

How To Think about Nuclear Forces and Deterrence in the 21st Century

(b) (7)(C)

2011

Contract HQ0034-09-D-3007-0003

Center for Strategic and Budgetary Assessments

The views, opinions, and/or findings contained in this report are those of the author and should not be construed as an official Department of Defense (DoD) position, policy, or decision.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

This Page Blank

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

CONTENTS

INTRODUCTION	1
PART 1: HOW TO THINK ABOUT A NUCLEAR NET ASSESSMENT	7
Time Horizon and Uncertainties	7
The Objectives of the United States and Other Nuclear Powers or Aspirants	7
Metrics and Scenarios for Assessing Adequacy	12
PART 2: THINKING ABOUT NUCLEAR COMPETITION IN THE 21 ST CENTURY	18
Competitor Assessments	18
Assessing the Adequacy of America’s Nuclear Posture	20
A World without Nuclear Weapons	23
Major-Power Conflict and Nuclear Weapons	25
The Psychological Requirements of Nuclear Deterrence	27
PART 3: SUPPORTING DATA AND ANALYSES	33
3A: The Shortcomings of Cold War Metrics and Methods	33
3B: U.S.-Soviet Mutual Nuclear Deterrence	36
3C: Excerpts from President Obama’s Speech Committing the United States to a World without Nuclear Weapons	40
3D: Prominent Nuclear Abolition Arguments by Former U.S. Government Officials	43
3E: Excerpts from Thomas Schelling’s 2009 Article “A World without Nuclear Weapons?”	45
3F: An Organizational Approach to Adversary Behavior	46
██████████	
██████████	
██████████	
██████████	
██████████	
██████████	
██████████ Estimated Worldwide Nuclear Stockpiles, 2011	2

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

FIGURES:

Figure 1: U.S. & Soviet/Russian Strategic-Nuclear (Inter-continental) Warheads 1945-2002	22
Figure 2: The Emergence of U.S.-Soviet Nuclear Parity	23
Figure 3: U.S. Cold War and 21 st -Century Deterrent Triads	30
Figure 4: First-Strike Stability Draw-Down Curves	37

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

INTRODUCTION

Colonel George A. Lincoln of the West Point faculty makes the further point that whether or not atomic weapons are ever again used in warfare, the very fact of their existence, the possibility that they could be used, will affect all future wars. . . . The atomic queens may never be brought into play; they may never actually take one of the opponent's pieces. But the position of the atomic queens may still have a decisive bearing on which side can safely advance a limited-war bishop or even a cold war pawn.

—Paul Nitze, 1956¹

If India builds the bomb, we will eat grass or leaves, even go hungry, but we will get one of our own.

— Zulfikar Ali Bhutto, 1974²

Nuclear weapons are as much political symbols as they are military assets. The Iranian people support the idea of going nuclear; it is just that they do not want to see them used.

— Thomas Reed and Danny Stillman, 2009³

In summary, a “world without nuclear weapons” would be a world in which the United States, Russia, Israel, China, and half a dozen or a dozen other countries would have hair-trigger mobilization plans to rebuild nuclear weapons and mobilize or commandeer delivery systems, and would have prepared targets to preempt the other nations’ nuclear facilities, all in a high-alert status, with practice drills and secure emergency communications. Every crisis would be a nuclear crisis, any war could become a nuclear war. . . . It would be a nervous world.

— Thomas Schelling, 2009⁴

How should one think about assessing the role of nuclear arms in U.S. national security and military strategy as the world enters the second decade of the twenty-first century? Much about the status and role of nuclear forces has changed since the Berlin Wall fell in 1989 and the Soviet Union itself collapsed in 1991. To mention a few of the more prominent developments: the threat of a nu-

¹ Paul H. Nitze, “Atoms, Strategy and Policy,” *Foreign Affairs*, January 1956, p. 195.

² “The Spider’s Stratagem,” *The Economist*, from the print edition January 3, 2008, at <http://www.economist.com/node/10424283>, accessed June 4, 2011. Earlier Zulfikar Ali Bhutto had written, “There’s a Hindu bomb, a Jewish bomb and a Christian bomb. There must be an Islamic bomb” (“Pakistan: The Islamic Bomb,” *Time*, July 9, 1979, at <http://www.time.com/time/magazine/article/0,9171,920461,00.html>, accessed June 4, 2011).

³ Thomas C. Reed and Danny B. Stillman, *The Nuclear Express: A Political History of the Bomb and Its Proliferation* (New York: Zenith Press, 2009), p. 299.

⁴ Thomas C. Schelling, “A World without Nuclear Weapons?,” *Daedalus*, Fall 2009, p. 127.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

clear Armageddon engulfing the planet has largely disappeared; the U.S. and Russian arsenals, which peaked at a combined total of some 64,000 nuclear warheads in the mid-1980s, have undergone huge reductions (Table 1), with more to follow under the New START (Strategic Arms Reduction Treaty) agreement signed in April 2010; two additional nations—India and Pakistan—have fielded regional nuclear forces; North Korea has conducted two nuclear tests (both of which probably fizzled); Iran’s leaders have understandable incentives to acquire nuclear weapons in this decade; and the United States, which seeks to continue reducing its dependence on nuclear weapons and undertake concrete steps toward a world without them, has allowed its capability to produce nuclear weapons to atrophy. As for the U.S. nuclear relationship with the Russian Federation, against which the American arsenal is still sized, the two countries’ paths have diverged. While the Russians have designed low-yield warheads with new military capabilities, Congress has consistently blocked even the redesign of existing nuclear weapons to optimize performance margins, reliability and safety on the grounds that such redesigns might lead to a future need for testing and undermine U.S. credibility on nonproliferation.⁵

Table 1: Estimated Worldwide Nuclear Stockpiles, 2011⁶

Country	Intercontinental "Strategic"	"Theater" "Tactical"	Reserve	Military Stockpile	Awaiting Dismantlement	Total Inventory
Russia	1,537	2,000?	4,200	6,737	3,000	9,737
United States	1,800	313	2,850	4,963	3,500	8,463
China	20 to 30	150	220 to 230	400	0	400
France	290	not applicable	10	300	0	300
United Kingdom	160	0	65	225	0	225
Pakistan	0	n.a.	100 to 110	100 to 110	0	100 to 110
Israel	0	n.a.	100	100	0	100
India	0	n.a.	80 to 100	80 to 100	0	80 to 100
North Korea	0	n.a.	a few?	<5	0	<5
Totals	~3,812	2,463	~7,645	~12,920	6,500	~19,420

These and other developments since the Cold War ended give rise to a number of questions about the role of nuclear weapons in U.S. national security and military strategy in the decades ahead. Among the more pressing are the following:

⁵ William J. Perry (Chairman) and James R. Schlesinger (Vice-chairman), *America’s Strategic Posture: Final Report of the Congressional Commission on the Strategic Posture of the United States* (Washington, DC: United States Institute of Peace Press, 2009), pp. 41, 44.

⁶ Hans M. Kristensen, "Status of World Nuclear Forces," Federation of American Scientists, April 13, 2011, at <http://www.fas.org/programs/ssp/nukes/nuclearweapons/nukestatus.html> (accessed May 19, 2011); William J. Perry and James R. Schlesinger, *America’s Strategic Posture: Final Report of the Congressional Commission on the Strategic Posture of the United States* (Washington, DC: United States Institute of Peace Press, 2009), p. 111; Department of Energy, "Increasing Transparency in the U.S. Nuclear Weapons Stockpile," May 3, 2010; U.S. State Department, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," June 1, 2001, at <http://www.state.gov/t/avc/rls/164722.htm#> (accessed July 22, 2011). Israel is thought to have produced enough plutonium for up to 200 warheads. Table 1 also ignores the possibility that China’s nuclear arsenal may actually exceed 2,300 weapons.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

- What is the structure and character of competition in nuclear arms today, and how might the global nuclear order change over the next two to three decades?
- Do the arsenals of the United States and Russia still overshadow those of all other nuclear powers, as they largely did during the Cold War?
- Which countries are likely to be the dominant nuclear powers by the late 2030s, and which currently non-nuclear states are likely to have acquired nuclear weapons?
- While the deterrence of nuclear use and the prevention of further proliferation remain overriding objectives for the U.S. nuclear strategy, what are the objectives and perceptions of other actors regarding the possession, threatened use, or actual employment of nuclear weapons?
- To what extent does the understanding of nuclear deterrence derived from the Cold War need to be rethought in light of the changed circumstances of the 21st century?
- What courses of action by other states—or terrorist organizations—can U.S. nuclear (and nonnuclear) weapons and policies deter, and in what situations or scenarios?
- Do the arsenal-exchange calculations so widely used to assess the adequacy of U.S. strategic-nuclear forces vis-à-vis the Soviet Union during the Cold War have much relevance for assessing deterrent relationships today or in the immediate future?
- What impact does the emergence of at least limited hit-to-kill ballistic missile defenses have on relationships between offensive nuclear forces?
- Are China’s rulers still committed to a minimalist deterrent posture, as is widely believed, or might they have a nuclear arsenal comparable to those of the United States and Russia concealed in an “Underground Great Wall”?
- Might Pakistan field a larger number of nuclear warheads than France or Britain in the foreseeable future, and to what extent would that matter?
- Would a world without nuclear weapons really be safer and more secure than one with at least some nuclear weapons in the hands of stable powers?

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

- Is nuclear use on any scale still as unthinkable and globally catastrophic as it was during the 1970 and 1980s when an all-out U.S.-Soviet exchange could have produced “nuclear winter”?
- Is it plausible to assume that states such as India and Pakistan—or, eventually, Iran should that country go nuclear—will not be capable of fielding miniaturized thermonuclear warheads?
- Should the deterrence of nuclear use against the United States or its close allies fail and a U.S. nuclear response become the least onerous option for the president, what would U.S. leaders expect the employment of their nuclear forces to accomplish operationally and strategically?

While this list is by no means exhaustive, it does reflect the range of questions about nuclear strategy and weapons that have arisen since the Cold War ended. Little consensus, however, has emerged within the United States on the answers. Indeed, the last question, which may be the most important of the lot, does not even get asked in most American discussions of nuclear matters. Given these facts, a net assessment of nuclear strategy, weapons and forces appears overdue. The purpose of this paper is to suggest how to think about such an assessment.

[REDACTED]

[REDACTED]

[REDACTED]

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

[REDACTED]

Part 1 of this report proposes a way of judging the adequacy of U.S. nuclear policies, strategies, modernization efforts and capabilities through 2040. This framework has two main layers. The first uses a series of scenarios to assess capacity of the United States' nuclear posture to deter nuclear use by any nation or organization and prevent further nuclear proliferation. Here the general question is: What courses of action, by whom, and in what circumstances can U.S. nuclear forces be expected to deter or prevent? The second layer focuses on the question of what operational and strategic results U.S. leaders might expect from the actual employment of nuclear weapons should situations arise in which a nuclear response was judged the lesser evil of the available options. Here the central issues are the credibility of U.S. nuclear threats and assurances in the decades ahead and the real possibility that deterrence could fail.

Part 2 provides a more in-depth development of certain underpinnings behind Part 1's approach to thinking about nuclear matters between now and 2040. Part 2 also covers some topics not discussed in Part 1, including the role of nuclear weapons in deterring the use of chemical or biological weapons of mass destruction (WMD) and the restraining effect nuclear arsenals have exerted on great-power conflict since the 1940s. However, even the more expanded discussions in Part 2 do little more than touch upon certain important pieces of America's nuclear history and more recent developments—including the resurgence of support for nuclear abolition in the United States. Consequently, Part 3 consists of a series of stand-alone discussions that go into these matters in greater depth. To help the reader link Parts 2 and 3, sentences or paragraphs in Part 2 elaborat-

[REDACTED]

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

ed in Part 3 are identified by a series of subsection designations. These identifiers are inserted in square brackets (in red) at the ends of the relevant sentences or paragraphs with short titles ([3A: Cold War Metrics and Methods], [3B: U.S.-Soviet Mutual Nuclear Deterrence], [3C: Obama Prague Excerpts], etc.).

[REDACTED]

■ Clark A. Murdock, “DoD and the Nuclear Mission,” *Joint Force Quarterly*, 4th Quarter 2008, p. 14.

PART 1: HOW TO THINK ABOUT A NUCLEAR NET ASSESSMENT

Time Horizon and Uncertainties

This assessment focuses on the adequacy of the United States' nuclear posture and capabilities over the next two to three decades. The uncertainties inherent in trying to peer this far ahead into the world's nuclear future are substantial. Consider how far off projections of the United States' security situation in 2011 would undoubtedly have been if they had been made in early 2001, much less in 1991 or 1981. Nevertheless, despite the many uncertainties of the next several decades, it seems safe to assume that nuclear weapons will still exist in 2040. There is little likelihood that current nuclear powers or aspirants will relinquish enough sovereignty between now and then for the verifiable and enforceable elimination of the world's nuclear weapons to occur. As the latest congressional commission on the United States' nuclear posture concluded in 2009, the "conditions that might make possible the global elimination of nuclear weapons are not present today and their creation would require a fundamental transformation of the world political order."⁹ Such a transformation is possible, but the chances of it occurring by 2040 currently appear to be remote to vanishingly small. Consequently, the need will almost certainly persist for at least several more decades to assess the adequacy of the United States' nuclear posture and capabilities relative to other nuclear powers and nuclear "wannabe"s.

The Objectives of the United States and Other Nuclear Powers or Aspirants

As long as nuclear weapons exist, two overriding objectives of the U.S. nuclear arsenal have been, and will continue to be:

- (1) to deter nuclear use by any nation or organization; and
- (2) to prevent further nuclear proliferation.

These goals have been consistent objectives of U.S. nuclear forces since the 1950s. However, at least two additional goals have been added since 2001. They are:

- (3) to begin reducing the dependence of U.S. national security on nuclear weapons; and
- (4) to undertake concrete steps toward achieving a world without nuclear arms.

The third goal emerged explicitly in the 2001 Nuclear Posture Review (NPR) but has antecedents that can be traced at least back to the 1975 Long Range Research

⁹ Perry and Schlesinger, *America's Strategic Posture*, p. xvi.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

and Development Planning Program (LRRDPP), which concluded that non-nuclear precision munitions could provide the president “with a variety of strategic response options as alternatives to massive nuclear destruction.”¹⁰ The fourth objective was announced as U.S. policy by President Barack Obama on April 5, 2009, at Hradcany Square in Prague, but it echoes President Jimmy Carter’s promise in his January 1977 inaugural address that the United States would “move this year a step toward the ultimate goal—the elimination of all nuclear weapons from this Earth.”¹¹ Arguably, then, the fundamental goals of U.S. nuclear forces have been relatively enduring and consistent over many decades.

