenal and in the U.S. ability to hear and heed any warning bells of unanticipated problems that may develop in the future.

One direct way to simplify the process of certifying the reliability and effectiveness of the warheads and to sustain this confidence over a longer period of time is to increase their performance margins. An example of this is to further enhance the explosive energy provided by the primary stage of a nuclear weapon above the minimum required to ignite the secondary, or main, stage of a nuclear weapon. A straightforward way to do this that requires no explosive testing to validate is by adjusting the boost gas fill in the primary during scheduled maintenance or remanufacturing activities. This is an example of an existing process for maintaining long-term high confidence in the arsenal. It is already available, has high merit, and should continue to be implemented.⁷ This approach is the appropriate focus of effort for the Reliable Replacement Warhead (RRW) program currently being funded at the U.S. national weapons laboratories.

7. Executive Summary, JASON Report on Nuclear Testing, JSR-95-320 (August 1, 1995).

The key question for the RRW program is: can we achieve its goals of increasing confidence in the nuclear arsenal and its long-term safety, reliability, and use control without underground testing? We do not know the answer to that question at present, and unless an informed scientific consensus can answer it positively, the RRW program should not move forward into a development stage toward manufacturing warheads with new or modified designs. To do so would be a mistake. It takes an extraordinary flight of imagination to postulate a modern new arsenal composed of such untested designs that would be more reliable, safe, and effective than the current U.S. arsenal based on more than 1,000 tests since 1945. A comprehensive and rigorous stockpile maintenance program confirms and sustains this high confidence. If testing were to be resumed, the damage to the broader nonproliferation regime, and thus to U.S. security interests, would far outweigh any conceivable advantages to be gained from the new designs. Other nuclear-weapon states, most notably China, would surely follow the U.S. testing lead. Non-nuclear-weapon states would interpret resumed U.S. nuclear testing as a repudiation of Washington's NPT commitments, which could have serious implications for how they might then view their own treaty obligations.

Two initiatives proposed by the Bush administration for developing new earth-penetrating weapons have also raised serious concerns. One called for developing advanced concepts for very low-yield weapons that were advocated as being "more useable" for limited military missions, particularly against shallow underground targets, because of the reduced collateral damage they would cause. They were also proposed for neutralizing stored biological and chemical agents without dispersing them widely. A second program, called the Robust Nuclear Earth Penetrator (RNEP) program, would have converted an existing high-yield, air-delivered nuclear bomb into an earth penetrator to make it more effective against deeply buried and hardened targets.

The need for such earth-penetrating weapons is highlighted in the Nuclear Posture Review, in order "to defeat emerging threats such as hardened and deeply buried targets" of military interest being built in many countries.

The effectiveness of warheads for destroying hardened underground targets is enhanced if their designs are sufficiently rugged so that, when delivered by aircraft or missile, they can be rammed into the earth intact and penetrate some three or more meters into the earth without damage before detonating.

It takes an extraordinary flight of imagination to postulate a modern new arsenal composed of such untested designs that would be more reliable, safe, and effective than the current U.S. arsenal based on more than 1,000 tests since 1945.

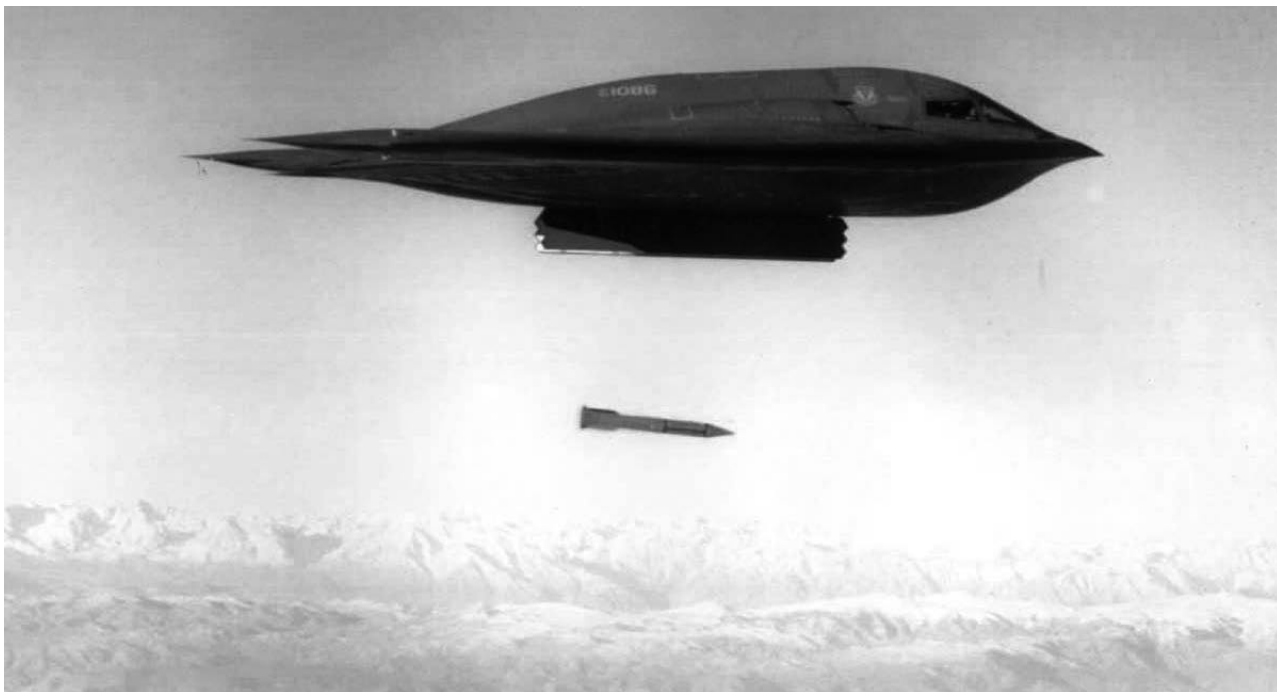
Such warheads will deliver a shock to destroy an underground bunker that is 10–20 times stronger than that of the same warhead exploded at or above the earth's surface, in which case much more of its blast energy would be spent in the atmosphere.

