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EDITOR'S NOTE

This issue of *Disarmament Forum*, "CTBT: Passing the Test", takes stock of the history and tribulations of the Comprehensive Nuclear-Test-Ban Treaty, and discusses its relevance today as well as practical options for making progress. It starts with an analysis of the original intentions for the CTBT in the broader scheme of disarmament measures, and goes on to discuss how relevant an operative CTBT would be in the current context of nuclear doctrines and developments. The issue also looks at the negative side of the issue in terms of what could go seriously wrong if the treaty does not come into force, for example in terms of decisions to test, whether by existing or aspiring nuclear powers, and the consequences thereof. Three contributions present arguments for different approaches to the current situation: maintaining the moratorium as a de facto CTBT, provisional entry into force, or treaty amendment. The final article addresses CTBT verification and its clear feasibility.

The next issue of *Disarmament Forum* will look at assuring compliance with the Biological and Toxin Weapons Convention. With the Sixth Review Conference almost upon us, the issue will examine the implications of the 2002–2005 process and how to implement the outcome of the next Review Conference. Additional articles will address how to revitalize confidence-building measures and describe the spectrum of supporting mechanisms for the convention that could be considered in the longer term.

The international Weapons of Mass Destruction Commission (WMDC), chaired by Hans Blix, presented its final report and recommendations to the United Nations Secretary-General, Kofi Annan, and to the President of the General Assembly and Foreign Minister of Sweden, H.E. Mr Jan Eliasson, on 1 June 2006 in New York. On behalf of the WMDC and its Chairman, and in her capacity as Commissioner, Patricia Lewis presented the report to UNOG Director-General Sergei Ordzhonikidze, in his capacity as Secretary-General of the Conference on Disarmament, at the same time. Entitled *Weapons of Terror: Freeing the World of Nuclear, Biological and Chemical Arms*, the report confronts the global challenge posed by weapons of mass destruction and puts forward 60 recommendations for the world community, both governments and civil society. On 15 June, UNIDIR had the honour of hosting Dr Blix's presentation of the WMDC report to the Geneva disarmament community. The report is available at <www.wmdcommission.org>.

UNIDIR's Disarmament as Humanitarian Action project held a seminar entitled "Disarmament as Humanitarian Action: From Perspective to Practice". UNICEF UK Ambassador for Humanitarian Affairs and former BBC war correspondent Martin Bell OBE, offered the keynote address. The meeting ended with a lively discussion. This seminar coincides with the publication of *Disarmament as Humanitarian Action: From Perspective to Practice*, edited by J. Borrie and V. Martin Randin. It analyses the relevance of humanitarian perspectives to multilateral arms control and disarmament work, drawing on examples including landmines, explosive remnants of war and small arms and light weapons. Building on these themes, it explores the challenges of applying humanitarian approaches in practical

ways that assist policy makers and negotiators, as well as new forms of activity, such as ethical disinvestment, that have implications for their work. The Disarmament as Humanitarian Action project is supported by the Governments of the Netherlands and Norway.

With the support of the Governments of Ireland, New Zealand and Sweden, UNIDIR organized the two-day meeting “Unfinished Business: Building on the NPT 2005 Review Conference” on 23–24 May 2006. The conference focused on a number of interesting proposals that had been made in various working papers submitted to the 2005 NPT Review Conference but were not properly discussed. This meeting thus offered a rare opportunity for governmental representatives and invited experts to meet and debate NPT-related issues in 2006. It also permitted discussion of a number of forward-looking proposals relating to compliance, cooperation and confidence-building; to the practical implementation of NPT provisions; to the institutional structure of the NPT; and to long-term issues. A conference report will be posted on our web site.

On 30–31 March 2006 UNIDIR hosted its annual space security meeting, entitled “Building the Architecture for Sustainable Space Security”. The conference discussed the current threats to the peaceful uses of outer space; the potential for developing a rules-based approach to ensure space security; the existing international instruments and their role in enhancing space security; the development of confidence-building measures in outer space; and the role of public awareness and advocacy in influencing governmental policy in outer space. The conference was timed to coincide with the Conference on Disarmament’s discussions on the prevention of an arms race in outer space (PAROS). This year’s conference was supported by the Governments of Canada, China and the Russian Federation, as well as the Simons Foundation. As in previous years, a conference report and selected presentations will be published by UNIDIR.

Kerstin Vignard

SPECIAL COMMENT

For the first time since its inception in 1999, *Disarmament Forum* dedicates an entire issue to the Comprehensive Nuclear-Test-Ban Treaty (CTBT). The choice is timely indeed—the treaty was adopted and opened for signature ten years ago in September. Back in 1996, the end of the Cold War had laid the foundations for another attempt to address the issue of a nuclear test ban. Negotiations at the Conference on Disarmament in Geneva were successful and resulted in the adoption of the CTBT by the United Nations General Assembly on 10 September 1996.

With the Comprehensive Nuclear-Test-Ban Treaty, the international community created a new and unique instrument for global nuclear non-proliferation and disarmament. The treaty bans “any nuclear weapon test explosion or any other nuclear explosion” in any environment. It thus impedes the development of new and the improvement of already existing nuclear weapons.

Almost ten years later, the CTBT has not yet entered into force, although with its 176 states signatories and 132 ratifiers it is close to universality. In the first three months of this year alone, six states ratified the treaty. More are expected to do so in the course of the year.

The most recent state to have ratified the treaty is Viet Nam, one of the 44 whose ratification is required for the treaty’s entry into force, and who are listed in Annex 2 of the treaty. With Viet Nam, 34 Annex 2 states have now ratified the treaty.

So, despite the high number of signatures and ratifications, the treaty can only enter into force once the remaining ten Annex 2 states have ratified it. Three of these states—India, Pakistan and North Korea—have yet to sign the treaty. Although entry into force will still take some time, the CTBT’s near universality in signatures illustrates the international community’s unwavering commitment to its goals.

The CTBT stipulates that upon entry into force a sophisticated verification regime must be in place and fully functioning, capable of meeting the requirements of the treaty. The verification regime consists of several elements designed to monitor compliance with the treaty’s provisions.

The establishment of the verification regime has proceeded at an impressive rate. Its centrepiece is the International Monitoring System (IMS) of 321 monitoring stations and 16 radionuclide laboratories. The IMS attracts worldwide interest due to its use of state-of-the-art technology and its global coverage. Currently, about two-thirds of the network has been completed. Most of the stations are already sending data to a central hub, the International Data Centre (IDC) in Vienna, Austria.

The IDC collects data from all monitoring stations around the world, processes these data and produces bulletins to be distributed to states signatories. This is a very democratic approach. All states signatories, regardless of their size or wealth, have equal access to verification data. And it adds to the political credibility of the verification regime that it is the prerogative of the member states to make the judgement on any registered event.

Although the monitoring network is only partially in place and operates in testing mode, it is already proving its capability to detect a potential nuclear explosion. The International Monitoring System, with its global coverage and its low detection threshold, proves a powerful deterrent to any potential violator of the CTBT. An impressive illustration of its capability is the registration of natural disasters such as the Indian Ocean tsunami in December 2004 or the earthquake in Pakistan in October 2005.

It was recognized early on that the vast amount of data streaming in from the monitoring stations could be used for a range of civil and scientific applications, such as tsunami warning, earthquake monitoring, detection of ash clouds from volcanic eruptions and oceanic research. This potential use is already being tested. Following the 2004 Indian Ocean tsunami disaster, the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization tasked the Provisional Technical Secretariat to explore how monitoring data can be used for tsunami early warning. The secretariat is working in close cooperation with a selected number of national authorities and international tsunami-warning centres during this test phase.

The mere existence of the CTBT has strengthened international nuclear non-proliferation and disarmament efforts. It has established an international norm against nuclear testing. With their signatures, 176 member states commit themselves to a total ban on nuclear explosions, be they of military or civilian nature. In addition, many states have declared national moratoria on nuclear-weapon testing, essentially in keeping with the spirit of the CTBT. The CTBT is already an important element in the international framework of nuclear non-proliferation and disarmament and a powerful deterrent to nuclear testing.

Tibor Tóth

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

Nancy GALLAGHER

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.

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.

The current administration's National Security Strategy places much greater emphasis on coercive prevention than on deterrence or cooperative threat reduction.

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

security challenges that prompted the treaty's negotiation have not disappeared; they have intensified over the past decade.

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 security challenges that prompted the treaty's negotiation have not disappeared; they have intensified.

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/lbt/text/lbt2.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, recalls 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 Retaliation: 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.c CFR.org/globalviews2004/sub/pdf/2004_US_Leaders_Topline_Report.pdf>.
 29. Terry L. Deibel, 2002, "The Death of a Treaty," *Foreign Affairs*, September/October.

Testing the Test-Ban Treaty

William Peden and Felicity Hill

Nuclear-weapon test explosions have been carried out in all environments, releasing culpable amounts of radiation above ground, underground and underwater. Nuclear tests have occurred on top of towers, aboard barges, suspended from balloons, on the Earth's surface, underwater to depths of 600m, underground to depths of more than 2400m and in horizontal tunnels. Test bombs have been dropped by aircraft and fired by rockets over 320km into the atmosphere. Wherever nuclear-weapon testing has occurred, environmental and health problems have also occurred. Radiation has leaked into the environment from underground nuclear tests, atmospheric and underground nuclear testing has rendered large areas of land uninhabitable, and the health and livelihoods of indigenous people, their children, and their children's children, have been profoundly affected.

Greenpeace contributed to the stopping of atmospheric and underground tests. From its humble beginnings in 1971, when the *Phyllis Cormack* set sail with a small group of environmentalists to stop United States (US) nuclear-weapon tests taking place off the coast of Alaska, to the last stand at Moruroa, Greenpeace has been there. The organization has not only protested but has also conducted public education, provided scientific analysis and made practical contributions, for example when the *Rainbow Warrior* and her crew evacuated all the residents of the former US nuclear-test site at Rongelap to Mejato, an island 200km away. For these efforts our boats have been rammed, our members beaten and in 1985 one staff member was killed when French agents blew up the *Rainbow Warrior* in Auckland harbour.¹

It is not difficult, then, to understand why Greenpeace celebrated when atmospheric nuclear testing stopped, when this was followed by the Partial Test-Ban Treaty² and when, after more than 50 years of testing nuclear weapons, the Comprehensive Nuclear-Test-Ban Treaty (CTBT) was opened for signature.³ In addition to the agreement of the CTBT, and despite nuclear-weapon tests having been carried out, a taboo and moratorium on testing have gradually been established.

Nonetheless, the damage caused by testing persists; concealment of the full medical and environmental effects of testing, suppression of the civil liberties of local communities opposed to testing, and cancer-causing contamination emitted by the sheer quantities of radiation released.⁴

Without the CTBT's entry into force, the damage caused by previous testing risks being overshadowed by the effects of a new wave of testing. Political, doctrinal and operational decisions could be taken at any time to reverse the taboo and moratorium on testing, further weakening the

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CTBT and endangering the goal of nuclear disarmament. The situation remains uncertain, and the signs are that it could all too easily deteriorate. Below, we outline a number of scenarios that could occur if current, negative trends are not arrested.

Ten years later—no progress

The preamble to the CTBT makes its purpose clear: "...the cessation of all nuclear weapon test explosions and all other nuclear explosions, by constraining the development and qualitative improvement of nuclear weapons and ending the development of advanced new types of nuclear weapons, constitutes an effective measure of nuclear disarmament and non-proliferation in all its aspects". The CTBT was meant to "contribute effectively to the prevention of the proliferation of nuclear weapons in all its aspects, to the process of nuclear disarmament and therefore to the enhancement of international peace and security". After signing the treaty, then United States President Clinton said before the United Nations General Assembly: "This Comprehensive Test Ban Treaty will help prevent the nuclear Powers from developing more advanced and more dangerous weapons. It will limit the ability of other States to acquire such devices themselves. It points us towards a century in which the roles and risks of nuclear weapons can be further reduced and ultimately eliminated."⁵

Ten years later only three countries that possess nuclear weapons are committed to the CTBT, and only one of those (France) has actually dismantled its nuclear-test site. Ten countries whose ratification is necessary for the entry into force of the treaty have not yet ratified and/or signed it (China, Colombia, Egypt, India, Indonesia, Iran, Israel, North Korea, Pakistan and the United States).⁶ The original vision of the CTBT, that it "will help prevent the nuclear Powers from developing more advanced and more dangerous weapons ... [and] limit the possibilities for other States to acquire such devices" has not been realized.⁷ In fact, today's world is undergoing a nuclear-weapon renaissance.

In the United States, the drive to resume testing of new nuclear-weapon designs continues despite the denials of the Bush Administration. Budgets for nuclear-weapon work have soared to roughly US\$ 6,000 million in the current fiscal year from their low of about US\$ 3,200 million in fiscal year 1995. The reality is that a nuclear-weapon industry resurgence is occurring in the United States. Millions are being spent at the Nevada nuclear-test site to ensure it is ready to resume nuclear testing within 18 months of any political decision being taken. In order to maintain expertise, non-nuclear or subcritical tests are being conducted, which simulate all parts of a nuclear weapon except the explosion itself. The Bush Administration denies any intention to test; the weapons laboratories deny any intention to resume nuclear testing. Given the evidence, this rings about as true as a car owner spending a lot of time and effort refurbishing an old car, learning to drive in a computer simulator, ordering a new engine to be designed for it, and then denying any intention ever to drive.

The United Kingdom (UK) has just announced its intent to spend just over £1,000 million over the next three years on refurbishing key facilities at its nuclear-weapon complex. This includes new facilities for assembling and disassembling nuclear weapons and the handling of high explosives and weapon-grade uranium, as well as a new high-energy laser facility. It also plans to recruit over 1,000 new staff over the next three years. The UK government is expected to make a decision on a replacement for its Trident submarine-launched nuclear-weapon system some time during 2006 and has just extended its nuclear-weapon cooperation agreement with the United States for another ten years.

In France, laboratory-based expansions of its nuclear-weapon design, development and production capacities have been under way for a number of years. For example, over US\$ 3,000 million are being spent on a new high-energy laser facility. This year, France is expected to start testing a new

missile for its submarine-launched nuclear warheads, which will have an increased range, and it is also working on improving the capabilities of its air-launched nuclear delivery vehicle along with a more “robust” warhead, the *tête nucléaire aéroportée*.

In January 2006 French President Jacques Chirac made a landmark speech, warning that “[t]he credible threat of their [nuclear weapons’] utilization permanently hangs over those leaders who harbour hostile intentions against us. ...[W]e always reserve the right to resort to a final warning to mark our determination to safeguard our vital interests.”⁸ He also warned that “the leaders of States who contemplate terrorist attacks against us, as well as those who might consider using weapons of mass destruction in one way or another, must understand that they would lay themselves open to a firm and appropriate response on our part. And this response could be a conventional one. It could also be of another kind.”⁹

Nuclear testing is very much a political statement—it is the most public way possible of proving possession of the bomb. There are few who believe that North Korea has the material and the capabilities to possess nuclear weapons, and other than holding an international press conference to show off its nuclear bombs, how else could North Korea prove it has a nuclear capability? Even if it did hold an international media event, how would you know that what you were being shown was actually a nuclear bomb? How would anyone know that it worked?

