
Numerology in the Second Nuclear Age

In collaboration with the Atomic Energy Commission (CEA)

Michael Krepon

Fall 2009



Security Studies Center

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Michael Krepon

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Introduction

The nuclear numbers game has changed. During the Cold War – the first nuclear age – deterrence strategists such as Henry Kissinger, Paul Nitze and Albert Wohlstetter claimed that the nuclear balance mattered, even at extraordinarily high numbers.¹ As a result, one great irony of the first nuclear age was that the “absolute” weapon still lent itself to the twin impulses of seeking advantage and seeking to avoid being placed at a disadvantage. This factor, among others, led to the production of approximately 125,000 U.S. and Soviet nuclear weapons during the Cold War.

Nuclear “numerology” during the Cold War centered around deployed capabilities in various categories, especially “prompt hard-target kill” capabilities, missile “throw-weight” and nuclear exchange ratios. By this musty logic, the United States now has more deterrence leverage against Russia than at any time since the Soviet nuclear build-up in the 1960s. This may help explain why the Kremlin feels so protective of its large stocks of tactical nuclear weapons, despite Washington’s preferences. US leverage on Moscow also appears to be limited on other matters pertaining to the nuclear order, including ways to persuade North Korea and Iran to adhere to UN Security Council resolutions. Critics of the Obama administration ascribe this lack of suasion to “soft” leadership that does not command respect or compel preferred behavior.²

But the “hard” policies they preferred during the presidency of George W. Bush produced, to put it charitably, mixed results. Whatever

¹ For classic analyses of this genre, see Henry Kissinger, “Arms Control, Inspections and Surprise Attack”, *Foreign Affairs*, Vol. 38, No. 4, July 1960, pp. 557-575; Paul H. Nitze, “Assuming Strategic Stability in an Era of Détente”, *Foreign Affairs*, Vol. 54, No. 2, January 1976, pp. 208-232; and Albert Wohlstetter, “The Delicate Balance of Terror”, *Foreign Affairs*, Vol. 37, No. 2, January 1959, pp. 211-234.

² See, for example, Enduring America (blog), “Video & Transcript: Cheney Speech on National Security”, October 22, 2009, at: <http://enduringamerica.com/2009/10/22/transcript-cheney-speech-on-national-security-21-october/>; John R. Bolton, “Obama Promises Bush III on Iran”, *Wall Street Journal*, January 2, 2009, at: <http://online.wsj.com/article/SB123086106688148103.html>; John R. Bolton, “Obama's NK Reaction: More Talks”, *Wall Street Journal*, at: <http://online.wsj.com/article/SB123897547166291201.html>; John R. Bolton, “Clinton's Unwise Trip to North Korea”, *Washington Post*, August 4, 2009, at: <http://www.washingtonpost.com/wp-dyn/content/article/2009/08/04/AR2009080401486.html>; John R. Bolton, “The Danger of Obama's Dithering”, *Los Angeles Times*, October 18, 2009, at: <http://www.latimes.com/news/opinion/la-oe-bolton18-2009oct18,0,4090854.story>.

value the nuclear numbers game had during the first nuclear age related primarily to contests played out with computers and hand calculators, not to real battlefields where nuclear-armed states fought with weaker foes, including contests between states with and without nuclear weapons.

Numerical imbalances have been far more profound between the United States and China. For financial and other reasons, Beijing did not play the nuclear numbers game during the first nuclear age, even when under the cross-hairs of both superpowers. China's prior disinterest in nuclear numerology may be waning somewhat, but its past restraint suggests recognition that big numbers and ready-to-use nuclear force postures provide very limited forms of leverage – either for Beijing or for Washington. The numbers that seem to matter most to the Chinese leadership have to do with economic growth, foreign trade, and conventional modernization programs. Beijing will continue to be a free rider from nuclear arms reduction negotiations for as long as it can. How long China's standoffishness continues will depend, in part, on the willingness of Moscow and Washington to accept far deeper reductions, and on whether Beijing views such reductions as mere common sense, or as an opportunity to close gaps in nuclear capabilities. But if, as this paper contends, nuclear numerology provides extremely modest leverage, it would be unexpectedly short-sighted of China's leaders to pad these numbers at the expense of more tangible manifestations of national power.

Nuclear numerology will not disappear, in part because numbers remain the easiest yardsticks to measure broad trends, and because those most invested in legacy nuclear arsenals will seek to hold on to their presumed utility and status. Washington and Moscow will continue to draw down deployed nuclear forces according to agreed numerical formulas in a mutually transparent way, as befitting a period of time in which the salience of nuclear weapons is reduced. But as long as tensions between major powers remain low and mushroom clouds do not blot the horizon, domestic and foreign audiences care less and less about the fine print of nuclear numerology. Nuclear arms reduction talks are no longer front-page news, and nuclear weapons have lost their shine as status objects for major powers as other indicators of status gain ground. Nuclear numerology has become the province of an aging, shrinking demographic.

Paul Bracken and others have labeled the post-Cold War period as the second nuclear age.³ One characteristic of the second nuclear age is that the United States is as much the object as the implementer of deterrence strategies – especially in the aftermath of the George W. Bush administration's preventive war to oust Saddam Hussein. The second U.S.-Iraq war has accelerated nuclear hedging strategies by Iran and North Korea.⁴

³ Paul Bracken, "The Structure of the Second Nuclear Age", *Orbis*, Vol. 47, No. 3, Summer 2003, pp. 399-413.

⁴ See, for example, International Institute of Strategic Studies, "Nuclear Programmes in the Middle East: in the Shadow of Iran", *IISS Strategic Dossier*,

In these cases, a “forward strategy” involving diplomacy, conventional deterrence, and containment are essential elements for regional security. In contrast the overwhelming nuclear capabilities possessed by the United States matter very little. In the second nuclear age, where asymmetric warfare has replaced arms racing, and where nuclear dangers have shifted from the Soviet Union to weak states and to die-hard extremists, thermonuclear yields, “prompt hard-target kill” capabilities, missile “throw-weight” and nuclear exchange ratios are less than helpful. Some, like John Mueller, have argued that this has always been so.⁵ Mueller far overstates his case, but the pendulum has clearly shifted in his direction and away from nuclear orthodoxy. Supporting evidence for this assertion can be found in the absence of nuclear weapon testing by major powers for over a decade, the shrinking and aging of infrastructure within the oldest members of the nuclear club, and significant reductions in their nuclear arsenals for the P-5 with the probable exception of China.

International Institute of Strategic Studies, 2008, at: <http://www.iiss.org/publications/strategic-dossiers/nuclear-programmes-in-the-middle-east-in-the-shadow-of-iran/read-the-dossier/>; Ed Shin, “U.S. Diplomacy with North Korea During the Bush Administration”, unpublished manuscript, 2009, at: <http://www.princeton.edu/research/cases/Shin4-09.pdf>.

⁵ John Mueller, *Atomic Obsession, Nuclear Alarmism from Hiroshima to Al-Qaeda*, New York, Oxford University Press, 2010 (forthcoming).