The major omission in these four objectives for U.S. nuclear forces concerns the credibility of American deterrent threats and promises. In light of the enormous nuclear arsenals that the United States and the Soviet Union accumulated during the Cold War, it is difficult to object to the goal of reducing U.S. dependence on nuclear weapons. On the other hand, if there are no contingencies besides a massive nuclear attack on American soil in which U.S. leaders might conclude that a nuclear response “was their best alternative,” then there can be little credibility to American nuclear threats or guarantees.¹² This insight is the reason the last question in the introduction is so important. During the Cold War, there was little ambiguity about what American administrations from Dwight Eisenhower’s to Ronald Reagan’s expected of U.S. nuclear forces should a thermo-nuclear exchange with the Soviet Union have occurred. [REDACTED]

[REDACTED] example, Robert McNamara’s notion of assured destruction sought to deter a deliberate Soviet nuclear attack on the United States and its allies by being able to inflict unacceptable damage on the USSR even after absorbing a first strike. Unacceptable damage, in turn, was defined as being able to kill 20 to 25 percent of the USSR’s population and destroy 50 percent of its industrial capacity.¹³ Thus, what American leaders expected from their strategic-nuclear forces during the Cold War was fairly clear and well defined.

¹⁰ D. A. Paolucci, “Summary Report of the Long Range Research and Development Planning Program,” Lulejian & Associates, Falls Church, VA, February 7, 1975, p. 45. This project was jointly sponsored by the Defense Advanced Research Projects Agency and the Defense Nuclear Agency. Albert Wohlstetter was the primary drafter of this summary report.

¹¹ President Jimmy Carter, “Inaugural Address,” January 20, 1977.

¹² In 1960 Herman Kahn argued that there were “plausible circumstances” in which Soviet or American leaders might decide that nuclear war “was their best alternative” (Herman Kahn, “The Nature and Feasibility of War and Deterrence, RAND, P-1888-RC, January 20, 1960, p. 4).

¹³ “Robert S. McNamara: January 21, 1961 – February 29, 1968,” Secretary of Defense Histories, at http://www.defense.gov/specials/secdef_histories/bios/mcnamara.htm (accessed June 28, 2011).

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

The problem today is that the four postulated U.S. goals concentrate single-mindedly on nuclear competition in peacetime and ignore the question what might be expected of American nuclear forces should their actual employment in a twenty-first-century contingency become necessary, even if only as a defensive last resort. In 2009 the congressional commission on America's nuclear posture described the "principal functions of the U.S. nuclear posture" as being "to create the conditions in which nuclear weapons are never used, to assure allies of the U.S. commitment to their security, and to discourage unwelcome competition while encouraging strategic cooperation."¹⁴ The commission argued that because a direct Russian nuclear attack on the United States is no longer likely, the Cold War "threat of a nuclear Armageddon has largely disappeared."¹⁵ Nevertheless, for perceptual reasons—reassuring allies about U.S. nuclear guarantees and dissuading potential adversaries—the commission found that the sizing of the U.S. nuclear arsenal "remains overwhelmingly driven by the requirements of essential equivalence and strategic stability with Russia."¹⁶ The U.S. nuclear arsenal should be safe, secure and reliable, but Congress has prohibited any warhead modernization, especially new designs with new military characteristics more suited to twenty-first-century contingencies in which U.S. nuclear use might be the least onerous option. Thus, the objectives for U.S. nuclear forces currently accepted by most American leaders and strategic analysts gives short shrift to the credibility of U.S. nuclear threats and guarantees. If we cannot articulate any generic situations other than a direct, all-out nuclear attack on the United States in which it would be rational for the president to respond with limited nuclear strikes (tailored to minimize collateral and environmental damage), then the credibility of U.S. nuclear threats and guarantees is, at best, minimal.

The contrast with current Russian nuclear doctrine and objectives is striking. Russian leaders, like their American counterparts, certainly hope to deter nuclear use against Russia itself. In 2010, the latest version of Russian military doctrine stated that avoiding nuclear conflict is "the most important objective of the Russian Federation."¹⁷ Nevertheless, Russian doctrine does not appear to subscribe to the view that a principal function of Russia's nuclear forces is to create the conditions in which nuclear weapons are never used. Instead the "Russian Federation retains the right to use nuclear weapons in response to the use against it and (or) its allies of nuclear and other types of weapons of mass destruction as well as in case of aggression against the Russian Federation with the application

¹⁴ Perry and Schlesinger, *America's Strategic Posture*, p. xvi.

¹⁵ Perry and Schlesinger, *America's Strategic Posture*, pp. xvii, 16, 24, 97.

¹⁶ Perry and Schlesinger, *America's Strategic Posture*, pp. xvii, 24, 99.

¹⁷ "Военная Доктрина Российской Федерации [Military Doctrine of the Russian Federation]," trans. Natalya Anfilofyeva, confirmed by order of the President of the Russian Federation, February 5, 2010, paragraph 18.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

of conventional weapons when its very existence is threatened.”¹⁸ Whereas a growing majority of American elites view reliance on offensive nuclear weapons by states to deter threats from other states as being “increasingly hazardous and decreasingly effective,”¹⁹ Russian elites see their nuclear arms as both the guarantor of great-power status and the means of offsetting conventional inferiority vis-à-vis the North Atlantic Treaty Organization (NATO) and, most likely, China. As a result, since 1999 Russia has adopted two deterrent strategies: a global one aimed at deterring nuclear aggression by threatening a massive, counter-value retaliatory nuclear strike; and a regional one aimed at deterring conventional aggression or, should deterrence fail, at deescalating the conflict and bringing it to a favorable conclusion with limited counter-force nuclear strikes in the theater of military operations or beyond.²⁰ The two countries have a similar divergence of views over missile defenses. The American view is that missile defenses “can play a useful role in supporting the basic objectives of deterrence,” understood broadly as discouraging nuclear use or proliferation.²¹ The Russians, on the other hand, stridently opposed President Reagan’s strategic defense initiative during the 1980s and 1990s; and, the day before New START was signed on April 8, 2010, the Russian Federation issued a statement saying that the treaty will “be effective and viable only in conditions where there is no qualitative or quantitative build-up in the missile defense system capabilities of the United States.”²² Thus, the Russians share American views on neither the functions of offensive nuclear forces nor ballistic missile defenses, which they view with longstanding paranoia.

Moreover, in support of their regional deterrence doctrine, the Russian Federation has designed a new generation of nuclear weapons with low yields, the capability to neutralize hard or deeply buried targets, “clean” qualities that minimize collateral damage, and electro-magnetic-pulse effects optimized to shut down enemy command, control, and communications (C3) as well as other elec-

¹⁸ Военная Доктрина Российской Федерации [Military Doctrine of the Russian Federation],” paragraph 22.

¹⁹ George P. Shultz, William J. Perry, Henry A. Kissinger and Sam Nunn, “A World Free of Nuclear Weapons,” *Hoover Digest*, No. 1, Winter 2007 (January-March Quarter), at <http://www.hoover.org/publications/digest/6731276.html> (accessed June 29, 2011).

²⁰ Dima Adamsky, “Russian Regional Nuclear Developments,” Long Term Strategy Group (LTSG), September 2010, pp. 13, 45.

²¹ Perry and Schlesinger, *America’s Strategic Posture*, pp. xvii, 31-33.

²² “Statement of the Russian Federation Concerning Missile Defense,” April 7, 2010, at <http://lugar.senate.gov/issues/start/pdf/RussianUnilateral.pdf> (accessed July 2, 2011). In response, the United States issued a statement insisting that its missile defenses are only designed to defend against a limited attack and are “not intended to affect the strategic balance with Russia” (“Statement of the United States Concerning Missile Defense,” April 7, 2010, at http://www.acq.osd.mil/tc/treaties/NST/Art%20By%20Art/art_uni_statements_annex.htm, accessed July 2, 2011).

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

trical equipment.²³ These new “theater” or “tactical” weapons are not captured by the New START agreement. Developed between 1998 and 2005, they have been likened to a “nuclear scalpel” based on their potential to terminate regional conflicts without catastrophic collateral damage.²⁴ And because the United States has not pursued similar designs, it would appear that Russian threats to employ their nuclear scalpel to avoid a major conventional defeat are far more credible than most U.S. nuclear deterrent threats and assurances.²⁵

Russia is not the only country whose goals regarding nuclear forces are at odds with those of American policy elites. Foreign observers drew lessons from the Persian Gulf War, in particular that:

There is a real divergence between the major powers’ view of the declining utility of nuclear weapons, and those of some—by no means all—regional states, which see the value increasing. This value . . . is much more political than military. Many analysts in India, for instance, believe that Iraq was on the right track in seeking nuclear weapons, not so much to use them against its adversaries, but as a means of keeping the superpowers out of regional conflicts by raising the risks they would accrue from intervention.²⁶

India and Pakistan each subsequently conducted a series of nuclear tests in May 1998, thereby joining the ranks of nuclear powers. Their actions confirm the judgments that at least some regional powers perceived renewed value in nuclear forces regardless of contrary American views. And much the same can be said of North Korea and nuclear aspirants such as Iran and Syria today. Consider the likely motivations behind Iran’s nuclear program. Having watched U.S. conventional forces achieve regime change in Iraq in about three weeks in 2003, it seems plausible that the ayatollahs view nuclear arms as a way of precluding a similar fate. To the extent that this assumption is correct, the primary motivation behind Iran’s interest in acquiring nuclear weapons is U.S. conventional capabili-

²³ John S. Foster, “The Nuclear Weapons Horizon,” *Comparative Strategy*, Vol. 26, No. 1, January 2007, p. 90. Reed and Stillman argue that late in the Cold War the Soviet Union and China developed enhanced radiation warheads (*The Nuclear Express*, pp. 198, 231).

²⁴ Adamsky, “Russian Regional Nuclear Developments,” p. 51.

²⁵ “It is ironic that those who most object to the existence of nuclear weapons steadfastly insist that our unnecessarily destructive weapons remain in the stockpile and that lower-yield systems should not be deployed. Congress has repeatedly cut off funding for research and development of weapons with lower yields or those with added safety features. Anti-nuclear groups have sought to characterize any change in our nuclear stockpile as tantamount to a unilateral resumption of the nuclear arms race, forgetting that Russia has announced that it is actively pursuing new weapons technology and deploying new nuclear weapons on new missiles.”—Stephen M. Younger, *The Bomb: A New History* (New York: HarperCollins, 2009), pp. 128-129.

²⁶ Patrick J. Garrity, “Why the Gulf War Still Matters: Foreign Perspectives on the War and the Future of International Security,” Center for National Security Studies, Los Alamos National Laboratory, Report No. 16, July 1993, p. 66.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

ties, not U.S. nuclear forces. In addition, developing a Shia bomb would go far to make Iran the dominant power in the region, increase Iranian freedom of action to continue supporting terrorist organizations dedicated to such goals as the destruction of the Israeli state, and provide a deterrent against Pakistan. There is little basis, then, for thinking that the United States' goals regarding the future utility of nuclear weapons are shared by all other nuclear powers and aspirants. The American aspirations of curbing further proliferation and putting the world on a path toward nuclear abolition by providing an example for other states to follow, therefore, appears to have little traction, perhaps most prominently in the case of the Russian Federation.

Metrics and Scenarios for Assessing Adequacy

Again, the key step in assessing U.S. nuclear forces and capabilities in the decades ahead is deciding how to measure the adequacy of the American arsenal relative to plausible American objectives and the objectives of other states. During the Cold War, a variety of static and dynamic measures were used to compare U.S. and Soviet intercontinental nuclear forces. However, neither static measures (the numbers of warheads and launchers, delivery-system accuracies, alert status, silo hardening, warhead arrival probabilities, throw weight, equivalent megatonnage, hard-target kill potential, etc.) nor "dynamic" exchanges of the opposing superpower arsenals were particularly satisfactory in assessing the overall adequacy of U.S. nuclear forces to deter either a direct Soviet nuclear attack on the United States, or a conventional conflict directly between U.S. and Soviet forces that could escalate into a nuclear exchange. These measures and methods omitted too many important factors, including: Soviet assessments of the risks, costs and benefits of nuclear war using Soviet metrics, analytic methods and scenarios; civil and active defenses; command and control; the survivability of national authorities; and the inherent uncertainties of a large-scale nuclear exchange (which were larger than generally recognized). As a result, once the USSR attained rough nuclear parity with the United States in the early 1970s, the principal metric for judging the adequacy of the U.S.-Soviet strategic-nuclear balance became each side's ability to absorb the other side's first strike and still devastate the opponent's homeland with a retaliatory strike.

Even under the New START limits, the United States retains the capacity to inflict massive nuclear destruction on any country in the world. Even limiting Trident II submarine-launched ballistic missiles (SLBMs) to four independently targetable reentry vehicles, a single *Ohio*-class ballistic missile submarine (SSBN) on patrol could, at any time, deliver ninety-six W-88 warheads, each with a yield of 475 kilotons, for a total of 45.6 megatons. Nevertheless, the existence of the large U.S. nuclear strategic arsenal of the late 1990s did not prevent either India or Pakistan from fielding nuclear forces. Their motivations for joining the nuclear club had to do with their own rivalry, independent of the U.S. nuclear arsenal. Nor is it at all clear how the current U.S. nuclear arsenal would deter a nuclear exchange between Pakistan and India at some point in the future. What deterrent threat could the United States make to either country to preclude a nuclear ex-

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

change across what may be the world's most dangerous border? The nuclear retaliatory capability of the United States today appears irrelevant to deterring nuclear conflict between Pakistan and India. The most central Cold War measure of U.S. nuclear adequacy—a secure second-strike capability—may matter to Russia or perhaps China, but to few other nations, and certainly not to terrorist organizations.