Nuclear testing is very much a political statement—it is the most public way possible of proving possession of the bomb.

If a nuclear test is a political signal, it is not hard to foresee that if one state considers it necessary to demonstrate its nuclear prowess through testing, others will follow. India’s first test in 1974 was a very blunt message to Pakistan and China and it sparked a regional arms race that continues today. Nine years earlier, President Bhutto of Pakistan had made it clear that “[i]f India builds the bomb, we will eat grass or leaves, even go hungry, but we will get one of our own. We have no other choice”. And so Pakistan began its nuclear bomb programme. The logic that prevails is certainly not rational or linear, but history has provided us with various examples that demonstrate the symbolic significance of testing, and the contagious effect it can have, escalating nuclear arms races.

What could go wrong?

This is the worst 2010 (when the next Non-Proliferation Treaty, or NPT, review process ends) we can imagine—none of these developments are inevitable, nor are they desirable, but they could happen if current trends continue and if key states continue to hold international law and treaties in contempt.

- The Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization has effectively established its ring of sensors and monitoring stations around the world but the treaty has still not entered into force, so the organization has been reduced to little more than an international earthquake and tsunami monitoring body. Its political structure has failed to meet for the last two years and the organization has no political clout, purpose or direction.
- The Conference on Disarmament and the United Nations Disarmament Commission have been suspended until further notice because of continued failure to agree a programme of work.
- The United States’ Global Nuclear Energy Partnership is up and running. This nuclear cartel of the Group of Eight controls the supply of over 80% of the world’s capacity for nuclear reprocessing, enrichment and supply services. Centralized facilities for providing these services either exist or are almost completed and supply agreements are in place with almost all of the nations that have

nuclear power programmes. Plans to expand into the African continent are now under way, with aid agreements and soft loans under negotiation with the oil-rich African nations.

- Iran has invoked Article X of the NPT¹⁰ and withdrawn because of the “nuclear racism” of the US-led Global Nuclear Energy Partnership, which has established a few centres for the provision of nuclear fuel and enrichment and reprocessing services to states that they deem to be trustworthy political allies. Iran has one nuclear power plant online, with four more under construction. The uranium enrichment plant at Natanz has 3,000 centrifuges operating successfully and the uranium conversion plant at Esfahan is providing sufficient feed material for Natanz to be creating enough enriched uranium for an estimated five nuclear warheads a year. Iran is obtaining technical assistance from China and Russia despite its withdrawal from the NPT.
- The global community has been unable to rein in the nuclear ambitions of Iran and North Korea. The United States remains bogged down in Iraq and in trying to contain new conflicts that have arisen over oil resources on the African continent.
- The nuclear deals between the United States and India and between France and India have now been in operation for 18 months, allowing India to successfully concentrate its uranium reserves and its technical abilities on miniaturizing and building up its nuclear arsenal. China has thus stepped in and signed its own nuclear cooperation agreement with Pakistan in order to bring some form of nuclear balance to the region.

As a result India and Pakistan have entered into a new nuclear arms race, each side desperately trying to beat the other to be the first to put nuclear payloads on the advanced missiles they have successfully developed.

- Israel and the United States have entered into a nuclear cooperation agreement similar to that with India to save Israel’s ageing nuclear research programme and build new reactors that will provide Israel with “true energy security”.
- The Eighth Review Conference of the NPT has just ended in failure with no agreement on a way forward. This is a result of all of the above plus the clear agreement of all the nuclear-weapon states¹¹ to proceed with the development and deployment of new nuclear-weapon systems and the adoption of new nuclear doctrines that allow for the use of nuclear weapons as a political and military tool even before the appearance of a clear threat.
- The United Kingdom has announced its intention, in cooperation with the United States, to replace its Trident submarine-launched ballistic missile system with a new system of submarines armed with sub-strategic warheads, to be fitted onto both cruise and ballistic missiles. France is about to deploy its new missile system for its Triomphante ballistic missile submarines and has embarked on the development of a new warhead with full United States cooperation. China has successfully deployed its first ballistic missile submarine and is building a further three, and Russia now has 12 ballistic missile submarines operationally armed with the Tupolov missile system, equipped with what is rumoured to be a manoeuvrable re-entry vehicle.

SCENARIO ONE: UNITED STATES IGNITES THE NUCLEAR TESTING STAMPEDE

It is 2010, and still the United States refuses to sign up to the CTBT. For years, US nuclear-weapon laboratories have been feverishly working on new nuclear warheads that will meet the administration’s wish to have small, robust, reliable warheads that can be easily used. However, the scientists still cannot say that the warhead will work as desired, despite the billions invested in computer

simulators and other fancy ways of creating the conditions of a nuclear explosion in the laboratory. The Nevada nuclear-test site is ready and waiting and the administration takes the decision to conduct just one, or maybe two, nuclear tests to check that the new weapon will operate the way it should. Under much secrecy, the test site is prepared with the public announcement that this will be another subcritical test—that is, a nuclear test in all but name—and that a subcritical assembly will be placed down the shaft, not a nuclear weapon.

Once ready, the United States government announces publicly that it has changed its mind, it intends to resume nuclear testing for “safety and reliability” reasons: this will be a limited series of tests and as soon as it is completed, the moratorium will once again apply. The French and the British, supposedly advocates and defenders of the CTBT, participate in the tests.

Result: China, experiencing difficulties and uncertainties about its nuclear warhead modernization programme, decides to seize the political opportunity and follow the United States. It announces its intent to resume a short series of nuclear tests. Russia follows the lead of the other four nuclear-weapon states because, despite all the economic and technical difficulties this will entail, it really does not want to be left behind. With their stranglehold on the UN Security Council, the supply of nuclear technology and the rest of the international nuclear non-proliferation regime, the five nuclear-weapon states engage in a new nuclear arms race, each rushing to finish developing and deploying new nuclear-weapon systems. The international community and global society look on helplessly.

SCENARIO TWO: NORTH-EAST ASIA LEADS THE CHAIN REACTION

This scenario could occur on its own or closely after the scenario outlined above.

It is 2010 and North Korea has had enough of being shunned by the international community and denied the rights others seem to have. The Six-Party Talks have ground to a halt, with mutual recriminations between the United States and North Korea, and between Japan and North Korea, that focus on unresolved historical angers and issues rather than nuclear weapons. The United States has stationed a carrier battle group permanently off the Korean coast, strengthening United States–South Korea military exercises, which have already heightened tension. North Korea is suffering extreme famine as so much of the nation’s wealth is ploughed into the military sector, power outages are the norm, and challenges to the leadership are brewing. To blast away any doubts about its programme or how tired it is of treatment as a second-class international citizen, and to reassert internal control, Kim Jong Il decides to blast away one of the few warheads.

Result: Now under threat of nuclear attack and reluctant to rely solely on the United States’ nuclear umbrella, Japan, South Korea and Taiwan quickly cooperate in a crash programme to arm themselves with nuclear weapons. The United States feels obliged politically to assist in this programme, including providing access to testing facilities and technology in the United States. The United States also announces its intent to redeploy nuclear weapons on the Korean peninsula and on its surface ships and other aircraft in the region. China, outraged by US intervention in the region, especially cooperation with Taiwan, comes to the aid of North Korea, providing it with a nuclear umbrella while assisting it in building up its nuclear arsenal and means of delivery. The United States quickly again redeploys nuclear weapons onto South Korean soil and its naval vessels in the region. Within two years the situation has escalated to a point similar to that along the Kashmiri Line of Control: two nuclear-armed states are in constant conflict across the Demilitarized Zone of the Korean peninsula, aided and abetted by two powerful nuclear-weapon states. A new cold war breaks out between China and the United States–ASEAN nuclear pact, inevitably accompanied by trade embargoes and a breakdown in political relations.

SCENARIO THREE: MIDDLE EAST MELTDOWN

This scenario could occur on its own or closely after scenario one above.

Iran has now designed and built a viable nuclear warhead, which it thinks can be carried by its advanced Shahab missile system. Facing the same doubts and dilemmas as other nuclear-weapon scientists, they decide to see if it will work and also to send a clear message to the world, and to Israel in particular, that Iran is now a nuclear power and a serious force to be reckoned with. The “Islamic bomb” is now a reality. Israel in turn makes public its possession of a nuclear arsenal by carrying out a test at US facilities.

Result: Saudi Arabia embarks on a crash programme of purchasing missiles and warheads from its nuclear ally, Pakistan, and within a year announces itself as also possessing nuclear weapons. It offers fellow members of the Gulf Cooperation Council protection under its nuclear umbrella.

Israel has no choice and, with the United States, launches a massive military strike on Iran to destroy its nuclear facilities. Simultaneously, Israel launches a massive military invasion of Lebanon and Palestinian-controlled territories and refuses to give up control of the Occupied Territories. Massive civil war breaks out in the region as a result. The strike fails to take out all of Iran’s nuclear capabilities or its regime and leaves the region with three military nuclear alliances continuously threatening to wipe each other off the face of the Earth. The Pelindaba Treaty¹² collapses before it enters into force, and there is mass withdrawal from the NPT.

SCENARIO FOUR: DELIVERING ON THE THREAT

The 2010 nuclear arsenals of India and Pakistan are believed to be fairly crude in design and unable to be efficiently carried by their relatively advanced missile technology. Delivering nuclear-weapon technology is about reaching the target within minutes, accurately and with little or no chance of being detected and destroyed before delivery. But thanks to India’s deal with the United States, and Pakistan’s with China, in 2010 one or both countries manage to develop a warhead small and light enough to fit the missiles, but are left with the same dilemma: will it work? India or Pakistan, or both, decide to test their new warheads.

Result: A tit for tat nuclear warhead and nuclear-capable missile-testing programme breaks out. Both sides start to build missile launch facilities close to the Kashmiri Line of Control and India deploys its Russian-supplied nuclear-capable aircraft carrier and support vessels on a month-long exercise just outside of Pakistan’s territorial waters before sailing off on a tour of the Mediterranean and the Atlantic Ocean with planned visits to France, the United Kingdom and the United States. The United States decides to redeploy some of its nuclear arsenal to Diego Garcia and China decides to move some of its nuclear arsenal closer to India.

This doesn’t have to happen

Whether it is through resumption of nuclear testing by established nuclear-weapon states or by “new” nuclear powers, a testing stampede will result if the taboo and moratorium against nuclear-weapon tests are broken.

Completion of global nuclear-test-ban treaty negotiations was a central nuclear arms control objective for more than 40 years. This long-awaited goal was finally won when the CTBT was opened for signature on 24 September 1996. Vital to the prevention of the dangerous and destabilizing modernization and qualitative improvement of nuclear weapons, the CTBT is one of the major elements necessary to achieving an end to these weapons of mass terror and destruction, and to ensuring that Hiroshima and Nagasaki are the last cities ever to suffer the effects of a nuclear-weapon attack.

Recent nuclear-weapon developments present a clear and present danger to the CTBT regime, and to the existing moratorium. If they continue unchecked, the worst scenarios that nuclear campaigners can dream up may become reality. But just as any nuclear-weapon test would have major political consequences, all efforts to bring the Comprehensive Nuclear-Test-Ban Treaty into force are steps toward real peace and security: and this is where we should all be directing our energy.

Notes

1. New Zealand Prime Minister David Lange called the attack “a sordid act of international state-backed terrorism”.
2. Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water, Moscow, 5 August 1963, at <www.fas.org/nuke/control/lbt/text/lbt2.htm>. Also known as the Limited Test-Ban Treaty.
3. Comprehensive Nuclear-Test-Ban Treaty, UN document A/50/1027, adopted by UN General Assembly resolution 50/245 of 10 September 1996, opened for signature 24 September 1996, at <www.ctbto.org/treaty/treaty_text.pdf>.
4. International Physicians for the Prevention of Nuclear War and the Institute for Energy and Environmental Research, 1991, *Radioactive Heaven and Earth: The Health and Environmental Effects of Nuclear Weapons Testing in, on and above the Earth*, New York, Apex Press.
5. Address by Mr William Jefferson Clinton, President of the United States of America, 6th plenary meeting, Fifty-first Session of the United Nations General Assembly, New York, in UN document A/51/PV.6, 24 September 1996.
6. As of April 2006.
7. Address by Mr William Jefferson Clinton, President of the United States of America, 5th plenary meeting, Fifty-second Session of the United Nations General Assembly, New York, in UN document A/52/PV.5, 22 September 1997.
8. Letter dated 13 February 2006 from the Permanent Representative of France to the Conference on Disarmament addressed to the Secretary General of the Conference transmitting the statement made by the French President at Landivisiau-L'île Longue/Brest (Finistère) on 19 January 2006, CD/1768, 14 February 2006.
9. Ibid.
10. “Each Party shall in exercising its national sovereignty have the right to withdraw from the Treaty if it decides that extraordinary events, related to the subject matter of this Treaty, have jeopardized the supreme interests of its country. It shall give notice of such withdrawal to all other Parties to the Treaty and to the United Nations Security Council three months in advance. Such notice shall include a statement of the extraordinary events it regards as having jeopardized its supreme interests.” Treaty on the Non-Proliferation of Nuclear Weapons, 1 July 1968, at <disarmament.un.org/wmd/npt/NPT%20text-English.pdf>.
11. These are the five nuclear-weapon states as defined by the NPT: China, France, Russia, the United Kingdom and the United States.
12. Full title: African Nuclear-Weapon-Free Zone Treaty, signed 11 April 1996. Entry into force after 28 ratifications.

Maintaining the moratorium—a de facto CTBT

Arundhati GHOSE

It is today widely recognized that an international arms control treaty can be successfully concluded only if and when the strong and powerful agree. By 1992, both the United States and the then Soviet Union had declared moratoria on nuclear testing, to be joined by the United Kingdom (which was in any case dependent on the United States for testing facilities). This set the stage for the negotiation of a Comprehensive Nuclear-Test-Ban Treaty (CTBT) in 1993. China and France did not announce moratoria until they had, in 1995–1996 (while negotiations on the CTBT were in progress), carried out series of tests to complete their testing programmes. As Rajesh Rajagopalan says: “[The nuclear non-proliferation regime] is the strongest international security regime in existence. It is strong not because it embodies the common interest of the international community but [that] of ... the strongest of its members”. “Its survival and strength are a testament to the importance of power in the formation of international regimes.”¹

Thus, for the nuclear non-proliferation regime to remain strong, and for it to progress, the positions taken by the “NPT five”—the five nuclear-weapon powers according to the Non-Proliferation Treaty—are crucial. This paper argues that for as long as the CTBT is not in force the self-declared moratoria of these five states, plus those of the nuclear-capable states, stand as a valuable part of the non-proliferation regime, and equate to a de facto CTBT.

Negotiating the test ban

Two parallel negotiations took place to finally arrive at the 1996 Comprehensive Nuclear-Test-Ban Treaty²—the formal negotiations in the Conference on Disarmament (CD) open to all interested states, and the negotiations among the nuclear-weapon five of the Non-Proliferation Treaty (NPT). These last negotiations were initially secret. The details of the agreements and compromises made between the NPT nuclear-weapon five were never known or made entirely public, but they were probably the most crucial, permitting final agreement among the five, if not among other members of the CD. India refused to be a party to the treaty, stating that the ultimate outcome was flawed, as the treaty was discriminatory and had no substantive link to disarmament, thus putting its security in jeopardy. In 1998, India conducted a series of weapon tests and declared itself a nuclear-weapon state. Shortly thereafter, India announced a voluntary moratorium on underground explosive tests.

