Nuclear Threat Reduction CAMPAIGN

A program of Vietnam Veterans of America Foundation and The Justice Project

THE COMPREHENSIVE TEST BAN TREATY (CTBT)

I. The Issue

History

Testing plays a key role in enabling countries to develop, produce, deploy, and improve nuclear weapons. Thus, a ban on testing could prove an effective nonproliferation strategy.

In 1954, in response to the burgeoning arms race between the United States and the Soviet Union, Indian Prime Minister Jawaharlal Nehru first proposed a "standstill agreement" that would ban further testing of nuclear weapons.[1] Though both nations pursued a tenable agreement, verification issues proved intractable. After a few years of unsuccessful efforts, negotiations for a testing ban broke down after a U.S. reconnaissance plane (the U-2) was shot down over the U.S.S.R. on May 1, 1960, immediately cooling Soviet-American relations.

Nevertheless, the growing risks of environmental damage from above-ground testing, resulted in the development of the 1963 Limited Test Ban Treaty (LTBT), which proscribed tests in the atmosphere, outer space, and underwater. Also, the LTBT parties noted in the preamble that the limited ban was a step toward "the discontinuance of all test explosions of nuclear weapons for all time"; and in article I, committed to "continue their negotiations [for] … the cessation of all underground nuclear weapon tests." Subsequently, in the Threshold Test Ban Treaty (TTBT), which was signed in 1974 and limited testing yields to not more than 150 kilotons, the United States and the Soviet Union agreed to "continue their negotiations [for] … the cessation of all underground nuclear weapon tests."

The 1970 Nuclear Non-Proliferation Treaty (NPT) recognized the association between nuclear testing and proliferation in its preamble, and subsequent NPT review conferences have expressed the need for the addition of a comprehensive testing ban to the nonproliferation regime. Through the 1970's and 80's, the United States and the Soviet Union reached other arms-limitation agreements; but concerns about verification, cheating, and falling behind the other side's nuclear program prevented a comprehensive ban from becoming a reality.

The end of the Cold War, however, fundamentally changed the competitive dynamic surrounding nuclear weapons. In 1992, President Bush eliminated several new nuclear weapons programs and signed into law the Hatfield-Exon amendment, which included a nine-month test moratorium and a call to begin negotiations for a comprehensive test ban treaty within four years.[2] President Clinton continued the test moratorium through his time in office, as has President George W. Bush thus far.

The Comprehensive Test Ban Treaty (CTBT), however, did not take shape until midway through the first term of the Clinton administration. Preliminary discussions began in 1994 at the United Nations Conference on Disarmament. A major breakthrough occurred at the 1995 NPT Extension and Review Conference, at which the parties agreed to extend the NPT indefinitely and called for a global and verifiable agreement by September 1996 to ban all testing.

The major points of contention in the negotiations were the conditions under which withdrawal would be permitted, whether to allow low-threshold (sub-kiloton) nuclear explosions, and the number and category of signatories required for the CTBT to enter into force.

On September 24, 1996, the CTBT passed the UN General Assembly and opened for signature. The United States was the first to sign, but has not yet ratified, the agreement. The treaty has not yet entered into force.

The CTBT was brought to the Senate for ratification in 1999 despite a letter signed by 62 Senators calling for postponement of a vote on it two days before the vote was to be held. Although polls showed that public support for the CTBT was over 80 percent,[3] the CTBT lost 48 – 51. The CTBT still sits with the Senate Foreign Relations Committee.

CTBT Provisions

The CTBT comprises seventeen articles that outline the proscription of nuclear tests, the creation of verification bodies and procedures, the range of responses for noncompliance, and the process of entry into force. In article I, the parties agree "not to carry out any nuclear weapon test explosion or any other nuclear explosion."[4]

To decide policy issues and govern disputes, the treaty stipulates the creation of the Conference of State Parties, which will oversee the Executive Council, a body of 51 nations that will serve as the Treaty's day-to-day decision-making body. Membership to the executive council will be partly decided by regional vote, include one regional rotating position, and allocate 1/3 of the seats to nations that contribute significant monetary and technical assistance or have a high level of nuclear advancement.[5]

To monitor compliance, the treaty requires that a global verification regime (GVR) be operational when the treaty enters into force. The establishment of such a regime is the main activity of the Preparatory Commission for the Comprehensive Test Ban Treaty Organization (PCCTBTO). The GVR consists of two parts: the International Monitoring System (IMS), with stations around the world, and a process, including challenge inspections, for clarifying and resolving suspected breaches of treaty obligations.

