‘Some observers have called for consideration to be given to provisional entry into force of the CTBT, both for its own sake and to allow the verification system to become fully functional and useable. From a verification perspective it would be preferable for the verification system to be used in an official, legally binding way. Yet, in a sense, provisional implementation of significant elements of the regime is already a reality. The nascent verification body, the forerunner of the CTBTO, is in place, the monitoring system is increasingly functional, and states are already receiving data from the system’

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B R I E F

The Comprehensive Nuclear Test Ban Treaty: virtually verifiable now

Ben Mines

VERTIC

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Introduction

Since the first nuclear device was detonated in July 1945, 2,050 nuclear tests have been conducted worldwide.[1] The Comprehensive Nuclear Test Ban Treaty (CTBT), which was opened for signature in 1996, was designed to bring all such tests, in all environments, to an end. Yet, almost eight years later, the treaty has still not entered into force. Despite enjoying almost universal support (171 states have signed and 111 have ratified[2]), its unique requirements for entry into force have prevented it from doing so.

Article XIV stipulates that 44 designated countries with an advanced civilian nuclear capability (Annex 2 states) must ratify. As of April 2004, only 32 have done so (see table 1). Another nine have signed but not ratified, while three—India, North Korea and Pakistan—have not even signed.

Although three conferences have been convened since 1999 to encourage the 'hold-out' states to commit, progress has been slow. Both India and Pakistan conducted nuclear tests in 1998 and North Korea has threatened to. The United States, while a signatory, has declared that it does not intend to ratify and has not ruled out further nuclear tests.

Nevertheless, construction of the treaty's verification system is proceeding apace, with at least a notional goal of 2007 for its completion. Already the system is exceeding the verification capabilities envisaged by its designers and on completion is likely to be significantly more powerful. As a result, the CTBT faces the unusual prospect of being a treaty with a fully-fledged verification system, but without the legally binding character that would permit compliance with its provisions to be officially verified.

This VERTIC Brief examines the current status of the CTBT's verification system, concluding with some consideration of the effect that non-entry into force might have on the completion of the system and vice versa.

Verifying the treaty

The CTBT envisages the creation of a Comprehensive Nuclear Test Ban Treaty Organization (CTBTO), which will verify compliance with the nuclear testing ban. A Preparatory Commission for the CTBTO (PrepCom) was established in Vienna, Austria, in November 1996 to begin setting up the verification system. The treaty provides that the system be ready when entry into force occurs. The PrepCom comprises a plenary body of all states signatories and a Provisional Technical Secretariat (PTS). The PTS is responsible for

Table 1
Status of the Annex 2 states

STATUS	STATES
Ratifiers	Algeria, Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Bulgaria, Canada, Chile, Finland, France, Germany, Hungary, Italy, Japan, Mexico, Netherlands, Norway, Peru, Poland, Romania, Russian Federation, Slovakia, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom
Signatories	China, Colombia, Democratic Republic of the Congo, Egypt, Indonesia, Iran, Israel, United States, Vietnam
Non-signatories	India, North Korea, Pakistan

1. See www.nrdc.org/nuclear/nudb/datab15.asp.
2. The most recent ratification was that of Bahrain, on 14 April 2004.

the progressive establishment and operation of an International Monitoring System (IMS) and an International Data Centre (IDC) and for making preparations for the conduct of on-site inspections (OSIs), as well as for the administration and legal affairs of the PrepCom. Created in March 1997 with only nine staff members, the PTS had grown, by April 2004, to 273 personnel from 70 states.[3] The inaugural and current Executive Secretary of the CTBTO PrepCom is Wolfgang Hoffmann of Germany.[4]

The International Monitoring System

The International Monitoring System (IMS) will eventually comprise 321 monitoring stations and 16 radionuclide laboratories located in some 90 countries (see the map on pp. 6–7). The establishment of the IMS poses management and engineering challenges unprecedented in the history of arms control verification, with many stations situated in remote and inaccessible parts of the globe. Some of the stations already existed when the IMS was envisaged, but most have had to be constructed from scratch or at least have had to undergo substantial upgrading. Two hundred and one of the stations belong to the system's primary network, which will provide data to the IDC on a continuous, round-the-clock basis.

