The Comprehensive Test-Ban Treaty's relevance to global security

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When President Clinton initiated the United States' ratification of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) in September 1997, he called it "the longest-sought, hardest-fought prize in the history of arms control".[1] And so it remains. A central challenge for global security is to reduce all dangers posed by nuclear weapons, be they from legacy arsenals of the Cold War, from new types of nuclear weapons or new nuclear-weapon states, or from terrorist groups. The CTBT is an integral part of a comprehensive approach to nuclear weapons,[2] yet, over the past decade many US CTBT supporters have been more passive than passionate, in the mistaken belief that the norm against nuclear testing is strong enough to provide the primary security benefits of the treaty without the costs and risks of ratification. Far too many people have also accepted the Bush Administration's assertion that the prize is no longer worth fighting for—i.e. that arms control is an outdated relic of the Cold War, which does more harm than good when applied to current security problems. But if the lengthy battle to ban all nuclear testing is viewed as a struggle between those who want to utilize nuclear weapons for national advantage and those who want to constrain them for mutual protection, then the stakes are clearly as high as ever.

The test ban as a bellwether of Cold War arms control

The start of trilateral test-ban negotiations in 1958 marked the superpowers' first concerted effort to use arms control to reduce the costs and risks of nuclear deterrence. Prior to the mid-1950s, neither side had actually believed that the benefits of cooperation on mutually acceptable terms outweighed the relative gains they might achieve through unfettered competition. As nuclear arsenals grew, though, it became increasingly difficult to envision long-term avoidance of nuclear disaster without some cooperation.

The leaders of the Soviet Union, the United Kingdom and the United States chose to focus first on nuclear testing for three simple reasons: each felt deterrence would be more stable without additional nuclear tests; each hoped that remote test-monitoring technologies would instil confidence in compliance with few on-site inspections; and each understood that the fallout from atmospheric testing stoked public fear of nuclear weapons.

Treaty opponents believed that freedom to keep testing nuclear-weapon refinements would benefit their country while covert testing might advantage the other side. But rather than publicly debating whether deterrence would be helped or hurt by more testing, opponents used a string of

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verification concerns to avert a comprehensive agreement. As one of Eisenhower's arms control advisors observed, the sceptics were like "a kid you are trying to put to bed. First he wants a drink of water and then he wants to go to the bathroom, but what he really wants is not to go to bed."[3] The net result was a split-the-difference agreement on the 1963 Partial Test-Ban Treaty (PTBT), which prohibited nuclear-weapon tests in the atmosphere, outer space, and underwater, but allowed unlimited testing underground.[4]

From the mid-1960s through the late 1970s, the superpowers remained rhetorically committed to a total test ban, but the main pressure for a CTBT came from non-nuclear-weapon states. The 1968 nuclear Non-Proliferation Treaty codified the basic bargain of the global non-proliferation regime: non-nuclear-weapon states (NNWS) would forgo nuclear arms if nuclear-weapon states (NWS) made good faith efforts to halt, then reverse, their arms race.[5] A permanent end to all nuclear testing is the only specific arms control measure mentioned in the NPT, underscoring the importance placed on this step.

The three decades between the signing of the PTBT and the start of post-Cold War CTBT negotiations are often viewed as a barren wasteland in the journey to end nuclear testing. The 1974 Threshold Test Ban Treaty and the 1976 Peaceful Nuclear Explosions Treaty prohibited only explosions that no longer appealed to either superpower, but nonetheless they languished unratified until the Cold War was over.

The frustrations of the past ten years can be put in perspective by remembering that even during this much longer, bleaker period, there were achievements. Efforts to devise verification arrangements that balanced legitimate concerns about non-compliance with equally legitimate concerns about espionage and expense helped develop in practical detail the concept of managed access inspections that became a standard component of subsequent arms control accords. The inconclusive 1977–1980 comprehensive test-ban negotiations produced agreement in principle on regional monitoring stations, a data exchange system and challenge inspections—innovations that became part of the CTBT's verification system.