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There is a body of opinion that believes that a voluntary moratorium on explosive nuclear testing cannot be equated with participation in the Comprehensive Nuclear-Test-Ban Treaty that was negotiated in the Conference on Disarmament. Yet, ten years after the treaty was agreed and opened for signature, it still has not entered into force—and, as ten states have yet to ratify the treaty for entry into force, it seems some way from doing so. Today, when one of the signatories conducts subcritical nuclear-weapon tests (as both the United States and the United Kingdom have done 22 times since 1997), it is not considered to be in violation of the treaty. Many who oppose the subcritical tests speak in anguished tones of violations of the “spirit of the CTBT”; but there is no recourse. The international community is helpless.

From a disarmament treaty to a non-proliferation treaty

The objective of a comprehensive ban on nuclear testing had originally been truly comprehensive. As early as 1954, Jawaharlal Nehru had proposed a “standstill” on testing—something between a multilaterally negotiated verifiable treaty and a unilateral moratorium—pending the elimination of nuclear weapons. Speaking to the Lok Sabha (India’s lower house in parliament), he said: “...Pending progress towards some solution, full or partial, in respect of the prohibition and elimination of these weapons of mass destruction, the Government would consider, some sort of what may be called ‘standstill agreement’ in respect, at least, of these actual explosions, even if agreements about the discontinuance of production and stockpiling must await more substantial agreements amongst those principally concerned.”³

Clearly, all weapon testing was to be halted, as a step toward total nuclear disarmament. Non-nuclear-weapon states perceived the danger as coming from the existence of the weapons themselves, and the exhortations were addressed to those countries that possessed the weapons, “before which, our normal weapons were completely useless”.⁴ A ban or standstill on testing was seen as a possible step toward the elimination of the weapons and therefore the security of all countries.

However, over the years, the proposal of a test ban became interchangeable with that of a temporary moratorium, and the linkage with nuclear disarmament became more and more tenuous, as Jaap Ramaker’s painstakingly researched book, *The Final Test—A History Of the Comprehensive Nuclear-Test-Ban Treaty Negotiations*, points out. “The year 1958 proved to be an important one in nuclear test ban history. At the end of March the USSR announced that it would hold a unilateral moratorium on nuclear tests as long as other nuclear weapon States agreed to stop testing.” The United States, on the basis of an expert report that held that a test ban could not be adequately monitored, proposed that an expert group be established to study the problem. “The USSR agreed to participate... This was an important step, as it would appear that this was the first time that proposals for limiting nuclear testing were not linked to (other) disarmament measures.”⁵

Over more than three decades, and throughout the treaty negotiations themselves, the purpose of a ban on all forms of testing became progressively de-linked from the ultimate objective of the total elimination of nuclear weapons. In the final text, non-nuclear-weapon states were barely able to establish a relationship between the exhortations for disarmament in the preamble and the operative

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text. All tests were not banned, and India’s proposals of a commitment to negotiate for the elimination of nuclear weapons within an agreed time frame were ignored. The treaty as it now stands is not a disarmament treaty, as was originally intended; it is a non-proliferation treaty. It is there to control countries on the “learning curve” of nuclear weapon development.

The CTBT even permits non-explosive forms of testing, which, with advances in technology, may today be used to refine nuclear weapons and to design new ones. The CTBT appears to be a continuation of the Partial Test-Ban Treaty,⁶ signed in 1963, which is not really an arms control or disarmament measure at all. Of course, the CTBT is a more evolved treaty and, by banning all explosive testing, it places some constraints on the development of new nuclear weapons, but it is not a clear step toward nuclear disarmament. The constraints of the CTBT perpetuate the discrimination and imbalance that is so painfully apparent in the NPT, in that, because it allows non-explosive testing, and thanks to technological advances, countries with advanced nuclear technology have in a sense been exempted from the ban on weapon development.

A moratorium on testing: more effective than the CTBT?

A voluntary moratorium on explosive testing meets the requirements of the treaty, without the treaty's inherent discrimination and with greater likelihood of compliance, since it is voluntarily adopted and not imposed. After its nuclear tests in 1998, the Prime Minister of India, in a statement to parliament, announced a moratorium on further explosive tests. In the paper laid on the Table of the House on 27 May 1998 regarding the issue of the evolution of India's nuclear policy, it was stated: "Subsequent to the tests Government has already stated that India will now observe a voluntary moratorium and refrain from conducting underground nuclear test explosions. [India had already signed the Partial Test-Ban Treaty banning tests in the atmosphere, in space and underwater]...The basic obligation of the CTBT [is] thus met; to refrain from undertaking nuclear test explosions."⁷

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There are, of course, obvious differences between a multilaterally negotiated (albeit essentially just between the five NPT nuclear-weapon states), verifiable treaty and a voluntary moratorium announced by a state with nuclear weapons. On a more careful review and on deeper reflection, however, these obvious differences become, in the words of a former Algerian diplomat to the CD, "the suspenders in addition to the belt" (the belt presumably being the NPT). In other words, the differences are little more than embellishments: the essential objective of the CTBT as negotiated is "not to carry out any nuclear weapon test explosion or any other nuclear explosion" (Article I); a moratorium has an identical effect.

VERIFICATION AND COMPLIANCE

One frequent argument against a voluntary moratorium is that such a declaration cannot be verified, whereas the core of the CTBT is a punitive compliance and verification system. The dual purpose of a verification regime is to ensure compliance by preventing, or at least minimizing, violations of the obligations of the treaty, and to give all states parties a sense of security and confidence that the treaty is indeed being implemented without discrimination. It is clear that a voluntary moratorium cannot fulfil these purposes.

However, moratoria are still subject to international pressures. If a state felt it necessary to waive its self-declared moratorium, it would be entirely within its rights. But the state would have to take into account the impact of the waiver on its international interests. A moratorium that has been declared voluntarily by a country would be difficult to breach for political reasons, in the context of that country's international relations. In many cases, states waiving a self-declared moratorium would do so publicly,

informing the international community of their activities. But even if a state were to breach its own moratorium clandestinely, current levels of technology mean that any such activity is most likely to be observed.

On the other hand, states party to the CTBT intending to violate the treaty would be obliged to take action in a clandestine manner. In order for all member states to have confidence in the treaty, the verification system *must* be able to observe *all* clandestine activity. The pressure on the verification system is much higher: is it capable of identifying or preventing *all* clandestine tests?

As for the punitive aspect of the treaty, the reaction of the international community to a violation of the CTBT today is likely to be similar to that following the breach of a moratorium: the UN Security Council is likely to get involved.⁸ In other words, a moratorium is a severe constraint, particularly in being self-imposed, on future explosive testing. If one of the five NPT nuclear-weapon states (three of which are party to the treaty while two, the United States and China, are currently constrained only by moratoria and domestic laws) decides to conduct an explosive test or a series of tests, the reaction of the international community, whether through the United Nations Security Council or by other means, is more than likely to be the same. For example, the United States, which has signed but not ratified the treaty, has been trying to seek approval from its domestic legislative authorities to commence its testing programme sooner rather than later. If it conducts an explosive test, would the Russian Federation, a state party to the treaty, feel compelled to test in turn? Or if China waives its moratorium and conducts a test, would India also feel free to do the same? What power does the CTBT hold as it stands now, before entry into force, over its current states parties? And would the situation be very different if the United States and China became members of the CTBT?

To avoid any misunderstanding, this is not an argument against a verification system. On the contrary, a comprehensive verification system is absolutely necessary in order to give all states parties a sense of security and thereby make compliance more likely. The point here is that the declaration of a moratorium is better than not having any sense of security at all, as even without a verification regime, the international community would be likely to discover any breach of a moratorium, be it clandestine or not, and this would have considerable and possibly severe consequences. For as long as the moratorium holds, a test ban is in effect, whereas current members of the CTBT are not under any obligation to ban tests until entry into force.

A PERMANENT TEST BAN?

A moratorium, according to the dictionary, is a “temporary prohibition” of an activity; this is seen as a major difference from a treaty, which is of indefinite duration. However, Article IX, paragraph 2 of the CTBT states that “[e]ach State Party shall, in exercising its national sovereignty, have the right to withdraw from this Treaty if it decides that extraordinary events related to the subject matter of this Treaty have jeopardized its supreme interests.” As noted by Ramaker, it took the better part of three years to negotiate this article, so crucial was it to compliance and agreement on participation in the treaty.⁹ During the treaty negotiations, there were concerns over and some sought to spell out what would constitute extraordinary events jeopardizing supreme interests, for example a nuclear test by another state party or non-state party. Ultimately, however, the extant much more general formulation was accepted, with wide discretion available to the state party wishing to withdraw, as the “extraordinary events” could include a threat or even simply the perception of a threat of an attack using weapons of mass destruction, or changing international developments necessitating a change in nuclear doctrine. Paragraph 2 of Article IX means that the CTBT could be seen as a “temporary prohibition”, just like a

moratorium. And surely a moratorium would be governed by the same conditions? After all, a country is unlikely to abrogate a self-declared moratorium unless its “supreme interests” oblige it to do so.

Without an operative CTBT, we need moratoria

The above arguments have not been made to try to reduce the importance of the Comprehensive Nuclear-Test-Ban Treaty; after all, it is a multilaterally negotiated legal undertaking by states parties, which a moratorium is not. What is being argued here is that with voluntary moratoria announced by all nuclear-weapon or nuclear-weapon-capable states in place, a de facto test-ban treaty is in place, even if the CTBT itself has not entered into force. The need to maintain the moratoria should not be underestimated, particularly if the CTBT does not enter into force for another ten years. A moratorium fulfils the basic obligations of the test-ban treaty negotiated in the CD; even without a verification regime, a moratorium is a constraint on the actions and intentions of countries that may wish to test; finally, the “temporary” character of a moratorium is not very different from a treaty that gives states parties such wide leeway to withdraw from it in their “supreme interests”. The major flaw in moratoria is that they do not move us closer to a nuclear-weapon-free world, since there is no linkage to disarmament. But neither does the CTBT. The 1996 test-ban treaty is, at best, an arms control treaty; a voluntarily declared moratorium on nuclear-weapon testing serves a similar purpose, and promotes the same degree of stability in international relations, as the Comprehensive Nuclear-Test-Ban Treaty. An opportunity was lost in 1996; disarmament can only be put back on the testing agenda if a commitment to disarm, or at least to start negotiations to eliminate nuclear weapons, can be added as a protocol to the treaty. The likelihood of that happening in the near future appears slim.

The need to maintain the moratoria should not be underestimated, particularly if the CTBT does not enter into force for another ten years.

Notes

1. Rajesh Rajagopalan, 2005, “The Prospects for the Nuclear Non-Proliferation Regime”, in C. Uday Bhaskar and C. Raja Mohan (eds), *Emerging Nuclear Proliferation Challenges*, IDSA–Pugwash India conferences held in New Delhi, 28–29 March 2005, New Delhi, Institute for Defence Studies and Analyses, p. 13.
2. Comprehensive Nuclear-Test-Ban Treaty, UN document A/50/1027, adopted by UN General Assembly resolution 50/245 of 10 September 1996, opened for signature 24 September 1996, available at <www.ctbto.org/treaty/treaty_text.pdf>.
3. Jawaharlal Nehru, speech to Lok Sabha, New Delhi, 2 April 1954, in Government of India (ed.), 1988, *India and Disarmament: An Anthology of Selected Writings and Speeches*, New Delhi, Ministry of External Affairs.
4. Ibid.
5. Jaap Ramaker, 2003, *The Final Test—A History of the Comprehensive Nuclear-Test-Ban Treaty Negotiations*, Vienna, Provisional sTechnical Secretariat of the Preparatory Commission for the CTBTO.
6. Full title: Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water.
7. Paper laid on the Table of the House (Lok Sabha) by Prime Minister Atal Bihari Vajpayee, entitled “Evolution of India’s Nuclear Policy”, 27 May 1998. Quoted by Jaswant Singh, 1999, *Defending India*, Bangalore, Macmillan India, p. 335.
8. This may change if and when the CTBT enters into force, as the list of measures prescribed for cases of violation does not involve the Security Council at all.
9. Ramaker, 2003, op. cit.

Is it time to consider provisional application of the CTBT?

Rebecca JOHNSON

The Comprehensive Nuclear-Test-Ban Treaty (CTBT)¹ has been in limbo for ten years, and there seems little prospect of meeting its stringent conditions for entry into force any time soon. Even so, the test ban is supported throughout the world, most of the verification system is up and functional, and no one has conducted a nuclear test since India and Pakistan exploded their underground bombs in May 1998.

The United States has just concluded a nuclear technology deal with India that tears a hole in non-proliferation norms and regulations. Even supporters of the nuclear deal have criticized Washington for failing to exert leverage to halt fissile materials production in India. That the CTBT went unmentioned in the deal surprised no one, as the Bush Administration has taken every opportunity to proclaim its opposition to this treaty.

With the Bush Administration dead set against the treaty, which President Clinton signed in September 1996, how safe is the norm against nuclear testing? Does it matter that the test ban has not taken full legal effect, or is it time for friends of the treaty to consider provisional application, by which the states that have ratified the ban (there are now over 130) agree to take a collective step toward implementing its provisions even though some of the major states have not yet come on board?

If a group of states took such an initiative forward, how would the United States (US) or other hold-outs react? Would such a move, if led by US allies such as the United Kingdom, help test-ban supporters in the United States (who are backed by an overwhelming 80% of public opinion, according to polls)? Or would it provoke a backlash and give the neocons reason to remove the United States' signature from the treaty and take even more US funding away from the verification regime? Would it help to bring India, Pakistan and North Korea into the regime, or would the move renew Indian hostility to the pact? In the treaty's tenth year, provisional application is again being discussed, with test-ban supporters divided over the wisdom, practicality and potential benefits and drawbacks of such a move.

Background

At the time of writing, 176 states have signed the CTBT, and 132 have ratified. By any normal assessment this is a well-supported treaty. More states have signed and ratified the CTBT than many pacts that entered into force years ago. The CTBT, however, has been crippled by an entry-into-force

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provision that makes the signature and ratification of 44 specified states with nuclear facilities² a strict requirement before the treaty can take full legal effect.

Article XIV of the CTBT contains the messy entry-into-force provision that was settled on to appease some of the nuclear-weapon states party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT)—notably China, Russia and the United Kingdom—who did not want to accept restrictions on their nuclear programmes unless all “threshold” or aspirant nuclear-weapon programmes were likewise curbed. The imposition of this list of 44 caused India to block the adoption of the treaty by the Conference on Disarmament, where it had been negotiated. India had been unsure about the test ban all along, and had first tried to scupper agreement by taking the moral high ground and insisting that the treaty should commit to nuclear disarmament and ban all laboratory testing as well as nuclear explosions; when that failed, as everyone knew it would, India declared its opposition to the test ban. It was obvious to all that the list of nuclear-capable states that the United Kingdom had argued for would condemn the treaty to a long period in the shadows, so Canada proposed holding periodic conferences to offer a way of addressing the problems that the addition of this list would entail. Now known as the Article XIV Conferences, these would be held to decide on measures “consistent with international law ... to accelerate the ratification process in order to facilitate the early entry into force of this Treaty”.³

It is nearly ten years since the United Nations (UN) General Assembly adopted the CTBT by 158 votes to 3 (Bhutan, India and Libya), with 5 abstentions (Cuba, Lebanon, Mauritius, Syria and Tanzania). Libya and Tanzania have now joined the treaty, and Lebanon has recently signed.