Reformation and Reaction

Old habits of the mind are hard to break. The diminished role of nuclear deterrence in the second nuclear age did not necessarily mean giving away the advantages of nuclear pre-eminence. To the contrary, well-placed officials in the George W. Bush administration hoped to reap the benefits of U.S. nuclear dominance. A key strategist conducting the Bush administration's nuclear posture review, Keith Payne, once co-wrote a journal article entitled "Victory is Possible" during the height of the Cold War.⁶ After the Soviet Union dissolved, this objective seemed far more realizable, but it could not be plainly articulated. The Bush administration's plans to leverage U.S. strategic superiority fell short because of Congressional resistance, competing defense budgeting priorities, as well as because of public and allied resistance to nuclear muscle-flexing.

Disciples of dominance in the Bush administration then fell into the briar patch of Iraq. They believed in the utility of deterrence against China and Russia, while denigrating deterrence, along with the utility of containment, diplomacy, and arms control, against states with minimal or prospective nuclear arsenals. Plans for revitalizing the U.S. nuclear infrastructure and modernizing tactical nuclear weapons went awry. Dominators then focused on more realizable gains – disposing of treaty obligations that limited the U.S. military's freedom of action in the event of nuclear contingencies, and preventing new accords that could constrain future plans. Ironically, while civilian defense strategists were engaged in hacking away at treaties, the U.S. military lost almost all enthusiasm for nuclear options, consistently opting in internal Pentagon budget battles for conventional over nuclear force modernization programs, while seeking budgetary savings by disposing of existing nuclear capabilities. The "delicate balance of terror" that Western deterrence strategists worried about so obsessively during the Cold War now sounds like the laments of an ancient, interred religion. Terror continues to exist, but there is nothing delicate about it. New nuclear dangers are now reducible by cooperative threat reduction initiatives rather than by increasing warheads, yields, and throw-weights. Another ironic consequence of the second nuclear age is that the country with the most pronounced nuclear advantages is most constrained from exploiting them.

The salience of nuclear numerology can be reduced further because the flashpoints between major powers that highlighted the first nuclear age – Cuba, Berlin, Taiwan, and the Middle East – have either greatly

⁶ Colin S. Gray and Keith Payne, "Under The Nuclear Gun: Victory is Possible", *Foreign Policy*, No. 39, Summer 1980, pp. 14-27.

diminished potential to prompt confrontations, or have been entirely removed from our checklist of nuclear nightmares. The nuclear nightmares that have taken their place, led by the specter of nuclear terrorism and further horizontal proliferation, are quite different in their particulars, but share the commonality of being extremely difficult to leverage by means of sophisticated or plentiful nuclear weapons. Since contemporary nuclear nightmares are common to all major powers, and since major powers have less to fight about than before, prospects for containing further nuclear proliferation may be less grim than are commonly surmised. During the first nuclear age, proliferation occurred, but at a modest pace, in part because Washington and Moscow collaborated effectively to build and sustain the Nonproliferation Treaty regime. Back then, one precondition for successful collaboration was that the United States not share the Bomb with allies (especially West Germany). NPT regime maintenance also required that negotiations on strategic arms control and reductions demonstrate respect for the NPT's Article VI obligation "to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race". This requirement for regime cohesion lent further importance to the Cold War's nuclear numerology, since such treaties needed to be based on rough numerical equality. The focus on numbers, in turn, generated intense debates over which ones mattered most.

Another irony of the second nuclear age is that the country most victimized by nuclear excess during the Cold War is having the hardest time letting go of its fixation with numbers. The reasons most often cited to help explain the Kremlin's lingering attachments to the Bomb include the loss of status in other domains, the perceived need to shore up deficiencies in conventional military capabilities, and lingering concerns about U.S. strategic dominance and missile defenses. For whatever reasons, Moscow is reluctant to accept the abolitionist credo, warhead dismantlement provisions, and extending the scope of verifiable reductions to tactical nuclear weapons in the follow-on to START.

Russian nuclear strategists dutifully dwell on how conventional force deficiencies might affect a crossing of the nuclear threshold, and they are contemplating a new military doctrine that considers the use of nuclear weapons in regional and local wars. This is not the first time that Moscow (and Washington) have viewed tactical nuclear weapons as a potential source of leverage and as compensation for conventional military weaknesses. However, the track record of major powers that seek to substitute nuclear weapons for usable military power has not been very edifying. Thus the Kremlin leadership is focusing on more practical means of suasion. Moscow seeks to affect the decisions of its neighbors by its ability to block energy supplies and consensus at the United Nations, not by means of nuclear-tinged threats.

Because monitoring treaty compliance and NPT regime maintenance matter a great deal to the Obama administration, a new treaty codifying nominal equality in deployed strategic forces at lower numbers is being seriously pursued. The Kremlin does not appear inclined to tack on to these negotiations attempts to impose prohibitions on space-based

weapons and missile defenses (These gambits, which are likely to lead to prolonged negotiations over provisions that do not lend themselves to verification or to the U.S. Senate's consent to ratification, appear slated for talks on "preventing an arms race in space" at the Conference on Disarmament).

Path-breaking nuclear arms reduction accords during the 1980s and 1990s were made possible when Mikhail Gorbachev realized the folly of insisting on linkage between offensive reductions and defensive prohibitions. Instead, he took refuge in the understanding that modest countermeasures could nullify expensive missile defense schemes, and that meaningful technical, financial, and political constraints on space-based defenses and "space strike" weapons would become even stronger if Moscow and Washington negotiated nuclear arms reduction accords. Russia's conventional force posture and its perceived deficiencies now appear to be a more critical constraint to deep cuts in nuclear forces than concerns over prospective U.S. space-based missile defenses.

Because the measurement of national power and influence in the second nuclear age is based far more on economics than on nuclear numerology, Russia appears to be hostage to "old thinking" and extractive industries. China, which derives leverage from its economic dynamism, trade surpluses, and holdings of U.S. currency, has the wherewithal to take nuclear numerology far more seriously. But to what extent? Beijing is likely to deploy in due course a nuclear deterrent on land and at sea sufficiently large to foil what the Bush administration obliquely characterized as "dissuasion". But Beijing's past nuclear behavior suggests that it will seek to avoid generating intense anxieties in foreign capitals and around its periphery, like those accompanying the Soviet strategic build-up during the first nuclear age.

China's primary deterrents at present are its ability to harm U.S. warships and satellites in the event of a clash over Taiwan, and its ability to threaten, but not generate economic turbulence in the United States because of its dollar holdings. Nuclear weapons constitute a secondary, slowly evolving deterrent.⁷ The habits of mind we have come to associate with the Kremlin's deterrence calculations place significant importance on numbers. The habits of mind we have come to associate with China's deterrence calculations have not. If Beijing's attachment to nuclear weapons changes appreciably, this will be one of the defining (and unwelcome) features of the second nuclear age.