After the Reagan Administration renounced the CTBT as a policy goal, the Group of Scientific Experts kept the issue on the agenda by using the World Meteorological Organization's Global Telecommunications System to demonstrate how a global seismic network could work. And in the mid-1980s, Mikhail Gorbachev let a US non-governmental organization place seismic monitoring stations near the main Soviet test site as part of his public diplomacy campaign to persuade Congress, the American public and other NATO members that the Soviet Union was not the "Evil Empire".

The end of the Cold War was expected to remove the most fundamental obstacle to a comprehensive test-ban treaty. In 1991, Russia began another moratorium that continues to this day. In 1992, George H.W. Bush announced that the United States had no further need to test for the purpose of developing new types of nuclear weapons, and Congress restricted testing for stockpile safety and reliability purposes. Test-ban treaty negotiations offered a way to formalize, institutionalize and internationalize these parallel testing moratoria—important both to consolidate improvements in Russia–United States strategic relations and to expand the nuclear restraint regime to address emerging global security challenges.[6]

The value of a comprehensive test ban in 1996

The 1995 NPT Review and Extension Conference, at which the future of the NPT was to be decided, provided an important impetus to initiate test-ban treaty negotiations. All five NWS were

united against proliferation and in favour of indefinite extension.[7] A majority of NNWS, though, were reluctant to extend the NPT indefinitely without corresponding commitments to speed the pace of nuclear arms control, as covered by Article VI of the treaty.[8] Significant progress toward a comprehensive test ban before the 1995 NPT conference would therefore be important in gaining the best possible outcome at the conference. The five nuclear-weapon states explicitly approved a statement of Principles and Objectives for Nuclear Non-Proliferation and Disarmament, with the first action item being a comprehensive test-ban treaty by 1996.

Thus, the primary importance of the CTBT for strengthening the non-proliferation regime is not that it prevents non-nuclear-weapon states from testing nuclear weapons, an obligation already covered by the NPT. Rather, it represents the principle of equity in the eyes of NNWS, without which the non-proliferation regime will not be enthusiastically supported or indefinitely sustained.

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The CTBT was also intended as a pragmatic response to the dilemma posed by the three "threshold states". India, Pakistan and Israel had no intention of joining the NPT as NNWS, and could not join it as NWS, so the goal was to draw them into the nuclear restraint regime using accords that did not differentiate between nuclear "haves" and "have-nots". Moreover, nuclear tests have historically been used for political purposes as well as technical ones, so a legal commitment by the threshold states not to test was considered very important for regional stability and global non-proliferation, even if the three states had undeclared bombs in the basement or just a screwdriver away.

Finally, China was at a critical decision point in the mid-1990s regarding its future security policy. It had historically been the most restrained of the nuclear-weapon states in terms of doctrine, stage of development, and numbers of deployed weapons. It had never, however, accepted any legal constraints on its nuclear programme nor pursued arms control as an important element of its security policy. When it came to the CTBT, the choice for China was starker than for any other NWS, because ending tests would preclude putting multiple warheads on its new long-range missile or significantly expanding the size of its nuclear arsenal without resuming fissile material production. Thus, China's decision to participate constructively in the CTBT negotiations calculated that its current minimal deterrence posture would be sufficient for post-Cold War strategic circumstances and that the benefits of a stronger non-proliferation regime outweighed those of nuclear-weapon development.[9]

Even after all five NWS had concluded that an end to nuclear testing could enhance their security, agreement on the details proved difficult. The United States made concessions on some secondary issues such as the entry-into-force requirements, but on issues of primary importance US negotiators got terms very close to those that the Clinton Administration thought would strike the optimal balance between ensuring compliance while preserving stockpile reliability and protecting sensitive information. The other NWS acquiesced with the United States' preferred "true zero" definition of the treaty's scope, even though the US Stockpile Stewardship Program could make better use of subcritical experiments. The CTBT also permits states to request an on-site inspection based on information from their national technical means of verification without being required to reveal their sources and methods, even though many delegations believed that this gave the United States "a clear advantage and a license to spy".[10] The US delegation even delivered what the US intelligence community wanted in terms of monitoring technologies and station locations to complement US national technical means. The terms are so advantageous to the United States that the chief US negotiator predicted that should the Senate reject the treaty, there would be "jubilation among our foes … (while) [o]ur allies and friends will feel deserted and betrayed".[11]