When the CTBT was adopted by the General Assembly in September 1996, India’s ambassador, Arundhati Ghose, declared that “India will never sign this unequal treaty, not now, nor later”.⁴ Indeed, India has not signed or ratified, but since its nuclear tests in May 1998 it has declared a moratorium on nuclear testing that it continues to maintain. And despite this proclamation of undying opposition to the CTBT, New Delhi’s present policy is that India will not prevent entry into force, which is interpreted as meaning that by the time the other 43 necessary ratifications have been achieved, India will not be the last to hold out.

Pakistan voted to adopt the CTBT in 1996 but followed India in conducting nuclear tests in 1998 and in then declaring a moratorium. Since Pakistan traditionally votes in favour of the annual CTBT resolution in the General Assembly, it is assumed that Islamabad would sign and ratify the treaty as soon as India does, but (for regional reasons) not before.

North Korea has remained aloof from the CTBT; it has not tested, but neither has it signed or ratified. After Pyongyang announced its withdrawal from the Non-Proliferation Treaty in 2003, there have been periodic rumours of a nuclear test being planned, but no evidence of preparations. Though China has not yet ratified (claiming that the treaty is still being considered by the National People’s Congress), it conducted its last nuclear test months before the treaty was concluded and signed, and continues to abide by its moratorium. A North Korean nuclear test would not be in China’s interests, and Beijing has no doubt made that clear to Pyongyang. If a security and incentives package could be agreed with the United States (through the medium of the Six-Party Talks or bilaterally), by which North Korea would give up its nuclear-weapon programme and rejoin the nuclear non-proliferation regime, it is assumed that North Korea would also accede to the CTBT.

The major impediment to the CTBT’s entry into force is the United States. For reasons that stretch back to 1992, when, over the objections of President George H.W. Bush, a Democrat-led Congress voted to impose a nuclear test moratorium, the CTBT seems to have been made into a litmus test of Republican loyalty. A series of misjudgements in 1998–99 by the Clinton Administration led to the treaty being pushed before the Senate for ratification at a time convenient to the Republicans. In a bitterly charged Senate fight that focused more on party loyalty and opposition to Clinton, the treaty’s

merits barely got a hearing. Even known supporters of the test ban, such as Senator Richard Lugar, were whipped into voting on party lines against the CTBT's ratification in October 1999. Since taking over the presidency in 2000, President George W. Bush has openly repudiated what his administration derides as the "Clinton Test-Ban Treaty". The United States has provided the sole vote against it in successive General Assembly sessions (India abstains). Going even further, Washington has boycotted the last three Article XIV Conferences.⁵

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To underscore its hostility to the CTBT, the Bush Administration has also voted against non-proliferation resolutions put forward by moderates such as Japan, a staunch US ally on many issues, but also a strong supporter of the test ban. On at least two occasions, in 2001 and again in 2004, test-ban opponents in the Bush Administration have circulated a secret memo among principal domestic agencies in which various approaches have been canvassed, including removal of the United States' signature and suspension of funding for the verification regime being established under the Preparatory Commission for the CTBT Organization (CTBTO). In 2002, the United States took the unprecedented step of withholding its financial contribution from activities associated with on-site inspections, while continuing to support the International Monitoring System established under the CTBT. The wider implications of such cherry-picking for the integrity of international law and non-proliferation are profoundly worrying, as is the United States' recent nuclear deal-making with India: the Bush Administration gave away the technology store without (at the very least) either getting India to halt its production of fissile materials for weapons or to join the CTBT and make a binding commitment not to test again.

The last Article XIV Conference, held in New York in September 2005, had virtually no political or public impact. A new Executive Secretary, the very experienced Hungarian diplomat Tibor Tóth, was welcomed; set speeches were made by a variety of states extolling the virtues of the treaty and its verification regime; and a final document was adopted exhorting the remaining 11 of the 44 Annex 2 states to accede. Unlike in 1999 and 2003, provisional application did not come up either in proposals or in non-governmental organizations' presentations, but there are signs that the question will surface again before the next scheduled conference in 2007.

What is provisional application?

Provisional application is a rarely evoked but useful mechanism to bypass extraordinary, temporary or unanticipated political obstacles impeding entry into force. It enables a treaty that is supported by a large and significant number of ratifiers to be implemented for those states at least. It is not a panacea or a substitute for entry into force, but it can temporarily bolster the legal authority of a treaty and prevent it being undermined by transitory forces. In the past, it has contributed to building confidence and helped create more positive conditions and incentives to facilitate full entry into force. Two recent examples are the 1990 Treaty on Conventional Armed Forces in Europe and the 1982 United Nations Convention on the Law of the Sea.⁶

According to Article 25 of the 1969 Vienna Convention on the Law of Treaties, "[a] treaty or part of a treaty is applied provisionally pending its entry into force if: (a) The treaty itself so provides"—which the CTBT does not—or if "[t]he negotiating States have in some other manner so agreed".⁷ Depending on how provisional application is entered into, this means that, pending entry into force, all or part of a treaty takes legal effect for those who wish to abide by the agreement. Though not binding on those who remain outside, a treaty that is provisionally applied by a large number of states has enhanced legal standing, increasing the political costs of violation.

Though the CTBT text does not specifically mention provisional application, it does not in any way rule it out. Moreover, during the difficult and rushed negotiations over entry into force, provisional application was discussed as a way to prevent an individual country exercising a veto; certainly, though not explicitly referred to, it was in the minds of Canadian diplomats and others when special conferences were proposed in the event that the treaty does not enter into force in a timely manner (under Article XIV). Aware of the politics of the positions held by China, the Russian Federation and the United Kingdom on the one side and India on the other, the Conference on Disarmament did not invest these Article XIV Conferences with the power to waive the stringent entry-into-force requirements or the list of states in Annex 2, but it did pave the way for participating states to agree on procedures for further measures, including, potentially, provisional application.

Provisional application would require the agreement of most but not all states that have ratified the treaty already. There are several ways in which this could be initiated. Most simply, a group of friends of the treaty that have already ratified could decide to convene a two- or three-day special conference and invite all those who have ratified (together with signatories, who would participate as observers) to negotiate and agree a protocol on provisional application. This could be done in conjunction with an Article XIV Conference or separately.

Based on precedent and the particular needs of the CTBT, the provisional application agreement could be worded along the following lines and endorsed by a majority vote in the UN General Assembly:⁸

1. To promote the implementation of the Comprehensive Nuclear-Test-Ban Treaty, as opened for signature on September 24, 1996, hereinafter referred to as the Treaty, the States Parties hereby agree to the provisional application of certain provisions of the Treaty.

2. Without detriment to the provisions of Article XIV of the Treaty, the States Parties shall apply provisionally all other Articles, Protocols and Provisions of the Treaty.

3. The Treaty shall be applied provisionally [on date] by all States which have signed and ratified the Treaty, unless they notify the Depositary in writing that they do not consent to such provisional application.

4. The Treaty shall be applied provisionally by any State which has signed the Treaty, which consents to its provisional application by so notifying the Depositary in writing. Such provisional application shall become effective from the date of receipt of the notification by the Depositary.

5. Regardless of whether a signatory State has agreed to provisionally apply the Treaty, financial contributions for supporting Treaty implementation and verification shall be as agreed in the Schedule [give details] unless a State notifies the Depositary in writing of its intention to alter its financial contribution.

6. Provisional application shall terminate upon the entry into force of the Comprehensive Nuclear-Test-Ban Treaty. In conformity with Article IX of the Treaty, any State may also withdraw its consent from provisional application by notifying the Depositary in writing, and must include a statement of the extraordinary event or events related to the subject matter of this Treaty which the State regards as jeopardizing its supreme interests.

The approach above has two advantages: an automatic co-optation of all ratifiers (with a provision for opting out if a national decision is taken to that effect) plus a mechanism for signatories to opt in by executive decision. In the first case, states that have already ratified are not required to take additional national steps to be included in provisional application: it is simpler if the decision to provisionally apply the CTBT does not require additional legislative or judicial action (unless specific conditions have

already been attached to a country's ratification). Whether additional legislation or agreement would be needed if a government wished to opt out would, of course, depend on national law or specific implementation procedures. The opt-in option for signatories could be used in cases where the executive branch of government wishes to participate fully in the treaty's benefits but is impeded, as sometimes happens if national ratification becomes bogged down in difficult legislative, judicial or bureaucratic processes.

Paragraph 2 is crucial: it means that the entire treaty, as concluded and signed, is applied, apart from the entry-into-force requirement listing the 44 states. Since it is without detriment to Article XIV, every effort should continue to be made to fulfil the requirements and enable full entry into force. Though it would be hoped that none would seek to exercise the right of withdrawal, it is important to note that provisional application would not interfere with the withdrawal provisions in the treaty. According to Article IX of the CTBT, which would stand, withdrawal is possible after six months' notice if a state decides that extraordinary events related to the subject matter of the treaty have jeopardized its supreme interests.

Though the rules of procedure for Article XIV conferences currently require consensus among the ratifiers, decision-making in the case of provisional application would be according to rules determined by the participating states. With regard to amendments, for example, Article VII of the CTBT states that an amendment may be adopted at an amendment conference by "a positive vote of a majority of the States Parties with no State Party casting a negative vote". However, Article 9 of the Vienna Convention takes as general practice for treaty decision-making the less stringent requirement of a positive vote of two-thirds of the states participating and voting.

Pros and cons

The CTBT would seem to be a prime candidate for provisional application. Support is demonstrably high, and opponents are few (and motivated more by ideology or narrow interests than technical objections). The verification regime is practically established but cannot be fully utilized until entry into force (a point underlined by the Bush Administration's withholding of funds from anything related to on-site inspections). While the current US leadership's opposition is implacable, the test ban is popular with American public opinion.

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Most, if not all, of the other hold-outs could be pressured or enticed to come on board, including India, if the inducements were sufficiently attractive. The process leading up to a provisional application conference and decision could and should be used to exert pressure on the remaining hold-outs, particularly key states like China, Egypt and Indonesia, to accelerate their ratification processes in order to be "in" (and ensure their interests are fully represented). As was demonstrated in the run-up to entry into force of the Chemical Weapons Convention, the fear of being left out of plum appointments and influential posts can be an effective incentive for slow or reluctant ratifiers! Though it cannot be assumed that such incentives would reverse the Bush Administration's hostility to the CTBT, they might work in cases where the delays to ratification are less ideological.

While nuclear testing does not appear to be in the plans of anyone at present, a test ban in limbo may be more easily ignored than one that has over 130 adherents. Any nuclear explosion could destroy years of efforts to curb the proliferation of nuclear weapons. It was hard enough getting the relevant states to the negotiating table. If the CTBT were killed off, either intentionally or as a by-product of some state's nuclear ambitions, it would be almost impossible to resurrect it. Such a threat would seriously set back international efforts to prevent the spread of nuclear weapons and reopen a

nuclear Pandora's box, with little hope of putting the regime back together again. Even if provisional application did not impose a sufficient deterrent to prevent a first test—as one might be carried out in defiance of the international community by a determined opponent of multilateralism or a reckless proliferator—a treaty in provisional force would be more likely to act as a brake on further “me too” testing. Hence, there would be some chance of preventing an overall collapse of the test-ban norm, while at the same time the applied treaty would provide a stronger legal basis for collective UN action against the violator than the current anomalous status of the treaty would make possible.

Against these calculated benefits lies the uncertainty of how test-ban opponents in the principal hold-out countries—especially the United States—might react. Though the Bush Administration has twice circulated options internally for removing the United States' signature from the treaty, it has not done so. It withheld funding from the CTBTO's work on inspections, which set a bad precedent, but continues to pay a significant sum toward the international monitoring system, which is widely welcomed. With the “war on terrorism”, the mess in Iraq and the president's approval ratings plummeting, Republicans seem to have forgotten their hate symbols of the 1990s, such as the CTBT. So, say some Washington insiders, don't remind them with a multilateral initiative like provisional application: let sleeping dogs lie.

At present, the CTBT lies quietly in the lap of the Senate Foreign Relations Committee, where it has remained since the failed ratification vote of October 1999. Legal opinion differs as to whether the president could take an executive decision to remove the United States' signature or whether the treaty would first have to be returned to the White House, requiring a majority vote by the Senate committee; given the committee's changed leadership and current concerns, this might not be as easy as it once appeared. Even if Bush could not implement on his own the drastic decision of expunging the United States' signature, the major fear among CTBT officials is that any international move toward provisional application could provoke a petulant reaction, such as cutting off all US funding for the CTBTO and the verification regime.

Though the concerns of the “don't poke the Republicans” faction among test-ban supporters in the United States should not be ignored, it should be noted that some former senior US government officials have recently been expressing interest in provisional application. They believe that Bush is too

By putting a spotlight on the CTBT, a move toward provisional application could put pressure on the Bush Administration.

weak now to take on the kind of opposition that would be mounted if he tried to destroy the treaty by removing the United States' signature or further cutting its financial contribution. On the contrary, they note that while the CTBT has little visibility or salience with the public at present, opinion polls continue to indicate consistently high support

for maintaining the test ban. By putting a spotlight on the CTBT, a move toward provisional application could put pressure on the Bush Administration. Even if it did not succeed in bringing the United States on board while Bush remains in the presidency, they argue that the greater attention would make it much harder for the administration to harm or undermine it further.

The United States currently contributes around a fifth of the overall costs of the CTBTO. As a signatory, the United States is obliged to contribute this share, but there are fears that if a group of states agreed to provisional application, the United States might refuse to contribute any further funding. Currently, the treaty is funded in accordance with UN schedules, based on each country's gross national product. However, regardless of the United States' position, provisional application might necessitate some changes. Some analysts argue that if the treaty were to be provisionally applied, the cost of its upkeep would fall solely on the parties to that agreement, while others suggest that this, as with most questions in multilateralism, is open for negotiation. Certainly, this would need to be worked out, and any consideration of provisional application would have to weigh the implications of losing US funding, which would increase the financial burden for at least some of the parties to provisional application.

Though a high proportion, the United States' contribution is not a very large sum of money in comparison with the defence or foreign affairs budgets for most countries. It must be assumed that provisional application would not be adopted unless there were more than one hundred states in support, including some of the richest countries of the world, such as Japan and members of the European Union, who have all ratified. If the United States' shortfall were shared out, the increased portions for any individual country would not raise its bill by very much (and would be nothing like the cost of any military intervention to counter nuclear proliferation).

Moreover, those that fear the United States would pull out of funding the CTBTO fail to take into account the benefits the United States receives through its participation in the organization, particularly the posts it occupies in Vienna and the data it receives through the International Monitoring System. It is understandable that CTBT officials in Vienna should worry about losing US funding, but a strong argument can be made that a decision by the United States to pull out of its contribution would be far more costly to Washington in terms of security and intelligence resources and political influence, than it would be for those facing a marginally increased financial burden.