U.S. conventional military superiority in the second nuclear age has multiple implications for nuclear numerology and deterrence. One consequence has been that weak countries threatened by U.S. military superiority have sought their own nuclear programs for purposes of dissuasion. Another is that long-range conventional military capabilities can

⁷ For one projection of where Beijing might be headed, see Jeffrey G. Lewis, *The Minimum Means of Reprisal: China's Search for Security in the Nuclear Age* Cambridge, MIT Press, 2007.

substitute for some U.S. nuclear strike options. The Bush administration's nuclear posture embraced this shift by endorsing a "new triad" composed on offensive strike capabilities (both nuclear and conventional), defenses (passive and active), and "a revitalized defense infrastructure".⁸ The innovation of adding conventional strike capabilities to U.S. nuclear war plans has meant, for all practical purposes, an ever greater tilt within the Pentagon in the direction of weapons with great military utility and away from weapons with extremely limited utility. The advent of improved, long-range conventional war-fighting capabilities has facilitated further contractions in the U.S. nuclear arsenal.

Nevertheless, nuclear orthodoxy remains well entrenched. The U.S. nuclear arsenal has been down-sized, but not fundamentally altered in structure or targeting requirements from the first nuclear age. Adding up the requirements of nuclear deterrence, the George W. Bush administration's nuclear posture review concluded that approximately 2,200 deployed nuclear weapons would be required through 2012, of which 1,500 could be launched in a matter of minutes. No less than 2,500 additional weapons would be kept as reserves and spares that could be reconstituted and deployed in a matter of days to many months, as deemed necessary.⁹ These projected requirements suggest little diminished value to nuclear weapons since the latter years of the Clinton administration, which reached similar numerical conclusions. Perhaps this can be explained by the perceived requirements of extended deterrence, the time-honored practice of nuclear planners to hedge against uncertainties and reversals, or merely the Clinton administration's disinclination to do battle with nuclear orthodoxy.¹⁰ The Obama administration is pursuing more ambitious objectives, but appears constrained by the high valuation placed by the Kremlin on its last semblance of great power status, and by the other factors noted earlier. The range of reductions now under consideration in the START Follow-On Treaty (500-1100 delivery vehicles and 1500-1675 for their associated warheads) seem unlikely to prompt radical changes in the U.S. deterrence posture or targeting plans.

⁸ Donald H. Rumsfeld, "Nuclear Posture Review", Foreword. Submitted to Congress on December 31, 2001, at: <http://www.globalsecurity.org/wmd/library/policy/dod/npr.htm>.

⁹ For Hans M. Kristensen's accounting of the likely size of the U.S. nuclear reserve, see http://www.fas.org/blog/ssp/2007/05/estimates_of_us_nuclear_weapon.php. Also see Robert S. Norris, Hans M. Kristensen and Christopher E. Paine, "Nuclear Insecurity: A Critique of the Bush Administration's Nuclear Weapons Policies", National Resource Defense Council, September 2004, at: <http://www.nrdc.org/nuclear/insecurity/critique.pdf>.

¹⁰ "Remarks by Samuel R. Berger, Assistant to the President for National Security Affairs, to the Annual Washington Forum of Business Executives for National Security", The White House, Office of the Press Secretary, Clinton Presidential Library, National Archives and Records Administration, May 5, 1998, at: <http://clinton2.nara.gov/WH/EOP/NSC/html/speeches/19980519-2612.html>.

Nuclear Numerology, Missile Defense and Space

Nuclear numerology has long been intricately linked to missile defense and space-related activities. The lingering effects of offense-defense linkage can be found in contemporary Russian anxieties and diplomatic initiatives. China has far more reason to be sensitive about this linkage, given its more modest nuclear force posture and lingering, albeit reduced, concerns over a possible clash with the United States over Taiwan. Consequently China has partnered with Russia in advancing space diplomacy initiatives that seek to negotiate prohibitions on space-based military capabilities.

Chinese and Russian sensibilities on such matters were heightened during the Bush administration, when the U.S. Air Force Space Command issued a “Strategic Master Plan” declaring that, “Our charter is to rapidly obtain and maintain space superiority and the space, nuclear, and conventional strike capabilities that produce desired war-fighting effects... We must also pursue the ability to apply conventional combat in, from, and through space”.¹¹ After this military guidance was published, the Bush administration denied that it reflected national policy, eventually issuing an unclassified national space policy in August, 2006 in which references to “space dominance”, “space superiority”, “war-fighting” and “combat in, from, and through space” were conspicuously absent. Instead, Bush’s National Space Policy borrowed heavily from the language of the more ambiguous formulations used during the Clinton administration.¹² At the same time, the Bush administration continued to oppose any agreement that would limit U.S. freedom of action in outer space, including the first use of space weapons.

The awkwardness of this position was evident when the People’s Liberation Army blew up an aging Chinese satellite in January 2007. The primary purpose of this test – only the second of its kind, after an ASAT test conducted by the Reagan administration in 1985 – was most likely to send a deterrence message to Washington by means of a proof of concept, clarifying Beijing’s intention to deny the Pentagon space dominance in the event of a crisis or a clash over Taiwan.

¹¹ “Air Force Space Command: Strategic Master Plan FY06 and Beyond”, U.S. Air Force Space Command, October 1, 2003, at: <http://www.cdi.org/news/space-security/afspc-strategic-master-plan-06-beyond.pdf>.

¹² The George W. Bush administration’s National Space Policy can be found at: <http://www.ostp.gov/html/US%20National%20Space%20Policy.pdf>.

The Bush administration's public rejoinder was handcuffed by its staunch resistance to negotiations that would prevent the United States from developing, testing, and using space weapons, including kinetic energy ASATs. The PLA's test was not barred by any agreement, but it was nonetheless an egregiously irresponsible act, since it produced the largest man-made debris field in the history of the Space Age. As a result of this test, there are now tens of thousands of additional pieces of debris in low-Earth orbit, presenting a lethal threat to satellites and manned space operations in their path –including China's own space assets.¹³

The Bush White House's critique focused on the debris consequences of the particular means of space warfare that Beijing tested, which will last for perhaps a century. Since an end to all forms of purposeful, harmful interference against satellites would have conflicted with the Bush administration's insistence on U.S. freedom of action in space, its public rejoinder dwelled on the rather lame message that Beijing's anti-satellite test made civil space cooperation with the United States more remote.¹⁴ A far more pointed rejoinder came later, in February 2008, when the Bush administration successfully modified a sea-based missile defense interceptor to blow up a nonfunctioning U.S. spy satellite about to enter the Earth's atmosphere.

Space-based missile defenses continue to pose hard technical and cost challenges, since a large number of interceptors in space would be required to have timely coverage over countries that can threaten missile attacks. If technical, political, and cost challenges can somehow be met, space-based weapons and missile defenses could be negated by relatively inexpensive countermeasures, such as space mines parked nearby.¹⁵ While Moscow and Beijing are particularly sensitive to U.S. missile defenses, they may still help Washington with hard proliferation cases when doing so serves their national security interests. If, however, U.S. missile defenses appear designed and sized to negate the Chinese nuclear deterrent and to make Russia very uneasy about the offense/defense equation, they are likely to generate more problems than they solve.