Many hardened underground targets are at relatively shallow depths of some 30 meters, particularly large industrial targets for manufacturing weapons or producing fissile material to fuel nuclear weapons. Other targets of very high value are more likely to be buried at depths of 300 meters or more and reinforced to withstand over-pressures of 1,000 atmospheres or more. Assuming the optimal penetration capability into the earth, taking into account experimental data and known limits on

material strengths, a warhead's yield would have to be significantly larger than 100 kilotons for the shock from its blast to reach down to 300 meters with enough strength to destroy such targets. That is certainly not a low-yield weapon. The primitive atomic bomb that pulverized Hiroshima had a yield of only 15 kilotons.

Low-yield warheads, with yields less than five kilotons, offer a possibility of attacking underground military targets at shallow depths, particularly those containing biological and chemical weapons. Their alleged value is that the reduced collateral damage they would cause makes them more useable. It is unavoidable, however, that any such warhead that has penetrated into the earth as deep as it can before detonating will still create a huge cloud of radioactive debris and a very large crater. The blast of even a very low-yield, one-kiloton earth penetrator, detonated at its maximum penetration depth of 15 meters into dry hard rock, will eject more than one million cubic feet of radioactive debris from a crater about the size of ground zero at the World Trade Center. A nuclear weapon with at least a 100-kiloton yield capable of destroying a hardened target 300 meters underground will dig a much larger crater and create a substantially greater amount of radioactive debris.

The technical realities of nuclear weapons and their value in destroying biological and chemical weapons must also not be exaggerated. In order to neutralize the deadly effects of biological pathogens and chemical gases, they must be subjected to very high temperatures or radiation levels. The energetic neutrons and gamma rays emitted in a nuclear explosion that create such extreme conditions, however, do not travel many meters from the point of an explosion underground



The B61-11 bomb being dropped here is an earth penetrator currently in the U.S. nuclear arsenal. Congress rejected the Bush administration proposal for modifications to the high-yield B83 warhead to make it an earth-penetrator as well.

before they are absorbed by the earth. In contrast, the shock from the explosion will extend out far and wide, as is observed in earthquakes, spreading debris from large craters, as discussed above, that very likely will contain sizable quantities of the deadly agents.⁸ Therefore, they would be more likely to spread these agents widely rather than to destroy them completely.

On quantitative technical grounds, one is led to conclude that low-yield penetrators are of marginal military value, useful only for relatively shallow targets. The collateral damage they cause may be reduced due to their lower yield, but the physical destruction, not to mention the political fallout, would still be very considerable. Recalling Eisenhower's warning in 1956 that, with nuclear weapons, "we are rapidly getting to the point that no war can be won" and that, although conventional wars can be fought to exhaustion and surrender, nuclear war can come close to "destruction of the enemy and suicide," does it make any sense at all to cross the nuclear threshold, especially for limited military missions?

What is the likely impact on U.S. security of a new initiative for new low-yield weapons? First, the United States already possesses tested and deployed weapons, both conventional and nuclear, that would be effective for missions against shallow bunkers. In view of that, a decision by the world's

only superpower to develop and deploy new low-yield nuclear weapons as bunker busters that are presumably "more useable" in limited war-fighting situations, would send a clear, negative signal about the nonproliferation regime to non-nuclear-weapon states. If the United States, the strongest nation in the world, concluded that it could not protect its vital interests without relying on a newly developed nuclear weapon, it would be a clear signal to other nations that nuclear weapons are necessary for their security purposes too. This would hardly contribute to dissuading them from joining the nuclear club. In fact, because resumed nuclear explosive testing might eventually be required for a newly designed weapon, the United States would most likely deal a fatal blow to the nonproliferation regime in order to have a capability of questionable military value. Such concerns led Congress to refuse funding for this concept in the fiscal year 2005 budget, and no new funding request has been made since.

The argument for the RNEP initiative to develop a high-yield earth-penetrating weapon is based on the goal of holding at risk hardened and deeply buried targets at depths of 300 meters or more. In this instance, we are talking about weapons with yields of hundreds of kilotons to megatons. This wartime situation may be one in which conventional weapons might not be able to do the job, and thus a nuclear

8. May, M. and Haldeman Z., "Effectiveness of Nuclear Weapons Against Buried Biological Agents," pgs. 91-114; and, and Nelson R. W., Nuclear 'Bunker Busters' Would More Likely Disperse than Destroy Buried Stockpiles of Biological and Chemical Agents," pgs. 69-90, *Science and Global Security*, vol. 12, nos. 1-2, 2004.

weapon might be required. As such, this requirement needs thorough analysis.

The need for such a capability was recognized and addressed appropriately for many years during the Cold War. The Soviet Union no longer exists, however, and, in words of Bush and Putin, neither the United States nor Russia “regards the other as an enemy or threat” but as “increasingly allied against terrorism.”

If any new threats are emerging in other countries with deeper and harder targets than those presented by the former Soviet Union, the United States has a number of options for holding them at risk. One, of course, is to target them with several of our existing nuclear bombs with the highest yields.

