CHAPTER 6

Dealing with objections to the CTBT

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Introduction

This chapter deals with a major piece of unfinished business—achieving entry into force of the Comprehensive Nuclear Test Ban Treaty (CTBT). This Treaty, called 'the longest-sought, hardest-fought prize in arms control history' by President Clinton, was negotiated from 1994 to 1996 at the Conference on Disarmament in Geneva. It has been signed by 183 countries and ratified by 164. According to the Treaty's provisions, it cannot enter into force until it has been ratified by 44 named countries. This chapter focuses on the technical, legal and political situation and issues surrounding the CTBT. It has a US focus, since ratification by the US is widely viewed as the key to finally achieving entry into force.

Recent developments

The importance of the Comprehensive Nuclear Test Ban Treaty (CTBT) on the world stage was brought into sharp focus by the appearance of more than 100 references to it at the Nuclear Non-Proliferation Treaty Review Conference, held at the UN in New York from 27 April to 22 May 2015. These conferences, which occur only every five years, provide important insights into the status of nuclear nonproliferation worldwide and the strengths and weaknesses of this crucial regime. Many countries, in their national statements to the conference, emphasised the importance of bringing the Treaty into force and called out those eight states whose ratification is required for this to occur—the US, Iran, Israel, Egypt, China, India, Pakistan, and North Korea.

Another important event was the CTBT Science and Technology Conference held in Vienna from 22–26 June 2015. This is the latest in a series of such events, held every two years, to report the latest scientific research relevant to the implementation and verification of the CTBT. This work focuses on the four monitoring technologies used by the International Monitoring System (IMS)—seismic, radionuclide, hydroacoustic and infrasound—plus on-site inspection (OSI); which together make up the CTBT's verification regime This latest conference drew over 1,000 scientists from around the world, who presented a large number of formal lectures and more than 300 poster presentations. It was preceded by a three day workshop on a large on-site inspection

exercise held in Jordan in November, 2014.[1] The Science and Technology Conference concluded with an 'Academic Forum,' in which professors and other experts discussed their experiences in presenting on the CTBT to students and other audiences.

The gathering was hosted by Lassina Zerbo, Executive Secretary of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO). Keynote addresses were given by Naledi Pandor, Minister of Science and Technology of South Africa, Ahmet Uzumcu, Director General of the Organization for the Prohibition of Chemical Weapons and Lord Des Browne, former UK Secretary of Defence and current Vice-Chairman of the Nuclear Threat Initiative. Strong contributions were also made by William Perry, former US Secretary of Defense, Frank Klotz, Administrator of the US National Nuclear Security Administration', Robin Grimes, Chief Scientific Adviser to the UK Foreign and Commonwealth Office and Michael Linhart of the Ministry of Foreign Affairs of Austria, among others.

It is difficult to summarise such a large scientific gathering. Many of the reports will be published in scientific journals and the abstracts are already available.[2] While there were no dramatic scientific headlines, it is fair to say that the overall conclusion is that the techniques for detecting and identifying clandestine nuclear explosions are continuing to improve impressively and there is great interest in the associated science.

Nevertheless, it must be recognised that obstacles to entry-into-force still exist. In particular, in spite of the high priority assigned to US ratification of the treaty by the Obama administration when it came into office in 2009, the two-thirds vote required in the US Senate have yet to be secured. The reasons for this are no doubt partly political, but it should be recognised that more tangible objections are also put forward by reasonable people. An examination of these, in view of the latest developments, could be helpful in clarifying these issues.

One rather unusual aspect of the CTBT debate is how little the arguments against the CTBT have changed over decades, going back even to the Eisenhower and Kennedy administrations of the 1950s and 1960s. In particular, the statements made today in opposition to the Treaty are remarkably similar to those heard in 1999, when the Treaty went down to a rather decisive and surprising defeat in the US Senate. The arguments in favor are also largely the same as those which were, or which should have been, made then. These arguments, while familiar, are strengthened by 16 years of hard work and experience by the CTBTO and the States-Signatories themselves.