The IMS would assist in information sharing, transparency, and verification through an international databank accessible to every signatory. Currently, the IMS features 83 seismic, radionuclide, hydroacoustic, and infrasound stations[6] to detect nuclear explosions. Eventually it is to include 321 monitoring stations and 16 radionuclide laboratories.[7] If a state party cannot adequately explain within 48 hours an ambiguous event detected on its territory by the IMS, an individual state monitoring system, or other

means consistent with international law (not espionage), any other state can request an onsite inspection. Inspection proposals must include the approximate depth and location of the event, search boundaries not to exceed 1,000 square kilometers, and all evidence upon which the request is based. An inspection will go forward if it is supported by 30 of the 51 nations in the CTBT Executive Council. The Comprehensive Test Ban Treaty Organization (CTBTO) would conduct any inspections approved by the Council. Such inspections may not exceed 60 days or drill for soil and rock samples without approval from the Executive Council. Also, if the Council decides a request is frivolous or abusive in nature, it may penalize the requesting party.

For the treaty to come into force, all 44 of the "nuclear states," that is, those with either nuclear power or research reactors as of September 1996, must both sign and ratify the treaty. State parties must agree without reservations; and once ratified, the treaty remains in force indefinitely.

The CTBT, which has been signed by 171 countries and ratified by 109, has not yet entered into force, as only 32 of the 44 nuclear states have signed and ratified the agreement. Of the nuclear weapons-states, the United Kingdom, France, and Russia have ratified the treaty; China, the United States, and Israel have signed but not ratified it; and India, Pakistan, and North Korea (assuming it has a nuclear weapon) have not signed.

The Ratification Debate

Since the United States became a signatory in 1996, policymakers have examined the treaty in every detail. Proponents of the CTBT consider it a bulwark against proliferation and a future arms race and thus vital to U.S. national security. Adversaries of ratification deem the treaty as weak and dangerous to U.S. national security. Below are the major points of contention voiced by experts, scientists, and legislators in the context of CTBT debate, particularly in the Senate hearings before the ratification vote in 1999. The major areas of concern are as follows: Locking in U.S. Nuclear Superiority; Maintenance of the Nuclear Stockpile; Effectiveness of the International Nonproliferation Regime; Reliability of the Verification and Monitoring Provisions; and Advisability of an Agreement of Indefinite Duration.

Locking in U.S. Nuclear Superiority

Treaty supporters argue that the CTBT would curtail advances in nuclear weaponry by our main strategic competitors, Russia and China, and effectively "lock in" existing American strategic superiority. Opponents, however, express apprehension about successfully maintaining the integrity of the U.S. nuclear arsenal without testing.[8]

Assuming the stockpile remains effective, as discussed below, the United States would maintain a huge advantage in expertise over any other existing or burgeoning nuclear weapons state in the presence of a testing ban. From 1945 to 1992, the United States conducted 1054 nuclear tests involving a wide variety of designs, yields, and environments, outnumbering the closest competitor, the Soviet Union, by 339 tests.[9] Given the great U.S. technological advantage resulting from these tests and U.S. computer simulation capabilities, no other nation could conceivably challenge the United States in developing and deploying more powerful and advanced nuclear weapons in the absence of the kinds of detectable testing that would be necessary for the development of such

weapons.[10] Furthermore, the CTBT's contribution to the establishment of an international norm against the legitimacy of nuclear weapons plays in to the vast conventional superiority currently enjoyed by the United States.[11]

Maintenance of the Nuclear Deterrent

The disagreement about the possibility of maintaining the U.S, nuclear deterrent in the absence of testing revolves around the Stockpile Stewardship Program (SSP).[12] The SSP is intended to ensure the "safety and reliability" of the U.S. nuclear arsenal without an explosive test. Instead, scientists use sophisticated computer simulations, lasers, and physical tests on selected components of weapons to prove the viability of the arsenal.[13] In consultation with the three nuclear weapons laboratories, the Secretaries of Energy and Defense annually certify the safety and reliability of the nuclear stockpile in a memorandum to the President.[14] Opponents assert that only actual explosions of these devices can both ensure readiness and indicate unforeseen problems from aging that need to be addressed. Proponents, however, cite the nearly half a century of experience with nuclear weaponry as more than adequate to determine both the effects of aging and any flaws in design. Spurgeon Keeny Jr., then-president of the Arms Control Association, remarked:

> "The notion that our stockpile, which has more than half a dozen different designs of nuclear weapons and several thousand deployed weapons, would suddenly, despite the tremendous resources available to the stewardship program, become unreliable, unusable and known to be so by the rest of the world, is simply absurd."[15]

Moreover, in the event that a problem develops in the stockpile that, in the President's view, necessitates testing, the treaty's six-month withdrawal period is a year shorter than the 18-month test-readiness capability that DOE hopes to achieve by the end of FY 2005.