Furthermore, the effectiveness of these weapons can be greatly enhanced by improvements in precision of delivery and in accuracy of the intelligence in locating and identifying such targets. The United States also has a substantial ability to render hardened underground targets ineffective with conventional military systems. These kinds of targets have vulnerable points, such as air ducts and tunnel entrances for personnel, equipment,

It is not necessary to destroy hardened underground targets physically by crushing them with large nuclear blasts in order to defeat them as a threat.

and resources that can be sealed off by conventional munitions if their positions can be pinpointed. These vulnerabilities can be exploited with accurate intelligence; specialized delivery systems; tailored munitions; and when possible, special forces on the ground at the critical sites. The United States is, as it should be, working on important projects to achieve gains in the effectiveness of tactics such as these. It is

not necessary to destroy hardened underground targets physically by crushing them with large nuclear blasts in order to defeat them as a threat.

Given enormous U.S. intelligence and conventional military assets, not to mention its great relative strength, there is no credible military case for RNEP. Recognizing existing U.S.

military capabilities, including high-yield nuclear warheads, and the likely harmful impact of such an initiative by the world’s only superpower on international efforts to preserve and strengthen the nonproliferation regime, the Congress determined the additional capabilities of new nuclear bunker-buster weapons are not worth the high costs and eliminated funding for this program.

Including Other Nuclear-Weapon States

We suggested above that a significant buildup of China's strategic nuclear forces could adversely affect the build-down that Russia and the United States should carry out in the next few years. The broader point is that each of the *de jure* and *de facto* nuclear-weapon states will have to be involved in some fashion in the effort to reduce the salience of nuclear weapons in international security relations. Given the up-and-down history of the U.S.-Russian relationship, it would be prudent to pursue further verifiable reductions in operationally deployed strategic nuclear warheads and delivery systems through new legally binding arrangements. Other nuclear-armed countries could reciprocate the actions of Russia and the United States, thus moving all closer toward zero nuclear weapons. The actions that each of the states directly involved might take are described below.

China

We suggested in *The Gravest Danger* that a U.S.-China Consultative Group for Strategic Security be established, along the lines of the U.S.-Russia group. This could be a vehicle for exchanging information concerning strategic nuclear force structures in each country. For China, a key agenda item probably would be the U.S. ballistic missile defense program, while for the United States, the Chinese ICBM modernization programs would be of interest. If both sides were convinced that their worst-case threat scenarios would probably not materialize, nuclear restraint would be easier to manage.

India and Pakistan

Both countries are already showing restraint in their nuclear programs. In the environment we are projecting, third-country threats such as China would not increase to the level where a response, in the case of India, would be required. That said, the tensions between the two countries of the subcontinent could foster a buildup of operationally

deployed nuclear forces. The point here is that the reductions programs we are advocating require an effort to resolve or at least contain regional conflicts. The impact on requirements for U.S. operationally deployed warheads of a worsening situation in regional conflict situations would be minimal, as noted above. Yet, the impact on the force levels of other states, for example, China, could be more pronounced, and this could unravel the effort to reduce the salience of nuclear weapons on a global scale.

In addition to political negotiations between India and Pakistan over Kashmir, measures to improve the safety and security of Indian and Pakistani nuclear forces would have a positive effect on the regional security environment. Indian and Pakistani cooperation with other nuclear-weapon states in this regard could run afoul of the NPT, but if properly calculated, the effort should strengthen the NPT regime.

Israel

Resolving the Israeli-Palestinian conflict will be the first step in including Israel in a program to

reduce the salience of nuclear weapons globally. Thereafter, the most likely diplomatic track would be a resumption of discussions concerning a nuclear-weapon-free zone in the Middle East.

Iran

Since mid-2006, negotiations between Iran, France, Germany, and the United Kingdom regarding Iran's uranium enrichment program have broken down. The UN Security Council has called on Iran to suspend the program, yet Iran has proceeded. If negotiations resume, it is possible that Iran can be persuaded to suspend its enrichment and other sensitive nuclear fuel cycle activities. This would likely require the extension of negative security assurances, and in that case, the United States will have to make a strategic decision about its future relations with Iran. Iran will have to do the same. The most immediate need would be to reassure Iran that U.S. forces in the Middle East are not a threat to its security and in fact can serve Iran's interests in that volatile region of the world.

North Korea

As progress in six-party negotiations with North Korea suggest, it is not too late to reverse the North Korean nuclear weapons program, although the prospects for doing that remain uncertain. North Korea is a key factor in decisions that other Asian states may make concerning their own nuclear weapons status. Of these, Japan is the most consequential because a Japanese decision to acquire nuclear weapons would trigger rethinking in other Asian states. For that reason, efforts to engage North Korea, as in the six-party talks, are essential. Failing to do so or having tried and failed to reach an accommodation, the only resort will be containment, in which the United States and other regional powers should cooperate, of course, in a nonprovocative fashion. This calls for a positive program of cooperation among all of North Korea's neighbors and others, rather than mobilizing a narrowly constructed anti-North Korean alliance. As in the Middle East and South Asia, an effort to reduce the salience of nuclear weapons globally requires attention to the resolution or containment of regional conflicts.

The United Kingdom and France

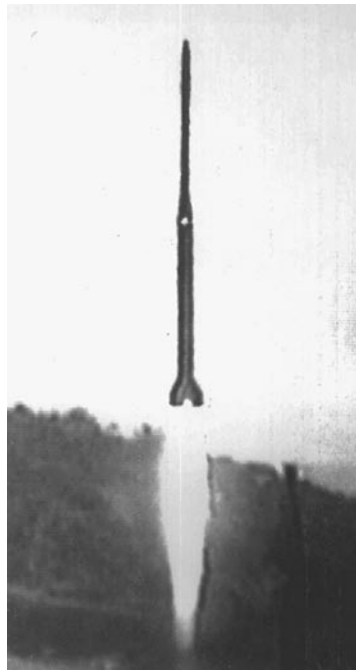
Both countries have very capable nuclear forces and force levels that would loom larger as the United States and Russia reduced their operationally deployed nuclear warheads to the levels we believe should be possible. This suggests the United Kingdom and France would want to consider their force requirements in light of the levels that the United States and Russia are actually able to achieve. As in other cases, such as China, the mechanism to record any revised force levels would be through unilateral decisions announced in consultations with other concerned states, probably in this case meaning Russia, first and foremost.