Four types of stations are being set up:

- seismic;
- infrasound;
- hydroacoustic (the three waveform technologies); and
- radionuclide.

The four different technologies operated by the IMS are able to detect tests in different environments and are complementary, indeed synergistic, in regard to the contribution that they make to CTBT verification. Seismic monitoring is most capable of detecting underground tests, although it might also be able to discern atmospheric tests conducted at low altitudes. Hydroacoustic technology primarily monitors the oceans for underwater nuclear tests. Infrasound is most effective in detecting atmospheric tests, but it may also discern some underwater and shallow underground events. Seismic and acoustic detection technologies might not, however, in certain cases, provide enough conclusive data to reveal whether a large conventional explosion or a small nuclear test has taken place. Radionuclide stations, by detecting radioactive particles emanating from a nuclear explosion, could then be the most powerful tool in clarifying the nature of an event.

'The four different technologies operated by the IMS are able to detect tests in different environments and are complementary, indeed synergistic, in regard to the contribution that they make to CTBT verification'

Seismic

The seismic network will form the core of the verification system. Seismic waves generated by earthquakes, explosions or other phenomena will be detected using 50 primary and 120 auxiliary seismic stations, distributed worldwide. The latter will supply data only on request, for example to clarify suspicious events. Operated by treaty parties themselves, 62 percent of these stations essentially already meet the technical specifications of the CTBTO, but all are being required to undergo the same certification procedures as the primary stations.

Technological advances in detection devices and improved methods of analysis have allowed seismologists to identify virtually all events that might be nuclear explosions of military significance.[5] For instance, seismic arrays, which have an enhanced detection capability and can accurately measure the direction and distance of the source of an event, will contribute to the IMS. These consist of between nine and 25 geometrically arranged seismic sensors distributed over an area of between 15 and 500 square kilometres.

3. Information from the PTS, Vienna.
4. In November 2003, Hoffmann announced that he would not seek to extend his contract beyond July 2005. He was convinced to stay on, however, in order to avoid a change in leadership at a crucial time in the organisation's life.
5. In addition to the IMS primary and secondary stations, there is a vast and expanding network of seismic monitoring stations established for scientific or other purposes which will inevitably detect nuclear tests and will enhance CTBT verifiability.

'Radionuclide monitoring is the only one of the four technologies that can unambiguously differentiate between a nuclear and a conventional explosion'

Analysis by Professor Lynn Sykes of Columbia University's Lamont-Doherty Earth Observatory of 72 events of uncertain origin that have occurred since 1960 has demonstrated that seismologists are increasingly able to identify and determine the nature of events at ever lower magnitudes.[6] Previously only events in the range of 4.3–5.6 mb (body wave magnitude)[7] were likely to be detected and identified. Today this has been reduced to 2.0–3.5 mb. In terms of nuclear explosive yield, 3.5 mb equates to an explosion of between 0.1 and 1.0 kilotons (kt). This means that nuclear explosions 1,000 times smaller than before can now be reliably discerned.[8] The IMS will comfortably exceed its original detection goal of 4.0 mb. The widespread and evenly distributed nature of the IMS will also help in the identification of the source, as the closer a seismic monitor is to an explosion, the shorter the distance that high frequency signals have to travel.

Infrasound

Sixty land-based infrasound stations will use sonar to spot atmospheric tests. Each station uses an array of between four and eight infrasound detectors (highly sensitive devices known as microbarometers), separated by between one and three kilometres. As an infrasound signal crosses the array, the small differences in the times of arrival of the signal at the individual detectors allow the signal's velocity and direction to be calculated. For most of the planet the threshold at which an event will be detected by such means is 0.5 kt, but this falls to 0.3 kt for large continental areas and as low as 0.1 kt for particular localities.