Objection #1: the verification regime is not effective enough

This argument has grown steadily more difficult to sustain as the IMS has been developed and operated, and experience with OSI has grown—in particular with the Integrated Field Exercise in Jordan last year (IFE14).[3]

A major milestone was the 2012 report by the US National Academy of Sciences.[4] Briefly, this highly authoritative report concluded that, as of 2012, the size of a nuclear explosion anywhere in the world that could be reliably detected by the IMS is well under 1 kilotonne TNT equivalent. In Asia, Europe and North Africa, the thresholds are substantially better—between 0.09 and 0.22 kilotonne TNT equivalent. This is no accident—the system was designed that way. The detection threshold for underwater explosions is much lower—about 10 tonnes TNT equivalent worldwide, and explosions down to about 1 ton TNT equivalent through the majority of the world's oceans. Regarding OSI, the academy concluded that teams of inspectors investigating a location suspected of having hosted a nuclear test would have a high likelihood of detecting evidence of any explosions greater than about 100 tonnes TNT equivalent.[5,6] Of course, there is very little likelihood that even a modest explosion could go undetected in the atmosphere or space.[7]

The conclusions of the 2012 report by the National Academy of Sciences—which would be even more favorable after three years of further progress—are generally accepted. However, objections persist. One obvious contention is that no one has said that the IMS could reliably detect *all* nuclear explosions down to zero yield. In particular, claims are still made that a state could cheat by carrying out a clandestine explosion in a specially prepared cavity or salt dome, thus attenuating (decoupling) the seismic signal, perhaps by as much as a factor of 70. These claims are based upon very limited test data involving old tests and ignore other factors that would complicate or reveal such efforts. The academy largely dismissed this cheating scenario. Other hypothetical possibilities, such as hiding a small nuclear explosion in conventional mining blasts were also considered and dismissed as unrealistic.

Of course, it is possible that a very small explosion could go undetected. Those familiar with the CTBT verification regime have always understood that. The next question is: 'so what?' How much advantage would be gained by conducting such a test against the substantial risk of being caught? That goes beyond the scope of this paper, but the key point to bear in mind is that the possibility that a state could make undetected advances through very small explosions would be far greater if there were no CTBT.

Scientists have justifiably pointed to the performance of the IMS during the North Korean underground nuclear tests in 2006, 2009 and 2013. An impressive number of seismic stations detected these relatively small explosions, along with some data from radionuclide and infrasound stations. Nevertheless, some critics have objected that North Korea made no attempt to hide their tests and even announced them publicly. This is, of course, true, but that hardly means there is something deficient in the IMS. Another criticism was that the IMS produced no radionuclide detection data during the second North Korean test. Several points can be made about this. First, the radionuclide

network was not fully operational, especially with respect to stations close to North Korea. Second, although the lack of radionuclide detections may have been somewhat of a surprise, it was never claimed that all underground tests would vent radionuclides from the underground site of the explosion into the atmosphere—perhaps North Korea was fortunate in this respect or perhaps they showed some skill at containment. Third, if the CTBT were in force and the on-site inspection mechanism invoked at the request of a member state, the excellent location information generated by the IMS would have put inspectors on–site where convincing evidence of a nuclear explosion would almost certainly have been obtained. Satellite imagery also provided good location information on these activities.

One interesting development at the CTBT Science and Technology Conference was speculation that there may have been an additional very small nuclear explosion in the DPRK on 12 May 2010. This had been inferred from data from Chinese seismic stations and an intensive search that produced data from three additional stations which may support that conclusion.[8] This study represents an exemplary case for a suspected CTBT violation which could have prompted an on-site inspection, if the Treaty had been in force.

A key point which is generally not discussed is that the outstanding efforts of the CTBTO, which develops and maintains treaty's verification regime discussed above, are not the only tools in the verification arsenal.[9] The entire world of so-called 'National Technical Means' would be brought to bear to help monitor the CTBT. It is widely known that the US has substantial assets in this realm, but it is certainly not alone. Among these capabilities available to many states are national seismic and radionuclide detection stations not in the IMS, high-resolution satellite imagery, collection of both particulate debris and gases from both the ground and the air, Bhangmeters and electromagnetic pulse detectors on satellites, interferometric synthetic aperture radar and other NTM. The key point is that, the potential cheater knows neither the capabilities nor the location of these systems.