Effectiveness of the International Nonproliferation Regime

If the CTBT enters into force, it will represent a substantial cog in the international nonproliferation regime along with the NPT. Supporters declare that this test ban would further build upon the success of the NPT by making it even harder for proliferant states to develop nuclear weapons, especially those incorporating the sophisticated designs necessary for manufacturing missile warheads.[16] The CTBT would also advance the NPT's nuclear disarmament goal by helping to de-emphasize the role of nuclear weaponry. Furthermore, the CTBT could bring states outside the NPT into the broader nonproliferation system, thereby impeding further development of their arsenals.

Opponents of the CTBT, however, express doubt as to its effectiveness as an anti-proliferation measure. No international agreement about nuclear weapons, in their view, will prevent any signatory that is determined to develop nuclear weapons from doing so. They question the effectiveness of international arms control agreements in general, citing the behavior of states such as North Korea, Iran, Iraq under Saddam Hussein, and Libya, which pursued WMD programs despite their explicit treaty obligations not to do so. In the view of CTBT opponents, a test ban would constrain the options of only states that pose no threat in the first place.[17]

Supporters, however, present a very different worldview. They claim that the CTBT would prevent states that wanted to cheat on NPT obligations from developing nuclear weapons, particularly the more advanced kind, without detection, by raising the political costs of doing so.[18] The CTBT will alter the cost-benefit calculations a state would consider when deciding whether or not to test a nuclear device. It would not only enable a universal international response to cheating, making political and economic sanctions much more effective, but significantly increase the likelihood that cheating will be detected by the IMS as well. The costs become more tangible and the benefits thus become more elusive. Advocates of the CTBT point to success that the NPT has exhibited over the past 33 years as evidence that international norms, also known as "soft power,"[19] really do affect state behavior in tangible ways. South Africa's renunciation of its nuclear arsenal, the persuasion of countries such as South Korea, Brazil, and Argentina to abandon their nuclear arms programs, and the surrender by three former Soviet republics of nuclear weapons contained in their borders after the breakup of the USSR illustrate this point. As Deputy Secretary of State Richard Armitage said in a 2003 speech,

> "…instead of the 25 or so countries, that President Kennedy once predicted, only a handful of nations possess nuclear weapons… Agreements such as the Nuclear Nonproliferation Treaty and the Chemical Weapons Convention, organizations such as the IAEA and Nuclear Suppliers Group—these constitute a global security architecture that has served us satisfactorily and kept us safe."[20]

Under the "soft power" rubric, the additional political costs and obligations embodied within the CTBT could thus be used to apply further pressure on North Korea and Iran to comply with their NPT obligations.[21] The test ban would also limit the development of more advanced weapons by India, Pakistan, and Israel.

Reliability of Verification and Monitoring Provisions

The likely effectiveness of Comprehensive Test Ban Treaty Organization (CTBTO) inspections and the IMS also impact the question of ratification. Backers of ratification argue that the IMS can at worst supplement existing U.S. capabilities to detect both low-yield nuclear explosions and preparations for testing, including the development of the capacity to build nuclear weapons. In fact, the Administration's FY 2005 budget request describes the IMS as "providing important security benefits."[22]

Moreover, an express U.S. commitment would supply both further legitimacy and additional competence to the monitoring and verification effort. Opponents, conversely, assert that the monitoring system can never detect every low-yield test that may be militarily significant. They argue that under conditions in which the United States cannot test, undetected cheating, particularly by countries antagonistic to U.S. interests, may threaten our security.[23] Additionally, detractors assert the potential for political stalemate in the inspection process for violators, precluding swift international action when necessary.

Opponents also express major concerns not only about the effectiveness of inspections but also about the technical and logistical aspects of the IMS. The IMS itself involves not only technology questions but political exigencies as well; hence, the locations and types of monitoring systems are yet to be fully decided upon. Without a concrete plan for the IMS, as well as methods to ensure that monitoring data taken from within states suspected of cheating is not doctored, they assert that the CTBTO is

effectively deaf and blind.[24] Advocates for the CTBT answer that it is not likely the CTBT will come into effect until all of the technical issues have been worked out and that U.S. involvement is imperative in the preliminary stages. In addition, the measures necessary to evade detection by a functioning IMS will be almost impossible for most countries.