Cooperation in Ballistic Missile Defense

If the holdings of nuclear weapons by the United States and other countries can be brought down to very low levels, an idea discussed during the Reagan presidency should be reconsidered, that of "defense dominance." In principle, there should be a crossover point in the offense-defense equation where defensive capabilities against ballistic missiles exceed the ability of an attacker to penetrate ballistic missile defenses.

In Reykjavik in 1986, Reagan discussed with Soviet leader Mikhail Gorbachev a plan to zero out all U.S. and Soviet ballistic missiles and to cooperate fully in ballistic missile defenses. In doing so, Reagan was quite consciously pursuing this argument to its logical conclusion. Is it too much to think that such action may define a path leading to a world free of the curse of nuclear weapons?

We suggested in *The Gravest Danger* that international cooperation in ballistic missile defense should be a key component of a multinational coalition to combat the further spread of nuclear weapons capabilities. In an environment where total global numbers of deployed warheads on ballistic missiles are in the few hundreds, it would make sense to have a joint ballistic missile defense program among cooperating states. It would help to stabilize their own strategic nuclear relationships with each other and would link them in an effort to thwart the ambitions of noncooperating states. A cooperative



In August 1998, North Korea surprised the United States by conducting a flight test of its Taepo Dong-1 medium-range ballistic missile. The missile's third stage failed. North Korea tested several types of missiles in mid-2006.



President Ronald Reagan at the Reykjavik summit in October 1986 with (left) White House chief of staff Donald T. Regan and national security adviser John M. Poindexter. At Reykjavik, Reagan and Soviet leader Mikhail Gorbachev discussed eliminating all ballistic missiles, but they failed to reach an agreement because of a dispute over U.S. missile defense efforts.

program to develop an international, satellite-based early warning system against potential missile attacks could further strengthen these relationships. The principal requirement for membership in this coalition would be a firm agreement that each of them will act in accordance with the prescriptions of the NPT. Bush and Putin formally agreed at Moscow in May 2002 that they would cooperate in ballistic

missile defense activities, but little has been done in this regard. Instead, U.S. and Russian leaders are at odds over plans for U.S. ballistic missile defenses and radars in Eastern Europe, and Russia claims to be accelerating its missile modernization programs in response to what it believes could become a significant threat to its shrinking land-based nuclear-armed offensive ballistic missile force.

Why the Urgency?

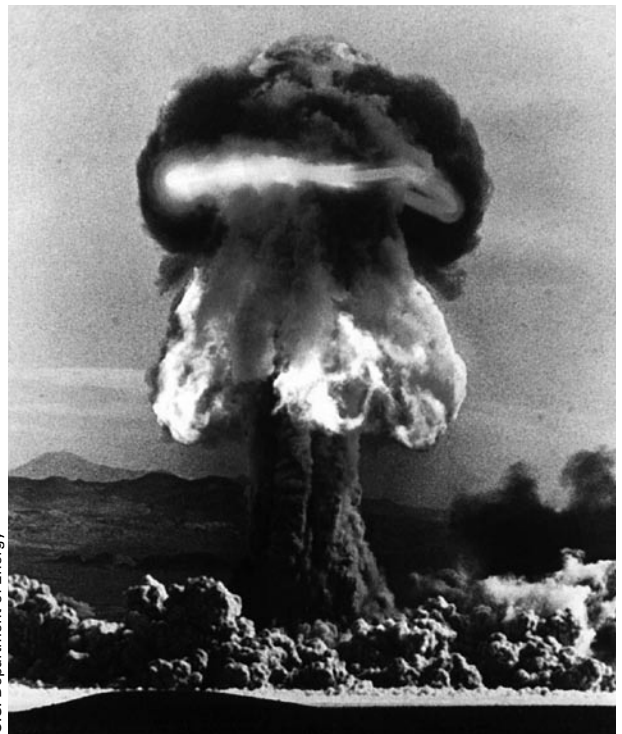
Why not let well enough alone and take deeper reductions in U.S. nuclear forces after 2012? Has the matter become more urgent since a few years ago? In our view, it has. There are four factors that necessitate deeper reductions faster.

- The nonproliferation regime needs to be strengthened, and it can be by a visible effort by Russia and the United States to reduce the salience of nuclear weapons in their force postures.
- Neither Russia nor the United States will resolve their most basic national security problems through maintaining higher levels of nuclear weapons than necessary. Rather, they should focus more intently on preventing the acquisition of nuclear materials by terrorist groups, an almost certain outcome if present trends continue.
- A tipping point has been reached in Asia that could lead to a nuclear arms race there and to pressures on Russia and the United States to increase, rather than reduce, their nuclear forces.
- Budgetary pressures in Russia and in the United States indicate that, where unnecessary defense expenditures can be avoided in favor of a more rational use of resources, perhaps in other areas of defense, this should be done.

To amplify these points, first, as to the nonproliferation regime, then-CIA Director George Tenet told the Senate on March 9, 2004, that the proliferation picture “is changing before our eyes; changing at a rate I have not seen since the end of the Cold War.” It is a time when the outcome of a decades-long nonproliferation effort hangs in the balance. A failure to move vigorously to maintain the nonproliferation regime could lead to a world far more dangerous than at present.