The United States and nuclear testing today

The 1999 vote against ratification said more about US domestic politics than it did about American attitudes toward the CTBT. There was overwhelming bipartisan public support for ratification,[12] but supporters underestimated how vigorously opponents would fight the treaty, and the Clinton Administration lacked a strategy to persuade Jesse Helms, then chair of the Senate Committee on Foreign Relations and a staunch arms control opponent, to give the treaty a fair hearing. A small group of treaty foes in the Senate knew that public support for the treaty was strong even among Republican voters, and they did not want ratification to become an election-year issue. The committee offered to hold a few hearings and a vote on a very truncated schedule in the hope of persuading all Republican Senators to vote "no" before the administration could assemble its best case or mobilize public pressure for ratification. Treaty supporters agreed, in the mistaken belief that Senate leaders would postpone the vote pending more thorough deliberations rather than repudiate a major international security agreement for the first time since the Treaty of Versailles in 1920.

After the ratification debacle, the White House and the State Department finally agreed to appoint a Special Advisor to the President and the Secretary of State for the Comprehensive Test Ban Treaty. Former Chairman of the Joint Chiefs of Staff General John Shalikashvili organized the type of consultation, education and assessment effort that should be a routine part of any meaningful ratification process. He met, over a ten-month period, with a broad spectrum of Senators, administration officials and other scientific, diplomatic and security experts. He commissioned reports from think-tanks and cooperated with a parallel National Academy of Sciences' study.[13] This process strengthened his conviction that "the Treaty is a very important part of global non-proliferation efforts and is compatible with keeping a safe, reliable U.S. nuclear deterrent".[14]

General Shalikashvili believed that with the end of the Cold War, the United States and NATO only needed nuclear weapons to guard against a catastrophic nuclear miscalculation by a potential adversary. He judged that:

> It would not be in our security interest to assign a high profile role to nuclear weapons in the U.S. military posture. Better that they remain in the background, for if the world's strongest conventional power needed new types of nuclear weapons, other nations would have even more incentive to acquire them. Any activities that erode the firebreak between nuclear and conventional weapons or that encourage the use of nuclear weapons for purposes that are not strategic and deterrent in nature would undermine the advantage that we derive from overwhelming conventional superiority.[15]

The Shalikashvili report was largely written when it was unclear whether Al Gore or George W. Bush would be the next president. By the time the final report was presented to President Clinton on 5 January 2001, Bush was set to assume the presidency. In his meeting with National Security Advisor-to-be Condoleezza Rice, General Shalikashvili underscored that CTBT supporters, sceptics and opponents all agreed that the United States needed to revitalize support for an integrated non-proliferation strategy. He hoped that since President Reagan had progressed from depicting arms control as "fatally flawed" to negotiating the first arms control accord to eliminate an entire class of nuclear weapons, George W. Bush might grow to appreciate the importance of CTBT ratification for US leadership of global non-proliferation efforts. General Shalikashvili warned that "the longer entry into force [of the CTBT] is delayed, the more likely it is that other countries will move irrevocably to acquire nuclear weapons or significantly improve their current nuclear arsenal, and the less likely it is that we could mobilize a strong international coalition against such activities".[16]

The Bush Administration and nuclear testing

The Bush Administration has made selective non-proliferation a centrepiece of its national security strategy, vowing to keep the world's most dangerous weapons out of the hands of the world's most dangerous people. However, the administration prefers ad hoc coalitions of the willing over binding agreements and implementing organizations. The 2006 National Security Strategy mentions the NPT, but only to call for closing a "loophole" by insisting that no more NNWS be allowed to have enrichment or reprocessing capabilities.[17]