In addition to the question of financing the treaty, any initiative to pursue provisional application would need to take account of a range of political, legal, technical and institutional factors. There would be little point in moving forward without the commitment of the majority of states that have ratified so far. The three nuclear-weapon states that have already ratified—France, the Russian Federation and the United Kingdom—would need to support the decision. Ideally, they should be among the core group calling for a conference to consider provisional application, though this would not be absolutely essential. The British government might be anxious not to offend Washington, particularly in light of its dependence on close nuclear-weapon collaboration with the United States, which has become more sensitive than ever now that the United Kingdom is facing decisions about the future of its nuclear policy.

France and Russia have much to gain and little to lose from leading such a non-proliferation initiative. France has closed its test sites in the Pacific and would find it prohibitively expensive, politically and financially, to resume nuclear testing. Russia, which lost the Semipalatinsk test site when Kazakhstan became an independent state, has only Novaya Zemlya in the Arctic. Though Moscow periodically engages in sabre rattling about new nuclear weapons, it would not welcome the instability and additional expense of responding in kind to a resumption of US testing, likely to be followed by China and others. If a British government refused to go along with France, the rest of the European Union and Russia in applying the CTBT, this would be massively unpopular and would feed into growing opposition to the current British government's moves to replace the Trident nuclear system and commit the country to nuclear dependence for a further 50 years.

Finally, some disarmament advocates argue that the CTBT is no longer worth the trouble, since basic nuclear weapons can be designed and tested without nuclear testing, and the nuclear-weapon states now use supercomputers, lasers and subcritical testing to get the information they need for modifications and modernization. After Congress refused the Pentagon's budget request for a robust nuclear earth penetrator (the "bunker buster"), the latest laboratory buzz is over the reliable replacement warhead (RRW)—planned as a tough design that can be adapted for a variety of delivery systems and purposes without requiring nuclear explosive testing. On 23 February 2006, the United States and the United Kingdom conducted a joint subcritical test primarily in connection with RRW developments. It is true that the RRW and continuation of inertial confinement fusion and subcritical tests for warhead purposes are attempts to circumvent the CTBT's long-held purpose of capping vertical as well as horizontal proliferation. That technological advances have undermined some of the treaty's broader objectives is a problem for disarmament and non-proliferation, but does not invalidate the need for the CTBT to enter into force and be fully implemented.

Conclusion

Though the CTBT is overwhelmingly supported around the world, its entry into force appears impossible to achieve in the near future. Its stringent entry-into-force requirement has combined with politically contingent circumstances in more than one of the required states to become an obstacle to its further development and implementation. Under such unpropitious circumstances, provisional application may be the best way to restore confidence in the test ban and confer greater legal authority on the treaty regime than it has at present. Nothing in the treaty or its negotiating record prevents provisional application being pursued. Procedurally it need not be very complicated. Legally, those states that have ratified have the power to do whatever they collectively agree to do, consistent with the treaty's obligations.

Provisional application needs now to be considered, with the recognition that there are complex political, financial and institutional factors that will need to be weighed on all sides before any initiative is actually launched. Before a conference is called, friends of the treaty would need to have consulted widely: they ought to be sure that they have the support of an overwhelming majority of the ratifying states, including the 34 nuclear-capable states in Annex 2 that have already ratified. If, for example, Russia or France were not prepared to endorse provisional application, the initiative would undoubtedly fail. Though desirable, British support at the beginning would be less crucial, because it is widely understood that the United Kingdom's dependent nuclear position vis-à-vis the United States compromises its ability to act independently if the United States disapproves.

In addition to those that have already ratified the CTBT, every effort should be made to bring nuclear-capable signatories such as China into the initiative as early as possible, while recognizing that Israel will likely stick close to the United States' position, and that in accordance with regional considerations, Egypt may not wish to ratify until Israel does.

The alternative is to let things slide along as they are now. Bit by bit, perhaps, the endeavours of the CTBTO and the patient diplomacy of Ambassador Jaap Ramaker, who was reappointed by the 2005 conference as Special Representative for entry into force, might reduce the 10 key hold-outs by one or two. But in the absence of political change in the United States or much higher levels of political pressure from the international community, it is difficult to see how such behind-the-scenes processes will be able to increase the political stakes sufficiently to get the main hold-outs to sign and ratify. The risk is that the CTBT ossifies and is marginalized before it can be effectively embedded in international law, and that when a state decides that a nuclear test would be useful, as India and Pakistan did in May 1998, it will be able to go ahead with impunity.

The purpose of provisional application is both legal and political. At its best it can provide greater legal stability and much higher levels of political pressure, thereby paving the way more expeditiously toward full entry into force. At its worst, it could provoke hostility in certain states and result in further attempts to undermine the treaty. Leadership, strategy, timing and political conditions will determine the usefulness of the initiative. Ideally, the process itself would accomplish most if not all of the objectives, and greatly accelerate full entry into force. These factors will all need to be carefully considered. Without a test ban we will be back to a proliferation free-for-all; with a test ban, we have a basis for taking further steps toward effective non-proliferation and disarmament.

Notes

1. Comprehensive Nuclear-Test-Ban Treaty, UN document A/50/1027, adopted by UN General Assembly resolution 50/245 of 10 September 1996, opened for signature 24 September 1996, available at <www.ctbto.org/treaty/treaty_text.pdf>.
2. See Article XIV and Annex 2 of the treaty.
3. Comprehensive Nuclear-Test-Ban Treaty, Article XIV, paragraph 2.
4. Arundhati Ghose, Ambassador/Permanent Representative of India to the UN Offices at Geneva, Statement in explanation of vote to the United Nations General Assembly, 10 September 1996, at <www.fas.org/news/india/1996/ctbt_UN_september_10_96.htm>.
5. R. Johnson, 2001, "Boycotts and Blandishments: Making the CTBT Visible", *Disarmament Diplomacy* 61, October–November, at <www.acronym.org.uk/dd/dd61/61ctbt.htm>; R. Johnson, 2003, "Beyond Article XIV: Strategies to Save the CTBT", *Disarmament Diplomacy* 73, October–November, at <www.acronym.org.uk/dd/dd73/73ctbt.htm>; D. Kimball, 2005, "Keeping Test Ban Hopes Alive: The 2005 CTBT Entry-into-force Conference", *Disarmament Diplomacy* 81, Winter, at <www.acronym.org.uk/dd/dd81/81dk.htm>.
6. I would like to thank Jozef Goldblat for his helpful comments on the legal status and multilateral precedents regarding provisional application.
7. Vienna Convention on the Law of Treaties, 23 May 1969, at <untreaty.un.org/ilc/texts/instruments/english/conventions/1_1_1969.pdf>.
8. The following section is taken from Rebecca Johnson, 2003, "Beyond Article XIV: Strategies to Save the CTBT", *Disarmament Diplomacy* 73, October–November.

Urging entry into force: lessons from the Partial Test-Ban Treaty amendment effort

Aaron TOVISH

A decade after the Comprehensive Nuclear-Test-Ban Treaty (CTBT)¹ was opened for signature, the treaty still has not entered into force. It cannot enter into force for the lack of ratification by 10 specified states, despite 132 ratifications. Widespread fears of the collapse of the international nuclear non-proliferation regime must be taken seriously.

How to escape the impasse? Efforts to promote the CTBT's entry into force have brought little success so far. This paper considers a previous attempt to promote the test-ban issue: the 1988 proposal to amend the Partial Test-Ban Treaty.² While the amendment was not adopted, the Amendment Conference helped to revive the international comprehensive test-ban process. Perhaps we can apply lessons from the PTBT experience to drive forward the CTBT's entry into force.³

Amendment of the Partial Test-Ban Treaty

The preamble to the Partial Test-Ban Treaty (PTBT) affirms the aim of “the discontinuance of all test explosions of nuclear weapons for all time”. And this aim is reflected in Article II, the amendment provision of the treaty, which makes amendment easier than any other arms control treaty. It empowers a majority of the states parties to impose an amendment upon a minority, as long as the three Original Parties (Russia, the United Kingdom and the United States) are among the majority.⁴

However, the revolutionary nature of Article II was vitiated by its discriminatory nature. For most countries the discrimination was of little consequence, as they had no intention of acquiring nuclear weapons, and thus had no intention of testing any. But France had already tested eight times, and China was to hold its first test in just over a year's time; the discriminatory provision reinforced their reluctance to join the treaty.⁵ As long as France and China stood outside the regime, there was no real prospect of the Original Parties using the amendment provisions to bind themselves to a more comprehensive ban.

But on 5 August 1988, the 25th anniversary of the PTBT, the ambassadors of the Original Parties were visited by the ambassadors of five non-nuclear-weapon states—Indonesia, Mexico, Peru, Sri Lanka and Yugoslavia, who formally submitted an amendment to transform the treaty into a comprehensive test ban.⁶ An amendment proposal had been the subject of United Nations General Assembly resolutions for three years running (resolutions 40/80, 41/46 and 42/26), but all the same the three ambassadors were astounded that it was actually happening.⁷ However, at that time there

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were 116 parties to the PTBT; it seemed improbable that 34 more states would align themselves with the impudent action of the five.

It took almost six months, but by May 1989 41 parties had formally requested the convening of an Amendment Conference, including the key states of India and Pakistan. The Original Parties were legally bound to convene the conference, despite the fact that the United Kingdom and the United States governments were on record opposing any negotiation of a comprehensive test ban!

The Amendment Conference was held 7–18 January 1991 in New York. Because of the threat of veto from the United Kingdom and the United States, there was never any question of bringing the proposed amendment to a vote at the conference. However, the conference did provide an opportunity for President Gorbachev to state his willingness to “adopt an amendment to the 1963 Treaty in order

The United States and the United Kingdom were alone in trying to shut down the amendment process.

to convert the restrictions contained in the Treaty into a comprehensive ban”.⁸ It also highlighted the huge majority in favour of the amendment, and the isolation of the United States and the United Kingdom. When the conference proposed empowering the president

of the conference, Foreign Minister of Indonesia Ali Alatas, to reconvene the Amendment Conference whenever consultations indicated there might be better prospects of making progress, the proposal was adopted 74–19–2: the United States and the United Kingdom were alone in trying to shut down the amendment process.

Adjournment of the Amendment Conference did not bring relief from the pressure mounting on the two parties opposing the comprehensive test ban, particularly the United States. During the Amendment Conference legislation had been proposed in both chambers of the United States Congress to cut off funding for nuclear-weapon testing. Moreover, that year, France and Russia proclaimed moratoria on nuclear testing, which boosted Congressional efforts. But it was not until September 1992 that the United States Congress actually adopted the funding cut-off approach. While vowing to overturn the cut-off if re-elected, President George H.W. Bush refrained from vetoing it because Congress had attached legislation to it that he favoured. A de facto moratorium was thus instituted for both the United States and the United Kingdom (which had been conducting its tests at US facilities until then).

Efforts to formalize these national moratoria through a comprehensive test ban intensified with the arrival of the Clinton Administration in Washington in January 1993. But an internal debate raged over whether the objective should be a bilateral, “low-threshold” treaty (allowing small nuclear explosions) or a multilateral, comprehensive treaty, and so internationally the United States stalled. Minister Alatas intervened by calling for a two-day “collective consultation” among the PTBT parties to step up the pressure for a multilateral approach before a Special (informal) Meeting of States Parties scheduled for 10 August. On the morning of the consultation, in Geneva, the United States announced that it was prepared to go forward with multilateral negotiations in the Conference on Disarmament. The PTBT parties meeting later that day in New York welcomed the breakthrough. There would be no amendment to the PTBT, but the ground had been laid for a new Comprehensive Nuclear-Test-Ban Treaty.

Gaining momentum

Amendment is a drastic step to take. Who initiated the scheme? How did the five non-nuclear-weapon states come together to propose the amendment? And how was the momentum reached for the proposal to be taken seriously by the rest of the states parties and, perhaps more importantly, by the Original Parties? The PTBT amendment attempt is a demonstration of the effect of the sustained interaction of citizens, legislatures and executives.

Parliamentarians for Global Action played a central role in the amendment process—both at the national and international level. Founded in 1978, Parliamentarians for Global Action is a non-partisan network of national legislators working on a range of global issues. In the late 1980s, it had roughly 1100 members in about 80 countries.⁹

In 1984, the test-ban issue was at a low ebb, but Global Action became aware that the PTBT's amendment provisions could quite readily be utilized to revive the issue. Global Action approached Alfonso García Robles, Nobel Peace Prize winner and at that time Mexican Ambassador to the Conference on Disarmament, who immediately appreciated the potential of the idea and in due course took it to colleagues in Geneva. With the help of Global Action, he managed to bring together five states to request a resolution on amending the PTBT in the United Nations General Assembly.

These resolutions became stronger every year, but after three years, and despite the lobbying of individual governments by parliamentarian delegations from Global Action, no action had yet been taken. Global Action decided to make a final push. In simultaneous letters to the president, foreign minister, and leading disarmament specialist of each of the sponsoring countries, Global Action made the case for initiating the amendment process on the 25th anniversary, pointing out that there was now an explicit mandate from the General Assembly to act, and that of more than 100 countries that had voted for the resolution over 80 were party to the PTBT—and most could be counted upon to join in requesting the conference. At the next informal meeting of the five sponsors convened by Ambassador Robles in New York, all of the ambassadors agreed to propose to their governments to go forward as a group. Each of the five governments gave clearance to proceed.

The lobbying of the International Test Ban Campaign (ITBC) helped to broaden support even further. A broad coalition of non-governmental organizations—a network not unlike the successful International Campaign to Ban Landmines, ITBC lobbied governments for an Amendment Conference to be convened. It pointed out that the governments had a political obligation to translate their support in the United Nations General Assembly into actual requests for an Amendment Conference. Without ITBC's global, coordinated, civil society campaign, the 39 requests required to convene an Amendment Conference would not have been forthcoming.

Pressure was maintained by civil society and by legislators. Two months before the Amendment Conference, a “tripartite” delegation of British, Soviet and US legislators visited each of their three capitals. In Moscow they met with President Gorbachev and proposed that he send a personal message to the PTBT Amendment Conference. As mentioned above, Gorbachev ultimately acted upon the proposal. The delegation was not received at such a high level in London or Washington.

Despite the inconclusiveness of the Amendment Conference, many were still in favour of a comprehensive test ban, and Global Action persisted in working toward this goal. In 1993, there was a new administration in the United States, but it was stalling in the Conference on Disarmament. It was Global Action that suggested that Minister Alatas convene the “collective consultation” of the states party to the PTBT (mentioned above) to move things forward.

Clearly, civil society was working closely with its political representatives, especially in the United States. The work of national legislatures in those states that opposed a test ban was invaluable in achieving the CTBT's negotiation and sustaining the national moratoria on testing.

There was a measure of cross-party support for a test ban in 1988 in the United Kingdom parliament, but the political system meant that this support did not challenge the government directly. In the United States, however, Congress holds the “power of the purse”; and in the late 1980s Congress was in the hands of the opposition. In 1987, the House of Representatives had voted to impose a moratorium on nuclear testing by suspending funding, but the motion failed in the Senate. Nonetheless, there was an active group of members of Congress in favour of a comprehensive test ban, and members

affiliated with Global Action were prominent among them. Global Action had also chosen to hold the press conference to announce the submission of the PTBT amendment proposal (upon the treaty's 25th anniversary) not in Geneva but on Capitol Hill, so that a core group of members of Congress could use the attention the amendment effort was receiving internationally to advance the cause among their colleagues.