Here, it should be recalled that the nonproliferation regime consists of several layers of defenses: (1) the global norms established by the NPT, monitored by the International Atomic Energy Agency (IAEA), and supporting export control regimes

put into effect through the mechanism of the NPT; (2) the post-Cold War regime established mainly through the U.S. Cooperative Threat Reduction program sponsored originally by Senators Sam Nunn (D-Ga.) and Richard Lugar (R-Ind.), and (3) the set of multinational arrangements put in place during Bush’s first term, including the Global Threat Reduction Initiative, the Proliferation Security Initiative (PSI), and UN Security Council Resolution 1540, designed to strengthen national controls over fissile material. Each of these three layers of



U.S. Department of Energy

“Grable” was a 15 kiloton nuclear test explosion fired on May 25, 1953 at the Nevada Test Site. The United States conducted a total of 1,032 nuclear detonations; the Soviet Union conducted 750 test explosions. A total of eight states have conducted 2,053 nuclear explosions since 1945.

defense would be strengthened by a more dramatic U.S.-Russian turn away from reliance on nuclear weapons and a turn toward stronger support for the nonproliferation regime.

Second, the spread of nuclear technology, particularly for enriching uranium, has heightened concerns that terrorists or rogue nations will acquire nuclear weapons. Regarding U.S. and Russian security, it is generally agreed that the gravest threat they each face is at the crossroads of technology and radicalism, as Bush has put it. National resources and energy spent on supporting a higher level of strategic nuclear forces than necessary means that those national efforts are being misdirected.

Third, in India and probably China, national decisions are pending about how far to go in developing strategic offensive forces. North Korea and Iran may have nuclear weapons capabilities. If the battle to hold back this potential surge of nuclear buildups is lost, decisions will be made by other countries, certainly including Japan and probably, ultimately, Russia and the United States, which will restart a nuclear arms race. For more than three decades, the nonproliferation regime has successfully staved off dire predictions that dozens of countries would arm themselves with nuclear weapons, but that nuclear nightmare could still unfold if existing nuclear-weapon states reverse their downward trend.

Fourth, regarding the budgetary squeeze, the Bush administration has regularly sought nearly \$6.5 billion for funding nuclear weapons programs, an increase over the fiscal 2006 appropriation. Last year, Congress did not grant the administration's entire request, in particular for the research of earth-penetrating nuclear warheads and enhancing test site readiness. Congressional motivation in rejecting the administration's request is exactly the same as the argument being made here: it is wrong-headed to place more reliance on nuclear weapons when the nation's chief priority is in preventing the further spread of these weapons.

Fifth, in Russia, overall defense spending is rising. The program includes money for modernizing strategic offensive forces, among them the development of a mysterious weapon, purported to be a hypersonic cruise missile, touted by Putin. Russia is also pushing ahead with plans to field a mobile,

land-based version of its Topol-M ICBM and a new sea-based ballistic missile, the Bulava.

China is also increasing its defense spending, is building up its short-range missile numbers, and may soon begin to field a new generation of strategic nuclear-capable missiles.

Is another nuclear arms race just over the horizon? Quite possibly. Action is needed now to head it off, and not just because the results in themselves would be catastrophic. The sad and ironic fact is that these competitive efforts would do nothing to deal with the more urgent threats of nuclear terrorism and of the increasing probability that, somewhere in the world, nuclear weapons will be used in warfare. In fact, a new arms race would only make the problem worse.

For all these reasons, we judge that the urgency of getting on with deeper reductions in U.S. and Russian operationally deployed nuclear warheads is greater than the two nations' leaders thought in 2001 and 2002. Both leaders clearly envisaged deeper reductions and enshrined the idea in a solemn document they signed. Now is the time to move toward that vision.

The U.S. priority should be timely and bold actions, consistent with U.S. national security needs, to shore up international support for the nonproliferation regime. Elsewhere in *The Gravest Danger*, we have written of the need to

buttress the NPT with adequate means of verifying and enforcing compliance. This includes the PSI to intercept proliferation in progress; the creation of regional centers under international control for supplying enriched uranium as fuel for power reactors and reprocessing plutonium; enhanced support for an expanded Cooperative Threat Reduction program; and the Additional Protocol allowing IAEA on-site inspections as appropriate. We have also called for economic and security guarantees as the "carrots" to accompany the enforcement "sticks" for NPT compliance. The proposal presented above sets a practical, short-term goal for nuclear force reductions that the United States could initiate jointly with Russia and that the other nuclear powers could subsequently join. We see it as enhancing the nonproliferation regime by encouraging the present nuclear-weapon states to collaborate more effectively together to roll back nuclear proliferation before it is too late.

It is wrong-headed to place more reliance on nuclear weapons when the nation's chief priority is in preventing the further spread of these weapons.

Cold War Thinking About Nuclear Weapons

The First Decade, 1945–54

During the first decade after the obliteration of Hiroshima and Nagasaki and following the failure of U.S.-Soviet discussions about the possibility of mutual nuclear restraint, an all-out technical-industrial race to develop nuclear weapons began. The U.S. arsenal grew rapidly, driven by advancing technology and by mounting fears of the expansionist policies of the Soviet autocrat, Joseph Stalin. Starting with only a few primitive fission bombs in 1945, the U.S. arsenal, supported by a rapidly expanding production base, exceeded 3,000 bombs by 1955.⁹ These weapons were mostly aircraft-delivered gravity bombs, but some low-yield weapons were also developed for battlefield use if needed to repel a Soviet attack on Western Europe. The danger of the actual use of nuclear weapons in combat, whether in Asia or in the event of an attack on Western Europe, loomed menacingly since the early years of the Cold War, which were marked by repeated crises, including the 1948 Berlin blockade and North Korea's 1950 invasion of South Korea. The test of the first Soviet atomic bomb in 1949, followed by a Soviet buildup to an arsenal of several hundred bombs by 1955, raised tensions in an environment in which fear and suspicion were already pervasive. A wider range of military options became possible for both sides, given the growing numbers and sophistication of nuclear weapons and delivery systems.