The moratorium on nuclear tests has been maintained and the United States has repeatedly called on other countries to do likewise. President Bush himself decided in August 2001 that the United States should pay all but a small percentage of its assessed contribution to the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), on the grounds that building up the International Monitoring System helps deter and detect foreign nuclear tests, but that developing procedures for on-site inspections is pointless since the United States has no intention of ratifying the treaty. In 2006, however, the Bush Administration requested and Congress agreed to pay only US$ 14.4 million (about 75% of the United States' share), a reduction that Secretary of State Rice attributes to tight budgets, not opposition to the CTBTO's mission.[18]

The Bush Administration claims that it wants to reduce the role of nuclear weapons in US security policy to reflect the changed circumstances of global security. Official statements and leaked portions of the classified Nuclear Posture Review make clear, however, that the intent is to reduce relative dependence on offensive nuclear weapons by increasing US non-nuclear strike options and missile defence, not by significantly decreasing the number, type, or alert status of nuclear weapons in the US arsenal.[19] The United States currently spends about US$ 6.4 billion a year on stockpile stewardship, up from US$ 4.5 billion at the time of the ratification vote in 1999.

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The current administration's National Security Strategy places much greater emphasis on coercive prevention than on deterrence or cooperative threat reduction. It assumes that rogue states will use weapons of mass destruction (WMD) for aggression, intimidation and blackmail, and that traditional deterrence will not work against terrorists. It declares the intention to use force, unilaterally if necessary, to prevent adversaries from acquiring the means to make WMD.[20] This strategy expands potential missions for nuclear weapons and increases pressure to develop new, more "usable" designs.

American proponents of new nuclear-weapon development have focused on two very different initiatives: low-yield warheads that could purportedly be used with minimal collateral damage to sterilize stores of chemical and biological weapons (i.e. "mini-nukes") and earth-penetrating weapons (EPWs) to destroy hard and deeply buried targets (i.e. "bunker busters"). These two concepts frequently get conflated, leaving the impression that if only the United States could test again, it could have a clean nuclear solution to a wide range of post-Cold War security problems that cannot be easily addressed with current conventional capabilities.[21]

In reality, most targets that the Nuclear Posture Review identifies for new nuclear missions could be disabled or destroyed using non-nuclear means with less harm to nearby civilians and none of the costs associated with using nuclear weapons for the first time since 1945. Only a small subset of targets—those that are moderately deep and precisely located—could be destroyed by a nuclear weapon. Earth-penetrating nuclear warheads could not destroy targets below 50m for a one-kiloton weapon and 300m for a one-megaton weapon. EPWs require lower yields to achieve the same effect as other types of nuclear weapons, so collateral damage could be reduced. But use of a single relatively

small EPW would still kill tens to hundreds of thousands of people if detonated near an urban area.[22] Therefore, after several years of supporting Bush Administration requests to study new types of nuclear weapons, Congress has denied funds for the Department of Energy's Robust Nuclear Earth Penetrator (RNEP) project and directed the Department of Defense to focus on conventional options.

Some Congressional critics of RNEP have been more enthusiastic about another rationale for new nuclear-weapon designs called the Reliable Replacement Warhead (RRW) programme. Proponents assert that stockpiled warheads are deteriorating with age, could become unreliable, and would be difficult to remanufacture and certify without nuclear testing. Therefore, they want the Department of Energy to develop replacement warhead designs that would be less expensive to build and maintain. RRW-backers suggest that weapons based on these new designs would be easier to certify without nuclear testing than would weapons remanufactured to the specifications of previously tested designs. They also hold out the hope that more reliable warhead designs and a "responsive infrastructure" able to produce large numbers of nuclear weapons at short notice would allow for further cuts in the United States' non-deployed strategic warhead stockpile.[23] Congress provided almost three times as much money as the Bush Administration requested for 2006, on the condition that RRW design efforts "stay within the military requirements of the existing deployed stockpile and … the design parameters validated by past nuclear tests".[24]