The Obama administration is clearly more skeptical about space-based interceptor and weapons, and more open to space diplomacy initiatives, than its predecessor. Interagency reviews have yet to be conducted to settle on the administration's proposals, but two, in particular,

¹³ "Detection of Debris from Chinese ASAT Test Increases; One Minor Fragmentation Event in Second Quarter of 2007", *Orbital Debris Quarterly News*, National Aeronautics and Space Administration, Vol. 11, No. 3, July 2007, pp. 1-2.

¹⁴ William J. Broad and David E. Sanger. "China Tests Anti-Satellite Weapon, Unnerving U.S.", *New York Times*, January 18, 2007, at: <http://www.nytimes.com/2007/01/18/world/asia/18cnd-china.html>.

¹⁵ Richard L. Garwin has spoken and written on this subject for some time. See, for example, Richard L. Garwin, "Space Defense – The Impossible Dream?", Speech at the Commonwealth Club of California, July 18, 1986, at: <http://www.commonwealthclub.org/missiledefense/garwensp.html>.

would accord with Mr. Obama's presidential campaign.¹⁶ These initiatives are not mutually exclusive. The first is a "Code of Conduct" for responsible space-faring nations, one provision of which might constrain acts of harmful interference against man-made space objects, especially those with destructive effects. Codes of conduct are usually not negotiated in the form of treaties. A second approach that would be consistent with candidate Obama's positions would be a verifiable treaty banning the testing and use of destructive methods against man-made space objects.

Whatever initiatives the Obama administration ultimately pursues, it is worth recalling that, the Outer Space Treaty, the last major diplomatic agreement regarding space which barely encroached upon military capabilities in space, was negotiated over forty years ago. One reason why space treaties are so rare is because they typically are accorded a lower priority than those covering nuclear forces. Another is that, precisely because space-related treaty negotiations are so rare, there is a natural impulse on the part of some to advance ambitious negotiating agendas, which make successful outcomes less likely. A third reason is that many countries sit around the tables at which space treaties are negotiated and that the venue for such negotiations, the Conference on Disarmament, operates by consensus rules.

The last time Washington and Moscow attempted to negotiate limits on military capabilities in space, during the administration of President Jimmy Carter, Moscow overreached, perhaps most egregiously by initially seeking to brand the U.S. space shuttle as an anti-satellite weapon. More importantly, negotiations over strategic arms control and nuclear testing took center stage, and when these lost momentum, talks on ASAT weapons became an afterthought.

The Pentagon's missile defense and space-based programs that the Kremlin fears most have long been constrained by technical, cost, and political factors. The two administrations that tried to break free of these constraints, led by Presidents Ronald Reagan and George W. Bush, learned how difficult this task was. The Obama administration and Democratic majorities on Capitol Hill do not wish to weaponize space and are shrinking the most glaring excesses of missile defense programs inherited from the Bush administration. Under these circumstances, Russian and Chinese attempts to link useful measures to enhance space security at the Conference on Disarmament with the resuscitation of elements of the ABM Treaty would appear to reaffirm Voltaire's dictum about the best being the enemy of the good.

¹⁶ See, for example, Council for a Livable World, "2008 Presidential Candidates' Responses to Seven Key National Security Questions", August 16, 2007, at: http://livableworld.org/assets/pdfs/2008_presidential_candidates_questionnaire_responses.pdf; and see also Barack Obama's program on space policy, at: http://www.barackobama.com/pdf/policy/Space_Fact_Sheet_FINAL.pdf.

Cooperative Threat Reduction in the Second Nuclear Age

What used to be known as arms control during the first nuclear age has morphed into a more expansive, adaptable set of cooperative threat reduction practices in the second nuclear age.¹⁷ These practices are built on the hard-won achievements reflected in treaties that reduce and eliminate nuclear forces in verifiable ways, but have far greater geographical scope and variety. For example, the U.S. Government now works with over 150 countries to improve monitoring capabilities of dangerous weapons and materials that might transit national borders and ports, tighten export controls, and strengthen protections against internal threats.

On a macro level, the effectiveness of such cooperative threat reduction measures still depends on the extent of cooperation among the veto-wielding members of the UN Security Council. What happens in space will therefore help define how much backing Moscow and Beijing give to the most difficult cooperative threat reduction initiatives. Opposing North Korea's nuclear program has fallen within this zone, at least in large measure, while cooperating on space security has not, at least not yet. One constraint is that both Washington and Beijing seek to maximize their freedom of action in the event of friction over Taiwan. Another is that China, like Russia, discovered hidden agendas in the stated rationales of the Bush administration's national security policies. The year before the Bush administration took office, a Defense Intelligence Agency assessment concluded that, "China feels [its] deterrent is at risk over the next decade because of U.S. targeting capabilities, missile accuracy, and potential ballistic missile defenses. Beijing is, therefore, modernizing and expanding its missile force to restore its deterrent value".¹⁸

The Bush administration subsequently proceeded to withdraw from the ABM Treaty, issue a revised, classified nuclear posture calling for

¹⁷ For a discussion of this metamorphosis, see Michael Krepon, *Cooperative Threat Reduction, Missile Defense, and the Nuclear Future*, New York, Palgrave Macmillan, 2003.

¹⁸ Defense Intelligence Agency, *The Decades Ahead: 1999-2020, A Primer on the Future Threat*, July 1999, reprinted in Rowen Scarborough, *Rumsfeld's War: The Untold Story of America's Anti-Terrorist Commander*, Washington, Regnery Publishing Company, 2004, p. 203.

capabilities “to defeat opponents decisively”,¹⁹ and negotiate an agreement on civil nuclear cooperation with New Delhi that would facilitate the growth of India’s nuclear arsenal. The PLA took seriously the U.S. Air Force’s military space guidance, as well as the administration’s plans to deploy over forty long-range missile defense interceptors – at a time when the U.S. intelligence community estimated that China possessed perhaps twenty aging ocean-spanning missiles that required hours to prepare for launch.

In one of his more disingenuous speeches, Secretary of Defense Donald Rumsfeld did not help matters by asking rhetorically, “Since no nation threatens China, one must wonder: Why this growing investment? Why these continuing large and expanding arms purchases? Why these continuing robust deployments?”²⁰ Rumsfeld surely knew that Beijing’s moves were not unrelated to the nuclear, conventional, and space postures that he championed. By 2015, the Central Intelligence Agency estimates that China would increase four- or five-fold the number of warheads carried by ocean-spanning missiles that would be targeted against the United States.²¹ This estimate, like its predecessors, is probably overstated,²² but the Bush administration pushed enough of Beijing’s buttons to speed up China’s leisurely approach to fielding new and better nuclear forces.

The principle author of the Pentagon’s 2001 Nuclear Posture Review and a longstanding advocate of missile defenses, the aforementioned Keith Payne, argued that, in any crisis or military engagement over Taiwan, Chinese leaders would need to

believe that Washington would persevere despite their nuclear threats and possible regional nuclear use. Washington would have to deny Chinese leaders confidence that such threats could deter U.S. intervention, a hope to which they would likely cling. Consequently, U.S. deterrence policy in this case could require that the United States be able to limit its own

¹⁹ Verbatim excerpts of the Nuclear Posture Review submitted to the U.S. Congress on December 31, 2001 were leaked and can be found at www.globalsecurity.org/wmd/library/policy/dod/npr.htm.