Hydroacoustic

Eleven underwater hydroacoustic stations are being set up. Owing to the efficient transmission of acoustic energy through water, these are more than capable of revealing events throughout all of the world's oceans. Explosions of only a few kilograms in yield can be readily detected from thousands of kilometres away. Six of the 11 stations will use hydrophones deployed on the ocean floor, their signals sent by cable to a nearby island for transmission to the IDC. In addition, five so-called T-phase seismic stations are to be deployed on oceanic islands. A T-phase hydroacoustic wave travels horizontally from an ocean source, converting to a seismic wave when it meets land. The hydroacoustic and seismic networks are complementary in verification terms: hydroacoustic stations are more sensitive than seismic ones in regard to monitoring the southern oceans, while the reverse is true for the northern oceans.

Radionuclide

Eighty radionuclide stations will measure radioactive particles in the atmosphere (radioactive fallout) from atmospheric nuclear tests or radioactive material vented by underground or underwater explosions. Sixteen CTBTO-certified radionuclide laboratories will analyse filters from the stations (and samples taken by inspectors should an OSI take place). For a one kiloton explosion there is a 50 percent probability of detection within five days, increasing to 90 percent within ten days. However, although the chances of detecting an event rise over time, the likelihood of identifying its location decreases over time. Radionuclide monitoring is the only one of the four technologies that can unambiguously differentiate between a nuclear and a conventional explosion.

Progress in establishing the IMS

The PTS has made excellent progress since 1999 towards making the IMS fully functional. As of early 2004 site surveys had been completed at 91 percent of the planned stations and laboratories (293 out of 321). By the end

6. Lynn R. Sykes, 'Four decades of progress in seismic identification help verify the CTBT', *Eos, Transactions*, American Geophysics Union (AGU), vol. 83, no. 44, 2002, p. 497.
7. A measurement that is roughly equivalent to the Richter scale.
8. For further analysis of the verifiability issue see Final Report of the Independent Commission on the Verifiability of the CTBT, VERTIC, London, 2000 (available at www.vertic.org); 'Findings and recommendations concerning the comprehensive nuclear test ban treaty', Report by General John Shalikashvili (US, Ret.), Special Advisor to the President and Secretary of State, submitted 5 January 2001, Washington, DC; and *Technical Issues Related to Ratification of the Comprehensive Nuclear Test Ban Treaty*, National Academy of Sciences, Washington, DC, September 2002.

of 2003, approximately 55 percent of the IMS network had been installed and had met or substantially met specifications. As of April 2004 the following had been certified as satisfying all technical specifications:[9]

- 81 monitoring stations (26 primary seismic, 11 auxiliary seismic, four hydroacoustic, 17 infrasound and 23 radionuclide); and
- four radionuclide laboratories, at Seibersdorf, Austria (certified November 2001), Helsinki, Finland (certified December 2003), Bruyeres-le-Chatel, France (certified December 2003), and Christchurch, New Zealand (certified June 2003).

Another 80 stations are under construction or are the subject of contract negotiations. Currently some 85 stations are contributing data to the IDC.

Site surveys are done to assess the suitability of locations and the scope of equipment or construction work required. The latter includes the installation of satellite and other communications hardware and anti-tampering devices to ensure prompt and secure two-way transmission of authenticated data. A station is certified and officially becomes part of the IMS when it meets all of the PrepCom's technical specifications and is sending reliable data to the IDC. Once established, monitoring stations are provisionally operated by local institutions contracted by the PTS.

The IMS will perform better than the conservative estimates made by the Group of Experts during the CTBT negotiations in the early 1990s. Today it is believed that IMS seismic stations could detect explosions as low as ten to 25 tons, while the probability of discerning a one kiloton explosion is very high. As militarily significant tests are likely to produce yields of at least five to ten kilotons, the IMS has been deliberately over-engineered. The non-seismic verification technologies will provide further capabilities, while OSIs will be used to resolve doubts about highly suspicious events.