If the Bush Administration is determined to explore new nuclear-weapon designs, then RRW is less provocative than RNEP, but it is still unnecessary and unwise. The Secretaries of Energy and Defense certify annually that US nuclear weapons are safe and reliable, and top energy officials routinely testify that the Stockpile Stewardship Program is working well. The claim that the United States could save money by building less streamlined warheads is flawed because proposed changes to the "nuclear explosive package" (the core of the weapon, and the only part that cannot be fully tested under the CTBT) would probably necessitate extensive testing and possibly very expensive redesign of the re-entry vehicle. The assertion that the RRW programme would make future nuclear testing less likely rests on the faulty assumption that political and military leaders would have more confidence in newly designed warheads that had never been explosively tested than they would in remanufactured warheads based on extensively tested designs.[25] Finally, starting down this road without US adherence to the CTBT is risky because there is no guarantee that Congress will maintain current restrictions on the RRW programme in future years.

The moratorium has apparently lulled a majority of US citizens into believing that the United States has already ratified the CTBT and that these new nuclear-weapon projects are not likely to lead to a resumption of nuclear testing around the world. An April 2004 poll found that 56% of respondents believed that the United States already participates in the treaty, compared with 36% that knew it does not. In all cases, there was a strong preference for non-proliferation strategies based on multilateral arms control over those based on unilateralism and military threats. Well over 80% of respondents favoured US participation in the CTBT regardless of whether or not they heard pro and con arguments.[26] The American public clearly believes that the CTBT remains highly relevant to global security, even if the President and many policy elite think that mutual moratoria are good enough.

Encouraging ratification and entry into force

The CTBT still matters

Efforts to persuade elected officials to undertake the work and accept the stronger legal commitment that comes with ratification should begin by reviewing why the treaty remains a worthy prize. The

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China and the United States face stronger pressures now to develop new types of nuclear weapons than they did in the mid-1990s. The primary impetus in the United States is internal, and comes from the same community of people who have always believed that the solution to any tough security problem is nuclear. The main motivation for China would be external, should it become seriously concerned about deterrence stability in light of the more offensive orientation of US security strategy and its progress on missile defence.

The challenges posed by the nuclear programmes of Iran and North Korea have grown more urgent without the non-proliferation regime being able to agree on a response at the 2005 NPT Review Conference. The South Asian tests in 1998 sharpened the dilemmas posed by the Indian and Pakistani nuclear-weapon programmes, while the deteriorating security situation in the Middle East makes it hard to ignore the fact that Israel is also outside the NPT. Finally, fear of nuclear terrorism has increased significantly since the mass casualty attacks of 11 September 2001.

The CTBT alone could not solve any of these problems. But it is hard to argue that the United States and the rest of the world are in a better position to address them if a testing free-for-all resumes or the mutual moratoria are maintained than if the treaty enters into force. Instead, the CTBT remains an important part of an integrated strategy to prevent proliferation and strengthen the nuclear restraint regime. And while it does not deal directly with terrorist acquisition or use of nuclear weapons, it would help create a climate in which states might seriously consider the innovative forms of collaboration needed for mutual protection against such possibilities.

From a technical standpoint, the constraints on new nuclear-weapon development and stockpile confidence are the same if states forgo all explosive testing as a policy choice or as a legal obligation. There is no agreed scope definition for the moratoria, though, raising the possibility that a nuclear-weapon state could quietly and unilaterally redefine its moratorium policy to exclude very low-yield tests.[27] The technical possibilities for undetected testing are also greater with mutual moratoria than with the CTBT in force.