What about the various static measures that were widely used during the Cold War to compare U.S. and Soviet nuclear forces? Given the limited utility of a secure retaliatory capability, do metrics such as the numbers of operational warheads or delivery vehicles have much relevance today? There appear to be at least three ways in which these sorts of numbers still matter. First, there is the perceptual issue about the relative size of U.S. and Russian intercontinental nuclear forces. The congressional commission on America's nuclear posture was probably right to argue that the U.S. arsenal should be essentially equivalent in size to that of the Russian Federation. A substantially smaller U.S. arsenal would not be very reassuring to American allies and would surely undermine perceptions of American power by other states. Perceived U.S. nuclear "inferiority," whether accurate or not, would only make it more difficult for the United States to achieve its goals of deterring any nuclear use and preventing further nuclear proliferation.²⁷

Second, as the numbers of U.S. and Russian intercontinental warheads and launchers approach or go below the New START limits, it will become increasingly important to begin limiting, if not eliminating, the two countries' non-strategic warheads. A related issue, so far unaddressed, is China. The conventional wisdom is that the People's Republic of China (PRC) has a minimalist nuclear posture: to deter a U.S. or Russian nuclear strike, all the PRC need do is to field a capability to mount nuclear strikes against a few U.S. or Russian population centers.²⁸ This comforting view of Chinese nuclear doctrine is the basis for the estimate of the PRC's nuclear arsenal in Table 1. [REDACTED]

[REDACTED] Here it is worth recalling that China initially deployed the medium-range DengFeng(DF)-2 (CSS-1) in 1965 or 1966, but the U.S. intelligence community did not realize the Chinese had an operational nuclear capability until 1972 due to the covert way in which these first Chinese mis-

²⁷ Herbert Goldhamer's foremost conclusions about perceptions and beliefs in military affairs were that "military-political behavior is often a function of images of the enemy and of self," and that "these images often deviate from reality" (Herbert Goldhamer, edited by Joan Goldhamer, "Reality and Belief in Military Affairs: A First Draft (June 1977)," RAND R-2448-NA, February 1979, p. 5).

²⁸ For the minimalist reading of China's nuclear posture, see Jeffrey Lewis, *The Minimum Means of Reprisal: China's Search for Security in the Nuclear Age* (Cambridge, MA: MIT Press, 2007).

[REDACTED]

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

siles were deployed.³⁰ Moreover, even if the numbers for China's nuclear arsenal in Table 1 are currently accurate, as U.S. and Russian numbers come down, China's leaders will have less and less ground to make up quantitatively to achieve numerical nuclear equivalence—or even superiority—with the United States.

A somewhat stronger argument for concern about the actual size and character of the PRC's nuclear posture stems from the Second Artillery Corps' build-up of short- and medium-range ballistic missiles such as the DF-11 (CSS-7), DF-15 (CSS-6) and two-stage DF-21 (CSS-5).³¹ In 2010, the Pentagon estimated that the Chinese had built 1,135-1,245 of these three missiles (for which they had 285-325 mobile launchers).³² Most likely all of these missiles are capable of carrying nuclear warheads but it is unclear whether the PRC has actually built warheads for some or all of them. Consequently, sizing the U.S. arsenal based solely on quantitative equivalence with Russia could prove inadequate long before 2040 given the pace of PRC military modernization and the possibility of further proliferation in the Middle East or elsewhere. If Iran is neither dissuaded nor prevented from going nuclear, there is a real possibility of a nuclear cascade in which the leaders of nations such as Saudi Arabia, Egypt and Turkey feel compelled to follow suit.³³ Similarly, in the Far East, if the credibility of the U.S. nuclear umbrella becomes sufficiently questionable in the eyes of Japanese and South Korean leaders, they too could go nuclear to offset the growing military power of a rising and more assertive China.

³⁰ Rather than building launch pads or silos as the Americans and Soviets had done, the CSS-1s were concealed in caves or tunnels, and the Chinese took great pains to hide their initial deployment. The CCS-1s were targeted on cities and U.S. military bases in Japan. In October 1966, the Chinese conducted a full system test in which a DF-2 was launched from Shuangchengzi to an impact area in the Lop Nur test area. The missile delivered a live 20-kiloton warhead—Bates Gill and James Mulvenon, paper in “China and Weapons of Mass Destruction: Implications for the United States,” Conference Report, National Intelligence Council, November 5, 1989, at http://www.dni.gov/nic/confreports_chinawmd.html#Link3, accessed July 27, 2011.

³¹ The two-stage DF-21 (CSS-5) was used to shoot down an inoperative Chinese weather satellite in January 2007.

³² Office of the Secretary of Defense, “Military and Security Developments Involving the People's Republic of China,” 2010, p. 66.

³³ In Turkey's case, the decision NATO ultimately makes about retaining U.S. tactical nuclear weapons could also affect Turkey's response to the emergence of a nuclear Iran. The 2010 Nuclear Posture Review (NPR) announced the U.S. decision to retire “the nuclear-equipped sea-launched cruise missile (TLAM-N),” some of which were committed to NATO (Robert M. Gates, “Nuclear Posture Review Report,” Department of Defense, April 2010, p. xiii). That decision left NATO with a 150 to a few hundred air-delivered B-61s stored in five NATO countries, including Turkey (Bruno Tertrais, “The Sky Would Not Fall, but it Might Get a Little Darker: A French Perspective,” in Malcolm Chalmers and Andrew Somerville (eds.), “If the Bombs Go: European Perspectives on NATO's Nuclear Debate,” RUSI Whitehall Report 1-11, 2011, p. 11). Whether NATO retains these weapons or eliminates its collective nuclear capability seems likely to influence future Turkish decisions about whether to acquire nuclear weapons.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

The third way in which the numbers of nuclear warheads and launchers may matter stems from U.S. efforts to field defenses against a limited number of ballistic missiles launched accidentally or by a rogue state such as North Korea. The smaller U.S. and Russian nuclear arsenals become, the greater the potential impact of even limited missile defenses. This likely interaction between offensive nuclear missiles and missile defenses suggests that there may be a minimum size for the U.S. nuclear arsenal below which the deterrence of nuclear use grows increasingly unreliable. The fact that the PRC's nuclear missiles are protected in thousands of kilometers of underground tunnels only reinforces concern over how low the U.S. arsenal can prudently go.

While perceptions of the U.S. nuclear arsenal can be broadly addressed with simple quantitative metrics reflecting force size, assessments of the ability of American nuclear forces to deter nuclear use or prevent further proliferation cannot. In a peacetime-competition context, the core question is: *What courses of action, by whom, and in what circumstances can the U.S. nuclear arsenal be expected to deter or prevent between now and 2040?* One way to tackle this question is to pose a set of plausible nuclear contingencies and then try to answer this question in each case. A reasonable list of such scenarios might consider the following situations:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

These are not, of course, the only plausible nuclear contingencies that could be considered, and focusing too much on worst-case scenarios should be avoided. That said, the merit of these six situations is to provide a systematic basis for answering the core question about what courses of action, and by whom, the U.S. nuclear arsenal can be expected to deter or prevent. Notice that while nuclear use against the United States or its allies is not included, some of the scenarios involve direct conflict between two nuclear-armed adversaries. Direct combat between the United States and the USSR is something that (thankfully) did not occur during the Cold War. Scenarios involving combat between two nuclear-armed states are, therefore, situations for which there is no historical experience. Further, assessing the United States' capacity to deter nuclear use or prevent proliferation will surely require insight into the objectives, fears and concerns, strategic cultures, technical metrics and calculations, analytic methods and dominant scenarios of the states the United States seeks to influence. In the final analysis, the assessment of each case will hinge on thoughtful judgments rather than quantitative metrics or traditional exchange calculations.

Finally, deterrence of nuclear use can fail, as can efforts to curb or reverse nuclear proliferation. To repeat, the credibility of U.S. deterrent threats and nuclear guarantees cannot rest on the perception that there are no longer any situations except an all-out nuclear attack on the United States in which an American president would judge a nuclear response to be the least onerous option. As of May 2010, the United States had just under 2,000 deployed intercontinental nuclear warheads, a reduction of 87 percent from the Cold War peak of some 15,700 warheads in the mid-1970s. In addition, since 1991 U.S. non-strategic nuclear weapons have been reduced by over 90 percent. The New START goal of 1,550 deployed strategic warheads will be a 90 percent reduction, and further reductions are being contemplated in post-New START negotiations with Russia. Moreover, as the secretaries of energy and defense noted in 2008, "the United States does not have the ability to produce new nuclear weapons [emphasis in the original]."³⁴ Thus, the credibility of U.S. nuclear deterrence and assurances will increasingly depend on a small, shrinking, aging arsenal based on warheads designed in the 1980s that maximized yield-to-weight rather than safety, reliability, or longevity.³⁵

What sorts of situations might lead a U.S. president to consider a nuclear response? Certainly the use of a nuclear weapon against the United States itself or U.S. forces overseas are two such possibilities. A nuclear attack on close U.S. allies is another. But what would the president expect from the employment of U.S. nuclear forces in these situations? In most cases it is likely that the initial response would be limited rather than massive, and efforts would be made to minimize unnecessary deaths, collateral damage, and environmental degradation.

³⁴ Samuel W. Bodeman and Robert M. Gates, "National Security and Nuclear Weapons in the 21st Century," Department of Energy and DoD, September 2008, p. 2.

³⁵ Perry and Schlesinger, *America's Strategic Posture*, p. 41.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

The most modern U.S. warheads for Minuteman III intercontinental ballistic missiles (ICBMs) and Trident II D-5 submarine launched ballistic missiles (SLBMs), the W87 and W88, have yields of 300 to 475 kilotons. Variants of the dial-a-yield, aircraft-delivered B61, by contrast, have been reported to offer yields as low as 0.3 to 10 kilotons, depending on the model. The B61-11, which penetrates up to 20 feet into dry earth before detonating, transfers a much higher proportion of its energy downward than a surface burst, thereby enabling it to attack deeply buried facilities. Most of the weapon's output is, of course, x-ray energy. If the weapon is covered with enough soil to trap the x-ray energy, then "much more of its energy is directed downward into the earth."³⁶ Variants of the B61 are, therefore, the U.S. nuclear weapons most suited to a limited nuclear strike intended to minimize avoidable deaths and damage—particularly if the targets include deeply buried facilities. Reinforcing this conclusion, Stephen Younger has argued that, with sufficient accuracy, a ten-kiloton warhead would suffice for around 90 percent of the plausible twenty-first-century targets.³⁷ However, while relatively inexpensive guidance kits have been developed to convert "dumb" conventional bombs into precision weapons such as the Joint Direct Attack Munition, they have not been adapted to the B61. Given congressional opposition to new warhead designs like those the Russians have developed, it would appear that U.S. leaders have been unwilling to take even modest steps to adapt American nuclear forces to the possibility of their actual use. This judgment suggests that the credibility of U.S. deterrent threats and nuclear assurances is increasingly questionable and likely to grow more dubious between now and 2040. Much the same conclusion can, therefore, be drawn regarding the overall adequacy of America's nuclear posture.

³⁶ Younger, *The Bomb: A New History*, p. 115.

³⁷ Younger, *The Bomb: A New History*, pp. 112-113, 217. Regarding the fragility of U.S. designs Younger adds, "But in reducing the size and weight the weapons designers also reduced confidence—the more one optimized a system, the closer it came to the performance 'cliff,' beyond which it would fail to detonate" (*ibid.*, p. 29).

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

This Page Blank

PART 2: THINKING ABOUT THE GLOBAL NUCLEAR ORDER IN THE 21ST CENTURY

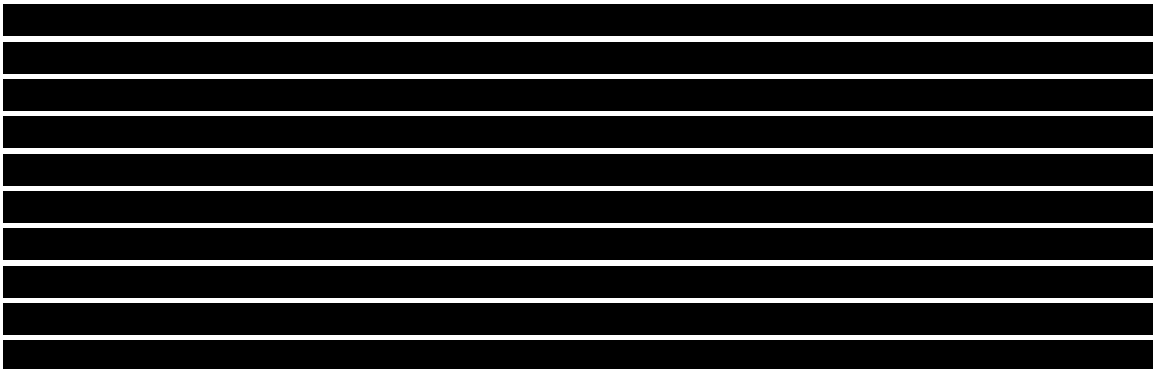
- Are nuclear weapons necessary for US deterrence and assurance strategies?
- If so, how many and what types are adequate for deterrence and assurance of whom against what?
- Are certain types or numbers of forces predictably “stabilizing” or “destabilizing”?
- What makes US deterrence strategies credible, and how important is the credibility of US threats?

At the risk of shattering widespread illusions, it is important to understand an inconvenient truth: there is no basis for confident, definitive answers to any of these fundamental questions. All attempts to answer these questions involve considerable speculation. And no answer, however insightful for the moment, can be considered pertinent across time and place.

— Keith Payne, 2011³⁸

This second part of the report offers a more in-depth development of certain underpinnings behind Part 1’s approach to thinking about nuclear competition between now and 2040. Issues such as mutual assured destruction and the renewed momentum among U.S. elites to begin moving toward a world without nuclear weapons were mentioned in Part 1 but not examined at any length. Part 2 also raises some topics not previously discussed, including the role of nuclear weapons in deterring the use of chemical or biological weapons of mass destruction (WMD) and the restraining effect nuclear arsenals appear to have exerted on great-power conflict since 1945.

Competitor Assessments



³⁸ Keith B. Payne, “Maintaining Flexible and Resilient Capabilities for Nuclear Deterrence,” *Strategic Studies Quarterly*, Summer 2011, pp. 1-2.



**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

[REDACTED]

[REDACTED]

[REDACTED]

⁴¹ USSR Ministry of Defense, "Whence the Threat to Peace," Military Publishing House, Moscow, 1982 (2nd ed.), p. 21. See, also, "Soviet Union: Battle of the Booklets," *Time*, February 1, 1982.

[REDACTED]

[REDACTED]

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

That misunderstandings this elementary could have persisted into the 1980s shows how difficult it is to grasp fully the metrics, technical calculations, analytic frameworks, dominant scenarios and judgments of a nuclear competitor. In the case of the Soviets, even decades of intelligence and analysis did not produce full understanding of how the General Staff viewed the USSR's nuclear competition with the United States, much less the attitudes of the Politburo. Continuing disagreement today between American and Russian officials over the implications of limited missile defenses underscores how divergent strategic cultures can be, and Soviet/Russian strategic culture is surely far closer to that of the United States than those of the Chinese, Pakistanis or Iranians. As Keith Payne has argued, judgments about the ability of U.S. nuclear forces and policies to deter nuclear use or prevent further proliferation are beset by irreducible uncertainties. Successful deterrence ultimately occurs in the minds of those being deterred or dissuaded. This state of mind hinges on the perceptions of other national leaders regarding the benefits, costs, and uncertainties likely to flow from a decision to use nuclear weapons. Insofar as causal linkages are sought between America's nuclear posture and the rejection of nuclear use or proliferation by other national leaders, U.S. nuclear forces and policies must influence their assessments. Understanding of competitor assessments is therefore necessary for this influence to be anything other than luck. Difficult as it may be to appreciate the assessments of other strategic cultures, the logic of deterrence demands that we try—even if this sort of understanding has rarely been an area in which American leaders and strategists have excelled.