International Data Centre

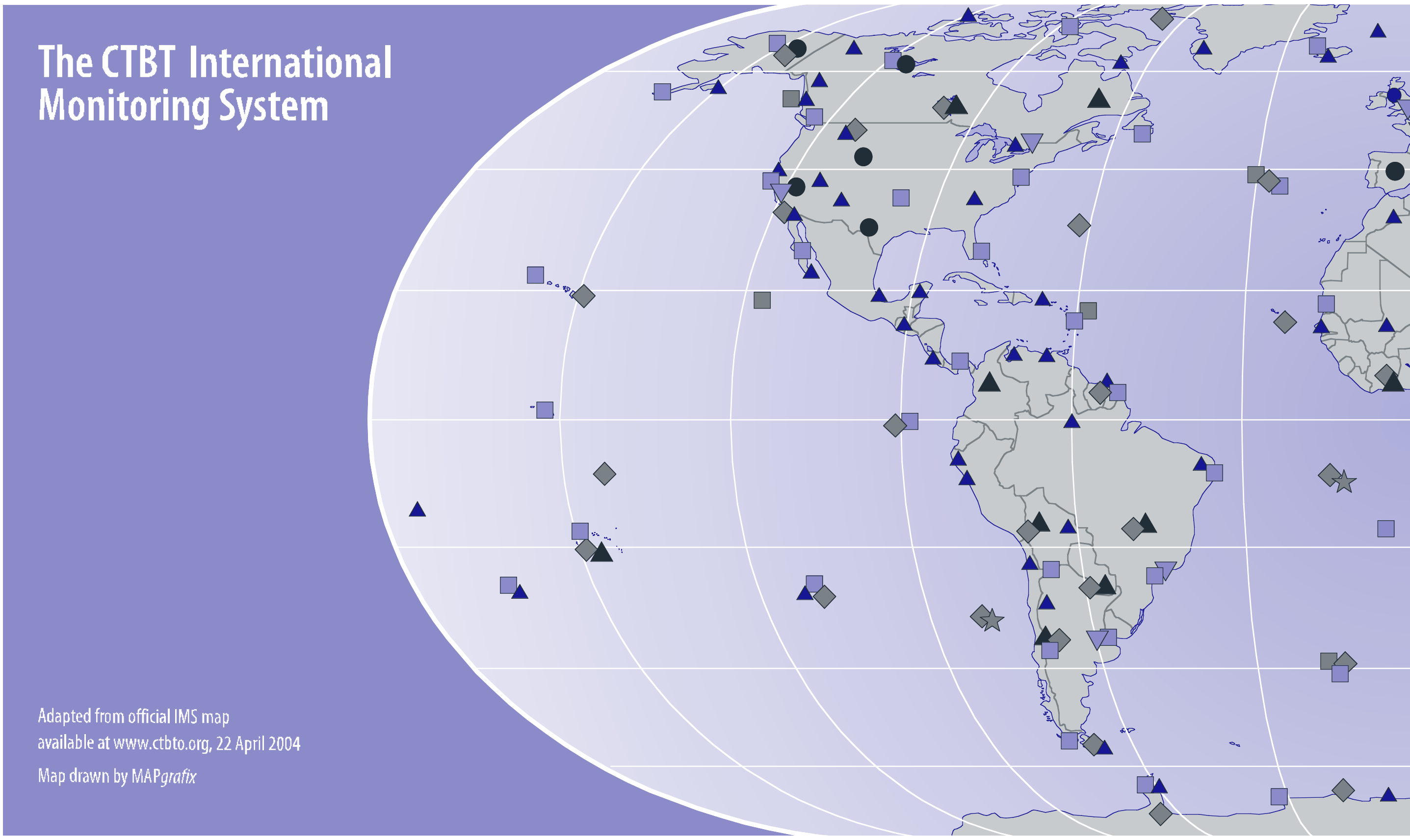
The International Data Centre (IDC) was inaugurated in January 1998 and started to transmit data in May of that year. The IDC receives, collects, processes, analyses, reports on and archives data from the IMS, including from the radionuclide laboratories. The IDC seeks to take the following steps when examining data: to associate various signals from a common source or origin (an 'event'); to estimate the parameters of the event source (such as time, location and magnitude) and to highlight uncertainties associated with them; to identify or distinguish the nature of the event; and, if the event is suspicious, to attribute it to a particular party.