The bottom line on verification is that it is no longer credible to argue that the Treaty does not meet the standard of being effectively verifiable.

Objection #2: the CTBT is not compatible with the need to maintain the nuclear weapon stockpile

The other major argument that has been circulating for decades is the possible need for nuclear weapons states to carry out new nuclear explosive tests to determine the safety and effectiveness of existing stockpiles, or perhaps even to develop new weapons. This argument has been most prominent in the US, but presumably might be of

concern to all states with nuclear weapons. The National Academy of Sciences also addressed this important issue in some detail. In summary, the report noted that US plutonium pit lifetimes now are 85–100 years and concluded that a safe, secure and reliable US stockpile can be maintained without explosive testing, provided that certain criteria are met. These criteria had to do with the scientific and engineering workforce, production facilities, stockpile surveillance, among other issues. These safeguards were largely refined and updated versions of those recommended by the 2001 Shalikashvili Report.[10] Similar considerations would presumably apply to any country which felt the need to maintain its stockpile as long as nuclear weapons exist. Another key point is that the Treaty does not prohibit a very wide range of testing of the many components of a nuclear weapon—only the actual nuclear explosion itself—and powerful computer simulations can be brought to bear on this task.

It should be noted that some of the more thoughtful opponents of the Treaty grant that there is no need for testing for the foreseeable future. However, they are reluctant to agree to a prohibition in perpetuity, given that it is impossible to predict future needs and circumstances. This is a valid point, which is why the negotiators of the CTBT thought to include Article IX, which provides for withdrawal under extreme circumstances. The objection used to be made that no country would summon the political will to withdraw from an important arms control treaty. This argument has been demolished by the US withdrawal from the Anti-Ballistic Missile Treaty and Russia's behavior under the Conventional Forces in Europe Treaty.

Objection #3: the CTBT has little to do with nonproliferation

The CTBT is generally understood to be part of the 'grand bargain' in the NPT. In exchange for the fact that the NNWS were giving up the possibility of having nuclear weapons, the five NWS would eventually give up theirs. Prior to the actual elimination of nuclear weapons, the NWS would stop nuclear explosive testing, which was seen as a key way in which existing nuclear weapons were maintained and improved and new ones created. A CTBT was also seen as a necessary environmental step, especially as regards testing in the atmosphere. The path to a prohibition on all testing ran through a series of important, but less ambitious treaties—the 1963 Limited Test Ban Treaty, the 1974 Threshold Test Ban Treaty and the 1976 Peaceful Nuclear Explosions Treaty. The latter two only entered into force in 1990, after major improvements were made to the verification regime. Thus there is clearly a link between the CTBT and nonproliferation. However, in a backwards sort of way, this came to be oversold and misunderstood, at least in the US.

Well-intentioned proponents of the CTBT claimed that it was strictly a nonproliferation measure—that is, it would prevent other states from developing nuclear weapons. This overlooked the fact that the NPT already contained this prohibition for NNWS and, in fact, blocked new nuclear weapons programs at an earlier stage than conducting actual nuclear explosions. Thus a CTBT would add a new constraint on NNWS only in the case of India, Israel and Pakistan, who were not in the NPT. Of course, none of these three have joined the CTBT, which further illustrates the point (North Korea was a Party, but withdrew). The correct understanding was that the main purpose of the CTBT was to stop testing by the NWS. Since this understanding of the real purpose of the CTBT did not seem like a winning one in a skeptical Washington, it was hidden and the emphasis was put on the supposed pain it would place on NNWS. It was also emphasised that it would involve little sacrifice for the US, since this country already had vast testing experience and superior computer simulation capabilities. The fact that it was a fulfillment of a solemn obligation in NPT Article VI and elsewhere, for which payment from the NNWS had already been received, was almost never mentioned in preparing for, or lobbying for ratification of, the CTBT. When India, Pakistan and North Korea acquired nuclear weapons, and it was further revealed to the US Congress and the public that explosive testing was probably not actually necessary to construct a rudimentary nuclear weapon, this aspect of the nonproliferation rationale for the CTBT became vulnerable.