Non-nuclear-weapon states could expect an unsophisticated fission device to work without testing it, but states could not confidently develop more efficient fission weapons, thermonuclear designs with higher yield-to-weight ratios, or third-generation technologies such as enhanced radiation weapons. Renewed US study of advanced nuclear weapons has not identified any concepts where the marginal improvement over current capabilities would outweigh the costs of test resumption. If China, India or Pakistan were to test again, however, their nuclear postures could then change, with major implications for regional and global security. The North Korean situation is significantly different if that country has a handful of untested nuclear devices or not, if it explodes a bomb to draw attention to its capabilities, or if it makes many warheads that can be mated to its ballistic missiles.

While Americans often prioritize the technical side of arms control, the rest of the world places at least as much weight on the political dimension. Here, the differences between mutual moratoria and a comprehensive test-ban treaty in force are even clearer. The nuclear-weapon states made an explicit commitment in 1995 to secure the indefinite extension of the NPT. It is not realistic to expect the NNWS to rush forward with more intrusive International Atomic Energy Agency oversight of their civilian nuclear programmes, let alone to accept new constraints on their nuclear activities, if the NWS do not fulfil their Article VI obligation, which is what matters most to everyone else.

The most important effect of the CTBT may be psychological. An agreement to end all nuclear testing amounts to acceptance that further nuclear-weapon development will not enhance security.

Ever since the invention of nuclear weapons, some security experts have viewed them as the "ultimate weapon", which can be used for a wide range of military and political purposes, while others have viewed them as too destructive for any rational purpose besides deterrence, if even that. Historically, the strongest opposition to nuclear-test restrictions has come from people who think about nuclear weapons in traditional war-fighting terms and assume that continued improvements could enhance security more than closer international cooperation would. A global ban on nuclear testing would symbolize widespread acceptance of the opposite point of view: that post-Cold War deterrence requirements can be easily met by a fraction of existing nuclear weapons and emerging threats to global security are better addressed through international collaboration. An indefinite moratorium minimizes pressure to resolve this conceptual conflict, and thus perpetuates uncertainty about the basic principles shaping the future of global security.

CTBT opponents fought so intensely during the 1999 ratification debate because their entire worldview was threatened, and this gave them disproportionate influence on the outcome. This perspective dominates US policy at the moment, but only about 20% of American policy elites and the general public actually believe that initiating the use of nuclear weapons might be appropriate in some circumstances, while another 20% believe that the United States should never use nuclear weapons, and 57% believe that they should only be used in response to a nuclear attack.[28] If ratification of the CTBT was pursued, not as an end in itself, but as part of a well-organized effort to articulate principles for US nuclear policy that are in accord with majority beliefs and to institutionalize policies reflecting current nuclear realities, the outcome would likely be better.

How to ratify

Some people have suggested that US domestic politics has "killed" the CTBT in its current form, and that the only way to move forward on test restrictions is to renegotiate a new treaty on terms that are even more favourable to the United States. For example, Terry Deibel has argued that Clinton should have "lowered the stakes" by excluding small nuclear explosions, limiting the treaty's duration and lowering the bar for on-site inspections, even though such a treaty would have been more difficult to negotiate and less effective for non-proliferation.[29] Such suggestions may be intended as constructive incrementalism, but they are similar to the "sinkers" that test-ban treaty sceptics incorporated into the Carter Administration's negotiating position to preclude agreement in the late 1970s. Ambassador Ledogar has testified that a test-ban treaty could not have been negotiated on those terms in the mid-1990s. It would be completely counterproductive to try to back-pedal now, when over 130 countries have ratified the treaty and the world has invested more than US$ 300 million in its verification regime.

It would be equally unwise to invest time and energy in provisional entry into force for those countries that have already ratified the treaty. Even if such an effort were successful—and that is unlikely—it would not accomplish any of the main objectives for the treaty because China, India, Iran, Israel, North Korea, Pakistan and the United States are still outside. To create a major difference between the current situation and that under provisional entry into force, states parties would need to agree that the consultation, clarification and on-site inspection provisions could be invoked amongst themselves. Since the Russian Federation has ratified, but the United States has not and yet has a number of close allies among the ratifying states, such an arrangement could subject Russia to an on-site inspection if questions were raised about activities being done at its test site in the name of stockpile maintenance, whereas the same possibility would not apply to the United States. This asymmetrical situation would give the United States a new incentive to remain outside the treaty, whereas keeping the treaty's full verification provisions provides a reason to keep doing the work necessary for ratification and entry into force.