The data received by the IDC is processed immediately, with the first automated products released within two hours. An automatic Standard Event List is produced through the automated processing of seismic, hydroacoustic and infrasound data, which is analysed and revised to generate a Revised Event Bulletin (REB). States can request either the raw data or information in bulletin format. An REB can be compiled between four and six days after the event. However, while the wave energy data is transmitted almost in real-time, the radionuclide data takes up to two weeks due to the need to physically collect samples from the stations for appraisal. The aim is increasingly to automate this process using new technology.

In 2002, 71 waveform monitoring stations contributed data on a staggering 23,082 events (on average 151 events per day for the Standard Event List and 64 for the REB). This is thought to have increased in 2003: between January and April alone there were on average 156 events per day for the Standard Event List and 66 for the REB. The 18 radionuclide stations are contributing approximately 3,600 radionuclide spectra per month. The IDC has been providing IMS data and IDC products to states signatories on a trial basis since 21 February 2000 and has established around 50 secure accounts that allow states to access data and products.

'The IMS will perform better than the conservative estimates made by the Group of Experts during the CTBT negotiations in the early 1990s'

9. Information from the PTS, Vienna.

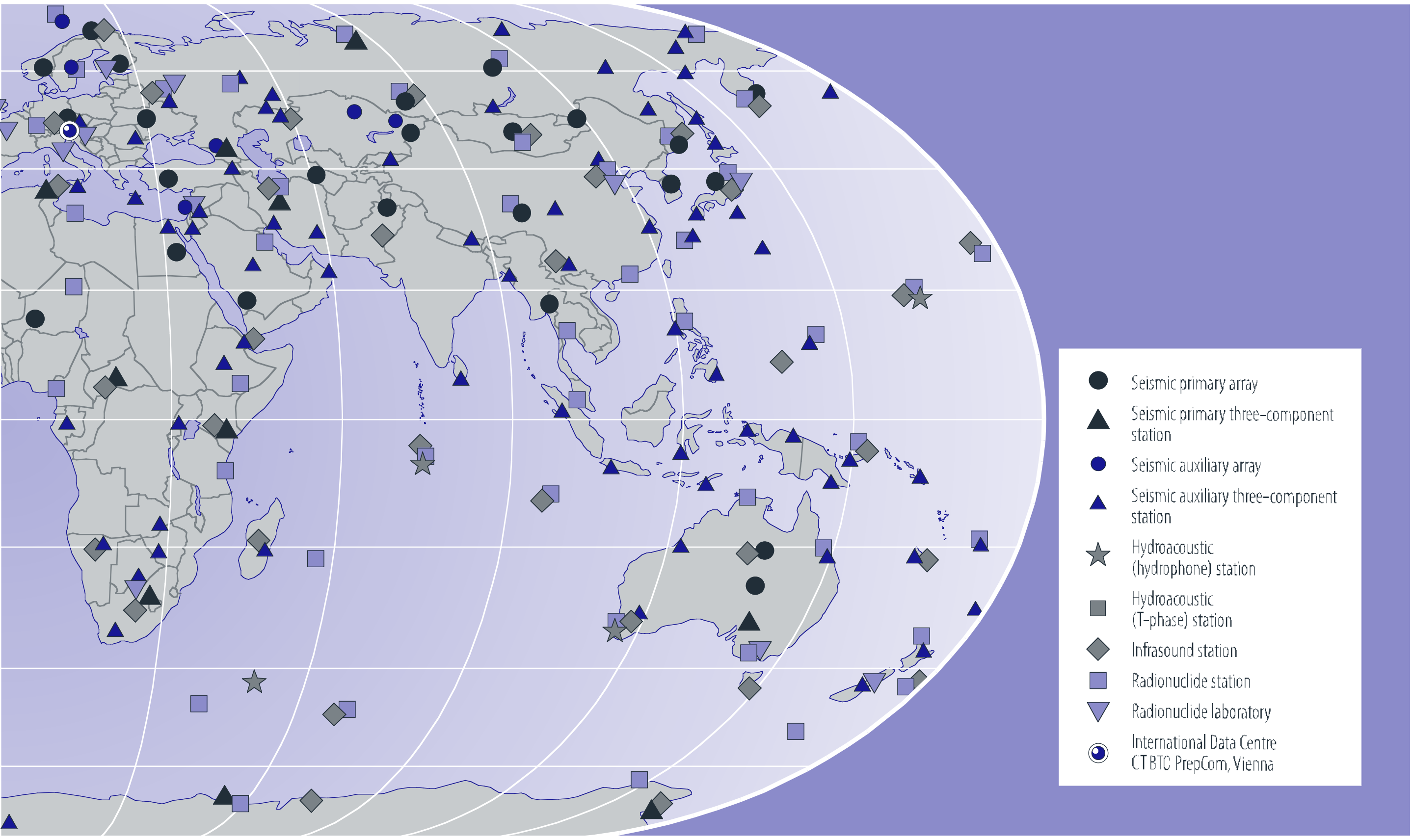


Global Communications Infrastructure

The CTBTO's dedicated satellite-based Global Communications Infrastructure (GCI) permits data collected by the IMS to be transmitted in near real time to the IDC in Vienna. The system also permits IDC data to be transmitted to national authorities. The GCI became functional in mid-1999. It receives and distributes information through a network of three geosynchronous