²⁰ Remarks delivered at the Shangri-La Hotel, Singapore, June 4, 2005, at: <http://www.defenselink.mil/speeches/2005/sp20050604-secdef1561.html>.

²¹ See National Intelligence Estimate of Foreign Missile Developments for the Ballistic Missile Threat through 2015, Hearings before the International Security, Proliferation, and Federal Services Subcommittee of the Committee on Government Affairs, United States Senate, Senate Hearings 107 – 467, March 11, 2002, at: <http://www.fas.org/irp/nic/bmthreat-2015.htm>.

²² See Hans M. Kristensen, Robert S. Norris, and Matthew McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*, Washington, The Federation of American Scientists and The Natural Resources Defense Council, November 2006, pp. 35-136. The extent of official U.S. overestimates of Chinese nuclear capabilities has, however, shrunk over time.

prospective losses to a level compatible with the stakes involved.²³

In classical deterrence theory, the ability to destroy an adversary's deadliest weapons before they can do great harm is known as damage limitation. U.S. conventional and, if necessary, nuclear strike forces would be assigned this mission, and missile defenses would have the task of intercepting warheads that have otherwise escaped destruction. In other words, the dictates of damage limitation call for superior American offensive forces and missile defenses to serve as a deterrent, and if deterrence fails, to provide the decisive margin of victory mandated in the Bush administration's nuclear posture statement.²⁴

Moscow and Beijing understand such calculations, which is why they are so sensitive to small increments of U.S. missile defense deployments. They have gotten some relief from poor U.S. missile defense test results, competing Pentagon priorities, and Congressional resistance to deploying costly, unproven missile defenses. The Obama administration has given reason for Moscow and Beijing to presume a less ideological and more pragmatic approach to missile defenses. Nonetheless, U.S. national missile defense interceptors will become more capable over time, even if their numbers are pared down. Consequently, Beijing and Moscow have become more interested in techniques to disrupt and destroy U.S. satellites and in deploying mobile, long-range, ballistic missiles that will be harder for the Pentagon to target.

During the first nuclear age, damage limitation strategies like that embraced by the Bush administration used to be called "high quality deterrence" by strategists such as Paul H. Nitze. From this perspective, numerical advantages mattered a great deal in determining the outcome of nuclear exchanges. "The victor", as Nitze wrote during the Eisenhower administration, "will be able to issue orders to the loser and the loser will have to obey them or face complete chaos or extinction". The greater the margin of superiority, Nitze wrote, "the less likely it is that a nuclear war will ever occur. The greater that margin, the greater are our chances of seeing to it that nuclear war, if it does come, is fought rationally and that the resulting destruction is kept to the lowest levels feasible".²⁵ In Nitze's view, there was "no doubt as to the desirability of a war-winning capability, *if feasible*".²⁶ Nitze's views changed, but his old play book was not thrown

²³ Keith B. Payne, "Post-Cold War Deterrence and a Taiwan Crisis", *China Brief*, Vol. 1, No. 5, September 12, 2001, at: [http://www.jamestown.org/programs/chinabrief/single/?tx_ttnews\[tt_news\]=3746&tx_ttnews\[backPid\]=191&no_cache=1](http://www.jamestown.org/programs/chinabrief/single/?tx_ttnews[tt_news]=3746&tx_ttnews[backPid]=191&no_cache=1).

²⁴ Much is in the public domain about older nuclear war plans, and newer have been leaked shortly after they were issued. For excerpts of the George W. Bush administration's nuclear posture, see www.globalsecurity.org/wmd/library/policy/dod/npr.htm.

²⁵ Paul H. Nitze, "Atoms, Strategy, and Policy", *Foreign Affairs*, Vol. 35, No. 2, January 1956, pp. 190-191.

²⁶ Emphasis in the original. This reference was to the Soviet Union, but the conclusion applied just as well to the United States. Paul H. Nitze, "Assuring Strategic Stability in an Era of Détente", *op. cit.*, p. 216.

away after the dissolution of the Soviet Union – not when the presumed value of high quality deterrence and the potential for damage limitation finally appeared to be applicable.

The Dynamic Between Nuclear Dominance and Abolition

In nuclear politics as in physics, actions generate reactions. Thus, it should not be surprising that, when U.S. nuclear strategists have been most drawn to a nuclear posture based on dominance, others have been drawn to abolitionist campaigns. This was true after the Bomb's sudden appearance in 1945, during the Reagan administration, and during the George W. Bush/Barack Obama conjunction. No-one symbolized this duality more than Paul H. Nitze. Nitze yielded to no one in his obeisance to nuclear numerology during the Cold War, but Nitze ultimately switched sides: When the demise of the Soviet Union was well advanced, Nitze, offered the truly heretical notion that, for the world's preeminent military power, the use of nuclear weapons made little sense, even in retaliation.²⁷ It is doubtful that this heresy will become U.S. declaratory policy. Nitze also endorsed abolition as a serious goal worthy of serious pursuit by future U.S. Presidents. His reasoning was straightforward: since nuclear weapons can do the most harm to the United States, its armed forces, friends and allies, and since they can negate U.S. conventional military superiority, the elimination of nuclear weapons is the best end state for U.S. national security policy. Pursuit of abolition also provides support for global efforts to prevent proliferation and nuclear terrorism.

Many other eminent persons have endorsed the goal of abolishing nuclear weapons, including President Barack Obama. What alternative nuclear end state is more politically compelling or useful? Shall we march behind the banner of "managed" proliferation? Arms control speaks more of the past than of the future. Nuclear anarchy is to be avoided at all costs, and attempts to assert U.S. nuclear dominance have accelerated the demise of global nonproliferation and disarmament norms. Abolition is the end state best suited to assist U.S. leaders to reduce nuclear dangers, and to strengthen the global nonproliferation system, which is a cornerstone of international security.

The "fourth abolitionist wave" now emanating from American shores²⁸ worries many deterrence strategists. The practices of nuclear deterrence were excessive and at times dangerous, but they did help prevent cataclysmic wars and contain proliferation by extending protective

²⁷ Paul H. Nitze, "A Threat Mostly to Ourselves", *New York Times*, October 28, 1999, at: <http://www.nytimes.com/1999/10/28/opinion/a-threat-mostly-to-ourselves.html>.

²⁸ See Michael Krepon, "Ban the Bomb. Really", *The American Interest*, Vol. 3, No. 3, January/February 2008, pp. 88-93.

nuclear umbrellas over close friends in troubled regions. These concerns regarding abolition must be taken seriously. One way to alleviate these concerns is to stress that nuclear disarmament is a process, not an on/off switch. It is a journey, as well as a destination. The destination will not be reached unless public safety, national and regional security, as well as alliance solidarity are enhanced every step along the way. The journey will proceed only as far as security and political conditions permit.

How many steps are taken in the direction of nuclear disarmament also depends on the absence of disturbing developments, beginning with a third battlefield use of nuclear weapons, unchecked nuclear weapon-related programs in Iran and North Korea, terrible news out of Pakistan, and a cascade of new nuclear testing. Even if every one of these negatives can be avoided, significant positive developments are required to gain sustained traction in the direction of nuclear disarmament, beginning with cooperation among major powers.