Assessing the Adequacy of America's Nuclear Posture

Turning to U.S. assessments of nuclear competition, what metrics, calculations and contingencies should we use to judge the adequacy of America's nuclear posture? Part 1 argued that the answer to this question has at least three layers, each suggesting its own approach to measuring nuclear adequacy.

1. So long as there are convincing reasons for the United States to maintain a nuclear arsenal quantitatively equal to Russia's, the numbers of U.S. intercontinental delivery systems and their associated nuclear warheads not only matter, but provide one (albeit rough) measure of adequacy.
2. To the extent that key U.S. objectives include deterring any use of nuclear weapons and arresting nuclear proliferation, a second test of adequacy is to assess whether America's nuclear posture is likely to achieve these objectives across a range of plausible contingencies (e.g., Iran is about to go nuclear, Pakistan elects to use nuclear weapons in response to Indian conventional retaliation for terrorist attacks in Mumbai or



**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

other cities, or Russian use of theater nuclear weapons succeeds in preventing a conventional defeat).

[REDACTED]

[REDACTED] the first is fundamentally quantitative, but involves some complications. One is whether Chinese leaders might one day aspire to quantitative equality—or even superiority—with the United States and Russia; another is the interaction between offensive nuclear forces and missile defenses—especially if the United States and Russia agree to go significantly below the New START limits and eliminate most of their non-strategic warheads. The second layer focuses on sustaining the taboo against nuclear use that has held since 1945 and arresting further nuclear proliferation. It is likely that America’s current nuclear posture may not be able to achieve these goals in the more likely future contingencies, starting with an Iranian decision to field nuclear arms. Here the most disturbing scenario is one which relatively clean, low-yield nuclear weapons are used successfully to avert conventional defeat. Such an event would surely affect perceptions about the efficacy of nuclear weapons by many states and could spell the end of nonproliferation efforts. [REDACTED]

[REDACTED]

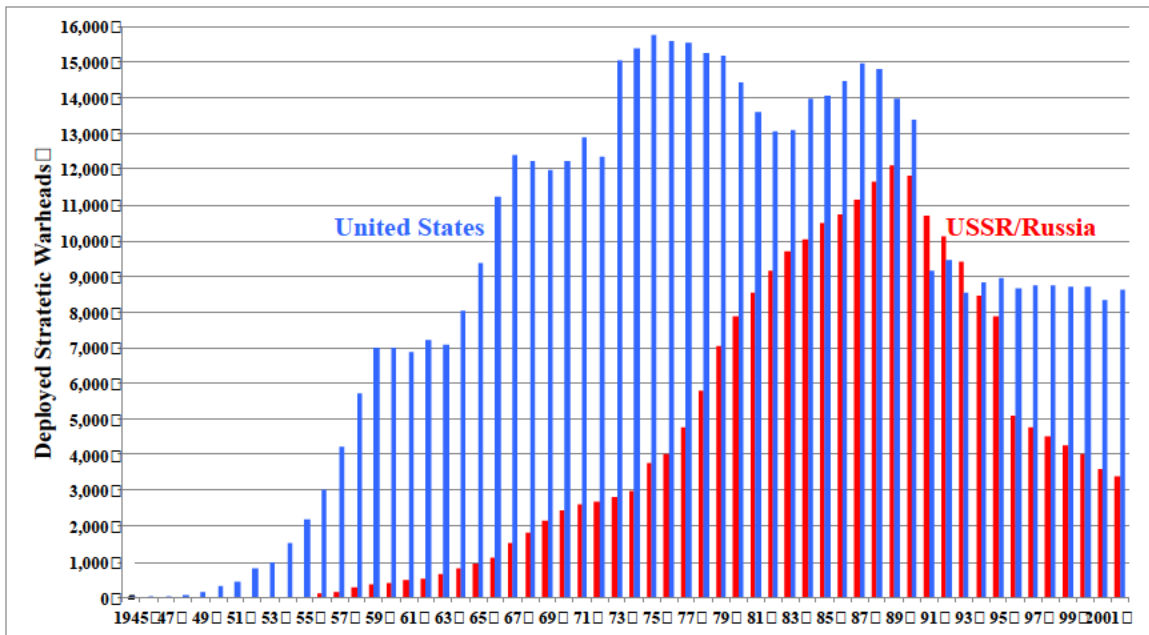
These three ways of judging U.S. nuclear adequacy between now and 2040 are fundamentally different from the measures and calculations that largely dominated U.S. thinking about nuclear competition during the Cold War. As mentioned in Part 1, neither the static measures (numbers of warheads and launchers, throw weights, response times, etc.) nor the arsenal exchange calculations adequately captured underlying issues such as how a nuclear exchange might arise in real life or the many other uncertainties about the prevention or conduct of actual nuclear war [3A: Cold War Metrics and Methods]. Prominent features of the U.S.-Soviet strategic-nuclear competition during the 1970s and 1980s were its symmetry and, compared to the early twenty-first century, its seeming simplicity. Even as early as the mid-1970s, the American and Soviet nuclear arsenals had grown so large that they overshadowed those of the other nuclear powers, making the competition a bilateral one (Figure 1).⁴⁴ Moreover, because defenses were so

⁴⁴ “It is true that Britain and France possessed nuclear weapons in the first nuclear age. But it is difficult to argue that they made much difference in cold war dynamics. Both superpowers treated the two as if they were almost irrelevant to the central contest.” (Paul Bracken, “The Second Nu-

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

feeble—particularly against ballistic missiles—the competition was between opposing U.S. and Soviet offensive nuclear forces. As for deterrence in this set of circumstances, once the USSR had achieved rough nuclear parity—which both U.S. and Soviet observers judged to have occurred in the early 1970s (Figure 2)—it came to rest increasingly on each side’s ability to devastate the other’s homeland after absorbing a nuclear first strike [3B: Mutual Deterrence]. After all, if a first strike by either side could not, with any confidence, eliminate the other’s capacity to respond with devastating nuclear retaliation, then the logic of the situation argued that striking first would simply precipitate one’s own nuclear destruction. Hence, by the early 1970s, both American and Soviet leaders had a compelling incentive to avoid initiating nuclear war. In a two-party competition between nuclear superpowers, the question was whether to shoot first, and logic clearly dictated waiting.⁴⁵

**Figure 1: U.S. & Soviet/Russian Strategic-Nuclear
(Intercontinental) Warheads, 1945-2002⁴⁶**

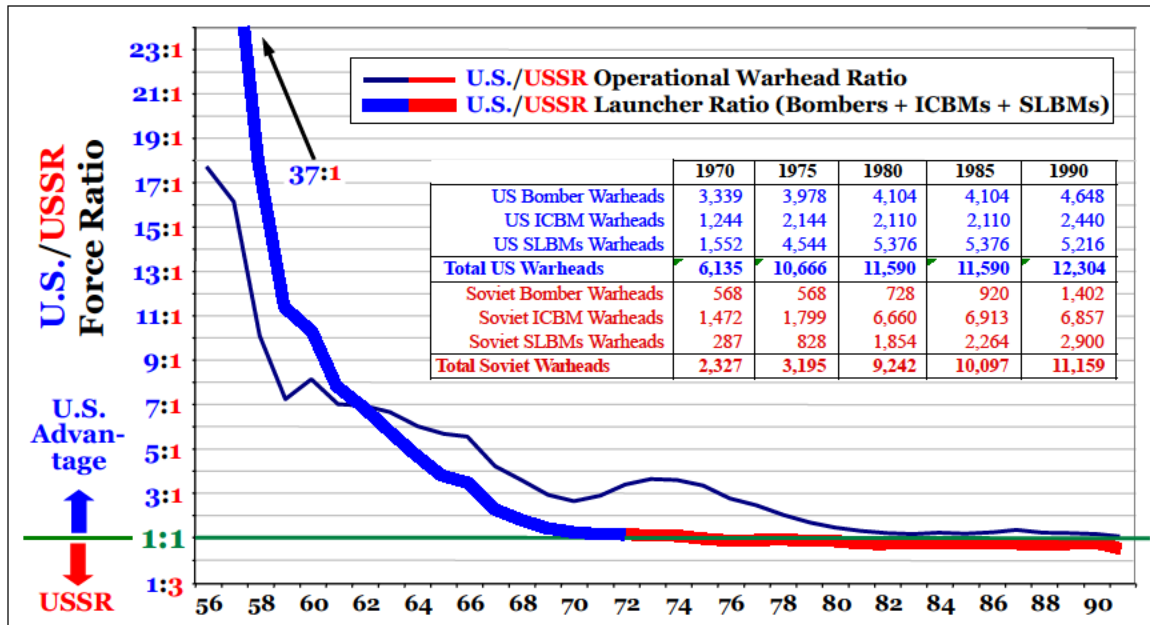


clear Age: How Much Has Changed, How Much Remains the Same?”, November 17, 2002 [Draft 2], p. 6).

⁴⁵ Bracken, “The Second Nuclear Age: How Much Has Changed, How Much Remains the Same?”, pp. 6-7.

⁴⁶ Natural Resources Defense Council (NRDC), “Archive of Nuclear Data from NRDC’s Nuclear Program,” at <http://www.nrdc.org/nuclear/nudb/datainx.asp> (accessed April 26, 2011). The warhead totals in Figure 1 omit the theater, tactical, and reserve warheads in the U.S. and Soviet/Russian arsenals (see Table 1). To check the overall accuracy of the NRDC data against formerly classified Central Intelligence Agency (CIA) national intelligence estimates (NIEs) and research by Russians who gained access to Soviet sources in the 1990s, see Donald P. Steury, *Intentions and Capabilities: Estimates on Soviet Strategic Forces, 1950-1983* (Washington, DC: Center for the Study of Intelligence, CIA, 1996); and Podvig, et al., *Russian Strategic Nuclear Forces*.

Figure 2: The Emergence of U.S.-Soviet Nuclear Parity⁴⁷



A World without Nuclear Weapons

Part 1's most consequential judgment about the evolving global nuclear order is the conclusion that nuclear weapons will almost certainly exist through the 2030s. Despite the strong commitment of former U.S. government officials and the Obama administration to a world without nuclear weapons [3C: *Obama Prague Excerpts*], permanent, irreversible nuclear disarmament is neither likely nor possible so long as the international order is fundamentally structured around independent, sovereign states. Nuclear abolitionists argue that reliance on nuclear weapons by states to deter threats from other states is becoming "increasingly hazardous and decreasingly effective" and poses a growing threat to the world for two reasons: first, the Cold War doctrine of mutual Soviet-American deterrence is "obsolete" and, second, ongoing proliferation is likely to enable non-state terrorist groups to get their hands on nuclear weaponry [3D: *Arguments for a Nuclear-Free World*].⁴⁸

However, the likelihood that the various nuclear powers will surrender enough of their sovereignty by late 2030s to permit the emergence of an international authority able to *enforce* a global ban on nuclear weapons is minimal at best. The fundamental transformation of the world political order achieving global zero would require is simply not in sight. On the matter of enforcing global ze-

⁴⁷ NRDC, "Archive of Nuclear Data from NRDC's Nuclear Program," at <http://www.nrdc.org/nuclear/nudb/datainx.asp> (accessed April 26, 2011).

⁴⁸ George P. Shultz, William J. Perry, Henry A. Kissinger and Sam Nunn, "A World Free of Nuclear Weapons," in George P. Shultz and Sidney D. Drell (eds.), *Implications of the Reykjavik Summit on Its Twentieth Anniversary: Conference Report* (Stanford, CA: Hoover Institution Press, October 2007), pp. 3-4.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

ro, James Acton and George Perkovich argued that a world government is not required; instead, marshaling the means “to confront a violator” could be achieved, in Harald Müller’s words, by a “great power concert” in which states would decide collectively upon the response to breakout.⁴⁹ Here the hope is that dialogue and diplomacy would suffice, although the use of non-nuclear force would remain an option of last resort for those nations enforcing global zero on the basis of an alignment of their security interests. Surely, though, absent a fundamental transformation of the world political order, the probability is minimal that a concert of great powers would act promptly enough and forcefully enough to prevent a rogue nation from rearming itself with nuclear weapons.

Furthermore, even if nuclear weapons were eliminated by mid-century, “why we should expect a world without nuclear weapons to be safer than one with (some) nuclear weapons?”⁵⁰ On this question Thomas Schelling has pointed out that if a world without nuclear weapons is understood to include the stipulation that no nation will thereafter be able to reconstitute nuclear forces in the event of becoming involved in a major-power conflict, then “there can be no such world”: every crisis “would be a nuclear crisis, [and] any war could become a nuclear war”⁵¹ [3E: Schelling Excerpts]. Stephen Younger has added that even “if every country were to promise to eliminate all its nuclear weapons, the wide availability of nuclear technology means that we could never be sure that somewhere, some country was not keeping one or a few weapons in reserve, a capability that could shift the strategic balance in the event of conflict.”⁵² Younger further notes that, based on fundamental physics, it is not possible to build a detector that, from low earth orbit, could pinpoint the location of illicit nuclear weapons materials.⁵³ Confident verification of global zero is, therefore, technically doubtful, if not impossible. Consequently, detecting an attempt to violate a global ban on nuclear weapons before they became operational would demand more certain and timely warning than national intelligence agencies have ever been able to guarantee in the past. Regarding the prospect of intelligence ever insulating us from strategic surprise, Roberta Wohlstetter concluded in 1962 that the “possibility of such surprise at any time lies in the conditions of human perceptions and stems from un-

⁴⁹ James M. Acton and George Perkovich, “A Response to Elbridge Colby,” *St Antony’s International Review*, February 2009, p. 121.

⁵⁰ Thomas C. Schelling, “A World without Nuclear Weapons?,” *Daedalus*, Fall 2009, p. 125.

⁵¹ Schelling, “A World without Nuclear Weapons?,” pp. 125, 127.

⁵² Younger, *The Bomb: A New History*, p. 136.

⁵³ Younger, *The Bomb: A New History*, p. 159. From 1982 to 1989, Younger was a nuclear weapons designer at the Lawrence Livermore National Laboratory, where he developed and oversaw the testing of several new concepts in nuclear explosives. He then served as senior associate director for national security at the Los Alamos National Laboratory, and from 2001 to 2004 he was director of the Defense Threat Reduction Agency (DTRA) in DoD. It was during his time as DTRA director that Michael Wynne insisted that he find a way to pinpoint nuclear weapons materials from space.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

certainties so basic that they are unlikely to be eliminated.”⁵⁴ More recent intelligence surprises such as al Qaeda’s September 11, 2001, attacks on the World Trade Center and the Pentagon (9/11) and the absence of an active Iraqi nuclear weapons program in 2003, argue that the inherent limitations of intelligence have yet to be overcome.