satellites (and two additional satellites, for North America and Europe), which route transmissions through geosynchronous hubs and then to the IDC. GCI terminals, known as Very Small Aperture Terminals (VSATs), transmit data from the IMS to the IDC and are installed at 46 IMS stations, national data centres and development sites. The VSATs are a key element of the GCI, which is the first global satellite communications system to be based on this technology.

The network is capable of transporting, error-free, up to 11.4 gigabytes (GB) of data daily (currently five GB is received by the IDC each day), within five seconds of signals being detected and processed. The network is also secure from unauthorised access. It can operate 365 days a year in temperatures ranging from -40 to +60 degrees Celsius and in wind speeds of up to 100 kilometres per hour.

The detection and identification of an earthquake in Indonesia on 10 October 2002 offers an excellent example of the IMS and IDC at work. An earthquake measuring 7.3 on the Richter scale was detected by over 50 waveform IMS stations, including numerous seismic stations, four hydroacoustic stations and one infrasound station. This was the first time that all three technologies contributed data on a single event. The IDC was able to distinguish the location of the event, observing the data in near real time.



However, the system is still experiencing some teething problems. In Brazil, for instance, the IDC is failing to report most events (over 80 percent) at or under 3.5mb and a significant number (approximately 40 percent) at or under 4.0mb.[10] This may be due to the low density of primary stations in Brazil. Notably, this is also hindering the achievement of the IMS detection goal of 4.0mb across South America.

Overall the quality and availability of the system's data will improve as more IMS stations are established globally, existing stations are upgraded, and the satellite communications system is extended.