Successful evasion for would-be cheaters is a tough challenge indeed. With a fully functioning IMS, only outlandish scenarios, such as testing behind the sun on a deep space vehicle or testing during an earthquake, might enable a cheater to have a realistic chance of evading detection.[25] The only practical evasion strategy is "decoupling," a method in which tests are performed in large underground caverns in salt deposits or hard rock. When a weapon is detonated in a thin shaft, as is the case with most underground tests, the explosive force melts, moves, and crushes the surrounding rock, emitting strong seismic signals similar to earthquakes and volcanoes. Decoupling serves to diminish, or prevent completely, these "noisy" seismic effects of a nuclear test by allowing much of the force to dissipate before it reaches the walls of the cavern. In the 1966 "Sterling" test, the United States decoupled a 0.38-kiloton nuclear test in an underground salt cavity created by a previous nuclear explosion, reducing the low-frequency seismic signature by a factor of 71.7.[26] In other words, while the explosion had a yield of 380 tons of TNT, it "sounded" to low-frequency seismic detectors like 5.3 tons. However, as noted below, high-frequency detectors closer to the test site can greatly reduce the decoupling factor.[27]

The difficulty with decoupling, of course, is in acquiring a sufficiently large cavity; only salt caverns created by previous nuclear explosions have ever been used to successfully muffle a nuclear explosion.[28] To illustrate, the size of the salt cavern necessary to decouple a 5-kiloton explosion at 820 meters of depth (close to the deepest a salt deposit can support) could hold the Statue of Liberty; and caverns closer to the surface require even larger volumes for the same effect.[29]

No non-nuclear method, such as hydraulic mining, has ever created a stable salt cavern large enough for a decoupling experiment. The effort necessary to create such a large space under the surface using any technologically feasible non-nuclear technique would surely create perceptible byproducts, such as increased salinity in surrounding bodies of water or visible depressions in the ground above, that satellite imagery, human intelligence, or onsite inspections would detect. Furthermore, if the physical characteristics of the cavity and the yield of the explosive are not appropriately matched, the decoupling effect is reduced precipitously.[30] Hydraulic salt mining produces cavities that are elongated, irregular, and filled with brine, significantly decreasing their utility for predictable decoupling experiments.[31] Proliferators with little or no test experience would find it difficult to accurately predict the yield of a nuclear device, making it even harder for them to create the ideal cavern for a decoupled test. In terms of geography, decoupling is far beyond the physical resources of many countries of particular concern. Iran, Pakistan, and the western region of China, (where China's large salt deposits exist), lack the water sources necessary for large-scale hydraulic mining; and North Korea does not even have large enough salt deposits to support a decoupling experiment.[32]

Finally, no country has ever successfully decoupled an explosion in hard rock. The stability of a rock cavern is harder to predict. Moreover, in addition to being more difficult to decouple, explosions in rock formations provide an additional means of detection: Natural or explosion-caused fissures and faults in the surrounding rock could allow for the venting of radioactive materials into the atmosphere.[33]

A robust IMS will give the United States access to stations closer to potential test sites. Monitoring posts closer to an event can detect higher frequency seismic waves that are less susceptible to decoupling and provide a clearer picture of the true size of any nuclear explosion.[34] For example, taking into account high frequency signals, the decoupling factor of 70 experienced in the Sterling test decreases to 7.[35] Furthermore, the IMS has proven capable of detecting events below its intended minimum threshold of 1 kiloton. The IMS system allowed scientists to conclude that the August 1997 seismic event at the Russian Novaya Zemlya test site originally suspected to be a clandestine nuclear test was actually an earthquake in the Kara Sea, something that the existing U.S. monitoring capabilities alone could not determine.[36] The earthquake measured 3.3 on the Richter scale, the equivalent of a 0.1-kiloton nuclear explosion.[37]

General John Shalikashvili illustrated the barriers to successfully hiding a nuclear test in his report on the CTBT in 2000:

> A potential cheater would have to calculate correctly the combined capabilities of national, international, and scientific monitoring systems. … [I]t would have to surmount numerous practical constraints and make tough judgment calls on a long list of technical questions about which even American experts disagree. Attempts to camouflage tests or test preparations generate their own suspicious signals. Synergies among monitoring technologies must also be considered. Most objectives would require a series of secret tests, and each explosion would increase the probability of discovery. Finally…states that violate their legal obligations risk having their citizens reveal what remote monitoring could not uncover.[38]

Any testing necessary to produce weapons comparable to those in the U.S. arsenal would easily be detected seismically and thus would allow the United States adequate time to develop any needed response before such weapons would become operational. Even smaller nuclear weapon tests, including those below one kiloton, are still in danger of detection by the IMS, satellite imagery, on-site inspections, residual gas analysis, or human intelligence. Ultimately, the treaty's supporters claim, the CTBT and the IMS can only help the United States' own detection capabilities, essentially improving U.S. monitoring that has already demonstrated the ability to detect low-yield explosions.[39]