Getting to zero is not about arithmetic or fixed timelines. Deadlines appeal to those who will not have responsibilities for implementing them. Deadlines may even be helpful in some instances when much heavy lifting has already occurred, and national leaders are haggling over details. But for the most part, ambitious deadlines do not prompt sustained, heavy lifting. Ironically, trying to establish a time-bound framework is likely either to increase resistance against, or disinterest in, abolition. If the deadline chosen for nuclear disarmament seems too close, it is likely to increase resistance to near-term steps, at least in the United States. If it is too distant, the deadline is likely to have little practical effect or influence.

In addition, timelines reinforce a natural tendency of the mind to telescope contemporary worries against a distant goal. This mental juxtaposition makes visionary goals appear to be other-worldly – how, for example, could we contemplate abolition when the ayatollahs in Iran may be seeking nuclear weapons? Abolition, like other visionary goals, can only be achieved if contemporary security concerns are systematically reduced and eliminated. It is hard to conceive of how a deadline for nuclear disarmament – unlike progress on tangible, pragmatic steps – reduces hard security concerns.

Some reductions can be carried out unilaterally, but unilateral U.S. reductions can be waylaid unless accompanied by steps that provide further confidence in deeper cuts. Will others follow the U.S. lead? As noted above, Moscow remains disinclined at present to accept far-reaching reductions in the roles and missions it ascribes to nuclear weapons. And it is a safe bet to presume that Beijing will seek to remain outside the process of strategic arms reductions for as long as possible. It is also safe to presume that the hardest proliferation cases are likely to proceed whether or not the United States actively pursues the goal of nuclear disarmament – especially if their bomb programs are partly driven by the need to deter superior U.S. conventional power. Because of these and other constraints, it is hard to imagine significant progress toward abolition without U.S.

leadership. Besides, if the United States fails to lead wisely, others may be more likely to make poor choices.

The dominant military power is also a dominant standard bearer, role model, and trendsetter. Abolition as an end state needed to be reaffirmed after eight years of the Bush administration to shore up the NPT regime. Alliance management and extended deterrence can be shored up if emphasis is placed on pragmatic steps required to make progress toward abolition. Pragmatic steps have the added advantage of opening the aperture toward ideal objectives. As the panel led by General Andrew Goodpaster convened by the Stimson Center noted, "By contemplating the unthinkable, the boundaries of the feasible might well be stretched".²⁹

Washington's current quest for nuclear disarmament helps provide the glue that holds the global nonproliferation system together, whereas the Bush administration's pursuit of a war-winning nuclear posture acted as a solvent. Policies designed to maintain or extend U.S. nuclear dominance invite the very impulses dominance seeks to prevent. They also become trapped in contradictions and hypocrisy. Nuclear dominance, unlike conventional military dominance, is not a very usable commodity in the second nuclear age. Preventive wars or preemptive strikes by means of conventional military capabilities can buy time by slowing down or setting back some proliferation programs. The application of conventional firepower to combat proliferation can, however, provide short-lived gains and be exhausting, even for the United States. The best chance of lasting success to prevent proliferation derives from a norms-based system backed up by the threat of collective action. The norm of nonproliferation has the most credibility when it is linked to the norm of nuclear disarmament, and when norms apply to everyone, not just to bad actors.

²⁹ The Henry L. Stimson Center, "An Evolving US Nuclear Posture", Second Report of the Steering Committee, Project on Eliminating Weapons of Mass Destruction, Report No. 19, December 1995, p. 38.

The New Nuclear Numbers Game

During the first nuclear age, Washington and Moscow adopted all of the accoutrements of nuclear war-fighting capabilities, while second-tier nuclear powers settled for far more modest requirements. In the second nuclear age, when the U.S. military budget is larger than any feasible military alliance directed against it, only Washington can afford to possess “high quality” nuclear deterrence. Russia and China will seek to maintain, at a minimum, the ability to target American cities, and will upgrade their capabilities to counter any U.S. efforts to “escape” from nuclear deterrence.

Nuclear requirements are determined by the presumed military and political utility of nuclear weapons. Old arguments on these matters have not been settled, but the weight of these arguments has undeniably shifted. Powerful weapons that have not been used in warfare for six decades have very little or no military utility, especially for nations that enjoy conventional military advantage against potential foes. The Bomb’s military utility for the United States has, therefore, never been lower. But political considerations relating to the Bomb remain paramount, and this factor comes into play in determining how many – or how few – nuclear weapons to keep.

Complications arise because the political and military utility of nuclear weapons are not completely separable, since presumed political value rests on the Bomb’s destructive capacity. Numerical calculations were inconclusive during the first nuclear age because U.S. comparative advantages related to technical ingenuity, while the Soviet Union generally relied heavily on brute force. Consequently, there were endless reasons to suspect disadvantage, stoke anxieties, and build the next bomb. Despite arguments to the contrary, there is scant evidence that political leaders in the White House or the Kremlin believed in the war-fighting particulars of the plans they signed off on. A close observer of presidential instincts on such matters, McGeorge Bundy, emphatically noted that nuclear analysts lived in an “unreal world. In the real world of real political leaders – whether here or in the Soviet Union – a decision that would bring even one hydrogen bomb on one city of one’s own country would be recognized in advance as a catastrophic blunder; ten bombs on ten cities would be a disaster beyond history”.³⁰ But very few U.S. and Soviet leaders were willing to buck nuclear orthodoxy, especially by delving into nuclear war plans.

³⁰ McGeorge Bundy, “To Cap the Volcano”, *Foreign Affairs*, Vol. 48, No. 1, October 1969, p. 10.

Ronald Reagan and Mikhail Gorbachev were willing to buck nuclear orthodoxy. Their anti-nuclear revolution remains ongoing, in the sense that the Bomb's political as well as military utility continues to decline in relations between major powers, which understand that it would be foolhardy to use nuclear weapons as a deliberate act against one another. There also appears to be a growing recognition among major powers that the manipulation of water or energy resources, trade flows, and currency transactions now have far greater effect than brandishing nuclear weapons. This does not, of course, rule out the use of conventional forces when deemed necessary. But after sixty-plus years in which nuclear weapons have not been used on battlefields, this bar has been raised quite high, applying both to contests between nuclear-armed states and to wars between nuclear- and non-nuclear-armed states.

The trend lines of the second nuclear age have already had dramatic effects on the nuclear numbers game. The "mad momentum" of the nuclear arms competition that Secretary of Defense Robert McNamara railed against in 1967 died with the Soviet Union.³¹ The days when the United States alone produced fifteen variants of nine warhead designs between 1970 and 1997 – an average of one new variant every two and one-half years – are long over.³² The average age of a nuclear weapon in the U.S. stockpile now exceeds twenty-two years.³³ The "action-reaction" phenomenon that McNamara also warned against has not gone away, but it is far more muted during the second nuclear age.³⁴ If nuclear numerology matters less, and if progress toward lower numbers proceeds apace, then the complex relationship between nuclear offense and missile defense could again gain prominence. A distinct minority view in the formative stages of arms control held that a defensive competition would be far preferable to an offensive competition.³⁵ This pristine choice was not, however, in the cards. The real world choice facing the Nixon administration and the Kremlin in the early 1970s was whether the arms competition would proceed unimpeded in both offenses and defenses. Offenses worked and had powerful backers, while missile defenses did not work and had powerful opposition in the United States. As a practical matter and in deference to strategic stability, the Nixon administration elected to compete on offense while greatly constraining missile defense deployments.