On-site inspections

Once the CTBT has entered into force, any state party can request an OSI in the event that a suspected nuclear explosion is detected either by the IMS or by national technical means (NTM), that is monitoring systems owned and operated by a state party. Unlike many other treaties, the CTBT assigns responsibility for raising issues of non-compliance or alleged violations to states parties themselves, not to the international verification organisation. Under Article IV each state party has the right to request clarification from any other state party with regard to a matter that may indicate possible non-compliance. If this does not satisfy the requesting state, it may ask the CTBTO's Executive Council (comprising a representative selection of 51 states parties) to consider the issue. The council may seek further information, including by means of an OSI.

The purpose of an OSI is to clarify whether there has been a nuclear explosion in violation of the treaty and to gather information that might help to identify the

10. Vasile I. Marza, Cristiano N. Chimpliganond, Lucas V. Barros, Daniel, F. Caixeta, Takato Nakayoshi, Marcus F. Chiarini, Dhébora B.R. Ventura and Maria Fernanda Novo Barbosa, 'Assessment of Comprehensive Nuclear-Test-Ban Treaty Organization's IMS/IDC seismic monitoring in Brazil vs ground truth', Eighth International Congress of the Brazilian Geophysical Society, Rio de Janeiro, Brazil, 14–18 September 2003.

‘It is critical that the PrepCom and the PTS continue to receive financial support to allow them to develop the verification system further. So far this support has been, in some respects, unprecedented for an international organisation’

violator. OSIs are regarded as a verification measure of last resort. The CTBT requires that the inspection—to be carried out by a team designated by the Director-General of the CTBTO—be conducted in the least intrusive manner, in order to protect the national security interests of the inspected state party. Disclosure of confidential information unrelated to the purpose of the inspection is prohibited.

Preparations for the OSI regime are being hampered, though, by slow progress on the Operational Manual, which is intended to guide the conduct of on-site inspections. Significant disagreement remains over its content, particularly in regard to the level of detail that should be included. Essentially the debate is between those states that fear OSIs being used as a cover to spy on installations and activities irrelevant to the CTBT and which therefore wish to constrain the rights and options of the inspectors, and those that believe that tying the hands of the inspectors too much will render them ineffective or less effective in undertaking their verification tasks. Currently the draft text is several hundred pages long and attempts by the working group to shorten it have made little headway, despite the best efforts of its chair, Ambassador Arend Meerburg of the Netherlands.

This situation does nothing to convince treaty sceptics that the CTBT is verifiable. In contrast to the steady progress being made on the IMS, moreover, it gives the impression that political support for this aspect of the treaty is unsteady. Some observers argue, however, that should entry into force of the treaty become imminent, political backing will miraculously materialise to permit agreement on the Operational Manual.

In the meantime, progress has been made in relation to OSI field experiments. The most recent was a large-scale exercise in a remote part of Kazakhstan in September–October 2002. Over 25 inspectors, from 17 states, along with PTS staff, took part. A 12.5 tonne chemical explosion, detonated 200 metres underground, was used to simulate an underground nuclear blast. Several smaller explosions were used to simulate seismic aftershocks. For the first time in such an experiment, inspectors were able to integrate a variety of technologies and techniques, such as portable seismometers like the Seismic Aftershock Monitoring System (SAMS) and visual observation, including via low altitude helicopter overflights. In addition, soil and air samples were taken in order to determine the presence of radionuclides.

One surprise was that the ‘inspected party’ managed to camouflage successfully the site of the explosion, to the extent that the putative inspection team could not locate it. The experiment was nonetheless deemed a resounding success: it certainly constructed a realistic scenario (beyond the planners’ expectations) in a challenging environment. The exercise suggested numerous lessons that will contribute to the drafting of the OSI Operational Manual, as well as enhancing PTS procedures and practices and future training programmes.

Financial support for the verification system

It is critical that the PrepCom and the PTS continue to receive financial support to allow them to develop the verification system further. So far this support has been, in some respects, unprecedented for an international organisation. The CTBTO’s budget has risen from US$27.7 million in 1997 to US$83.5m in 2003, with a planned level of US$94.5m for 2004. The rate of collection of assessed contributions from member states remains excellent, with approximately 90–97 percent of the budget collected annually.