Advisability of an Agreement of Indefinite Duration

The CTBT has no termination date; once it enters into force, it will remain in effect in perpetuity. Supporters laud the indefinite time-span of the CTBT because it represents an effort by the international community to preclude further nuclear weapons development. From that point, it is hoped, the world could focus on eliminating the weapons already in existence. Opponents, however, fear this perceived commitment due to uncertainty about the SSP, the IMS, and future threats to U.S. security. They believe that with no room to re-evaluate or renew the treaty under changing circumstances, the United States will be constrained in responding to a national security threat in the future.[40]

Concerns about the time-span of the CTBT touch every other issue surrounding its ratification from the effectiveness of the SSP to the detection capability of the IMS. For critics, the indefinite tenure of the treaty raises the stakes in those other areas, making the margin of error much smaller. For example, many fear that the SSP will ultimately prove inadequate to maintain the U.S. stockpile. Some may be willing to submit to a "test run"

for a finite period with the prospect for re-evaluation. In their eyes, however, the CTBT asks for a full commitment with no opportunity to turn back.

However, the CTBT, as in the case of other treaties involving the security of nations, allows for withdrawal when a state determines that its "supreme national interest" requires it to do so.

Furthermore, if a U.S. nuclear test does become necessary, the six-month withdrawal period is much shorter than the time required to prepare for a nuclear test in the first place.[41] No proposal evinced more ire on the part of the international community than the U.S. suggestion of a ten–year/easy-out provision in which any country could leave the treaty after ten years with no explanation.[42] Renegotiation to include such a measure would thus come at a price, presumably the dismantling of a major part of the not only the CTBT but perhaps the elimination of the indefinite status of the NPT as well.[43]

II. Recent Legislation

- The United States' contribution to the CTBT Preparatory Commission is funded annually through the Nonproliferation, Anti-terrorism, Demining and Related Programs account in the Foreign Operations appropriations bill. For fiscal year 2004, under title II of division D of the Consolidated Appropriations Act, 2004 (Public Law 108-199; January 23, 2004), the amount allocated to the Commission, primarily the International Monitoring System, is $18.9 million.[44]

III. Obstacles

- The CTBT cannot come into force until all 44 states with nuclear technology, enumerated in Annex II, have both signed and ratified the treaty. To date, only 32 of these states have done so.
    - China, Colombia, Congo, Egypt, Indonesia, Iran, Israel, the United States, and Vietnam have signed but not ratified.
    - North Korea, India, and Pakistan have not signed.
- So long as the United States refuses to ratify the CTBT, the ability of the international community to put pressure on states such as North Korea, India, and Pakistan to sign and ratify the treat will be minimal.
- Recent U.S. policy decisions involving the Robust Nuclear Earth Penetrator and the Advanced Concepts Initiative and the lowering of the minimum preparation time for a nuclear test to 18 months by 2005 may make other nations wary of adhering to a nuclear testing ban.

IV. Q&A

Q: Can a nation successfully develop a nuclear weapon in the absence of a testing? If so, what is the use of the Comprehensive Test Ban Treaty?
A: It is true that a working nuclear weapon can be designed, manufactured, and detonated without testing – Little Boy, the atomic weapon dropped on Hiroshima in 1945, was not a tested design. The physics and design of a Hiroshima (gun-type) atomic weapon are relatively simple, and, with the right material (highly enriched uranium), most states could build a working device rather easily. However, the CTBT would prevent the development of implosion-type weapons using plutonium and the more efficient and complicated

designs necessary to build weapons that can be loaded onto missiles, which require extensive testing and expertise to develop a reliable weapon.

Q: If a country's clandestine testing program can successfully evade detection by the IMS or other monitoring entity, will this put the United States at a disadvantage?
A: With the development of the International Monitoring System, enhanced by the United States' own means of detection, it is only remotely possible that even a small nuclear explosion could be concealed. Any country contemplating the conduct of a test or series of tests in violation of the CTBT, it if were to enter into force, would thus have to balance the likelihood of detection and the ensuing sanctions against the military advantage that it would gain from testing. Also, the size of the weapon or weapons that such a nation could hope to test without detection would have to be quite small. Thus, it is most unlikely that even a series of clandestine nuclear tests would place the United States, which has conducted over 1,000 nuclear tests, at any disadvantage relative to its own nuclear weapons stockpile.

Q: Is the CTBT verifiable?
A: No verification regime, not even the Nuclear Nonproliferation Treaty safeguards process, can provide absolute certainty regarding a state's compliance with its treaty obligations. A treaty's verification procedures can, however, dramatically decrease the likelihood a state can ignore its obligations without detection. The IMS has been proven to exceed original expectations by detecting at several stations a seismic event in the Kara Sea that was equivalent to a 0.1-kiloton nuclear explosion,[45] which is less than one-fifth of one percent the size of the Hiroshima bomb's destructive force.