Time and energy would be much better spent blocking initiatives that further endanger the CTBT; promoting the moratorium as an interim measure rather than a stable solution; and preparing the International Monitoring System for entry into force. In the United States, the most important challenges are to raise public awareness about the disconnect between majority preferences and current security policies, and to promote a more penetrating discussion of nuclear weapons' relevance to current global security problems. The other countries that have or are contemplating nuclear weapons and that have not yet ratified the CTBT must confront this fundamental question too. Will competitive nuclear-weapon development make them safer or stand in the way of the closer cooperation needed for security and prosperity in a world of porous borders, diffuse threats, powerful technologies and tightly linked economies?

The half-century of efforts to end testing has symbolized the struggle between those who believe that nuclear weapons are too destructive for any purpose besides core deterrence, if even that, and those who believe that the power of nuclear weapons can be used for national advantage on security problems of any scale from global war, to civil conflict, to terrorist cells. Progress has been possible when the former group has been just as creative, persistent, and intense as those with the latter views. With the successful conclusion of the CTBT negotiations in 1996, the marathon entered the home stretch, although obstacles remain and the end is out of sight. The obstacles are evidence that those who view nuclear weapons in traditional military terms still have disproportionate influence on nuclear policy. The higher the hurdles seem, though, the more valuable the prize will be when the finish line is crossed.

Notes

1. James Bennet, "Clinton, at U.N., Says He'll Press Senate on Test Ban Pact," *The New York Times,* 23 September 1997, p. A3, at <www.fas.org/nuke/control/ctbt/news/nws_nyt.htm>.
2. See Weapons of Mass Destruction Commission, 2006, *Weapons of Terror: Freeing the World of Nuclear, Biological, and Chemical Arms,* Stockholm, at <www.wmdcommission.org>.
3. Quoted in Robert Divine, 1978, *Blowing on the Wind: The Nuclear Test Ban Debate, 1954-60*, New York, Oxford University Press, p. 239.
4. Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water, Moscow, 5 August 1963, at <www.fas.org/nuke/control/ltbt/text/ltbt2.htm>. Also known as the Limited Test-Ban Treaty.
5. Full title: Treaty on the Non-Proliferation of Nuclear Weapons, 1 July 1968, at <disarmament.un.org/wmd/npt/npttext.html>.
6. The term "nuclear restraint regime" refers to all the treaties, norms and national policy decisions since 1945 that have helped minimize the number of states with nuclear weapons, reduce the role of nuclear weapons in security policy, and prevent the use of nuclear weapons in war. For a comprehensive assessment, see Sidney Drell and James Goodby, 2003, *The Gravest Danger,* Palo Alto, CA, Hoover Institution Press.
7. China and France had joined the NPT in 1992. Thomas Graham, who served as President Clinton's Special Representative to the NPT Review and Extension Conference, recollects that France and Russia, the United Kingdom and the United States were strong public supporters of indefinite extension, and that China was more circumspect, but probably favoured that outcome, too. See Thomas Graham, 2002, *Disarmament Sketches*, Seattle, WA, University of Washington Press.
8. Article VI states:

   > Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.
9. Jeffrey Lewis, forthcoming, *The Minimum Means of Reprisal: China's Search for Security in the Nuclear Age,* Cambridge, MA, MIT Press.
10. Statement by Ambassador Stephen J. Ledogar, Senate Foreign Relations Committee Hearing on the CTBT, 7 October 1998, at <www.fas.org/nuke/control/ctbt/text/100799ledogar%20.htm>.
11. Ibid.
12. In July 1999, a poll commissioned by the Coalition to Reduce Nuclear Dangers found that 82% of Americans

wanted the treaty ratified, with 71% of respondents *strongly* supporting ratification and only 14% saying that it should not be approved. See <www.clw.org/archive/coalition/rel072099.htm>.