The US did finally come to a more accurate recognition of the purpose of a CTBT, when US Ambassador John Holum made the following statement to the Conference on Disarmament in January, 1996:

> . . . the test ban's 'core value' is to avert an arms race . . . The CTBT will help impede the spread of nuclear weapons. But its great practical impact will also be for arms control—to end development of advanced new weapons and keep military applications from emerging . . . In truth it is and will remain possible to make simple nuclear weapons without nuclear explosive testing. So the CTBT's fundamental effect is less to preclude the acquisition of nuclear weapons as such, which the NPT addresses, than to constrain the advancement of nuclear weapon capabilities by any country.

Unfortunately, this clarification came too late—after the impression had been created that the primary purpose of the CTBT was to prevent the horizontal proliferation of nuclear weapons. The consequence of this serious tactical mistake on the part of advocates for the CTBT and their misunderstanding of history, is that opponents now question how the US will benefit from ratification. Specifically, they may ask whether proponents seriously believe that North Korea will give up its nuclear weapons if the

US ratifies the CTBT. The answer, of course, is 'no'—but no serious proponent of the CTBT has ever claimed that would be the case.

The correct reverse linkage between the CTBT and nonproliferation is clearly seen in considering the indefinite extension of the NPT at the 1995 Review Conference. Reluctant NNWS agreed to this extension on the condition that a CTBT would be completed by 1996. The text was indeed completed on time, but, 19 years later, it has still not entered into force—a clear failure to fulfill this promise. Thus there is a firm linkage between the CTBT and nonproliferation, though not the one put forward as a straw man by opponents.

What the US, or any other Nuclear Weapon State, will get out of the CTBT in the future is the wrong question. The primary benefit to the U.S and other NWS has already been received, and honorable countries should fulfill their promises. The key question of the importance of the link to nonproliferation surely lies with the NNWS themselves. One should ask them whether they see the CTBT as important to nonproliferation and international peace and security. The answer can be found in the official statements of these countries in international fora and especially at the NPT Review Conferences. As noted above, the message was clearly delivered at the most recent of these conferences earlier this year.

Objection #4: what is the definition of a nuclear explosion?

The verification and stockpile reliability arguments against the CTBT have remained largely unchanged for decades. A new technical and legal argument appeared after the CTBT was negotiated. This argument points to the fact that the Treaty does not contain a definition of a 'nuclear explosion', although that is what the central prohibition is all about. At first glance, this does seem like a curious oversight, given the extreme attention given to definitions in other arms control treaties—for example START I contains 124 definitions, New START has 90[11] and the just-released P5 Glossary has definitions of 227 nuclear terms.[12] However, this was not an oversight. The NPT contains no such definition and this has never been a problem. It was decided that crafting a legally and technically precise definition without either creating loopholes or casting doubt on legitimate peaceful activities, such as nuclear power and research reactors, particle accelerators, peaceful research into fusion power, among others, would be too difficult. The US put forward a statement on this subject at the 1975 NPT Review Conference and no objections were raised. No country involved in the negotiations saw the need for such a definition during the CTBT negotiations.

The negotiating record indicates no problem on the issue of what is prohibited and not prohibited under the Treaty. Under customary practice, anything that is not

prohibited is allowed. However, in order to assure that there would be no misunderstandings, there were discussions of 'activities not prohibited' during the negotiations. In addition to the 1975 statement noted above, an illustrative list of such activities was included in the US Article-by-Article Analysis submitted to Congress. It was made clear that such activities would not be considered a nuclear explosion, despite the fact that they may result in the release of nuclear energy.[13]

In the early stages of the negotiation, several countries favored allowing small nuclear explosive yields—in effect, defining a nuclear explosion for the purposes of the treaty, as one with a yield greater than a certain number of tonnes TNT equivalent. This approach was rejected by President Clinton in 1995 and all countries agreed that the CTBT would be a zero-yield treaty—'true zero' as the treaty negotiators called it. As an aside, the use of the term 'yield', while easy to understand in popular usage, is not the best formulation from a physics point of view. A more accurate formulation would be that what is prohibited is an explosion that goes supercritical—that is, one that creates a self-sustaining nuclear reaction.