In addition, individual country monitoring systems, human and satellite intelligence, and CTBTO onsite inspections would provide further avenues of detection for even a single clandestine nuclear explosion. Techniques to evade all of these detection methods range from the near impossible (muffling the explosion in an enormous underground cavity) to the outlandish (performing a test explosion in space behind the sun). All said, it is highly unlikely that a single nuclear explosion, and nearly impossible that a series of nuclear explosions, would escape detection by all of the monitoring systems available to the CTBT.

Q: What does the United States gain by the CTBT?
A: The CTBT would prevent a future nuclear arms race to develop new generations of nuclear weapons—which would require testing—and maintain the primacy of the superior (or at a minimum, unsurpassed) United States nuclear technology acquired through the conduct of 339 more tests than the Soviet Union conducted. Perhaps most importantly, the CTBT would prevent new states from developing nuclear warheads that could be mounted on ballistic or cruise missiles.

In contrast, the United States gives up almost nothing. The U.S. retains its nuclear stockpile. If reasons of national security necessitate a nuclear test, the United States can withdraw from the treaty at any time. In addition, if the U.S. does withdraw from the CTBT, the six-month withdrawal period will **at best** be a year shorter than the time necessary to prepare for a nuclear test.

V. Talking Points

- From the very beginning of nuclear weapons treaties, the United States and the international community has expressed the need, and intention, to proscribe any nuclear explosions. The CTBT represents the culmination of this movement.
- The CTBT will support the Nuclear Nonproliferation Treaty (NPT) by further marginalizing states that continue to pursue nuclear weapons. In fact, at the 1995 NPT review conference, all member states agreed to move towards a global and verifiable testing ban as a key component of the global nonproliferation regime.
- The monitoring systems under the CTBT would add to the U.S. ability to detect nuclear tests around the world.
- A successful test ban would "lock-in" U.S. nuclear superiority and prevent new states from developing the capability to build nuclear warheads that could be mounted on ballistic or cruise missiles.
- The CTBT would allow the United States to withdraw from the CTBT when it is in its "supreme national interest" to do so. Thus, in the unlikely event that a difficulty in the U.S. nuclear stockpile ever necessitated testing in order to maintain a safe and reliable arsenal, the United States could withdraw upon giving six-months' notice.

VI. Factoids

- The United States was the first state to sign the CTBT in 1996, but has not yet ratified the agreement despite public support upwards of 80% for the treaty.
- The CTBT would be verified through the International Monitoring System (IMS) and onsite inspections performed by the Comprehensive Test Ban Treaty Organization (CTBTO).
    - Upon completion, the IMS will have at least 321 seismic, hydro-acoustic, and infrasound monitoring stations and 16 radionuclide laboratories located around the world.
    - If a suspicious event is not adequately explained within 48 hours, any member state may request an onsite inspection, which will proceed if 30 of the 51 nations of the Executive Council vote in favor.
- The CTBT will enter into force after every nation with nuclear power or research reactors signs and ratifies the agreement. Of the 44 states, only 32 have signed and ratified. Three states, India, Pakistan, and North Korea, have not signed the treaty.
- The United States maintains a substantial lead in testing experience. Since 1945, the United States has performed 1,054 test explosions, 339 more than its closest competitor.
- The Stockpile Stewardship Program began in 1995 to maintain the readiness, safety, and security of the U.S. nuclear stockpile in the absence of testing.[46]
- The United States could withdraw from the CTBT six months after announcing its intention to do so and perform a nuclear test. In contrast, it will take 18 months to prepare for a test by the end of 2005.

VII. Applicable Treaties, Legislation, and Other International Agreements

- The Comprehensive Test Ban Treaty[47]
- The Nuclear Nonproliferation Treaty[48]
- The Limited Test Ban Treaty (also known as the Partial Test Ban Treaty)[49]

[1] The brief history of test ban efforts draws from Gen. John M. Shalikashvili, "Letter to the President and Report on Findings and Recommendations Concerning the Comprehensive Nuclear Test Ban Treaty," Jan. 4, 2001, accessed at Hhttp://www.state.gov/www/global/arms/ctbtpage/ctbt_report.htmlH; and Lawrence Sheinman, "Issue Brief: Comprehensive Test Ban Treaty (CTBT)," Nuclear Threat Initiative, April 2003, accessed at Hhttp://www.nti.org/e_research/e3_9b.htmlH.

[2] "WMD 411 Chronology – 1992," Nuclear Threat Initiative and the Center for Nonproliferation Studies, Monterrey Institute of International Studies, accessed at: Hhttp://www.nti.org/f_wmd411/1992.htmlH.