This combination of pressures at the international and national levels helped the comprehensive test-ban effort enormously.

This combination of pressures at the international and national levels helped the comprehensive test-ban effort enormously. Fearful for the effect of their opposition to the PTBT amendment on the NPT review and extension process (which both states supported), the United Kingdom and the United States had initiated a diplomatic slowdown to ensure that the PTBT Amendment Conference occurred after the 1990 NPT Review Conference. This was successful. However, the 1990 NPT Review Conference failed all the same; and it failed on the issue of testing. The Non-Aligned Movement wanted a reaffirmation of the commitment to a comprehensive test ban, but the United States and the United Kingdom rejected this, and a compromise could not be found. The intransigence of both the United States and the United Kingdom regarding a comprehensive test ban was not just endangering the PTBT amendment effort, but also the NPT review and extension process.

The US Congress was all too aware that the NPT review and the PTBT amendment processes were now bound together: the PTBT Amendment Conference represented the second chance to resolve the testing question and improve the chances of a successful NPT Review and Extension Conference in 1995. If the executive branch of the United States could not see the trouble that lay ahead if it persisted in its opposition to the PTBT amendment, then Congress would have to step into the breach.

And this is precisely what Congress did: it re-launched the effort to cut off funding for testing just as the PTBT Amendment Conference convened in New York. These efforts continued after the Amendment Conference and support for a test ban gathered strength. Working closely with members of Congress, the ITBC was key to mobilizing public support for the adoption of the legislation that eventually stopped testing. By the time of Minister Alatas's "collective consultation", support for the PTBT amendment was such that when the administration announced its intention of boycotting the consultation, a storm of protest arose from members of Congress and the ITBC. The bilateral, low-threshold approach to a testing agreement favoured by some government experts had no popular support.

The Clinton Administration could procrastinate no longer: faced with so much pressure at all levels, it would have to undertake multilateral negotiations for a comprehensive treaty. With France and China still not party to the PTBT, the United States opted for the Conference on Disarmament as the venue for negotiation, since all nuclear-weapon states were represented there.

It was the action of groups, in civil society and in legislatures, that ensured the success of the move to propose the amendment, but the role of experts and expert groups cannot be overlooked. Global Action relied on the support of world-renowned legal experts in drawing up and endorsing the amendment proposal and ensuring its credibility on the international stage. This group included several Americans who had taken part in the original negotiation of the PTBT in Moscow, including the chief negotiator, Averell Harriman. Global Action also asked the Verification Research, Training and Information Centre (VERTIC) to come up with recommendations for verification protocols for the test-ban amendment. VERTIC gathered together an outstanding team of British and US seismologists and verification experts. Its recommendations went far beyond previously discussed test-ban verification systems, helping to open the way for the kind of system operated by the CTBT Organization today.

How to force the hand of CTBT opponents?

For the CTBT to enter into force, signatures and ratifications by India, North Korea and Pakistan, plus ratifications by China, Colombia, Egypt, Indonesia, Iran, Israel and the United States are all needed. Is there anything we can learn from the PTBT amendment attempt that could help us obtain these? Is there scope for a similar interplay of the forces of governments and citizens, with an equally successful result, today?

The United States is the only party openly rejecting entry into force. While it would undoubtedly be helpful to have all other parties on board, that will be next to impossible as long as there appears to be no immediate prospect of a change in US policy. The recent agreement between the United States and India on nuclear commerce is a case in point. Knowing full well that the current administration in Washington does not value a permanent end to testing, the Delhi government was able to brush aside a proposed provision that the agreement would be terminated if India resumed testing. The bottom line is that there will be no decisive movement on the CTBT's entry into force until there is a political change of heart in Washington.

The key political change would be the return of a Democratic majority in the US Senate. It is the Senate that must give its advice and consent to ratification by a two-thirds majority. It is at the Senate's Committee on Foreign Relations that the CTBT now languishes, and it is at the discretion of that committee to choose when—if ever—to dust it off and take action.¹⁰ With a Democratic majority would come a new committee chairperson and the power to report the CTBT to the full Senate. Since neither political party has ever had a two-thirds majority in the Senate, ratification would almost certainly depend upon securing a substantial share of Republican votes.

With a Democratic-controlled Senate the dynamics described in this paper could begin to operate in earnest for the CTBT. Democratic-Party Senators would have a long list of international issues requiring their attention. If the Senators wished to atone for some of the lapses of the Clinton Administration, then the failure to push hard for ratification of the CTBT in 1996–1997 would be high on their list. Civil society arms control and disarmament advocates would certainly unite around them if there were genuine leadership coming from the Senate.

But it is just as likely that the CTBT would not get high priority: Senators would be confident that they could uphold the testing moratorium, but they would not be confident of gaining enough Republican support for CTBT ratification, regardless of the party controlling the White House. In this setting, international pressure and support could be decisive.

A coordinated international campaign along the lines of the PTBT amendment effort could be organized around the CTBT Conferences on Facilitating Entry into Force. These conferences have been held every two years in accordance with Article XIV of the CTBT, and the next are due in 2007 and 2009.

Both conferences should be convened at UN Headquarters in New York to maximize the attention of the US media. Prior to the 2007 conference, key political, diplomatic and civil society allies of the treaty should make a concerted effort to raise the issue publicly at the highest levels of government and to coordinate their actions. Domestically, Senators should be encouraged to form a bipartisan delegation to observe the event. This would put tremendous pressure on the United States government to have an official presence at the Conference—for the first time since 1999.

The Conference on Facilitating Entry into Force itself would serve as a lightning rod for deeper concerns. The days when the public could be roused on the testing issue alone are long over; only a resumption of testing could focus public attention so narrowly again. Today, the very foundations of

nuclear policy are under scrutiny and banning testing is just one of many measures seen as necessary to eliminate the threat posed by nuclear weapons. The conference could be the occasion for a public manifestation in New York calling for the abolition of nuclear weapons, and as an immediate step the permanent banning of all nuclear explosions via the CTBT. Civil society organizations should do their utmost to ensure that the public and leaders are hearing the message loud and clear. And diplomats of states parties should not be shy about using the conference as a “bully pulpit” to appeal directly to US citizens and political leaders to challenge government policy on this issue.

It is conceivable, but currently not considered likely, that the US Senate will have changed hands by the time of the 2007 conference. More likely is that only the House of Representatives will have changed hands. The House would be able to take some action on testing. As the body responsible for the budget, it could increase the US contribution to the CTBT Organization. This could be seen as a warm-up act for the 2009 Conference on Facilitating Entry into Force when perhaps the Senate would have a new majority. While it is always difficult to predict long-term political trends, looking toward 2009, it would certainly be prudent to make contingency plans based on the presumption of further change in the US Congress.

An added incentive that will already begin to have influence in 2007 is the Non-Proliferation Treaty review process. It will loom even larger in 2009 and could play much the same role it did in 1990–1995. The ideal schedule would be to hold the CTBT conference and the third NPT Preparatory Committee back-to-back in New York in 2009.

Could this confluence of political effort dislodge the CTBT from the rut in which it finds itself today? If the new US president were favourably disposed to the CTBT, the prospects would appear very good. This would be particularly true if the new president had benefited in the elections from taking a clear stance on nuclear disarmament. A Conference on Facilitating Entry into Force could provide a golden opportunity for a presidential candidate to distinguish him or herself sharply from any opponent: “The first thing I will do to demonstrate that my administration is ready to work with our allies and friends around the world to combat nuclear proliferation is to end this administration’s boycott of the CTBT by personally leading the US delegation to the 2009 CTBT conference!”

No such thing will happen, however, if other countries and civil society actors wait passively for it to transpire. Honouring the CTBT should feature prominently in the coming years in the work of all those who aspire to the achievement of a nuclear-weapon-free world.

Conclusion

The protracted effort to amend the Partial Test-Ban Treaty contributed decisively to bringing testing by the United Kingdom and the United States to a halt. It dramatically highlighted the huge majority in favour of a comprehensive test ban and the near total isolation of the United States and the United Kingdom. In combination with the NPT review process, it successfully countered the intentions of British and US governments to sideline comprehensive test-ban negotiations and it set the stage for the conclusion of the CTBT in 1996.

A similar coordinated effort around the CTBT and the NPT could yield significant results as early as 2009, while simultaneously promoting at long last the fundamental debate on nuclear policy that ought to have occurred at the end of the Cold War.

Notes

1. Comprehensive Nuclear-Test-Ban Treaty, UN document A/50/1027, adopted by UN General Assembly resolution 50/245 of 10 September 1996, opened for signature 24 September 1996, available at <www.ctbto.org/treaty/treaty_text.pdf>.
2. Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water, Moscow, 5 August 1963, at <www.fas.org/nuke/control/lbt/text/lbt2.htm>. Also known as the Limited Test-Ban Treaty.
3. There is a scholarly book covering most of this period, *Global Action: Test Ban Diplomacy at the End of the Cold War* by Philip G. Schrag (Westview Press, Boulder, CO, 1992). Everything in this short paper is consistent with his account while supplying some additional information.
4. Article II states:
 1. Any Party may propose amendments to this Treaty. The text of any proposed amendment shall be submitted to the Depositary Governments which shall circulate it to all Parties to this Treaty. Thereafter, if requested to do so by one-third or more of the Parties, the Depositary Governments shall convene a conference, to which they shall invite all the Parties, to consider such amendment.
 2. Any amendment to this Treaty must be approved by a majority of the votes of all the Parties to this Treaty, including the votes of all of the Original Parties. The amendment shall enter into force for all Parties upon the deposit of instruments of ratification by a majority of all the Parties, including the instruments of ratification of all of the Original Parties.
5. R.S. Norris, A. Burrows and R. Fieldhouse, 1994, *Nuclear Weapons Databook Series Volume V: British, French and Chinese Nuclear Weapons*, Natural Resources Defense Council, p. 405 and p. 420.
6. Cessation of All Nuclear-Test Explosions, UN document A/43/597, 8 September 1988, contains the original letter of 5 August 1988 and the amendment proposal.
7. UN documents A/RES/40/80 of 12 December 1985, A/RES/41/46 of 3 December 1986 and A/RES/42/26 of 30 November 1987.
8. Message of greetings from the President of the USSR to participants in the Amendment Conference of the States Parties to the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water, annex to UN document A/46/69, 18 January 1991.
9. For more information on Parliamentarians for Global Action, go to <www.pgaction.org>.
10. If the executive branch wished to “unsign” the CTBT, as it unsigned the treaty establishing the International Criminal Court, it would have to ask the Senate to relinquish the CTBT first.

An eye on the world: verifying the comprehensive test ban

Andreas PERSBO and Lisa LEITENBAUER

Toward the end of 2004, the then Executive Secretary of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Wolfgang Hoffman, claimed that the Provisional Technical Secretariat's Vienna-based global monitoring system had achieved global coverage.¹ The statement sounded good, and was clearly designed to grab the media's attention. But it was also grounded in fact. The monitoring system, designed to verify compliance with the 1996 Comprehensive Nuclear-Test-Ban Treaty (CTBT), has an impressive global reach. The organization is looking to 2008 for the system to be as complete as it can be, but it is already exceeding the verification capabilities envisaged by its designers. When finished is likely to be significantly more powerful.

Thus, while fundamental political will to bring the regime into legal reality is still lacking, the verification system is on the brink of completion. The complete verification regime will consist of four major elements: an international monitoring system, consultation and clarification procedures, on-site inspections and confidence-building measures. The concepts, methodologies and technologies underpinning this regime are impressive, and merit further examination. This article examines the International Monitoring System and its International Data Centre. It then looks at the development of on-site inspections before concluding with a short discussion on the future of the verification regime.²

The International Monitoring System and the International Data Centre

The keystone to verification of compliance with the CTBT is the International Monitoring System (IMS). The IMS is designed to detect nuclear tests conducted in any environment anywhere on Earth. It is a complex mechanism but the fundamental principle is quite simple. Remote monitoring stations using four different technologies will monitor the world for any suspicious behaviour. The monitoring process is largely automated and the product of the process is intended to be used to trigger on-site inspections.

Importantly, the CTBTO itself is not involved in determining whether an on-site inspection is warranted. The organization simply conveys information. Compliance determination is left to the states party to the treaty.

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THE IMS IS ACHIEVING GLOBAL REACH

In terms of global reach and interconnectedness, the IMS is the most ambitious remote monitoring infrastructure envisaged for a multilateral arms control or disarmament agreement. Its global network will eventually comprise 321 monitoring stations and 16 radionuclide laboratories located in some 90 countries. This network will transmit vast amounts of data via a dedicated Global Communications Infrastructure (GCI) to the International Data Centre (IDC) in Vienna, Austria, for compilation and analysis.

While coverage in some areas of the globe remains patchy, the system has proved to have remarkable accuracy in other territories, managing to pinpoint seismic events to within some 5km. By May 2006, 159 IMS stations had been certified for use, and another 63 stations had been found to substantially meet CTBTO specifications (i.e. close to certification). The pace of development remains rapid, and the system is due to be as complete as it can be in just a few years' time.³

COMPONENTS OF THE INTERNATIONAL MONITORING SYSTEM

The IMS has posed management and engineering challenges unprecedented in arms control verification, with monitoring stations scattered around the globe, many in remote and inaccessible locations (such as Tristan da Cunha in the South Atlantic, 2800km from the mainland). Some of the stations already existed when the IMS was envisaged, but most have had to be constructed from scratch or substantially upgraded. The IMS uses three waveform technologies to accomplish its task: seismic, hydroacoustic and infrasound monitoring. This is complemented by a radionuclide monitoring network, designed to detect particles released into the atmosphere by a nuclear test.

Detecting movements in the Earth: seismic monitoring

The largest and most important part of the IMS, the seismic network is intended to comprise 50 primary and 120 auxiliary stations. By 10 May 2006, 32 primary and 49 auxiliary stations had been certified for use. Others have been installed and are in the process of being certified.

Since the CTBT was first mooted in the 1960s, the ability to detect and identify underground nuclear explosions by seismic means has improved enormously. Very small seismic events are now readily detectable and attributable to earthquakes, nuclear blasts or chemical explosions for mining or engineering purposes. For instance, the IMS detection threshold is below 0.1 kilotons for all of Eurasia and below 0.2 kilotons for all continents.

Detecting underwater sounds: hydroacoustic monitoring

The treaty calls for the establishment of 11 hydroacoustic stations capable of detecting underwater sounds that may indicate that a nuclear detonation has occurred either under water or on nearby land. Although the hydroacoustic network is small compared with the seismic network, its detection capability is considerable because water allows sound to travel for long distances with little energy loss. Hydroacoustic stations can detect nuclear explosions with a yield as small as a few kilograms from thousands of kilometres away. By 10 May 2006, all but three stations had been certified for use. These remaining three are under construction.

Low-frequency sound in the atmosphere: infrasound monitoring

The treaty also calls for the establishment of 60 infrasound stations capable of detecting very low-frequency acoustic signals from atmospheric explosions as well as from shallow underground and near-surface underwater explosions. Infrasound technology has proved increasingly powerful in its detection capabilities: for instance, it has been able to detect take-offs and landings by Concorde aircraft from great distances. As of 10 May 2006, 33 infrasound stations had been certified for use, representing more than half the network.