The renewed interest in missile defenses by the Bush administration came at a time of steep decline in Russian offensive nuclear forces, a

³¹ Robert S. McNamara, "The Dynamics of Nuclear Strategy", *Department of State Bulletin*, October 9, 1967, p. 450.

³² Email communication from Hans M. Kristensen, August 22, 2007.

³³ "The Next Generation of Nuclear Weapons", *Bulletin of the Atomic Scientists*, Vol. 63, no. 4, July/August 2007, p. 30.

³⁴ McNamara, "The Dynamics of Nuclear Strategy", *op. cit.*, p. 448.

³⁵ One key figure present at the creation of arms control, Donald G. Brennan, left the fold over this issue. See, for example, Donald G. Brennan, "The Case for Missile Defense", *Foreign Affairs*, Vol. 47, No. 3, April 1969, pp. 434-448. For a comprehensive treatment of defense-oriented deterrence, see David Goldfisher, *The Best Defense, Policy Alternatives for U.S. Nuclear Security from the 1950s to the 1990s*, Ithaca, Cornell University Press, 1993.

reaffirmation of the U.S. doctrinal goal of victory in warfare of all kinds, and growing concerns about proliferation in Iraq, Iran, and North Korea. Under these circumstances, even the deployment of limited U.S. missile defenses, especially those situated in what was once the domain of the Soviet Union, could only reinforce the re-valuation of nuclear weapons in Russia. Missile defenses do have a role in protecting against worst cases. They also become more necessary as an insurance policy as significant progress is achieved toward nuclear abolition. But they undeniably complicate arms reductions.

During the first nuclear age, the primary axis of proliferation was vertical, as U.S. and Soviet nuclear arsenals grew precipitously, even without deploying sophisticated missile defenses. Rationales for missile defenses shifted in the second nuclear age, reflecting concerns over horizontal proliferation, especially in Iran and North Korea. While concerns have shifted to the horizontal axis, the problem of vertical proliferation has not gone away, since the Chinese, Indian, and Pakistani nuclear arsenals are growing. One test of the success of U.S. missile defense deployments in the second nuclear age will be whether they are able to counter horizontal proliferation without encouraging the vertical kind.

This dilemma cannot be resolved unless and until relations between major powers improve, and unless regional security issues become less contentious. Missile defenses could help dampen horizontal proliferation when they provide assurance of U.S. protection and support against threatening neighbors. At the same time, their deployment could prompt more investments in the very programs missile defenses are designed to blunt. As ballistic missile defenses mature, investments in cruise missiles – which require different kinds of defenses – are also likely to grow.³⁶

The hardest defense is against missiles that travel the longest distances, whose warheads arrive at very high speeds, accompanied by decoys designed to fool the defenders. Russia's capabilities to penetrate missile defenses are quite mature; little has been written publicly about China's capabilities. Very short-range ballistic missiles, such as those deployed by China opposite Taiwan, are also very hard to intercept when they are fired in mass. More progress has been made against missiles that travel intermediate distances, such as derivatives of Soviet SCUD missiles that have been widely copied. Japan and Israel have already deployed "theater" missile defenses, which also accompany U.S. expeditionary forces in regions where SCUD-type missiles are plentiful.³⁷

³⁶ See Dennis R. Gormley, "Dealing with the Threat of Cruise Missiles", *Adelphi Papers*, No. 339, London, International Institute of Strategic Studies, 2001, and, from the same author, *Missile Contagion. Cruise Missile Proliferation and the Threat to International Security*, Westport, Praeger Security International, 2008.

³⁷ See, for example, Dean A. Wilkening, "The Strategic Impact of Indian Ballistic Missile Defense", Paper presented at the 11th Annual Asian Security Conference, Institute for Defense Studies and Analysis, New Delhi, India, February 3-4, 2009; Michael Krepon, "Missile Defense and the Asian Cascade", in Michael Krepon (ed.), *Nuclear Risk Reduction in South Asia*, New York, Palgrave

Despite the complications that missile defenses pose, continued nuclear arms reductions can be carried out between Washington and Moscow because legacy nuclear arsenals from the Cold War remain so large and because the expense of replacing warheads on a one-for-one basis is so hard to justify. The permitted deployment of over 2,000 nuclear weapons in the 2002 Moscow Treaty reflects the preferences of those most heavily invested in their accumulation. The START Follow-on Treaty will go lower, but will not satisfy those who have completely cast off nuclear numerology. A long-term process that produces much deeper cuts requires parallel, verifiable steps by the Kremlin. To proceed otherwise would be to invite stoppage and setbacks.

Deep, parallel, and verifiable reductions in U.S. and Russian nuclear arsenals are also a prerequisite for other countries to join the long march toward nuclear abolition. One crucial determinant will be whether Russia's leaders can, over time, break the spell of nuclear numerology. Another is whether China's leaders will become significantly more attached to the Bomb as Beijing's fortunes grow. A third crucial determinant for deep cuts will be the willingness of other states with second-tier nuclear arsenals to accept transparency measures regarding nuclear weapon deployments and production like those accepted by Washington and Moscow in the late 1980s. This will be another hard habit to break.

How much will the United States draw down its nuclear arsenal? As low as political and national security conditions permit. The diminishing utility of nuclear weapons and the growing utility of conventional strike capabilities are enduring trends for the United States. Most Americans have fallen out of thrall with nuclear weapons, and the Bush administration's classified endorsement of "decisive" victory in nuclear warfare, was not publicly sustainable. All of this suggests that the pace and extent of bilateral reductions in deployed forces over the few decades will be constrained not by Washington, but by Moscow.

When the Bomb's military utility is low, then only a few particulars matter. Having mechanisms designed to prevent accidental detonations and unauthorized use certainly matters. Nuclear laboratories must also be sure that bomb designs and weapons on hand will produce mushroom clouds if, as a last resort, they are needed. Rudimentary bomb designs that never need to be tested can serve this most basic function of deterrence. Of course, the most obvious target for simple bomb designs – the cities upon which world civilization has been built – presents a morally reprehensible choice. To avoid this choice, more complex bomb designs have been designed for a long list of targets. In truth, these options have only served to provide more, not fewer, morally reprehensible choices.

Macmillan, 2004, pp. 237-270; also see Philip E. Coyle, III, "The Future of Missile Defense Testing", Prepared Testimony before the House Committee on Armed Services, Subcommittee on Strategic Forces, February 25, 2009, at: http://www.armcontrolcenter.org/policy/missiledefense/the_future_of_missile_defense_testing/; Dean A. Wilkening, "A Simple Model for Calculating Ballistic Missile Defense Effectiveness", *Science & Global Security*, 1999, Vol. 8, No. 2, pp. 183-215, at: http://www.princeton.edu/sgs/publications/sgs/pdf/8_2Wilkening.pdf.