[3] Mellman Group Inc. and Wirthlin Worldwide, "Analysis of Voter Attitudes Toward the Comprehensive Test Ban Treaty," Coalition to Reduce Nuclear Dangers, June 29, 1999, accessed at: Hhttp://www.clw.org/pub/clw/coalition/mellmanwirthlin0799.htmH.

[4] The text of the treaty can be accessed at Hhttp://www.ctbto.org/treaty/treaty_text.pdfH.

[5] *Ibid.*

[6] "International Monitoring System Station Certifications in 2003," CTBTO Featured Article, Jan. 15, 2004, accessed at Hhttp://www.ctbto.org/H.

[7] *Ibid.*

[8] Jeane Kirkpatrick, Prepared Statement for the Senate Foreign Relations Committee, Final Review of the Comprehensive Test Ban Treaty, Oct. 7, 1999.

[9] The U.S. total includes 24 joint U.S./U.K. tests; for more information, see: U.S. Department of Energy, *United States Nuclear Tests: July 1945 through September 1992*, DOE/NV—209-REV15, December 2000, p. xii, accessed at: Hhttp://www.nv.doe.gov/news&pubs/publications/historyreports/pdfs/DOENV209_REV15.pdfH; the figures for the Soviet Union come from: "Known Nuclear Tests Worldwide 1945-98," Coalition to Reduce Nuclear Dangers, June 1999, accessed at: Hhttp://www.clw.org/pub/clw/coalition/chartworldtests.pdfH.

[10] Robert A. Manning, "Test Ban Advances National Security, Opens Opportunity for New Nuclear Agenda," Progressive Policy Institute, August 16, 1995, accessed at: Hhttp://www.ppionline.org/ppi_ci.cfm?cp=2&knlgAreaID=450004&subsecid=900020&contentid=2040H; and Christopher Paine, "Facing Reality: Resuming Nuclear Test Explosions Would Harm U.S. and International Security," Natural Resources Defense Council, January 1999, accessed at: Hhttp://www.nrdc.org/nuclear/acato.aspH.

[11] John M. Shalikashvili, *op. cit.*, note 1.

[12] For more information about the SSP, refer to Issue Brief #18 earlier in this volume.

[13] National Academy of Sciences, Committee on International Security and Arms Control, "Technical Issues Related to the Comprehensive Test Ban Treaty" (Washington: National Academy Press, 2002) p. 20, accessed at: Hhttp://www.nap.edu/html/ctbt/H. See also Issue Brief #18 in this volume.

[14] James Tyler, "Annual Certification Takes a Snapshot of Stockpile's Health: The Nuclear Arsenal Gets a Yearly Checkup," *Science and Technology Review*, July-August, 2001, accessed at: Hhttp://www.llnl.gov/str/JulAug01/Tyler.htmlH.

[15] Quoted in "Damage Assessment: The Senate Rejection of the CTBT," *Arms Control Today*, Sep./Oct., 1999, accessed at: Hhttp://www.armscontrol.org/act/1999_09-10/pcso99a.aspH.

[16] "WMD 411: The Comprehensive Test Ban Treaty," Nuclear Threat Initiative and the Center for Nonproliferation Studies, Monterrey Institute of International Studies, accessed at: Hhttp://www.nti.org/f_wmd411/f2i.htmlH.

[17] Kathleen C. Bailey, "The Comprehensive Test Ban Treaty: The Costs Outweigh the Benefits," *Cato Institute Policy Analysis, No. 330*, Jan. 15, 1999, p. 23, accessed at: Hhttp://www.cato.org/pubs/pas/pa-330es.htmlH.

[18] Lawrence Sheinman, *op. cit.*, note 1.

[19] For more on Soft Power theories of international relations, see the writings of Joseph Nye, such as: Joseph Nye, "The Decline of America's Soft Power," *Foreign Affairs*, May-June 2004, *et alia.*

[20] Quotation taken from Carl Levin and Jack Reed, "Toward a More Responsible Nuclear Nonproliferation Strategy," *Arms Control Today*, Jan./Feb., 2004, accessed at Hhttp://www.armscontrol.org/act/2004_01-02/LevinReed.aspH.

[21] Terry L. Deibel, "The Death of a Treaty," *Foreign Affairs*, 81:5, Sep./Oct., 2002, p. 2.

[22] Department of State Fiscal Year 2005 Congressional Budget Justification, Foreign Operations Request, p. 141, accessed at: Hhttp://www.state.gov/documents/organization/28971.pdfH.

[23] Kathleen C. Bailey, *op. cit.*, note 17, p. 3.