Major-Power Conflict and Nuclear Weapons

Those advocating nuclear disarmament are quick to point out the risks and dangers of nuclear weapons, particularly the possibility of a terrorist organization getting its hands on a nuclear weapon. (Of course, possessing a nuclear weapon is one thing; having the knowledge needed to detonate it is another.⁵⁵) Those most strongly opposed to the existence of nuclear arms have not been inclined to acknowledge the positive effects these weapons appear to have had since 1945 on the behavior of states. The first half of the twentieth century witnessed two global conflicts. Estimates of the number of military personnel and civilians who died during World War II to all causes range from 50 million to over 70 million. For example, Matthew White’s best estimate based on a massive review of sources is that the death toll from 1939 to 1945 was 65.6 million (Allied military dead 12.3 million, Axis military dead 7.3 million, and civilian dead 45.9 million).⁵⁶ In the nearly seven decades since the atomic bombings of Hiroshima and Nagasaki, there has not been a global conflict among the major powers on anything approaching the scale and destructiveness of the Second World War. Particularly after both the United States and the USSR came so close to the nuclear abyss in October 1962 and Soviets began fielding second-generation ICBMs, the specter of nuclear Armageddon was surely one reason—if not the main reason—why the great powers have not directly gone to war against each other since 1945.⁵⁷ At the

⁵⁴ Roberta Wohlstetter, *Pearl Harbor: Warning and Decision* (Stanford, CA: Stanford University Press, 1962), p. 397.

⁵⁵ “Taking possession of a nuclear weapon does not imply that one has the capability to explode it. In contrast to what is shown in movies, nuclear weapons do not have a red button on their side with an LED display counting down the seconds to detonation. Most are tightly sealed packages with only a single electrical connector serving as their interface to the outside world. Looking at a connector provides no indication of what wire does what—some send coded signals that prepare the weapon to detonate, but others simply report details of weapon status. Dismantling the weapon (not always an easy task) would provide more insight, but here again, most subsystems are sealed in their own cases so that it is sometimes difficult even for an expert to identify what component does what. . . . Only a few people in the world have knowledge to cause an unauthorized detonation of a nuclear weapon.” (Younger, *The Bomb: A New History*, pp. 153-154). Further, U.S. weapons have environmental sensing devices that “block electrical power until the weapon senses the environment expected en route to the intended target. For instance, missile warheads must sense the intense G-loading associated with missile launch of warhead re-entry before they will arm.” (Reed and Stillman, *The Nuclear Express*, pp. 134-135).

⁵⁶ Matthew White, “National Death Tolls for the Second World War,” February 2005, at <http://necrometrics.com/ww2stats.htm#ww2chart>. White works as a librarian. He is the editor of the online compendium “Historical Atlas of the Twentieth Century,” at <http://users.erols.com/mwhite28/20century.htm>, last updated March 25, 2003.

⁵⁷ However, the assurance by some that even if nuclear weapons were eliminated, “the threat that they could be rebuilt would remain a reason [for the great powers] to avoid conflict” smacks more

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

least, nuclear weapons have “helped to prevent a repeat of such horrors” as the twentieth century’s two world wars.⁵⁸ As to the future, Schelling has said it best: “One might hope that major war could not happen in a world without nuclear weapons, but it always did.”⁵⁹

The 2001 and 2010 Nuclear Posture Reviews, like the 1975 Long Range Research and Development Planning report, all sought to reduce U.S. dependence on large-scale employment of nuclear weapons. A desideratum of many in the West today is to limit the scope of possible American nuclear employment to the extreme case of responding a direct nuclear attack on the United States. What the relationship between the absence after 1945 of major-power conflicts and the existence of nuclear weapons suggests, however, is that the role of nuclear arsenals in international affairs is, and will remain, broader than merely deterring a direct nuclear attack on one state by another. To cite two post-Cold War examples, according to former Indian army chief of staff, General Shankar Roychowdhury, Pakistan’s nuclear weapons deterred India from undertaking conventional retaliation for at least two attacks attributed to Pakistani terrorists: the first on the Indian parliament in December 2001, and the second involving shootings and bombings across Mumbai in November 2008.⁶⁰ Thus, nuclear weapons have not only limited major-power conflict but the fear of nuclear retaliation has, in some situations (though not in all), deterred the use of conventional military force as well.

There have also been occasions when nuclear threats evidently deterred the use of other weapons of mass destruction. During the run-up to the 1991 Persian Gulf War, both the United States and Britain issued threats to Saddam Hussein’s regime that the use of chemical or biological weapons against Coalition forces would demand, as President George H. W. Bush put it in a January 5, 1991, letter to Saddam Hussein, the strongest possible response. While the Iraqi minister Tariq Aziz refused to deliver Bush’s letter, Iraqi officials, including Aziz himself and Saddam Hussein’s son-in-law, General Hussein Kamal, subsequently confirmed that the threat of nuclear retaliation had deterred the Iraqis from using chemical weapons in 1991 even though they had previously been used against

of wishful thinking than a realistic view of the behavior of nations and states (“Move the Base Camp,” *The Economist*, June 18, 2011, p. 20). The notion is widespread in the West that nuclear deterrence can work with U.S. arsenals as low as 300 or 500 weapons (Payne, “Maintaining Flexible and Resilient Capabilities for Nuclear Deterrence,” p. 7). *The Economist*’s editors evidently go even further in arguing that nuclear deterrence of great-power conflict can work without the existence of any nuclear weapons.

⁵⁸ Payne, “Maintaining Flexible and Resilient Capabilities for Nuclear Deterrence,” p. 9.

⁵⁹ Schelling, “A World without Nuclear Weapons?,” p. 125.

⁶⁰ “Pak’s N-Bomb Prevented India from Attacking It after 26/11,” *Daily News and Analysis*, March 9, 2009, at http://www.dnaindia.com/india/report_pak-s-n-bomb-prevented-india-from-attacking-it-after-26-11_1237673, accessed July 21, 2011. “26/11” refers to the 2008 Mumbai attacks.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

Iran.⁶¹ As Charles Duefer later testified, the Iraqis did not resort to chemical or biological weapons “even they were losing” because Saddam Hussein feared that he would not survive nuclear retaliation.⁶² In short, the possession of credible nuclear forces can deter other actions than an all-out nuclear attack by one state on another’s homeland.

Of course, the unfortunate corollary to this observation is that these very deterrent successes highlight the value of nuclear weapons to many countries. Their leaders may well see the possession of nuclear weapons mainly as instruments of terror that can be brandished in the pursuit of political, economic or other objectives. But particularly in the case of nations hostile to the United States, it is difficult to argue that nuclear weapons have no value in advancing their political or strategic goals. As India’s former army chief of staff observed after the 1991 Persian Gulf War, the lesson of Desert Storm is: “Don’t fight the United States without a nuclear weapon.”⁶³ More generally, America’s own Cold War nuclear strategy was based on threats to use nuclear weapons. The very success of the United States in deterring a Soviet nuclear attack during the Cold War “should be convincing evidence that such threats work quite well,” as the North Koreans have also demonstrated.⁶⁴

The Psychological Requirements of Nuclear Deterrence

There have been many situations since 1945 in which nuclear deterrence ostensibly worked, even if was aided on more than one occasion by a certain degree of luck. The October 1962 crisis precipitated by the American discovery of Soviet R-12 (designated the SS-4 by NATO) and R-14 (SS-5) ballistic missiles with 2.3 megaton warheads being deployed to Fidel Castro’s Cuba is generally cited as the moment when the two Cold War adversaries came closest to the nuclear abyss.⁶⁵ We now know just how very close to that abyss they came.⁶⁶ In 1994 the Russians

⁶¹ Payne, “Maintaining Flexible and Resilient Capabilities for Nuclear Deterrence,” p. 10.

⁶² Charles A. Duefer, prepared statement, Senate Armed Services Committee, Subcommittee on Emerging Threats and Capabilities, *The Weapons of Mass Destruction Program of Iraq*, Senate Hearing 107-573, 107th Congress, 2nd Session (Washington, DC: GPO, 2002), p. 92. Interestingly, however, the Iraqis also thought that the possession of chemical and biological weapons had deterred the Coalition from going to Baghdad in 1991 (*ibid.*, p. 93).

⁶³ General Charles A. Horner, “What We Should Have Learned in Desert Storm, But Didn’t,” *AIR FORCE Magazine*, December 1996, at <http://www.airforce-magazine.com/MagazineArchive/Pages/1996/December%201996/1296horner.aspx> (accessed July 22, 2011).

⁶⁴ Richard P. Rumelt, *Good Strategy/Bad Strategy: The Difference and Why It Matters* (New York: Crown Business, 2011), p. 36.

⁶⁵ Podvig (ed.), et al., *Russian Strategic Nuclear Forces*, pp. 5-6, 182-188. Note, however, that more recent sources give the yield of the sixty R-12 and R-14 warheads that arrived in Cuba on October 4, 1962, as 1 megaton—Michael Dobbs, *One Minute to Midnight: Kennedy, Khrushchev, and Castro on the Brink of Nuclear War* (New York, Alfred A. Knopf, 2008), p. 58.



**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

revealed that the Soviet commander in Cuba, General Issa Pliyev, was delegated authority to use his tactical nuclear weapons, which included eighty ten-kiloton warheads for *frontovaya krylataya raketa* cruise missiles, and twelve two-kiloton warheads for Luna rockets.⁶⁷ Five of the six R-12 batteries, with four launchers each, are thought to have reached full operational status on October 26, 1962, although the Russians maintain that the warheads for the R-14 missiles never made it ashore from the *Alexandriysk* in the port of La Isabella.⁶⁸ In addition, on October 27th, the officers on the Soviet submarine *B-59* had to talk their commander, Valentin Savitsky, into bringing his submarine to the surface rather than firing a nuclear torpedo at the U.S. naval forces that were harassing his vessel.⁶⁹ Similarly, on the American side, responses during the thirteen-day crisis (October 16 to October 28) included Strategic Air Command (SAC) maintaining sixty-six nuclear-armed B-52s in the air around the clock, prepared to strike Soviet-block targets.⁷⁰

There were other close calls during the Cold War. Both the United States and the Soviet Union deployed satellites and ground-based radars to provide warning of launches from the other's ICBM fields. Both countries experienced false alarms from their warning systems. For example, on the morning of November 9, 1979, duty officers in command centers of the North American Air Defense (NORAD) Command, SAC, the Pentagon's National Military Command Center (NMCC), and the alternate NMCC all saw on their displays large numbers of Soviet nuclear missiles being launched at the United States.⁷¹ Within six minutes NORAD was able to confirm that the neither the PAVE PAWS early warning radars nor the Defense Support Program satellites were seeing any actual launches. The false alarm had been caused by the introduction of an exercise tape simulating a Soviet missile attack into the NORAD computer system.⁷² To



⁶⁷ Reed, *At the Abyss*, p. 323. One of the two *frontovaya krylataya raketa* regiments was deployed opposite the U.S. naval base at Guantanamo.

⁶⁸ Despite Russian revelations in the 1990s about the 1962 missile crisis, some uncertainty remains about precise status and yields of certain Soviet nuclear systems during the crisis. Compare Reed, *At the Abyss*, p. 323, with Dobbs, *One Minute to Midnight*, pp. 159-160 and Podvig (ed.), et al., *Russian Strategic Nuclear Forces*, pp. 185 and 188.

⁶⁹ Dobbs, *One Minute to Midnight*, pp. 317-318.

⁷⁰ Bernard C. Nalty, "The Air Force Role in Five Crises 1958-1965: Lebanon, Taiwan, Congo, Cuba, Dominican Republic," U.S. Air Force Historical Liaison Division, June 1968, p. 43.

⁷¹ Alan F. Philips, "20 Mishaps That Might Have Started Accidental Nuclear War," Nuclear Age Peace Foundation, at <http://www.nuclearfiles.org/menu/key-issues/nuclear-weapons/issues/accidents/20-mishaps-may-be-caused-nuclear-war.htm>, accessed March 23, 2011.

⁷² GAO, "NORAD's Missile Warning System: What Went Wrong", MASAD-81-30, May 15, 1981, p. 3.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

recall a similar episode on the Soviet side, on the evening of September 26, 1983, just after Soviet fighters had shot down Korean Airlines (KAL) Flight 007, duty officer Stanislav Petrov in an attack-warning command bunker near Moscow received satellite warnings of five U.S. ICBMs being launched at the Soviet Union.⁷³ But he reported these warnings as false alarms based on his intuition that a nuclear attack with five missiles made no sense, and he was right: it was later determined that a rare alignment of sunlight off high-altitude clouds and the satellite's Molniya orbits had generated the false missile tracks, which an associated computer program had failed to filter out.⁷⁴

The deeper implication of these episodes from the Cold War in which nuclear deterrence did not fail is that deterrence is highly contingent: its functioning ultimately depends on the perceptions, calculations, and judgments of the party being deterred in specific circumstances and at a specific point in time. As Keith Payne has emphasized, the numbers of U.S. nuclear weapons and their related capabilities to hold specific targets at risk “will mean little or nothing for deterrence unless the opponent also

- understands US threats and communications;
- values greatly the types of targets the US can threaten;
- links the US threat to some specific act it must not undertake;
- makes decisions per an informed calculation of estimated costs and benefits;
- is not driven by some internal or external imperative to act despite the US threat;
- believes, to some degree, that the US threat would be executed if it does not comply and would not be executed if it does comply;
- fears the US threat more than it fears conciliation over the issue in question;
- deems conciliation to be a tolerable act; and

⁷³ David E. Hoffman, *The Dead Hand: The Untold Story of the Cold War Arms Race and Its Dangerous Legacy* (New York: Anchor Books, 2009), pp. 6-11. For accounts of the KAL-007 shoot down, see Robert M. Gates, *From the Shadows: The Ultimate Insider's Story of Five Presidents and How They Won the Cold War* (New York: Touchstone, 1997), pp. 266-273; Hoffman, *The Dead Hand*, 72-79.