Drifting particles: radionuclide monitoring

Although seismic, hydroacoustic and infrasound stations may be able to detect a suspicious event and possibly classify it as a nuclear explosion, they may not be able to conclusively differentiate between a conventional and a nuclear explosion. To help detect the definitive signs of a nuclear test (the release of radioactive nuclear particles) the treaty envisages the establishment of 80 radionuclide stations. The samples taken from the radionuclide monitoring network will be analysed in designated radionuclide laboratories. By 10 May 2006, 37 radionuclide stations and 8 laboratories had been certified for use.

Collecting the information: the role of the International Data Centre

The IDC was inaugurated in January 1998 and started to operate in May of that year. The centre collects, processes, analyses, reports on and archives data from the IMS. Data are initially processed automatically, with the first products (such as integrated lists of all signals detected, as well as standard event lists and bulletins) being available within two hours. The IDC is also tasked with producing certain manual products for distribution via the Global Communications Infrastructure to states parties. One important product is the Revised Event Bulletin, which, if compiled from data from seismic, hydroacoustic and infrasound stations, can be available 4–6 days after an event. Radionuclide data, on the other hand, may take up to two weeks to compile, since samples have to be physically collected at the monitoring site and sent for laboratory analysis. However, the CTBTO's Provisional Technical Secretariat (PTS) aims to automate the radionuclide process using new on-site data processing technologies.

The IDC has been providing data and products to states signatories on a trial basis since February 2000. The CTBTO now has nearly 200 subscribers to its data, and seven countries are subscribing to so-called "real-time data forwarding". This means that data are transmitted from their origin to their final destination within seconds. Since the treaty gives states parties, not the treaty's verification body, the responsibility for drawing conclusions about the perpetrator of any treaty violation, products are provided by the IDC without prejudice to final judgements concerning the nature of any event.

PROGRESS AND EFFECTIVENESS OF THE IMS

Significant progress has been made in establishing the IMS as envisaged in the treaty. More than half the system is now installed, the IDC and GCI are fully functional and the PTS is continually gaining

experience in running these elements. As of 17 May 2006, 162 stations were sending data to IDC operations. Recently, the CTBTO set up a provisional operations centre in its headquarters and a state-of-the-art operations centre should be completed in 2006. The PTS estimates that the system will be 83% complete by the end of 2006. The first system-wide performance test took place during 2005: 163 IMS stations and 5 radionuclide laboratories (about half of the entire monitoring system) took part. The test provided a framework and data for further evaluation and assessment of the verification system.

However, the system is already ageing: some of the first installed stations are already 8 years old, and some of the auxiliary seismic stations are 20 years old. Stations have suffered accidents: for instance, a station constructed in the Pacific has been struck by lightning, and a hydroacoustic station in South America had a cable ripped apart by an anchor. Little critical attention has been given to wear and tear, and repairing a station can be both expensive and time consuming. A study was, however, carried out in 2004 on the centralization, formalization and standardization of existing operation and maintenance processes. Some CTBTO personnel estimate that around 8–10 stations will normally be malfunctioning to some degree at any given moment when the system is fully operational. As of May 2006, fewer than 10 installed stations were not working for one reason or another.

It is difficult to precisely pinpoint the effectiveness of the system in detecting and identifying illicit nuclear tests, as no nuclear tests are currently being conducted, and because the system is constantly improving. It is clear that the IMS is already exceeding the estimates its designers, the Group of Scientific Experts (GSE), made during the CTBT negotiations in the early 1990s.⁴ This is due to the benefits being derived from synergies between the various types of IMS data, advances in monitoring and communications technologies since the system was first envisaged, and the experience being gained in testing and developing the system.

Even in its unfinished state, the probability of the IMS detecting a one-kiloton nuclear explosion by seismic means alone is very high (militarily significant tests are likely to have yields of 5–10 kilotons). The capabilities of the IMS vary in relation to different types of tests and regions. Underground explosions in hard rock can be reliably detected and identified down to a yield of 100 tonnes. In some locations, such as the former test site at Novaya Zemlya, this shrinks to 10 tonnes or less. In any case, as noted by the US National Academy of Sciences, a nuclear explosion with a yield of 1 kiloton or more can be detected and identified with high confidence in all environments.⁵ Atmospheric nuclear explosions are in any event likely to be detected due to the radioactive fallout they produce. Underwater explosions in the ocean are likely to be reliably detected and identified as nuclear explosions at yields down to 1 tonne or even lower, some scientists even estimating that the IMS may pick up sub-surface explosions with yields as low as 60kg anywhere on the globe.⁶

In any assessment of verifiability, it needs to be remembered that the official treaty regime will be supplemented by other verification capabilities. The global network of scientific seismic stations that are not part of the IMS will add substantial capacity to CTBT verification. (Some observers, including those at the Washington-based Incorporated Research Institutions for Seismology, maintain that the non-IMS system's capability exceeds that of the IMS.⁷) Other verification capabilities include the national technical means available to individual countries, in particular those of the United States, which runs its own network of seismometers, radionuclide detectors and satellite-based sensors.

Although there have been various scenarios posited over the years as to how a state might attempt to evade detection, these have been effectively debunked and today have little credibility. The most persistent has been the idea of "decoupling"; conducting an underground test in a salt cavern in an attempt to muffle its seismic signature.⁸ This is not a simple task: the cavity would need to be sealed to prevent radionuclides from escaping and large enough to dampen the seismic waves without overstressing the rock. This technique requires specialist knowledge and equipment and a not insignificant number of skilled personnel. In addition, successful decoupling requires a precise estimate of the

likely yield of the device, so only states with significant testing experience are likely to be able to accomplish it.

At this stage it is safe to say that the IMS, once fully functional and upon entry into force of the CTBT, will have achieved, even surpassed, its originally planned capabilities. As far back as 2001, the Independent Commission on the Verifiability of the CTBT concluded that the CTBT could be verified “with high probability”.⁹

The Global Communications Infrastructure

Detecting data is of no use if the data cannot be transported reliably and securely. The data must be protected from tampering or corruption. The IMS facilities transmit data in near real time to the IDC in Vienna via the Global Communications Infrastructure (GCI). The infrastructure became functional in mid-1999 thanks to the system’s innovative use of very small aperture terminal (VSAT) technology. Five geosynchronous satellites enable IMS facilities and states parties around the world to exchange data via their local VSAT Earth stations. Transmissions are routed from the satellites to hubs on the ground, which forward the data to the IDC using terrestrial links. By the end of 1999, 11 North American stations were sending data to the IDC on a test basis.

HOT Telecommunications Ltd, a company based in Canada, was awarded the contract to design, install, manage, operate and maintain the GCI in 1998. In 2001, the Provisional Technical Secretariat launched a project to consolidate management of the system and strengthen the level of service. The PTS has taken great care to ensure that it stays up to date on the latest developments. The use of internet-based transmissions over virtual private networks from some 100 IMS sites was also considered to improve cost efficiencies of remote monitoring implementation. The IMS internet link has been upgraded from 2 to 5 megabits per second: internet reliability is high and consistent, with an overall availability of 99.9%. The PTS has recently taken successful initiatives to improve coordination between the Secretariat, the GCI contractor and station operators in order to sustain the expanding network.

By September 2005, 197 VSATs had been installed of the envisaged total of 248 (some 79% of the infrastructure). By 17 May 2006, 162 IMS stations were sending data to the International Data Centre. The data traffic carried by the GCI was almost 8 gigabytes per day in 2004 and obviously this figure will increase as the IMS approaches completion. The transmission rate is impressive, given that a lot of traffic is going via satellite and other traffic is being routed through national telecommunications networks of varying quality.

The construction and performance of the GCI is reviewed through, among other things, a series of PTS-organized workshops attended by participants from states signatories. The contract with HOT Telecom will expire in 2008. The PTS took advantage of this opportunity early on to assemble a group of experts from signatory states to define future GCI performance requirements and technology options. Based on this report, the PTS invited suppliers to announce their interest in becoming the next GCI contractor in December 2004. By March 2005, the PTS had received an excellent response and the process is expected to conclude by the end of 2006.

On-site inspections

The purpose of on-site inspections (OSIs) is, according to the CTBT, “to clarify whether a nuclear weapon test or any other nuclear explosion has been carried out in violation of Article I and to gather

facts, as far as possible, which might assist in identifying any possible violator".¹⁰ Any state party may invoke an OSI. The request may be triggered by an ambiguous IMS finding or by information obtained through established national technical means of verification.

A request for an OSI must contain detailed information about the event and the site to be inspected, as well as any results of a preceding consultation and clarification process or any explanations given by the state to be inspected. The request is presented to the organization's Executive Council for evaluation, and to the Director-General of the Technical Secretariat. After the Executive Council receives the OSI request, it commences a process aimed at fielding an inspection at the earliest opportunity. The treaty emphasizes speed. For instance, once a request for an on-site inspection arrives, it has to be communicated to the state party to be inspected within six hours, and to the Executive Council and all other states parties within 24 hours.

The Director-General then seeks clarification from the state party subject to the inspection. The state must provide a response within 72 hours. Any additional relevant information from the IMS or any state party or the Technical Secretariat is then transmitted to the Executive Council. Unless the requesting state party changes its mind, the Executive Council decides whether or not to approve the OSI. This decision has to be taken within 96 hours of receipt of the request. An approval to inspect requires at least 30 votes from the 51 members of the council. If the council decides to field an inspection, it also sets the parameters for it. The council has the authority to determine how the OSI will be executed and when it will be terminated. The requesting state party and the state party to be inspected may participate but not vote in the deliberations of the council or any subsequent discussions related to the inspection.

The Director-General then issues a mandate for the conduct of the OSI. At this stage, the Director-General notifies the state party to be inspected of the team at least 24 hours prior to arrival. The team should be on the ground within six days of the request. The physical area to be inspected is broadly defined in paragraph 2 of part II of the treaty's protocol. It stipulates that "the area of an on-site inspection shall be continuous and its size shall not exceed 1000 square kilometres", and that "there shall be no linear distance greater than 50 kilometres in any direction". The effectiveness of the inspection will in part depend on the ability of the IMS to accurately pinpoint the suspicious event. At present, the IMS is reputedly able to locate a nuclear explosion within a radius of 3–5km (in certain areas of the world).¹¹

OSI TECHNIQUES AND TECHNOLOGIES

The techniques and technologies to be used in inspections are specified in paragraph 69, part II of the protocol. The protocol indicates that the list of techniques and technologies is exhaustive. The techniques and technologies are:

- visual observation;
- video and still photography;
- multi-spectral imaging (including infrared measurements);
- gamma radiation monitoring and energy resolution analysis;
- environmental sampling;
- analysis of liquids, solids and gases;
- passive seismological monitoring for aftershocks;

- resonance seismometry and active seismic surveys;
- magnetic and gravitational field mapping;
- ground penetrating radar;
- electric conductivity measurements; and
- drilling.

THE OSI TEAM

The treaty protocol provides that an inspection team should consist of qualified inspectors, who may be assisted by inspection assistants. Inspectors and assistants are either nominated by the states parties or, in the case of staff of the secretariat, by the Director-General. They are selected on the basis of expertise and relevant experience. Notification to the Director-General by the states parties of the list of inspectors and assistants including relevant facts must occur within 30 days of entry into force of the treaty. Within 60 days, the Technical Secretariat must communicate the initial list to all states parties. Unless a state party objects to the designation of any inspectors or assistants within 30 days of acknowledgement of receipt the list is regarded as accepted.

OSI FIELD EXPERIMENTS

A number of field experiments to simulate OSIs have been conducted to assess the effectiveness of the OSI regime. In October 1999, the first field experiment was conducted at the Semipalatinsk site in Kazakhstan. The initial event was a 100-tonne non-nuclear explosion conducted in an underground tunnel. The inspection team consisted of 12 participants from various countries. The setting accurately simulated the conditions that might be faced by a real inspection team.

A second field experiment took place in Slovakia in 2002. This tested the effectiveness of the Seismic Aftershock Monitoring System, the purpose of which is to localize the search area and facilitate determination of the nature of the event triggering the OSI request. In September–October 2002, a successful large-scale field experiment was conducted in Kazakhstan, which involved the simulation of an underground nuclear explosion using 12.5 tonnes of chemical explosives. More than 25 inspectors participated in this experiment, and techniques were for the first time performed and examined in an integrated manner to assess the synergy between them.

During 2003, the PTS made a comprehensive evaluation of the preceding year's experiment in Kazakhstan. One of its major findings was that field analysis of very minor seismic events following small underground explosions imposes requirements on the available equipment that are very different from the requirements for natural seismic events. So the PTS began to plan an exercise directed at examining alternative seismic software for on-site inspections.

In 2004, an exercise took place near Bratislava, Slovakia, which concluded that reliable aftershock monitoring may require a passive seismic network, deployed during on-site inspections, that is two to three times denser than originally anticipated. The issue of seismic data processing was also addressed and some key features for future software development were identified.

A further exercise was conducted in Kazakhstan in 2005. It focused on the technical and procedural points of initial and additional aerial overflights, on gamma survey and on environmental sampling activities.

THE DEVELOPMENT OF THE OSI OPERATIONAL MANUAL

The completion of the OSI Operational Manual remains one of the major tasks of the CTBTO. The manual is to cover important technical issues such as procedures for overflights; deployment and redeployment of seismic, radionuclide and soil gas sensors; and collection, handling and analysis of samples. It will include a list of inspection equipment, as well as procedures for calibrating, checking and protecting such equipment. The manual will also deal with issues such as communications between

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the inspection team and the Director-General; health and safety provisions for the team; managed access and other measures for protecting confidential data, findings and information not related to the purpose of the inspection.

Some progress has been made. By 1998 the secretariat had completed a draft outline, as well as the first two chapters, which deal with rights of concerned parties during the conduct of OSIs. In 1999 the CTBTO decided to give the manual greater priority and it created a "Programme Coordinator and Friends" group. This group held five sessions and the PTS provided important technical and substantive support. By the end of the year, 75% of the material for the manual was in place. A CD-ROM reference tool was created for the elaboration of the manual, and a workshop on "OSI Technologies: Methodologies and Techniques for Application" was held in Vienna. Several logistics exercises, methodology and field experiment developments, such as the lessons learned from the 1999 Kazakhstan experiment, provided additional material.

The main achievement in 2001 was the completion of the initial draft rolling text (IDRT) of the OSI Operational Manual. The PTS provided legal consultations during the meetings of Working Group B (which deals with the examination of verification issues, including drafting the OSI manual), and assisted in processing states signatories' comments on the IDRT. A workshop in Beijing focused on field experiments and tabletop exercises, the managed access regime (the regime limiting on-site inspectors' access to sensitive areas unrelated to their mission), overflights and equipment issues.

In 2002 drafters completed Chapter 5 (Inspection Preparations) based on the IDRT, and began work on Chapter 6 (Inspections for Underground Event within the Territory of a State Party). A workshop in Vienna also took the manual into account. The main outcomes included specific suggestions on Chapters 3 and 4.

In 2003 Working Group B (WGB) had covered approximately two-thirds of the input for the manual. It turned to issues such as supplementing the manual with additional subordinate documents (covering operational, technical and administrative details), entrusting the PTS with more drafting and related tasks, and exploring other options to continue the elaboration process. The CTBTO encouraged states signatories to continue to contribute to the development of the manual, while the PTS prepared material based on the results of field experiments, tabletop exercises and workshops. A workshop in Hiroshima looked at topics such as confidentiality, the results and lessons from field experiments, and testing equipment.