There appears to be no misunderstanding on this point. However, a series of objections have been raised in the US, generally about whether the Russian Federation has the same understanding. These involve obscure statements made long ago by Soviet officials, concerns about tests fully contained in a special chamber (*kolba* in Russian) and the idea that a nuclear explosion with a yield that does not exceed an associated conventional explosion somehow does not count. One should note that all of these would be extremely small and might well go undetected, at least by seismic means, with or without a CTBT.[14]

Another possible 'loophole' related to the use of special containment chambers is the hypothetical status of their use above ground. One might argue that a fully-contained, very small nuclear explosion in a special chamber inside a building would be neither in the atmosphere nor underground and therefore not in any of the four prohibited environments—underground, underwater, in the atmosphere or in outer space. The idea, proposed by some NGOs prior to the negotiations, of creating a CTBT by simply adding 'underground' to the three prohibited environments in the LTBT might have been vulnerable to this obscure interpretation. The Russians did toy with the idea of listing four environments in the Treaty early in the negotiations. When questioned, they assured other negotiators that they were not attempting to create a loophole using such an interpretation. In any case, the CTBT does not list prohibited environments. It prohibits all nuclear explosions, which solves the problem. As an aside, the author did briefly float the option early in the negotiations of saying that, for purposes of the treaty, if an extremely small explosion is fully contained inside a building above ground, it is not a nuclear explosion. This would have solved some of the current

objections, but would probably have created others. In any case, a different and better path was taken.

More specifically, concerns have been raised about what Russia may be doing at its test site in Novaya Zemlya. These are questions that can and should be addressed by our Russian colleagues. The issue was addressed in 2009 by Victor Slipchenko, who was the Deputy Chairman of the Russian Delegation at the CTBT negotiations. Responding to questions raised in the US about the Russian position, his public recommendations to the Russian government included the following: 'To confirm at a high level our official position, as made public during the ratification of the treaty by the State Duma in 2001 that in accordance with the CTBT all test explosions of nuclear weapons are banned, including so-called 'hydro-nuclear experiments,' whatever the level of energy release.'[15]

For its part, the US conducts occasional announced 'hydrodynamic' tests underground in Nevada. Although these may involve small amounts of fissile material, they cannot go supercritical and are not prohibited by the Treaty. The unclassified version of the 2015 US Compliance Report addresses the definition issue, noting that the P5 Nuclear Weapon States have each declared a nuclear testing moratorium, but the scope of each moratorium has not been publicly defined. It goes on to say that 'While it is difficult to assess the compliance of a given state with its own moratorium, when the scope or meaning of a moratorium is unclear, US assessments are based on the US position of what constitutes a nuclear explosive testing moratorium. The United States currently defines its own nuclear testing moratorium as a commitment not to conduct 'nuclear explosive' tests.'[16]

One other possible insight into the definition issue is that the P5 issued, at the 2015 NPT Review Conference in New York, a new glossary, in four languages, of 227 nuclear terms.[17] One of these is for the term 'nuclear weapon,' whose definition is 'Weapon assembly that is capable of producing an explosion and massive damage and destruction by the sudden release of energy instantaneously released from self-sustaining nuclear fission and/or fusion.' While this is certainly not intended to be a definition of a 'nuclear explosion,' the reference to a self-sustaining nuclear reaction is instructive.

It is important to remember that the CTBT is not in force. Instead, rules for the current situation are provided by Article 18 of the Vienna Convention on the Law of Treaties, which says that a state which has signed a treaty 'is obliged to refrain from acts which would defeat the 'object and purpose' of a Treaty.'[18] Speaking hypothetically, it might be possible that, depending upon a state's interpretation of that obligation, it might conduct activities under the current legal situation that it would not do once the Treaty is in force.

Conclusion

It is not unprecedented for there to be policy differences between the US and its key Allies, though these are usually kept muted. The situation with the CTBT, however, is really quite unique in that, not only have all the NATO Allies ratified the Treaty, many of them are not shy about emphasising the importance of bringing the Treaty into force. This is basically criticism of the US failure, 19 years after completion of the negotiations (which were led by the US), to ratify. With progress on further constraints and reductions on strategic and tactical nuclear weapons beyond New START apparently blocked for the time being, perhaps it is time for a new push on the CTBT.