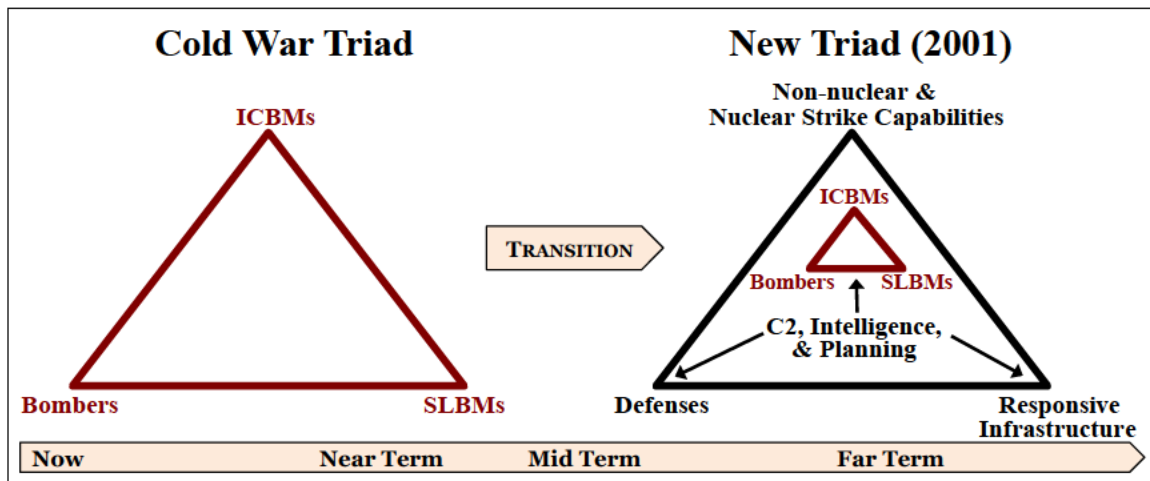
⁷⁴ David Hoffman, “I Had a Funny Feeling in my Gut,” *Washington Post Foreign Service*, February 10, 1999, p. A19, at <http://www.washingtonpost.com/wp-srv/inatl/longterm/coldwar/shattero21099b.htm>, accessed March 23, 2011.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

- has positive control over its own actions and forces.”⁷⁵

These requirements are like the links in a chain, and there were occasions during the Cold War when the chain was broken and deterrence failed. Among other instances, the possibility of U.S. nuclear retaliation did not deter the Soviet leadership from using tanks to suppress the Hungarian revolution in 1956 and the Prague spring in 1968. Nor, in 2008, did the new U.S. deterrent triad announced in 2001 (Figure 3) deter the Russian Federation from using military force to seize the breakaway Georgian republics of Abkhazia and South Ossetia.

Figure 3: U.S. Cold War and 21st-Century Deterrent Triads⁷⁶



Payne’s requirements also caution about the inclination to categorize adversaries as acting irrationally when they are not deterred. Setting aside potential problems such as miscommunication or flawed cost-benefit calculations, a deterrent threat can also fail because the leaders of the country being threatened simply deem acquiescence to U.S. threats to be unacceptable for cultural or other reasons. These reasons would tend to appear irrational in American eyes but seem perfectly rational in the opponent’s. Fidel Castro’s demand that the Soviets initiate nuclear war against the United States rather than withdrawing their missiles from Cuba is a striking illustration of such “irrationality.” Castro apparently pre-

⁷⁵ Payne, “Maintaining Flexible and Resilient Capabilities for Nuclear Deterrence,” pp. 2-3.

⁷⁶ J. D. Crouch, “Findings of the Nuclear Posture Review,” January 9, 2002, Slide 9. The new U.S. deterrent triad was the result of a congressionally mandated Nuclear Posture Review (NPR). While the 2001 NPR has yet to be declassified, its essential findings were presented publicly in early 2002. Observing that since nuclear forces alone are unsuited to most of the contingencies for which the United States military prepares to protect its interests (and those of allies), a “new mix” of offensive nuclear, non-nuclear precision, and defensive (active and passive) capabilities “is required for the diverse set of potential adversaries and unexpected threats the United States may confront in the coming decades (DoD, “Excerpts of Classified Nuclear Posture Review/S,” January 8, 2002, p. 2, at <http://www.globalsecurity.org/wmd/library/policy/dod/npr.htm>, accessed April 5, 2011).

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

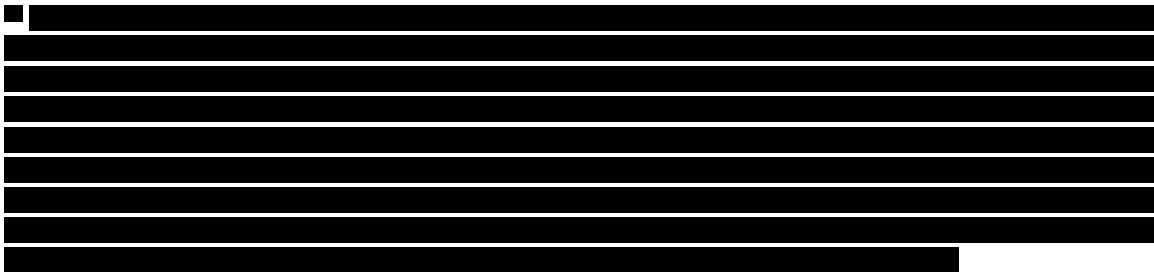
ferred the nuclear devastation of his country to the dishonor of backing down.⁷⁷ And there is nothing to prevent foreign leaders from holding genuinely irrational beliefs. Witness the claims of the Iranian president, Mahmoud Ahmadinejad, that he enjoys divine protection and was surrounded by a halo of light when he addressed the United Nations in 2005.⁷⁸

There is another way in which the decisions of foreign leaders about nuclear forces may fall short of being entirely rational. During the 1950s, the view was widely held by American analysts that Soviet choices about the USSR's nuclear posture over time were made by a handful of supremely rational, supremely informed decision-makers who exhaustively analyzed the costs, risks and benefits of all options and chose the optimal one. As became apparent in studying the evolution of Soviet nuclear forces over time, however, it was more plausible to understand their posture as emerging from disparate decisions taken within a large bureaucratic structure with multiple stakeholders—each organization having its own vested interests, power base and knowledge [3F: Organizational Behavior]. In hindsight, not only did the Soviets pursue some policies that made little sense to U.S. observers—notably continuing to build up their intercontinental nuclear forces after they had achieved rough parity with the United States in the early 1970s—but they also made decisions such as deploying the intermediate-range RSD-10 “Pioneer” ballistic missile (designated the SS-20 by NATO)—that they later regretted.⁷⁹

A final complication bearing on deterrence is the “n-player problem.” Again, when both the United States and the Soviet Union had nuclear arsenals so massive and diverse as to assure a retaliatory capability (Figure 1), the logic of their binary relationship argued strongly against initiating nuclear war because the U.S.-Soviet nuclear competition was essentially a two-player game. But a Middle East with several nuclear powers in addition to Israel, for example, would be a multi-player game. With just three countries having nuclear weapons aimed at one another, there is no longer any principle of societal rationality that can resolve whether to shoot first or adopt a waiting strategy, and “none is in sight.”⁸⁰

⁷⁷ Dobbs, *One Minute to Midnight*, pp. 295-296.

⁷⁸ Payne, “Maintaining Flexible and Resilient Capabilities for Nuclear Deterrence,” p. 6.



⁸⁰ Martin Shubik, *Game Theory in the Social Sciences: Concepts and Solutions* (Cambridge, MA: MIT Press, 1982), p. 2. John von Neumann and Oskar Morgenstern first surfaced the uncertainties of the “n-person problem” in 1944 (ibid.).

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

It is not that three-player nuclear situations have no solutions whatsoever. But, as Martin Shubik has observed, they cannot be “properly analyzed or solved until adequate information is provided about . . . the possibilities for communication, compensation, commitment, and trust” between adversaries—even if one assumes that international relations are reducible to mathematical game theory, which they are not.⁸¹

Nuclear deterrence, then, is not a condition that can be assumed to hold automatically and without exception among any two or more nuclear powers in any and all situations. It depends on the particular countries involved, the circumstances surrounding their interactions, and the specific actions their nuclear threats seek to deter. Moreover, if in the future nuclear weapons are again employed successfully without precipitating a nuclear Armageddon, then the range of actions they will be able to deter is likely to be narrower than it is today.

⁸¹ Shubik, *Game Theory in the Social Sciences*, p. 24; also, Paul Bracken, “The Second Nuclear Era: How Much Has Changed, How Much Remains the Same?” unpublished draft November 17, 2002, pp. 7-8, <http://www.nautilus.org/gps/scenarios/BrackenSecondNuclearAgeCEIP2002.pdf> (accessed March 23, 2010).

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

This Page Blank

PART 3: SUPPORTING DATA AND ANALYSES

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

⁸⁴ Accuracy is widely expressed as the circular error probably (CEP) of a weapon. CEP is the radius of a circle about an aim point within which 50 percent of the munitions will impact statistically. In 1976, the CEP of the Minuteman III intercontinental ballistic missile (ICBM) was thought to be 0.16 nautical miles (or 972 feet).

[REDACTED]

[REDACTED]

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

⁸⁸ Fritz W. Ermarth, "Contrasts in American and Soviet Strategic Thought," *International Security*, Autumn 1978, p. 147

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

[REDACTED]

[REDACTED]

[REDACTED]

In hindsight, Cold War analytic metrics and measures for assessing the adequacy of the U.S.-Soviet strategic-nuclear balance had glaring shortcomings. The near obsession with arsenal exchanges initiated by a Soviet nuclear first

⁸⁹ A. W. Marshall, "A Program to Improve Analytic Methods Related to Strategic Forces," *Policy Sciences*, 15 (1982), p. 48.

[REDACTED]

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

strike on the United States tended to reduce strategic analysis to something like a weight-lifting contest in which the nuclear balance was judged by comparing how many nuclear weapons each side could throw at the other.⁹² Such crude measures appear to have little applicability to the various and more complex nuclear competitions of today's global nuclear order.

3B: U.S.-Soviet Mutual Nuclear Deterrence

Shultz, Perry, Kissinger and Nunn have termed the allegedly stable nuclear balance that emerged during the late 1960s and early 1970s between the United States and the Soviet Union "mutual Soviet-American deterrence." This relationship was grounded on each side's ability to devastate the other's homeland even after absorbing a so-called "bolt-from-the-blue" counterforce strike to eliminate the opponent's nuclear forces (or at least reduce them to so low a level that the side striking first could survive its opponent's nuclear retaliation as a viable society). In its American formulation as "mutual assured destruction," the widely held belief in the United States after 1949 "was that nuclear war could not happen, especially as both sides acquired large and protected forces."⁹³

This view of a stable nuclear relationship between the United States and the Soviet Union based on each side's ability to inflict devastating thermonuclear retaliation on the other in the event of a nuclear exchange does not accurately reflect the history of the Cold War. In 1985, Fred Iklé pointed out that a "stable equilibrium" based on U.S.-Soviet mutual assured destruction only became a "partial reality" in the late 1960s.⁹⁴ From 1972 until President Reagan's 1983 speech announcing the Strategic Defense Initiative, the United States abandoned active missile defenses whereas Soviet Union continued to invest in them within the bounds of the 1972 Anti-Ballistic Missile treaty; in addition, during much of the 1970s "we misled ourselves by the mistaken forecast that the Soviet Union, in light of our self-restraint, would not want to overtake us in nuclear offensive forces, much less seek a capability for destroying most of our deterrent strength."⁹⁵

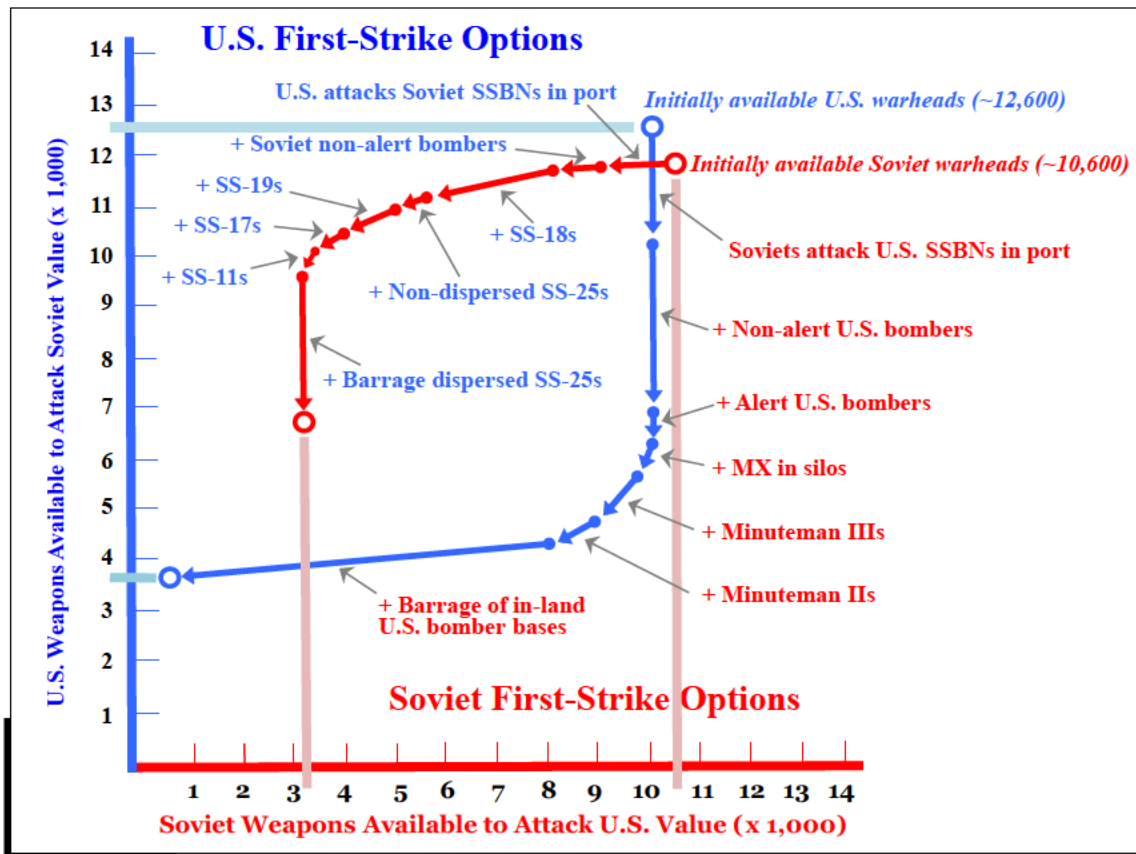
■ [REDACTED]

⁹³ Henry S. Rowen, "Introduction," in Henry D. Sokolski (ed.), *Getting MAD: Nuclear Mutual Assured Destruction, Its Origins and Practice* (Carlisle, PA: Strategic Studies Institute, November 2004), p. 2.

⁹⁴ Fred Charles Iklé, "Nuclear Strategy: Can There Be a Happy Ending?", *Foreign Affairs*, Spring 1985, p. 813.