Competition in building hydrogen bombs (two-stage fission-fusion bombs) commenced with the detonation of the initial U.S. device in 1952 and of the Russian one not long after. By the end of the first nuclear decade, 1945–1954, the United Kingdom also had become a nuclear-weapon state.

The Second Decade, 1955–64

During the second decade of the nuclear era, the buildup of nuclear arsenals accelerated. The Soviet Union launched Sputnik, the first earth-orbiting

satellite, in 1957, signaling the advent of the age of ICBMs. Soon, the two superpowers could deliver hydrogen bombs anywhere in the world within about 30 minutes. Fears of a devastating surprise attack haunted military planners and political leaders. The response was not to rid the world of these weapons but rather to make them more survivable. France (1959) and China (1964) joined the United States, the Soviet Union, and the United Kingdom as nuclear-weapon states. The size of the world's nuclear arsenals ballooned from slightly more than 3,000 in 1955 to more than 37,000 by 1965, with more than 99 percent held by the United States (approximately 31,000) and the Soviet Union (an estimated 6,000). Yet, also in this period, serious diplomatic discourse and formal negotiations between the West and the Soviet Union were resumed, after a lapse of several years, to address the risks of nuclear weapons. These risks included not only their use in combat, but also the environmental and health hazards created by nuclear fallout from test explosions and the spread of nuclear weapons to other countries. The question "What are nuclear weapons for?" was broadened to include:

- How can choices in force structure reduce the risk of pre-emptive use of these weapons in combat?
- Through diplomatic means, can we make a start in containing the dangers of an unrestrained arms race, of radioactive fallout, and of proliferation of nuclear weapons?

In practice, as can be seen from the numbers above, the fear of surprise nuclear attack did next to nothing to limit the overall magnitude of the buildup of U.S. and Soviet nuclear forces. In fact, it spurred the buildup. The enormous growth during this decade was driven not only by political forces reacting to the strategic dangers on the world scene, but also by the irresistible lure of technology—multiple warheads on a single missile and much greater accuracy, for

9. This and the following estimates of force levels are taken from R.S. Norris and T.B. Cochran, *Nuclear Weapons Databook: U.S.-U.S.S.R./Russian Strategic Offensive Nuclear Forces, 1945–96*. (Washington, D.C.: Natural Resources Defense Council, January 1997).

example—which opened doors for new missions for nuclear weapons. It was a matter of worst-case threat analysis feeding the most optimistic technical projections.

Mounting fears about nuclear war were driven during this period by a number of events: the Soviet repression of the 1956 Hungarian uprising, the 1957 Soviet launch of Sputnik, the 1961 construction of the Berlin Wall, and the test of the Soviet Union's largest nuclear device that same year. The 1962 Cuban missile crisis appeared to give confirmation to the inevitability of nuclear catastrophe.

Of key importance for the United States in those circumstances was the survivability of its deterrent forces. This problem was managed by deploying a broad array of retaliatory systems to ensure a capacity for inflicting massive and unacceptable destruction in response to any pre-emptive first strike by an enemy. This force included the B-52 bombers that could take off under severe threat conditions and be recalled if desired; a land-based ICBM force in hardened underground silos that could be destroyed only by weapons targeted and delivered with precise accuracy and little, if any, warning; and a mobile naval force of nuclear-powered Polaris submarines with prolonged underwater endurance that could sail undetected and thus were invulnerable to a potential first strike. The U.S. strategic triad was put in place during this decade. It remains in place today.

The stated U.S. force mission was not pre-emption, but deterrence by threat of nuclear retaliation. It was to convince the Soviet Union that, no matter how successful a nuclear attack on the United States and its forces might be, U.S. retaliatory capability would inflict unacceptable devastation on the attacker. The Soviet Union made similar claims about its intentions and forces, but it was increasingly difficult for either side to accept such assurances at face value.

So, it had become politically important to moderate and, if possible, dispel fears of nuclear pre-emption. Otherwise, those fears would drive out all possibility of finding a cooperative solution to the nuclear dilemma and become a self-fulfilling prophesy. As early as 1956, the creation and deployment of thermonuclear weapons led Eisenhower to remark, "We are rapidly getting to the point that no war can be won." He added that conventional wars can be fought to exhaustion and surrender, but nuclear war can come close to "destruction of the enemy and suicide." In this spirit, Eisenhower led an effort to initiate a broad dialogue on nuclear dangers and also peaceful benefits, with the 1955 Atoms for Peace Conference and the 1956 creation of the IAEA.

Additional diplomatic initiatives to limit the explosive testing of nuclear weapons were pursued at a disarmament conference in London in 1957.

Following the 1962 Cuban missile crisis, President John F. Kennedy stepped up efforts to achieve a treaty banning nuclear weapons testing. This succeeded in part in 1963 with a limited treaty ruling out all tests except those conducted underground.

A technical effort had been initiated earlier, under Eisenhower and starting with the U-2 flights, to penetrate the Iron Curtain by photo and electronic reconnaissance from space to gauge the growing threats better, without either under- or overestimating them. Eventually, this made it possible to begin the negotiation of subsequent strategic nuclear arms agreements with verifiable limits on offensive nuclear deployments.