During the first nuclear age, the United States and the Soviet Union felt obliged to replace elementary bomb designs with far more powerful thermonuclear weapons, which have subsequently become emblems of status and deterrence for Great Britain, France and China as well. India has claimed this capability, although its sole test of a thermonuclear weapon design may have been insufficient to warrant this claim. If and when India and Pakistan resume nuclear testing, they will likely be seeking greater assurance of similar capabilities.

All states possessing nuclear weapons are either refurbishing weapons built during the Cold War or building new warheads. The United States and, to a lesser extent, Great Britain, do not have the luxury of doing so without intense scrutiny. The United States retains many plutonium “pits” from dismantled weapons that could be recycled, as their shelf life may be as long as 100 years.³⁸ Nonetheless, U.S. deterrence strategists are greatly concerned by the aging cohort of bomb designers and the warheads they built, which are so complex they might someday fail.³⁹ These designs were not built to last; they were built to be replaced by newer, complex designs.

The Bush administration proposed to partially replace Cold War-era weapons with “reliable replacement warheads”, stressing that they would be easier to maintain and far less likely to require a resumption of underground nuclear testing. Acknowledging that an extensive, high profile, and expensive swap of old warheads for newer, more reliable designs could be harmful to U.S. global nonproliferation objectives, the Bush administration promised that the swap would facilitate unspecified reductions in warheads held in reserve, and that the new designs would not entail new roles or missions for the replacement warheads.⁴⁰ The initial reliable replacement warheads were to be fitted atop submarine-based missiles, and carry a yield, like their predecessors, of approximately 100 kilotons. During the Cold War, weapons of this kind were planned for use against industrial targets, harbors, and mobile missile launchers.

The Bush administration’s initiative was not well received domestically or internationally. Nuclear-weapon states under the NPT have every right to modernize their stockpiles, but the well-being of the global nonproliferation system mandates that obligations to nuclear nonproliferation and disarmament be taken as seriously as the dictates of

³⁸ The shelf life of plutonium pits was estimated by an independent panel of government experts, which was then relayed to the Congress. See Linton F. Brooks, “Letter to The Honorable John Warner, Chairman, Committee on Armed Services”, The Department of Energy, National Nuclear Security Administration, November 28, 2006, at: http://www.nukewatch.org/facts/nwd/JASON_ReportPuAging.pdf.

³⁹ See, for example, “Complex 2030: An Infrastructure Planning Scenario for a Nuclear Weapons Complex Able to Meet the Threats of the 21st Century”, Office of Defense Programs, National Nuclear Security Administration, U.S. Department of Energy, October 23, 2006.

⁴⁰ For a series of articles making the case for and against the reliable replacement warhead program, see *Bulletin of the Atomic Scientists*, Vol. 63, No. 4, July/August, 2007, pp. 24-49, especially John R. Harvey, “Nonproliferation’s New Soldier”, *Bulletin of the Atomic Scientists*, Volume 63, No. 4, July/August 2007, pp. 32-33.

nuclear deterrence. The Bush administration's enthusiasm for existing treaties, such as the Comprehensive Test Ban, let alone new ones, was quite selective. Supporters of reliable replacement warheads therefore found themselves in the awkward position of arguing that treaties could be discarded as relics of the Cold War, but that Cold War-era warheads needed to be replaced to execute Cold War-like targeting plans.

If the Obama administration pursues additional efforts to refurbish the U.S. nuclear stockpile, they will be accompanied by sincere efforts to affirm U.S. commitments to nonproliferation and nuclear disarmament. Stockpile refurbishment initiatives will generate howls of protest in some quarters but if, in doing so, the United States would foreclose nuclear testing, the net effect will be to further reduce the salience of nuclear weapons. Put another way, downward pressures on nuclear numbers are greater with stockpile refurbishment than with renewed nuclear testing. If the requirements of nuclear deterrence are greatly simplified as stockpiles are greatly reduced, warhead designs could eventually become quite rudimentary, while accompanying diplomatic initiatives could become more ambitious. Under these circumstances, stockpile refurbishment initiatives could ironically advance the policy preferences of those who are most opposed to them in the United States.

Conclusion

In the second nuclear age, Cold War formulations of nuclear deterrence and arms control strategists have been upended: abundant nuclear capabilities now matter less, while small numbers and modest potential matter more. In this sense, China's example during the first nuclear age may be the herald of the second. It would therefore be most unfortunate if Beijing, flush with new possibilities, becomes enamored with old-fashioned nuclear numerology.

Nuclear weapons continue to command attention, but the political utility of abundant stockpiles and sophisticated capabilities have faded. This can be explained in part because serious disputes between major powers have lost their intensity. In addition, details that mattered so much in the past – throw weights, weight-to-yield ratios, targeting exchange calculations, and the like – no longer fuel public anxieties, which are now focused on volatile or brittle states and religious extremists that seek the Bomb. Another reason for diminished political utility is that, in the second nuclear age, like the first, it is apparent that there is no leverage to be gained from nuclear weapons held by stronger states against weak foes. The new math of the second nuclear age is one of many compelling reasons to seek concrete advances toward the ultimate goal of abolition.

Those who continue to insist that nuclear weapons continue to have military utility must confront the salient fact that these weapons have not been used on battlefields for over sixty years. The informal tradition of non-military use, which includes several cases where states possessing nuclear weapons found themselves in deeply frustrating wars against non-nuclear-weapon states, grows more compelling with every passing year of restraint.⁴¹ Of course, we often hear that records are made to be broken. But the nation that breaks this particular record is likely to be judged quite harshly while inviting bitter consequences.

In asymmetric warfare, it is understandable why stronger states do not derive leverage from nuclear weapons in stand-offs against weaker foes. Far more puzzling and worthy of greater analysis is why weak foes committed to unconventional warfare have yet to employ unconventional weapons against much stronger opposition. One possible explanation is that the weak, like their stronger foes, find more utility in the threat, rather than the actual use, of abhorrent weapons when pursuing intensely political

⁴¹ For a new treatment of this subject, see T.V. Paul, *The Tradition of Non-Use of Nuclear Weapons*, Stanford, Stanford University Press, 2009.

objectives. Another explanation is that religious extremists do not need unconventional weapons to engage in mass casualty acts of terrorism that affect the psyches of their foes.⁴² For whatever reason, our worst nightmares have yet to be realized. They could, however, happen tomorrow – as has been the case every day since Josef Stalin acquired the Bomb six decades ago.

In the second nuclear age, as in the first, relentless, methodical, and comprehensive efforts are required to prevent our nuclear nightmares from occurring. Diplomatic engagement, strong conventional capabilities, containment, deterrence, and cooperative threat reduction efforts remain the best prescriptions for reducing nuclear dangers.

⁴² See Michael Krepon, “The Mushroom Cloud That Wasn’t: Why Inflating Threats Won’t Reduce Them”, *Foreign Affairs*, Vol. 88, No. 3, May/June 2009, pp. 2-7.

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