⁹⁵ Iklé, "Nuclear Strategy: Can There Be a Happy Ending?", pp. 813-814.

Figure 4: First-Strike Stability Draw-Down Curves⁹⁶



Nevertheless, in 1989 Glenn Kent and David Thaler at RAND published a formalization of the presumably stable relationship between U.S. and Soviet nuclear forces as “first-strike stability.” Figure 3, which constitutes the core of their analysis, assumes the actual U.S. and Soviet intercontinental nuclear forces that existed in the late 1980s. It illustrates graphically that for both the United States and the Soviet Union, even after attempting to disarm the adversary with a comprehensive counterforce first strike, the side absorbing the first blow would still retain over 3,000 megaton-class weapons. Hence, even in the aftermath of a disarming counterforce strike by either the United States or the Soviet Union, the other side would still retain enough surviving nuclear forces to mount a counter-value retaliatory strike against population and industrial centers that would decimate its adversary as a viable industrialized society. Despite Iklé’s historical concerns, Kent and Thaler concluded that first-strike stability applied equally to the United States and the Soviet Union and was relatively robust.⁹⁷

⁹⁶ Glenn A. Kent and David E. Thaler, “First Strike Stability: A Methodology for Evaluating Strategic Forces,” RAND R-3765-AF, August 1989), pp. 32-34. By factoring in costs and damage, Kent and Thaler were also able to construct a quantitative first-strike-stability index. Figure 1 simply shows the draw-down curves for each side’s surviving nuclear forces following a series of increasingly comprehensive counterforce first strikes by its opponent.

⁹⁷ Kent and Thaler, “First Strike Stability,” pp. 47, 48.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Further confirmation of psychological reluctance to initiate nuclear war even among Soviet missile troops has been provided by Valery Yarynich, who worked on command-and-control systems for Soviet ICBM forces. He recalls an incident in the mid-1970s when the Signal-M system erroneously transmitted a message to the command posts of all Soviet ICBM divisions to go to the next higher level of readiness. All but one of the duty officers, rather than summoning their division's missile troops to their combat sites, instead began telephoning their superiors to see if the message was genuine (Hoffman, *The Dead Hand*, p. 148).

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

[REDACTED]

[REDACTED]

It is important, however, to recognize that neither Khrushchev's behavior in 1962 nor Brezhnev's through the early 1980s should be interpreted as suggesting that the Soviet leaders assessed nuclear forces and viewed nuclear deterrence the same way as their American counterparts. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

One of the clearer and starker differences between American and Soviet views of their nuclear relationship during the Cold War lies in their differing attitudes toward the issue of vulnerability to the other side's nuclear forces. Succinctly stated mutual assured destruction consists of two precepts. The first is about nuclear targeting: attack the opponent's cities and industry, not its nuclear forces (because attacking forces is difficult and destabilizing); the second precept is to eschew developing defenses against the enemy's offensive nuclear forces (because missile defense is not very feasible and would also be destabilizing).¹⁰¹ [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

¹⁰⁰ A. W. Marshall, "A Program to Improve Analytic Methods Related to Strategic Forces," *Policy Sciences*, Vol. 15 (1982), No. 47, p. 48.

¹⁰¹ Rowen, "Introduction," in Sokolski (ed.), *Getting MAD*, pp. 3-4.

[REDACTED]

[REDACTED]

[REDACTED]

**3C: Excerpts from President Obama's Speech Committing
the United States to a World without Nuclear Weapons**

Remarks by President Barack Obama
Hradcany Square
Prague, Czech Republic
April 5, 1999¹⁰⁵

The existence of thousands of nuclear weapons is the most dangerous legacy of the Cold War. No nuclear war was fought between the United States and the Soviet Union, but generations lived with the knowledge that their world could be erased in a single flash of light. Cities like Prague that existed for centuries, that embodied the beauty and the talent of so much of humanity, would have ceased to exist.

Today, the Cold War has disappeared but thousands of those weapons have not. In a strange turn of history, the threat of global nuclear war has gone down, but the risk of a nuclear attack has gone up. More nations have acquired these weapons. Testing has continued. Black market trade in nuclear secrets and nuclear materials abound. The technology to build a bomb has spread. Terrorists are determined to buy, build or steal one. Our efforts to contain these dangers are centered on a global non-proliferation regime, but as more people and nations break the rules, we could reach the point where the center cannot hold.

Now, understand, this matters to people everywhere. One nuclear weapon exploded in one city—be it New York or Moscow, Islamabad or Mumbai, Tokyo or Tel Aviv, Paris or Prague—could kill hundreds of thousands of people. And no matter where it happens, there is no end to what the consequences might be—for our global safety, our security, our society, our economy, to our ultimate survival.

Some argue that the spread of these weapons cannot be stopped, cannot be checked—that we are destined to live in a world where more nations and more people possess the ultimate tools of destruction. Such fatalism is a deadly adversary, for if we believe that the spread of nuclear weapons is inevitable, then in some way we are admitting to ourselves that the use of nuclear weapons is inevitable.

Just as we stood for freedom in the 20th century, we must stand together for the right of people everywhere to live free from fear in the 21st

¹⁰⁵ Online at http://www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered/, accessed March 15, 2011.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

century. (Applause.) And as nuclear power—as a nuclear power, as the only nuclear power to have used a nuclear weapon, the United States has a moral responsibility to act. We cannot succeed in this endeavor alone, but we can lead it, we can start it.

So today, I state clearly and with conviction America's commitment to seek the peace and security of a world without nuclear weapons. (Applause.) I'm not naive. This goal will not be reached quickly—perhaps not in my lifetime. It will take patience and persistence. But now we, too, must ignore the voices who tell us that the world cannot change. We have to insist, "Yes, we can." (Applause.)

Now, let me describe to you the trajectory we need to be on. First, the United States will take concrete steps towards a world without nuclear weapons. To put an end to Cold War thinking, we will reduce the role of nuclear weapons in our national security strategy, and urge others to do the same. Make no mistake: As long as these weapons exist, the United States will maintain a safe, secure and effective arsenal to deter any adversary, and guarantee that defense to our allies—including the Czech Republic. But we will begin the work of reducing our arsenal.

To reduce our warheads and stockpiles, we will negotiate a new Strategic Arms Reduction Treaty with the Russians this year. (Applause.) President Medvedev and I began this process in London, and will seek a new agreement by the end of this year that is legally binding and sufficiently bold. And this will set the stage for further cuts, and we will seek to include all nuclear weapons states in this endeavor.

To achieve a global ban on nuclear testing, my administration will immediately and aggressively pursue U.S. ratification of the Comprehensive Test Ban Treaty. (Applause.) After more than five decades of talks, it is time for the testing of nuclear weapons to finally be banned.

And to cut off the building blocks needed for a bomb, the United States will seek a new treaty that verifiably ends the production of fissile materials intended for use in state nuclear weapons. If we are serious about stopping the spread of these weapons, then we should put an end to the dedicated production of weapons-grade materials that create them. That's the first step.

Second, together we will strengthen the Nuclear Non-Proliferation Treaty as a basis for cooperation.

The basic bargain is sound: Countries with nuclear weapons will move towards disarmament, countries without nuclear weapons will not acquire them, and all countries can access peaceful nuclear energy. To strengthen the treaty, we should embrace several principles. We need more resources and authority to strengthen international inspections. We need real and immediate consequences for countries caught breaking the rules or trying to leave the treaty without cause.

And we should build a new framework for civil nuclear cooperation, including an international fuel bank, so that countries can access peaceful power without increasing the risks of proliferation. That must be the right

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

of every nation that renounces nuclear weapons, especially developing countries embarking on peaceful programs. And no approach will succeed if it's based on the denial of rights to nations that play by the rules. We must harness the power of nuclear energy on behalf of our efforts to combat climate change, and to advance peace opportunity for all people.

But we go forward with no illusions. Some countries will break the rules. That's why we need a structure in place that ensures when any nation does, they will face consequences.

Just this morning, we were reminded again of why we need a new and more rigorous approach to address this threat. North Korea broke the rules once again by testing a rocket that could be used for long range missiles. This provocation underscores the need for action -- not just this afternoon at the U.N. Security Council, but in our determination to prevent the spread of these weapons.

Rules must be binding. Violations must be punished. Words must mean something. The world must stand together to prevent the spread of these weapons. Now is the time for a strong international response—(applause)—now is the time for a strong international response, and North Korea must know that the path to security and respect will never come through threats and illegal weapons. All nations must come together to build a stronger, global regime. And that's why we must stand shoulder to shoulder to pressure the North Koreans to change course.

Iran has yet to build a nuclear weapon. My administration will seek engagement with Iran based on mutual interests and mutual respect. We believe in dialogue. (Applause.) But in that dialogue we will present a clear choice. We want Iran to take its rightful place in the community of nations, politically and economically. We will support Iran's right to peaceful nuclear energy with rigorous inspections. That's a path that the Islamic Republic can take. Or the government can choose increased isolation, international pressure, and a potential nuclear arms race in the region that will increase insecurity for all.

So let me be clear: Iran's nuclear and ballistic missile activity poses a real threat, not just to the United States, but to Iran's neighbors and our allies. The Czech Republic and Poland have been courageous in agreeing to host a defense against these missiles. As long as the threat from Iran persists, we will go forward with a missile defense system that is cost-effective and proven. (Applause.) If the Iranian threat is eliminated, we will have a stronger basis for security, and the driving force for missile defense construction in Europe will be removed. (Applause.)

So, finally, we must ensure that terrorists never acquire a nuclear weapon. This is the most immediate and extreme threat to global security. One terrorist with one nuclear weapon could unleash massive destruction. Al Qaeda has said it seeks a bomb and that it would have no problem with using it. And we know that there is unsecured nuclear material across the globe. To protect our people, we must act with a sense of purpose without delay.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

So today I am announcing a new international effort to secure all vulnerable nuclear material around the world within four years. We will set new standards, expand our cooperation with Russia, pursue new partnerships to lock down these sensitive materials.

We must also build on our efforts to break up black markets, detect and intercept materials in transit, and use financial tools to disrupt this dangerous trade. Because this threat will be lasting, we should come together to turn efforts such as the Proliferation Security Initiative and the Global Initiative to Combat Nuclear Terrorism into durable international institutions. And we should start by having a Global Summit on Nuclear Security that the United States will host within the next year. (Applause.)

Now, I know that there are some who will question whether we can act on such a broad agenda. There are those who doubt whether true international cooperation is possible, given inevitable differences among nations. And there are those who hear talk of a world without nuclear weapons and doubt whether it's worth setting a goal that seems impossible to achieve.

But make no mistake: We know where that road leads. When nations and peoples allow themselves to be defined by their differences, the gulf between them widens. When we fail to pursue peace, then it stays forever beyond our grasp. We know the path when we choose fear over hope. To denounce or shrug off a call for cooperation is an easy but also a cowardly thing to do. That's how wars begin. That's where human progress ends.

3D: The Central Argument of Prominent Former U.S. Government Officials Advocating a World without Nuclear Weapons

The most prominent former American government officials who have endorsed “setting the goal of a world free of nuclear weapons and working energetically on the actions required to achieve that goal” are George P. Shultz, William J. Perry, Henry A. Kissinger, and Sam Nunn. (Shultz was secretary of state from 1982 to 1989; Kissinger was secretary of state from 1973 to 1977 and national security advisor from 1969 to 1975; Perry was secretary of defense from 1994 to 1997; and Nunn was chairman of the Senate Armed Services Committee from 1987 to 1995.) They first articulated their abolitionist position publicly in an article published in the January 4, 2007, edition of *The Wall Street Journal*. This article, in turn, reflected the sentiments and conclusions from a Hoover Institution conference held in October 2006 to review the implications of the 1996 Reykjavik summit between Ronald Reagan and Mikhail Gorbachev on its twentieth anniversary.¹⁰⁶

¹⁰⁶ Essays drawn from the October 2006 Hoover Institution conference can be found in George P. Shultz and Sidney D. Drell (eds.), *Implications of the Reykjavik Summit on Its Twentieth Anniversary: Conference Report* (Stanford, CA: Hoover Institution Press, October 2007). This conference report is available at <http://www.hooverpress.org/productdetails.cfm?PC=1322>.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

The central argument for nuclear abolition advanced by Shultz, Perry, Kissinger and Nunn in the 2007 Hoover Institution report from Hoover's 2006 conference on the implications of Reykjavik goes as follows. Their common point of departure is the observation that, during the Cold War, U.S. and Soviet nuclear weapons were essential to international security. Why? Because, once the Soviets achieved rough strategic-nuclear parity with the United States in the early 1970s, each side's nuclear forces deterred the other from either initiating general nuclear war or a conventional conflict that could escalate to a large-scale nuclear exchange. This relation of "mutual Soviet-American deterrence" was grounded on each side's ability to devastate the other's homeland even after absorbing a nuclear first strike (see [3D: Mutual Deterrence]).¹⁰⁷

However, with the end of the Cold War and the break-up of the Soviet Union itself, however, Shultz, Perry, Kissinger and Nunn argue not only that mutual Soviet-American deterrence became "obsolete," but that reliance on nuclear weapons by states to deter threats from other states "is becoming increasingly hazardous and decreasingly effective."¹⁰⁸ They offer two reasons for concluding that the new nuclear era "will be more precarious, psychologically disorienting, and economically even more costly than was Cold War deterrence."¹⁰⁹ First, as the cases of North Korea, Pakistan and Iran reveal, nuclear weapons have either been acquired, or are likely to be acquired, by states with far less experience and competence with nuclear weapons than that fortunately acquired by the United States and the Soviet Union during the Cold War. Second, there are terrorist leaders, notably Osama bin Laden, who seek nuclear weapons as a religious duty and would not hesitate to use them. Since neither U.S. and Russian nuclear arsenals nor the nuclear Non-Proliferation Treaty (NPT) seem able to stop the proliferation of nuclear weapons to unstable states, and because the chances of an organization such as al Qaeda eventually acquiring a nuclear weapon seem likely to

¹⁰⁷ Shultz, Perry, Kissinger and Nunn, "A World Free of Nuclear Weapons," in Shultz and Drell, *Implications of the Reykjavik Summit on Its Twentieth Anniversary: Conference Report*, p. 3. Other conference participants who endorsed "A World Free of Nuclear Weapons" were Martin Anderson, Steve Andreasen, Michael Armacost, William Crowe, James Goodby, Thomas Graham Jr., Thomas Henriksen, David Holloway, Max Kampelman, Jack Matlock, John MacLaughlin, Don Oberdorfer, Rozanne Ridgway, Henry Rowen, Roald Sagdeev and Abraham Sofaer. At a second conference in October 2007, sponsored jointly by the Hoover Institution and the Nuclear Threat Initiative (co-chaired by Ted Turner and Nunn), other former U.S. government officials who endorsed the ideas in "A World Free of Nuclear Weapons" included: Madeleine Albright, Richard V. Allen, James A. Baker III, Samuel R. Berger, Zbigniew Brzezinski, Frank Carlucci, Warren Christopher, William Cohen, Lawrence Eagleburger, Melvin Laird, Anthony Lake, Robert McFarlane, Robert McNamara and Colin Powell (George P. Shultz, William J. Perry, Henry A. Kissinger and Sam Nunn, "Toward a Nuclear-Free World," *The Wall Street Journal*, January 15, 2008, p. A13). Other supportive participants were General John Abizaid, Graham Allison, Brooke Anderson, Bruce Blair, Matt Bunn, Ashton Carter, General Vladimir Dvorkin, Bob Einhorn, Mark Fitzpatrick, Rose Gottemoeller, David Hamburg, Siegfried Hecker, David Holloway, Raymond Jeanloz, Ray Juzaitis, Michael McFaul, Pavel Podvig, William Potter, Richard Rhodes, Joan Rohlfing, Scott Sagan, Richard Solomon, and Philip Zelikov.