Throughout this decade, there was a growing appreciation that the only rational mission for nuclear weapons was for a second-strike retaliation as a way of deterring potential enemy attack. In the Kennedy administration, U.S. doctrine began to emphasize conventional arms buildups as the more realistic alternative response to threats. Kennedy graphically expressed the dangers nuclear arsenals posed to survival on June 10, 1963:

Total war makes no sense in an age when great powers can maintain large and relatively invulnerable nuclear forces and refuse to surrender without resort to those forces. It makes no sense in an age when a single nuclear weapon contains almost ten times the explosive force delivered by all of the Allied air forces in the Second World War. It makes no sense in an age when the deadly poisons produced by a nuclear exchange would be carried by wind and water and soil and seed to the far corners of the globe and to generations yet unborn.

The Third Decade, 1965–74

During the third decade of the nuclear era, the concept of deterrence by mutual assured destruction was elaborated, with added nuances and requirements. With improving accuracy of missiles and the variety of reliable nuclear warheads being deployed, both nations started developing strike forces with counterforce capability against hardened military and industrial targets. Technology inspired scenarios of controlled strikes, that is, limited attacks by nuclear weapons as opposed to an all-out massive strike, and protracted nuclear war. It also inspired concerns that the advantages of a first strike might tempt an opponent to attack in order to end up "relatively better off" in the nuclear rubble. War-fighting doctrines replaced simple massive retaliation threats as the best means of sustaining nuclear deterrence.

Technological advances in weaponry were accompanied by broadening diplomatic efforts to try to cap the nuclear arms competition. Two new nations, India and presumably Israel, became

de facto nuclear-weapon states during this period, and concerns about proliferation led to the negotiation of the NPT, which entered into force in 1970. This treaty became the cornerstone of a worldwide effort to freeze the number of nuclear-weapon states. As expressed in the preamble to the NPT and in Article VI of that treaty, the original five nuclear-weapon states were committed to efforts to reduce the nuclear arms competition and eventually to eliminate nuclear weapons.

The rate of growth in the total numbers of nuclear weapons slowed somewhat during this period. The total inventories of the two superpowers reached 47,000, comprising more than 98 percent of the world's total. While the estimated U.S. total decreased slightly to 27,000, the Soviet Union's arsenal increased to 20,000. As the U.S. and Soviet numbers of nuclear weapons converged, their negotiations focused on limiting those forces directly threatening each other's homeland. These negotiations became known as the Strategic Arms Limitation Talks (SALT). The advent of multiple independently targetable re-entry vehicles (MIRVs), which enabled single missiles to deliver multiple warheads with precision against separate targets, complicated the SALT negotiations.

A first strike by MIRVed ICBMs targeted against the silos of an opponent's ICBM force could destroy many more missiles than used in the attack. This ratio would thereby give an advantage to the first attacker by seriously diminishing the opponent's retaliatory force. MIRVing had the result of significantly increasing the total number of warheads and opened up the possibility of targeting a broader array of industrial sites and military installations. Yet, negotiations failed to limit MIRVing. New targets were added to an already long list in the war plans. The increasing accuracy of missiles made counterforce a more attractive strategic option. Post-war recovery of the enemy also became a consideration for targeteers.

MIRVing pointed to a conclusion that it would be more important for arms control agreements to focus on limiting warheads rather than delivery systems. However, the technology of photoreconnaissance satellites circling the earth in space could not count the individual warheads, and the state of U.S.-Soviet relations was such that direct inspection of the delivery vehicles was unacceptable. Therefore, the arms control talks focused on limiting the number of long-range bombers and missile launchers for nuclear weapons.

Ballistic missile defense had been under study in the United States since shortly after World War II. The first major U.S. effort to deploy some defenses against a nuclear attack commenced in the last years of President Lyndon B. Johnson's administration and, before that, in the Soviet Union. Subsequently, the ABM Treaty was concluded in 1972 as part of the SALT

negotiations. It recognized the limits of technology in providing such a defense but allowed for thin system deployments, more for cosmetic than real military purpose. In the United States, these deployments were eventually dismantled, being of little or no value. At the same time, the United States and the Soviet Union signed an Interim Agreement to limit their number of deployed ICBMs and submarine-launched ballistic missiles as well as their modernization programs. The treaty also recognized the legitimacy of verifying treaty compliance using national technical means (i.e., satellites in earth-circling orbits).

Despite these successes, the two superpowers remained poised eyeball to eyeball, with their nuclear pistols cocked. Mutual assured destruction, a phrase popularized by McNamara, continued to be accepted as an inescapable condition of the nuclear age. Nuclear weapons were not used in the bitter war in Vietnam, just as they had not been used earlier in Korea. This extended the tradition of non-use, even in otherwise unwinnable conflicts.

The Fourth Decade, 1975–84

The fourth decade of the nuclear era was a period in which force modernization continued apace and the size of the Soviet nuclear weapons stockpile almost doubled to approximately 39,000 while the U.S. force shrank slightly to 23,000 warheads. The two superpowers continued to possess more than 98 percent of all the nuclear weapons in the world and the nuclear club was enlarged, surreptitiously, by only one nation, South Africa. After the ABM Treaty and two strategic offensive arms limitation treaties, SALT I and SALT II, little negotiating progress was made with the Soviet Union under several years of transitional leaders in the Kremlin and as anti-détente attitude hardened in the United States. President Jimmy Carter withdrew SALT II from Senate consideration following the 1979 Soviet invasion of Afghanistan.

Soviet deployment of MIRVed SS-20 missiles, designed to target Western Europe, led to countermeasures by NATO in the form of intermediate-range nuclear forces. The decision to deploy these forces, made by NATO in 1979, was implemented in 1983 after a failed negotiation to limit such deployments on both sides.