13. National Academy of Sciences, 2002, *Technical Issues Related to the Comprehensive Nuclear Test Ban Treaty*, Washington, DC, National Academies Press, at <fermat.nap.edu/catalog/10471.html>.
14. General John M. Shalikashvili, 2001, "Findings and Recommendations Concerning the Comprehensive Nuclear Test Ban Treaty", January, at <www.fas.org/nuke/control/ctbt/text/ctbt_report.html>. The report identifies steps that the United States could take without renegotiating the treaty to address ambivalent Senators' concerns about its non-proliferation value, its verifiability, its effects on stockpile reliability and its duration.
15. Shalikashvili, op. cit., p. 5.
16. Transmittal letter to President Clinton, reprinted with the Shalikashvili report.
17. Government of the United States, The National Security Strategy of the United States, March 2006, p. 20, at <www.whitehouse.gov/nsc/nss/2006>.
18. Jacob Parakilas, 2005, "Congress Cuts CTBTO Funding", *Arms Control Today,* vol. 35, no. 10, December, p. 25, at <www.armscontrol.org/act/2005_12/Dec-CTBTO.asp>.
19. Excerpts from the January 2002 Nuclear Posture Review Report are at <www.globalsecurity.org/wmd/library/policy/dod/npr.htm>.
20. Government of the United States, The National Security Strategy of the United States of America, September 2002, p. 15, at <www.whitehouse.gov/nsc/nss.pdf>.
21. Jonathan Medalia, 2005, "Bunker Busters: Sources of Confusion in the Robust Nuclear Earth Penetrator Debate", CRS Report for Congress, 10 January, at <www.fas.org/spp/starwars/crs/RL32599.pdf>.
22. Charles L. Glaser and Steve Fetter, 2005,"Counterforce Revisited", *International Security,* vol. 30, no. 2, Fall, pp. 84–126. See also National Research Council, 2005, *Effects of Nuclear Earth-Penetrator and Other Weapons,* Washington, DC, National Academies Press, at<www.nap.edu/catalog/11282.html>.
23. Statement of Ambassador Linton F. Brooks, House Armed Services Committee Subcommittee on Strategic Forces, 1 March 2006, at <www.nnsa.doe.gov/docs/congressional/2006/2006-03-01_Brooks_HASC_Testimony.pdf>.
24. Wade Boese, 2005, "Congress Cuts Nuclear Bunker Buster Again", *Arms Control Today,* vol. 35, no. 10, December, pp. 23–24, at <www.armscontrol.org/act/2005_12/Dec-Bunker.asp>.
25. Robert W. Nelson, 2006, "If it Ain't Broke: The Already Reliable U.S. Nuclear Arsenal", *Arms Control Today,* vol. 36, no. 3, April, at <www.armscontrol.org/act/2006_04/reliablefeature.asp>.
26. Steven Kull, 2004, *Americans on WMD Proliferation,* A PIPA/Knowledge Networks Poll, April 15, at <www.pipa.org/OnlineReports/WMDProliferation/WMD_Prolif_Apr04/WMDProlif_Apr04_rpt.pdf>.
27. This occurred in the late 1950s nuclear test moratorium. See Nancy Gallagher, 1999, *The Politics of Verification*, Baltimore, MD, Johns Hopkins University Press, p. 108.
28. Chicago Council on Foreign Relations, 2004, *Global Views 2004: US Leaders Topline Report,* September, p. 22, at <www.ccfr.org/globalviews2004/sub/pdf/2004_US_Leaders_Topline_Report.pdf>.
29. Terry L. Deibel, 2002, "The Death of a Treaty," *Foreign Affairs,* September/October.