¹⁰⁸ Shultz, Perry, Kissinger and Nunn, "A World Free of Nuclear Weapons," pp. 3, 4.

¹⁰⁹ Shultz, Perry, Kissinger and Nunn, "A World Free of Nuclear Weapons," p. 4

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

grow over time, Shultz, Perry, Kissinger and Nunn conclude that the chances of nuclear use leading to nuclear catastrophe can only grow over the next fifty years unless something is done. The only long-term solution they can see is to eliminate the world's nuclear arms.

Shultz, Perry, Kissinger and Nunn have continued to argue for this conclusion since the 2006 Hoover Institute and conference. As recently as March 2011, they published an opinion editorial in *The Wall Street Journal* that reprised the basic line of argument in "A World Free of Nuclear Weapons." A significant addition, though, was that a "world without nuclear weapons will not simply be today's world minus nuclear weapons."¹¹⁰ A hotly debated issue since 2006 has been whether achieving a world without nuclear weapons would eventually require the emergence of an international political resembling a world government.¹¹¹ What Shultz, Perry, Kissinger and Nunn acknowledge in this article is that progress toward a safer and more stable form of deterrence would ultimately require "a joint enterprise among nations, recognizing the need for greater cooperation, transparency and verification to create the global political environment for stability and enhanced mutual security."¹¹²

3E: Excerpts from Thomas Schelling's September 2009 Article "A World Without Nuclear Weapons?"

This short article is well worth reading in its entirety. It raises questions about the likely stability of a world in which all nuclear weapons have been eliminated that the Obama administration and nuclear abolitionists have yet to address. However, the most important passages are reproduced below.

¹¹⁰ George P. Shultz, William J. Perry, Henry A. Kissinger and Sam Nunn, "Deterrence in the Age of Nuclear Proliferation," *The Wall Street Journal*, March 7, 2011, at <http://online.wsj.com/article/SB10001424052748703300904576178760530169414.html>, accessed March 18, 2011.

¹¹¹ In 2008, George Perkovich and James Acton published Adelphi Paper No. 396, *Abolishing Nuclear Weapons*. It was perhaps the most serious and realistic attempt to answer the question of how one might set about abolishing nuclear weapons. In 2009, Elbridge Colby reviewed *Abolishing Nuclear Weapons*. His main criticism was that Perkovich's and Acton's hope that the permanent members of the Security Council (or perhaps a separate body of the eight declared nuclear powers) could cooperate "in a manner timely and robust enough to deter or eliminate threats" by states or non-state entities attempting to violate the nuclear-weapons prohibition would entail "a revolutionary shift in global governance," if not the "creation of a sovereign-like entity to manage international security relations" (Elbridge Colby, *St Antony's International Review*, February 2009, p. 115). Perkovich and Acton rejected this interpretation, arguing that "global government is irrelevant: the real challenge is for the three big nuclear weapon competitors to reorder their security relations in ways that could end their reliance on nuclear weapons, and then to build on their convergence to induce the other nuclear-armed states to follow suit" (James M. Acton and George Perkovich, "A Response to Elbridge Colby," *St Antony's International Review*, February 2009, p. 123).

¹¹² Shultz, Perry, Kissinger and Nunn, "Deterrence in the Age of Nuclear Proliferation."

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

A crucial question is whether a government could hide weapons-grade fissile material from any possible inspection-verification. Considering that enough plutonium to make a bomb could be hidden in the freezing compartment of my refrigerator, or to evade radiation detection could be hidden at the bottom of the water in a well, I think only the feat of a whistleblower could possibly make success at all questionable. I believe that a “responsible” government would make sure that fissile material would be available in an international crisis or war itself. A responsible government must at least assume that other responsible governments will do so.

We are so used to thinking in terms of thousands, or at least hundreds, of nuclear warheads that a few dozen may offer a sense of relief. But if, at the outset of what appears to be a major war, or the imminent possibility of major war, every responsible government must consider that other responsible governments will mobilize their nuclear weapons base as soon as war erupts, or as soon as war appears likely, there will be at least covert frantic efforts, or perhaps conspicuous efforts, to acquire deliverable nuclear weapons as rapidly as possible. And what then?

I see a few possibilities. One is that the first to acquire nuclear weapons will use them, as best it knows how, to disrupt its enemy’s or enemies’ nuclear mobilization bases, while itself continuing its frantic nuclear rearmament, along with a surrender demand backed up by its growing stockpile. Another possibility is to demand, under threat of nuclear attack, abandonment of any nuclear mobilization, with unopposed “inspectors” or “saboteurs” searching out the mobilization base of people, laboratories, fissile material stashes, or anything else threatening. A third possibility would be a “decapitation” nuclear attack along with the surrender demand. And I can think of worse. All of these, of course, would be in the interest of self-defense.

...

In summary, a “world without nuclear weapons” would be a world in which the United States, Russia, Israel, China, and half a dozen or a dozen other countries would have hair-trigger mobilization plans to rebuild nuclear weapons and mobilize or commandeer delivery systems, and would have prepared targets to preempt the other nations’ nuclear facilities, all in a high-alert status, with practice drills and secure emergency communications. Every crisis would be a nuclear crisis, any war could become a nuclear war. The urge to preempt would dominate; whoever gets the first few weapons will coerce or preempt. It would be a nervous world.¹¹³

3F: An Organization Approach to Adversary Behavior

The two excerpts reproduced below address the inadequacies of the rational-actor model for describing and predicting the behavior of large organizations. They argue that an organizational approach is preferable in thinking about nucle-

¹¹³ Schelling, “A World without Nuclear Weapons?”, pp. 125-126, 127.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

ar matters. Both were written by Andrew Marshall during his long career at the RAND Corporation, which began in 1949 and only ended in 1972 when he became a U.S. government employee on Henry Kissinger's National Security Council.

The first excerpt is from a memorandum Marshall wrote as a background paper for an April 1968 meeting of RAND's board of trustees. The memorandum describes the aims and status of RAND's research into the organizational behavior of military institutions. It emphasizes the prospect that this alternative to the rational-actor view of Soviet behavior would improve estimates of future Soviet strategic-nuclear forces. As Marshall explains, the impetus for his renewed efforts starting in 1966 to develop an organizational approach to Soviet behavior originated from his close collaboration with Joseph E. Loftus in the late 1950s and early 1960s. Loftus had joined RAND in 1954 after spending four years working as a civilian in U.S. Air Force intelligence where he had headed the Air Force's efforts to track the USSR's atomic-weapons program. Loftus had also been directly involved in the Air Force's early efforts to target the Soviet Union using the growing U.S. inventory of atomic weapons. Because both Loftus and Marshall were among the few individuals at RAND in the late 1950s with access to communications intelligence, which was then providing extensive insights into Soviet Long Range Aviation (LRA), they were in a position to notice the discrepancies between actual Soviet behavior and forecasts made on the basis of the then widely accepted rational-actor model. The impetus to look for these discrepancies arose from a very simply question. In the case of Soviet strategic-nuclear forces, the key question was: Precisely what or who were Marshall and Loftus trying to make predictions about? Their answer was that it was a collection of competing organizations, not *the* Soviet government or a unified rational actor.

One part of RAND's current studies of organizational behavior—analysis of decision-making processes within large military organizations—is aimed at improving our ability to forecast Soviet military posture. This paper describes the genesis of this work, some current activities, and research ideas for the future.

In the early 1960s, Joe Loftus and I were studying very much the same problem, looking five to ten years into the future. In 1963 we published a report stressing the importance of bureaucratic and budgetary constraints likely to influence the evolution of Soviet military posture.* We felt that such constraints were given insufficient weight in the then-current methods of making intelligence estimates. By going over the history of the evolution of Soviet military posture from 1946 through 1961, we tried to show that it was more plausible that the Soviet posture evolved as the result of decisions taken within a large bureaucratic structure than as the output of a small set of individuals working in a highly consistent manner. We point-

■ [REDACTED]

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

ed out the probable value of confining forecasts of Soviet posture within patterns of budgetary expenditure projected from past allocations to specific missions or bureaucratic components. We suggested that a more detailed study of the evolution of Soviet posture might be useful in unearthing meaningful behavior patterns.

I returned to this set of problems in 1966. By that time, the progress being made in understanding decision-making in large organizations, in particular large American business firms, suggested that perhaps more could be done. The work of [Richard M.] Cyert, [James G.] March, and [Herbert A.] Simon at Carnegie Tech, and that of a small group of people at the Harvard Business School, has progressed far enough to permit effective studies of decision-making processes within large military organizations.

The orientation of the work of Cyert, March, Simon, *et al.* is toward developing a model of bounded rationality of the decision-making process within large organizations. Most theories of individual and organizational choice employ a concept of “comprehensive rationality,” according to which individuals or organizations attempt to choose the best alternative—that program that offers the highest probability of achieving the most preferred outcome. Conventional analyses of future Soviet choices among alternative force postures, or speculation concerning the reasons for past choices, use these standard models of decision-making or choice.

In contrast, the models of bounded rationality focus on the limits of human capacities in comparison with the complexity of the problems that individuals and organizations must face. The limits of man’s capacity to generate alternatives and process information, and of routines available for problem solving, constrain the decision-making process of both men and organizations. Because of these limits, organizations develop simplified models of the external environment and other aspects of problems they must deal with.

In the context of the intelligence-estimating problem, the hope is to replace the current rational-process model with something better, something that reflects more accurately the context and the constraints within which Soviet military posture incrementally evolves, as the result of a sequence of decisions over many years. In fact, experienced intelligence analysts who have been studying the Soviet military posture are less prone to use the rational model than are other US military planners. But whenever they try to describe how they make estimates, or to think about how to improve intelligence estimates, they seem to formulate the problem within the context of the rational model. The difficulty, in part, is that work on organizational decision-making derived from the behavioral science has not yet influenced their idea of the nature of decision-making processes.

U.S. systems analysts tend to treat the Soviet *en block* as a unitary rational decision-maker. The intelligence people need only to be given a new set of intellectual tools with which to analyze what they already feel about Soviet behavior; but the systems-analysis community needs much more persuasion.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

...

One of the major differences between the rational-planner model and the behavioral theory of decision-making lies in the range of alternatives which decision-makers are assumed to survey before making a final decision. The rational-planning model assumes a large range of alternatives from which the best alternative is chosen. Studies of actual cases indicate that decision-makers look at very few alternatives. Moreover, the process by which alternatives are generated within an organization tends to be biased by the specific nature of the process. It matters a great deal how and where in the organization alternatives are generated, and what the screening process is as they move up through the organization. This suggests that if we knew more about the alternatives an organization is likely to generate, we might be in a much better position at least to bracket the range of possible future behavior, even if we would be unable to predict decisions precisely.¹¹⁴

The second excerpt is from a paper Marshall prepared for an Arms Control and Foreign Policy Seminar in 1971. The seminar was jointly sponsored by the California Institute of Technology and RAND. Marshall's paper was written for the seminar working group on U.S. security and the strategic arms race.

What is wrong with the rational policy model? Although a maximizing model may be adequate for explaining and predicting some government actions, casual empiricism leaves no doubt that the actual processes by which government actions are decided upon and executed are not well described by the model of rational choice. Governments consist of individuals and organizations with different goals and objectives, with different perception of the alternative actions open to the nation, with different estimates of likely consequences for each course of action, and with different preferred choices of what ought to be done. Moreover, implementation of governmental decisions consists not of the specifically tailored implementation of formal governmental decisions, but is accomplished by the routine behavior of large organizations which are assigned responsibility and use their existing programs. It is not just that the rational policy model is not a good description of decisionmaking within the government bureaucracy; its explanations and predictions are often inaccurate and misleading. In particular, in the case of the strategic [nuclear] arms competition there have been a few conventional studies that have focused upon the nature of that competition. They suggest the limited explanatory and predictive power of the rational policy model.

...

¹¹⁴ A. W. Marshall, "The Improvement in Intelligence Estimates Through Study of Organizational Behavior," Seminar Background Paper for Board of Trustees Meeting, RAND D-16858-PR, March 15, 1968, pp. 1-3, 5, declassified January 14, 1977.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

Both the Soviet and U.S. military establishments are clusters of organizations, interconnected as regards perceptions and stimulation to adaptive changes. A picture of either side's adaptation process as rational centralized planning must be rejected, except perhaps during a period of major adjustment. The interaction process in general cannot be pictured as one in which changes in the other nation's forces are perceived centrally at a high level, appropriate counter force posture changes decided upon, and orders transmitted to lower levels for implementation. Rather, the perception of force posture changes in specific parts of one nation's military establishment is likely to be centered in a specific set of sub-organizations in the other nation's military establishment. Each of these sub-organizations, such as the five Soviet military combat services and their component branches, will have its own set of perceptions regarding changes in specific parts of the U.S. force posture. Each of the Soviet military services or their component branches will have its own goals and aspirations, especially with regard to an increased budget and new programs it wants to have authorized and funded. Only in part are these new programs likely to be designed solely to meet changes in those areas of the U.S. military establishment where the Soviet component focuses its attention.¹¹⁵

¹¹⁵ A. W. Marshall, "Bureaucratic Behavior and the Strategic Arms Competition," Southern California Arms Control and Foreign Policy Seminar, October 1971, pp. 4, 7-8.

**Do Not Copy or Distribute without Permission from the
Director of Net Assessment**

[REDACTED]

[REDACTED]

- | [REDACTED]
- | [REDACTED]
- | [REDACTED]
- | [REDACTED]
- | [REDACTED]
- | [REDACTED]
- | [REDACTED]
- | [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]