[24] *Ibid.*, pp. 13-14.

[25] Office of Technology Assessment, *Verification of Nuclear Testing Treaties*, OTA-ISC-361 (Washington, D.C.: U.S. Government Printing Office) May, 1988, pp. 95-97, accessed at: Hhttp://www.wws.princeton.edu/cgi-bin/byteserv.prl/~ota/disk2/1988/8838/883808.PDFH.
[26] *Ibid*., p. 101.
[27] See text accompanying note 35.
[28] Only the United States and Soviet Union have ever performed decoupled tests, the last, a Russian 10-kiloton partially decoupled test, occurred in 1976. Still existing caverns in Russia created by previous underground nuclear tests are only suitable for decoupling explosions of less than 0.1 kilotons. Larger caverns exist in Kazakhstan that could potentially support tests of up to 4 kilotons – but Kazakhstan no longer possesses nuclear weapons. For a more detailed and technical account, see Lynn R. Sykes, "False and Misleading Claims about Verification during the Senate Debate on the Comprehensive Nuclear Teat Ban Treaty," *F.A.S. Public Interest Report*, 53:3, May/Jun. 2000; accessed at Hhttp://www.fas.org/faspir/v53n3.htmH.
[29] Christopher Paine, *op. cit.*, note 10.
[30] *Ibid*.
[31] Office of Technology Assessment, *op. cit.*, note 25, p. 99.
[32] Lynn R. Sykes, *op. cit*., note 28 and Dan M. Davis and Lynn R. Sykes, "Geologic Constraints on Clandestine Nuclear Testing in South Asia," *Proceedings of the National Academy of Sciences of the United States of America*, September 1999: 96, accessed at: Hhttp://www.pnas.org/cgi/reprint/96/20/11090.pdfH.
[33] Office of Technology Assessment, *op. cit.*, note 25, pp. 99-100.
[34] *Ibid*.
[35] Christopher Paine, *op. cit*., note 10.
[36] Gregory van der Vink, Jeffrey Park, Richard Allen, Terry Wallace, and Christel Hennet, "False Accusations, Undetected Test and Implications for the CTB Treaty," *Arms Control Today*, May 1998. pp. 9-10, accessed at: Hhttp://www.geology.wisc.edu/~rallen/index.htmlH.
[37] Christopher Paine, *op. cit.*, note 10.
[38] John M. Shalikashvili, *op. cit*., note 1.
[39] Richard Garwin, "Panel Discussion: 'An Uncertain Future for the Nuclear Testing Moratorium," Carnegie International Nonproliferation Conference, November 14, 2002, p. 4, accessed at: Hhttp://www.ceip.org/files/projects/npp/pdf/conference/lottmantranscripts/Garwin.pdfH.
[40] Caspar Weinberger, Statement before the Senate Foreign Relations Committee, Final Review of the Comprehensive Test Ban Treaty, Oct. 7, 1999.
[41] The current timeframe required to prepare a site for a nuclear test is about 24 months; and DOE is trying to achieve an 18-month test readiness by the end of FY 2005. Department of Energy Fiscal Year 2005 Congressional Budget Submission, p. 83, accessed at: Hhttp://www.mbe.doe.gov/budget/05budget/content/weapons/Camp.pdfH.
[42] John M. Shalikashvili, *op. cit.*, note 1.
[43] Responses to media questions by Spurgeon M. Keeny, Jr., then president of the Arms Control Association, and Ambassador Thomas Graham, then-president of the Lawyers Alliance for World Security in "Damage Assessment: The Senate Rejection of the CTBT," *op. cit.*, note 15.
[44] The amount is not specified in the appropriations act. Rather, it is allocated by the Department of State within the amount appropriated to Nonproliferation, Anti-terrorism, Demining and Related Programs. See the Department of State Fiscal Year 2005 Congressional Budget Justification, Foreign Operations Request, p. 141, accessed at: Hhttp://www.state.gov/documents/organization/28971.pdfH.
[45] Testimony of John Holum, Director, Arms Control and Disarmament Agency, before the Senate Committee on Governmental Affairs, Subcommittee on International Security Proliferation and Federal Services, March 18, 1998, accessed at: **H**http://www.clw.org/pub/clw/coalition/0318hear.htm#holumtestimonyH.
[46] For more information on the Stockpile Stewardship Program, see Issue Brief #18 in this volume.
[47] Available at: Hhttp://www.ctbto.org/treaty/treaty_text.pdfH.
[48] Available at: Hhttp://www.nti.org/db/nisprofs/fulltext/treaties/npt/npttry.htmH.
[49] Available at: Hhttp://www.nti.org/db/nisprofs/fulltext/treaties/ptbt/ptbt.htmH.