The relevance and urgency of the CTBT, at least in the US, were enhanced by a speech given on October 21, 2015 in Washington by Secretary of State John Kerry. He said that 'I am determined that in the months to come, we're going to reopen and re-energize the conversation about the Treaty on Capitol Hill and throughout the nation.' [19] Former Secretary of State George Shultz had earlier remarked that 'Senators might have been right voting against the CTBT some years ago, but they would be right voting for it now.'[20]

The world is waiting for the CTBT to enter into force. While difficult to achieve, this is a moral and legal obligation that needs finally to be fulfilled.

The views expressed are those of the author and do not necessarily reflect the policies of the US Government or Georgetown University. This article is based on a lecture given by the author at the CTBT Science & Technology Conference in Vienna, Austria in June, 2015.

Endnotes

1 Earlier in 2015, a workshop was also held in Israel to consider the outcome of the 2014 on-site inspection exercise in Jordan.

2 *CTBT: Science and Technology Conference 2015 Book of Abstracts*, Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization, Vienna, June, 2015.

3 For an account of IFE14, see Jenifer Mackby, 'Special Report: Did Maridia Conduct a Nuclear Test Explosion? On-Site Inspection and the CTBT,' *Arms Control Today*, January/February, 2015; see also 'Major Exercise Tests CTBT Verification Regime,' *Strategic Comments*, International Institute for Strategic Studies (London), December, 2014.

4 *The Comprehensive Nuclear Test Ban: Technical Issues for the United States*, National Academies of Science, 2012, www.nap.edu. For a summary, see 'CTBT: US Scientists Answer Concerns of Opponents,' *Strategic Comments*, International Institute for Strategic Studies (London), 2012.

5 This is contingent on inspection teams having location information of sufficient precision—that is, the event was within the 1,000 square km inspection area limit agreed under the CTBT.

6 For more detailed discussion of on-site inspections under the CTBT, see Edward Ifft, 'On-Site Inspections under the 1996 Comprehensive Nuclear Test Ban Treaty:Modalities, and Technical Considerations' VERTIC Occasional Papers 1 and 2, December, 2009.

7 For the current status of the IMS, see www.ctbto.org.

8 Research by K. Koch, P. Richards, W. Kim and D. Schaff presented at the 2015 S&T Conference.

9 The proper full name of this body is the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization. It is called a preparatory commission since the Treaty is not yet in force. For simplicity, this chapter refers to it as the CTBTO.

10 General (ret.) John M. Shalikashvili, *Findings and Recommendations Concerning the Comprehensive Nuclear Test Ban Treaty,* January, 2001.

11 The Strategic Arms Reduction Treaty (START) was a bilateral treaty on the limitation and reduction of strategic nuclear weapons, between the United States and the Soviet Union in 1991. START expired in 2009, and was succeeded by the New START, which entered into force in 2011.

12 P5 Glossary of Key Nuclear Terms,' China Atomic Energy Press, April, 2015, at www.state.gov/documents/organization/243287.pdf. The Glossary was presented by the five NWS at the 2015 NPT Review Conference.

13 *Article-by-Article Analysis of the Comprehensive Nuclear Test Ban Treaty*, US Department of State, 1996, p. 4.

14 Arguments pro and con can be found in *America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States,* William J. Perry, Chairman, James R. Schlesinger, Vice Chairman, 2009.

15 *Russia: Former Envoy Outlines Proposals to help Ratification of Test Ban Treaty,* Moscow Carnegie Center for International Peace, July 24, 2009; See also Victor Slipchenko, 'Russia, Ratification and the CTBT's Entry into Force,' Occasional Paper #3, Verification Research, Training and Information Centre (VERTIC), (London), June, 2010.

16 *Adherence to and Compliance with Arms Control, Nonproliferation and Disarmament Agreements and Commitments*, U. S. Department of State, June 5, 2015.

17 'P5 Glossary of Key Nuclear Terms,' China Atomic Energy Press, April, 2015, at www.state.gov/documents/organization/243287.pdf.

18 *United Nations Convention on the Law of Treaties*, entered into force January 27, 1980.

19 Speech by Secretary of State John Kerry at the US Department of Energy, October 21, 2015.

20 *Ibid.*