In 2004, as WGB approached the end of its first reading of the main body of the IDRT, states signatories began to explore practical ways to speed up the elaboration of the draft manual. A workshop held in Vienna in October dealt with the manual. In June 2005, at its twenty-fourth session, WGB completed its first reading of the IDRT, recording its results in an annotated draft rolling text (ADRT). The ADRT provides the basis for the second round. The test manual is expected to be ready for WGB's twenty-seventh session in September 2006. An Integrated Field Exercise will be held in 2008 to test the procedures contained in the draft manual.

The future of the CTBT verification regime

The primary obstacle for the verification regime lies not in technical limitations. The system is being constructed in accordance with carefully laid plans, and the CTBTO is mindful to incorporate new ideas and technologies. The primary obstacle lies on the political level: on the entry into force of the treaty, and thus of the verification regime.

There is still a very long way to go for the test ban to become legal reality. But since Article IV provides that at entry into force, “the verification regime shall be capable of meeting [the treaty’s] verification requirements” there has been a natural inclination on the part of the CTBTO to complete the verification system as soon as possible. As a result, the treaty is in the unusual position of having an almost fully-fledged verification system, but, as it is not in force, nothing to verify.

Thanks to the rapid development of the regime, the CTBTO’s budget has grown from US\$ 27.7 million in 1997 to US\$ 88.5 million in 2003. A steep rise in the first few years reflected the rapid growth of the new organization and the high establishment costs of a global verification system. The budget for 2006 is approximately US\$ 50.9 million and 44.4 million euros, totalling approximately US\$ 104 million.

While the rate of collection of assessed contributions from member states remains unusually high for an international organization, with approximately 90–97% of the budget collected annually (94.5% in 2003), some states are now beginning to question whether, in light of the protracted—perhaps indefinite—delay in achieving entry into force, work should continue at the same pace as in the past.

Counter to this argument is the view that as the regime is providing constantly improving verifiability, and is increasingly proving capable of providing valuable scientific and civil benefits, the investment is worthwhile. For instance, the IDC received data on the 26 December 2004 tsunami off Sumatra. These could have saved thousands of lives, but the CTBTO did not have the resources or procedures in place to react to an event that was over in but a few hours. As CTBTO spokeswoman Daniela Rozgonova put it, “the whole system has not been set up to warn for natural disasters”.¹² Data produced by the IMS can also assist in air crash investigations or warn air traffic of volcanic eruptions.¹³

The regime is providing constantly improving verifiability, and is increasingly proving capable of providing valuable scientific and civil benefits.

Some observers have called provisional entry into force of the CTBT to be considered. From a verification perspective it would be preferable, as the verification system could then be fully used in an official, legally binding way. Others have said, however, that provisional entry into force, even if politically and legally achievable, may relieve pressure on non-signatory states. But international politics are notoriously unpredictable, and the opposite may well be true. If the majority of the world is signed up and committed to the test ban, would that not create pressures on the remaining few to sign up?¹⁴

Some, including the Verification Research, Training and Information Centre in the past, have argued that a formal move toward provisional implementation is unnecessary, as significant elements of the regime are already being provisionally implemented: the nascent verification body is in place, the monitoring system is largely functional and states are already receiving data. The taboo against nuclear testing is so strong that entry into force of the treaty, while highly desirable, may not be absolutely necessary for the verification and compliance system to function virtually as planned.

On the other hand, it is argued that international custom could not practically substitute an international agreement. International custom is very difficult to establish and maintain, and at the end of the day, a legally binding convention will be preferred over an uncertain customary norm. Moreover, the verification regime has been designed and set up to monitor compliance with an international treaty, not an unwritten international norm. Therefore, the regime will not be able to function fully

until the treaty enters into force. It will not be possible to trigger formal consultation, clarification and compliance mechanisms or to use on-site inspection provisions. We thus return to the initial problem regarding the future of the regime: without entry into force of the treaty for which the verification regime was designed, doubts are bound to be raised about continuing funding for operations and maintenance.

On a positive note, the fact that entry into force remains below the horizon means that there is ample time to perfect the verification regime for the day political will again materializes and the treaty does become full reality. States, and perhaps even the PTS itself, have only started to realize the immense scientific and technical benefits the regime may produce. Despite the fact that the regime is not yet fully functional, the concept of real-time monitoring of a treaty commitment is appealing, and the success of the CTBT in that respect remains a source of inspiration for those who are interested in treaty compliance in general, and verification in particular.

Notes

1. See David Ruppe, "Earth Fully Covered by Nuclear Test Surveillance System, Official Says", *Global Security Newswire*, 17 September 2004, <www.nti.org/d_newswire/issues/2004/9/17/8a333ed5-07a0-40f8-9444-9b54d6b3c518.html>.
2. Primary sources for this article were Ben Mines, 2004, "The Comprehensive Nuclear Test Ban Treaty: Virtually Verifiable Now", *VERTIC Brief no. 3*, London, VERTIC; Ola Dahlman, Jenifer Mackby, Svein Mykkeltveit and Hein Haak, 2002, "Cheaters Beware", *Bulletin of the Atomic Scientists*, vol. 58, no. 1, January–February; Oliver Meier, 2002, "CTBT Verification: Technical Progress versus Political Stasis", in Trevor Findlay and Oliver Meier (eds), *Verification Yearbook 2002*, London, VERTIC; David Hafemeister, 2003, "Effective CTBT Verification: The Evidence Accumulates", in Trevor Findlay (ed.), *Verification Yearbook 2004*, London, VERTIC. Unless otherwise indicated, the article is also extensively based on the reports of the Executive Secretary to the Preparatory Commission, available at <www.ctbto.org> (under Preparatory Commission, then PrepCom documents). Any system is at the end of the day dependent on the people that serve it. The authors are grateful to Daniela Rozgonova, Kirsten Haupt and Christian Evertz at the Provisional Technical Secretariat for supplying us with up-to-date statistics. Lassina Zerbo and Fil Filipkowski at the IDC deserve a warm mention. And of course, Don Phillips and others that are working to complete the IMS to the highest standards.
3. It is unlikely to be entirely complete because construction is necessary in some non-signatory states, and this cannot begin until they have signed the treaty.
4. Trevor Findlay et al, 2004, *WMD Verification and Compliance: The State of Play*, A study for Foreign Affairs Canada, London, VERTIC, p. 5, at <www.vertic.org/assets/WMD%20Verification%20Compliance%20The%20State%20of%20Play%20Oct%202004.pdf>.
5. National Academy of Sciences, 2002, *Technical Issues Related to the Comprehensive Nuclear Test Ban Treaty*, Washington, DC, National Academies Press, p. 5, at <darwin.nap.edu/books/0309085063/html/5.html>.
6. David Hafemeister, op. cit.
7. Rhett Butler et al, 2004, "The Global Seismographic Network Surpasses its Design Goal", *Eos*, vol. 85, no. 23, 8 June, pp. 225 and 229, at <www.gps.caltech.edu/~jtromp/research/PDF/eos.pdf>.
8. See, for instance, National Research Council, 1997, *Research Required to Support Comprehensive Nuclear Test Ban Treaty Monitoring*, Washington, DC, National Academies Press, p. 38, at <darwin.nap.edu/books/0309058260/html/38.html>.
9. Independent Commission on the Verifiability of the CTBT, 2000, *Final Report*, p. 8, at <www.ctbtcommission.org/FinalReport.pdf>. Subsequent reports have broadly reiterated this conclusion, see National Academy of Sciences, 2002, op. cit.
10. Comprehensive Nuclear-Test-Ban Treaty, UN document A/50/1027, opened for signature 24 September 1996, at <www.ctbto.org/treaty/treaty_text.pdf>, Article IV (D) Para. 35.
11. Interview with CTBTO official.
12. "CTBTO to Analyze Tsunami Data", *Global Security Newswire*, 3 January 2006, <www.nti.org/d_newswire/issues/2005/1/3/08fb0708-4e42-442f-95ab-9956b6bee9c2.html>.
13. See David McCormack, 2003, "Using Seismic Data in Air Crash Investigations", *CTBTO Spectrum*, issue 2, July, and Debora MacKenzie, 2002, "Someone to Watch over Us", *New Scientist*, no. 2346, 8 June, pp. 12–13.
14. For a full discussion of provisional entry into force of the CTBT, see the article by Rebecca Johnson in this issue of *Disarmament Forum*.

UNIDIR FOCUS

With the recent Programme of Action Review Conference, the international community's attention is focused on small arms and light weapons. Presented below is a selection of recent UNIDIR publications on small arms.

Five Years of Implementing the United Nations Programme of Action on Small Arms and Light Weapons: Regional Analysis of National Reports, Elli Kytömäki and Valerie Yankey-Wayne, 2006

This publication analyses the information contained in national reports voluntarily submitted by states on their implementation of the PoA from 2002 to 2005. It highlights the main trends in national reporting, including regional differences, thematic priorities and areas where further assistance is indicated to be needed. It also provides concrete recommendations on how different aspects of this reporting mechanism could be enhanced and used more efficiently to combat the illicit trade and proliferation of small arms and light weapons.

From Research to Road Map: Learning from the Arms for Development Initiative in Sierra Leone, Derek Miller, Daniel Ladouceur and Zoe Dugal, 2006

This report presents the results of a 1,200-person survey on small arms and security in Sierra Leone. It offers an overview of the post-conflict DDR process, the origins of UNDP's Arms for Development project, and the findings of the survey at the national and district levels. A detailed retrospective is provided on the design and conduct of the survey itself in order to see how such activities might be improved. An appeal is made for the development of a more rigorous and systematic approach to learning about local security problems as they are understood by the stakeholders themselves. Some first thoughts on how this might be accomplished are provided. The analysis concludes with a road map for future voluntary collection efforts to stimulate discussion and provide guidance.

Weapons for Development project

In September 2002, UNIDIR began a two-year research project to evaluate selected "weapons-for-development" (WfD) programmes using innovative participatory monitoring and evaluation (PM&E) techniques. Unlike conventional approaches that make use of external consultants and ready-made criteria to assess project operations and outcomes, PM&E relies on the local beneficiaries themselves

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to carry out the evaluation on the basis of locally defined measures drawn from their daily experiences and perceptions. Placing local stakeholders at the center of attention, where they belong, PM&E offers a grounded perspective on the functioning and effects of WfD programmes that conventional evaluation methodologies may overlook and that is often richer in detail and more indicative of the actual results achieved.

Comparative Analysis of Evaluation Methodologies in Weapon Collection Programmes,
Shukuko Koyama, 2006

This comparison of the findings of the participatory evaluation method with the standard, non-participatory evaluations shows that a combination of both evaluation methods could assist governments, donor agencies, international organizations and implementing agencies to develop and implement more effective post-conflict disarmament efforts.

Listening for Change: Participatory Evaluations of DDR and Arms Reduction in Mali, Cambodia and Albania, Robert Muggah, 2005

This publication summarizes the important lessons learned from the project: key amongst these are that WfD projects do lead to improved local security perceptions and conditions and that the full participation of local beneficiaries in the evaluation, but equally in the design and implementation of WfD activities, are determinant, cost effective factors of success that alone are able to recognize and match appropriate solutions to scarce resources to local needs.

From Exchanging Weapons for Development to Security Sector Reform in Albania: Gaps and Grey Areas in Weapon Collection Programmes Assessed by Local People, Geoffrey Mugumya, 2005

Exchanging Weapons for Development in Cambodia: An Assessment of Different Weapon Collection Strategies by Local People, Geoffrey Mugumya, 2004

Exchanging Weapons for Development in Mali: Weapon Collection Programmes Assessed by Local People, Geoffrey Mugumya, 2004

Each of these three publications presents the results of one of the WfD project's case studies. The studies find that, by and large, WfD programmes did succeed in attaining their objectives of improving the local security conditions and perceptions of targeted communities and, in the process, suggest that a PM&E approach to WfD programme monitoring and evaluation—and indeed, design and implementation—can yield fruitful results.

Cost Benefit Analysis of SALW Destruction versus Storage, Mandy Turner, 2006

The Cost Benefit Analysis Model was developed in order to allow states to estimate the real costs involved in ammunition and weapon storage. It allows each storage depot to calculate its full running costs and how much time it would take to break even in terms of the alternative costs of destruction. It also allows a comparison of the potential benefits from sale versus the costs of storage. The financial accounting systems of many states are often not sophisticated enough to identify these true costs. This model will help them to do this. The model is in the form of an Excel spreadsheet, which comes on the accompanying CD-ROM, and was developed with assistance from SEESAC and the UK Ministry of Defence. It was tested in Bosnia and Herzegovina.

Combating the Proliferation of Small Arms and Light Weapons in West Africa: Handbook for the Training of Armed and Security Forces, Anatole Ayissi and Ibrahima Sall (eds), 2005

The fight against the proliferation of small arms and light weapons is one of the key priorities on the peace and security agenda of West African states. Aware of the fact that the effective control of the illicit circulation of weapons requires competent and accountable security forces, ECOWAS members recognize the necessity to give appropriate training to their armed and security forces. Jointly published by PCASED, ECOWAS and UNIDIR, this book defines a convenient framework from which the necessary training could be conducted. The *Handbook* has been written by locally based West African experts, and the final product is a pragmatically framed and user-friendly training tool. Crafted in a simple, clear and sober style, it is intended to contribute to enhancing a deep sense of duty and accountability among the armed and security forces of the region.

A Guide to the Destruction of Small Arms and Light Weapons: The Approach of the South African National Defence Force, Sarah Meek and Noel Stott, 2004

In the area of small arms, South Africa has been an active participant in efforts to prevent the illicit trafficking of small arms and light weapons and to better regulate the legal use of SALW. The South African National Defence Force (SANDF) has developed its own procedures for planning, implementing and verifying the anticipated weapon destruction programmes. The information provided in this guide is based on the experience of destroying 260,000 surplus small arms and is designed for planners and practitioners of weapon collection programmes. The guide attempts to strike a balance between offering generic information that will be of use to a number of countries and providing specific illustrations of the approach adopted by the SANDF.

Destroying Surplus Weapons: An Assessment of Experience in South Africa and Lesotho, Sarah Meek and Noel Stott, 2003

Produced jointly by the Small Arms Survey and UNIDIR, this publication reviews and evaluates the experiences of South Africa and Lesotho with the disposal of surplus weapons and the management of small arms stocks. The destruction of surplus weapons is cost effective and can benefit societies in terms of security, development and economics. And the body of experience from Mozambique, Lesotho and South Africa has practical relevance for other countries in Africa.

The Scope and Implications of a Tracing Mechanism for Small Arms and Light Weapons, UNIDIR and the Small Arms Survey, 2003

Produced jointly by UNIDIR and the Small Arms Survey, *The Scope and Implications of a Tracing Mechanism for Small Arms and Light Weapons* examines the different aspects of SALW tracing and marking practices and international legal instruments currently in place. The volume argues that existing marking, record keeping and tracing cooperation need to be substantially improved in order to facilitate more effective tracing. An international instrument building on existing norms and standards, including those contained in regional agreements, could play an important role in this regard.