When Reagan took office in 1981, he proposed that the total number of nuclear warheads should be reduced rather than simply capped at higher levels. Later, in 1983, he launched perhaps the most contentious and potentially significant initiative in this decade: the proposal to build a missile defense shield, despite the ABM Treaty's prohibitions, in an effort to break out of the doctrine of mutual assured destruction by providing significant protection against ballistic missile attack.

The Fifth Decade, 1985–94

In the fifth decade of the nuclear era, fundamental political developments took place in relations between the United States and the Soviet Union. With the rise of Gorbachev and the development of a productive relationship between him and Reagan, a number of assumptions about the threat were swept away on both sides. In the aftermath of the deadly 1986 accident at the Soviet nuclear reactor in Chernobyl, worldwide concern about the dangers of nuclear conflict were heightened significantly, especially in the Soviet Union.

At the landmark October 1986 meeting between Reagan and Gorbachev in Reykjavik, the two leaders discussed the elimination of all ballistic missile systems. Stymied by differences on what limits to put on ABM research and development, they settled for progress in the negotiations to ban all intermediate-range ballistic missiles. This culminated in a treaty which they signed in 1987 to eliminate all such ground-launched missiles from U.S. and Soviet arsenals. Beyond that, the impulse given to nuclear reductions at Reykjavik led to enough progress in the strategic arms reduction talks (START) thereafter that an agreement was within reach by 1989 when George H. W. Bush took office. Bush and Gorbachev signed the START I treaty in July 1991. This treaty, for the first time, called for major reductions in the number of accountable strategic nuclear warheads and for a ceiling on such warheads of 6,000 for each country. This progress was based on procedures allowing on-site inspection that made verifying limits on numbers of warheads for each type of missile and aircraft possible. Further progress in negotiations between Bush and Yeltsin led to agreement on deeper cuts in strategic forces, to 3,000–3,500, formalized with the January 1993 signing of START II. This treaty never entered into force, however, even after modification by Clinton and Yeltsin in 1997 to accommodate some practical Russian concerns about the pace of reductions. Moscow announced that it would no longer consider itself bound by its START II signature following the U.S. withdrawal from the ABM Treaty in June 2002. The Kremlin's act was largely symbolic given the conclusion of SORT a month earlier.

Shortly before the collapse of the Soviet Union in 1991, Bush and Gorbachev also agreed to reciprocal unilateral steps to reduce their tactical nuclear weapon systems. In 1992, beginning with the unilateral declaration by Bush of a moratorium on underground nuclear explosive testing in response to congressional pressure, the path to negotiations on a lasting ban on all nuclear testing was opened. These developments played an effective role in the 1995 indefinite extension of the NPT.

By the end of this fifth decade of the nuclear era in 1994, there had been a drop of roughly one-third in the total nuclear forces in the world, with the U.S. number dropping to slightly less than 15,000 and Russia reducing to approximately 27,000. This decade ended with no net increase in the number of nuclear-weapon states, but the group was joined by Pakistan, while South Africa gave up its nuclear weapons. Also during this period, Ukraine, Kazakhstan, and Belarus, which had become *de facto* nuclear-weapon states upon the dissolution of the Soviet Union, renounced any nuclear ambitions and returned nuclear warheads stationed on their soil to Russia.

This era marked significant progress in the rethinking of the purpose of nuclear weapons. Renewed consideration was given to certain questions.

- How many nuclear weapons are enough?
- What is the remaining mission for nuclear weapons after the Cold War?
- How can the concerns of non-nuclear-weapon countries about the discriminatory nature of the nonproliferation regime be met?

The fact of mutual assured destruction as a basis for nuclear deterrence between the United States and Russia remained long after the collapse of the Soviet Union. Eventually, new thinking challenged the notions of deterrence based upon mutual assured destruction, and with this came a realization that the high levels of nuclear weapons that still existed could not be justified.

U.S. and Russian Strategic Nuclear Forces

Current U. S. Strategic Nuclear Forces (As of January 1, 2007)

START-Accountable ¹	Strategic Nuclear Delivery Vehicles	Strategic Nuclear Warheads
Intercontinental Ballistic Missiles (ICBMs)	550	1,600
Submarine-Launched Ballistic Missiles (SLBMs)	432	3,168
Bombers	243	1,098
Total	1,225	5,866

Current Russian Strategic Nuclear Forces (As of January 1, 2007)

START-Accountable ¹	Strategic Nuclear Delivery Vehicles	Strategic Nuclear Warheads
Intercontinental Ballistic Missiles (ICBMs)	530	2,146
Submarine-Launched Ballistic Missiles (SLBMs)	272	1,392
Bombers	78	624
Total	880	4,162

1. The United States and Russia met the START I implementation deadline of December 5, 2001, seven years after the treaty's entry into force. The treaty limits the United States and Russia each to no more than 6,000 "accountable" warheads and 1,600 delivery vehicles (missiles and bombers).

SOURCE: START Memorandum of Understanding (MOU) of January 1, 2007.

The Arms Control Association (ACA), founded in 1971, is a national nonpartisan membership organization dedicated to promoting public understanding of and support for effective arms control policies. Through its public education and media programs and its magazine, *Arms Control Today (ACT)*, ACA provides policy-makers, the press and the interested public with authoritative information, analysis and commentary on arms control proposals, negotiations and agreements, and related national security issues. In addition to the regular press briefings ACA holds on major arms control developments, the Association's staff provides commentary and analysis on a broad spectrum of issues for journalists and scholars both in the United States and abroad.

Arms Control Association

1313 L Street, NW, Suite 130
Washington, DC 20005
Washington, DC 20036
202-463-8270 • fax: 202-463-8273