The budget rose steeply in the first two to three years of the PrepCom’s existence, reflecting the rapid growth of the new organisation and initial enthusiasm for this unique multilateral verification effort. Since 1999, however, the budget has remained relatively steady, especially when corrected to take account of inflation (see figure 1).

In order to complete the IMS by 2007, a budget increase of between ten and 15 percent is needed over the next two to three years (although this could fall to around US$84m by 2007). Unfortunately there are already murmurings among some states, particularly a number of developing countries, that the financial burden is becoming too great, especially considering the fact that, currently, there is no prospect of the treaty entering into force.

The benefits of CTBT verification

The rejoinder to those states that question the value of the CTBT verification system is that it is already verifying. States are receiving data that they are free to use unilaterally or collectively to monitor compliance with the test ban, whether the treaty is in force or not. Since the CTBT requires that its verification system be set up and become operational prior to entry into force, a key component of the treaty is, in effect, being provisionally implemented. Moreover, because the IMS is global by design, on the assumption that all states will eventually become treaty parties, the system permits monitoring of the activities of non-states parties as well as of parties: the four technologies do not discriminate on the basis of national boundaries. Hence the nuclear tests conducted by India and Pakistan in 1998 were readily detected by the system. It is notable that the US values the IMS, even in its current unfinished state. The US continues to provide money for the IMS, despite cutting funding for the OSI activities of the PrepCom and even though President George W. Bush's administration has indicated it has no intention of ratifying the treaty.

Along with its pivotal role in global security and nonproliferation, the CTBT offers states parties significant additional benefits. Like other arms control and disarmament regimes that promise to supply technical assistance to developing states in return for their agreement on verification, the CTBT permits the upgrading and/or establishment of monitoring stations on the territory of states parties. This helps host states to improve their technical capacities, as well as providing them and their treaty partners with data that may be used for non-verification purposes.

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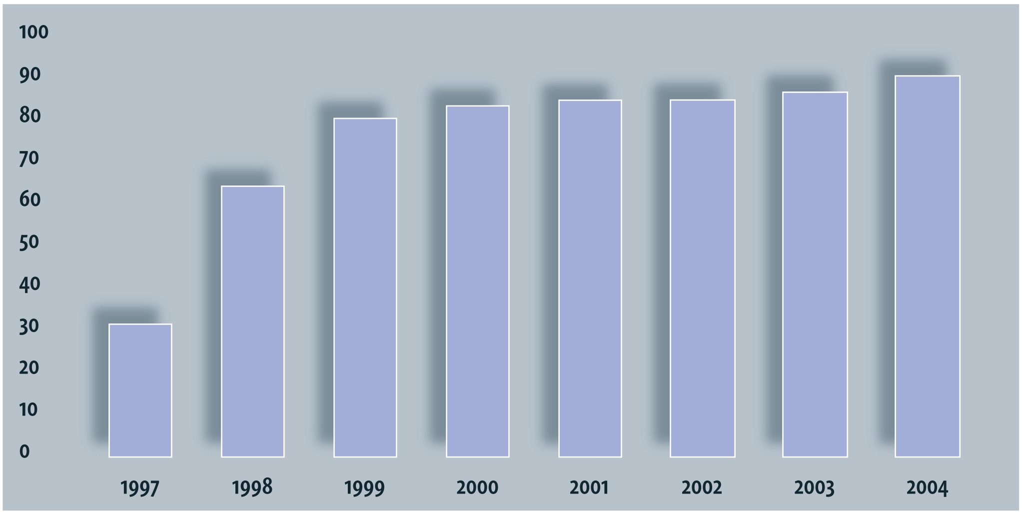
Figure 1
Annual CTBTO budget, 1997–2004, at constant (2002) prices (US$m)[11]



11. Robert C. Sahr, 'Inflation conversion factors for years 1665 to estimated 2013', Political Science Department, Oregon State University, 2003, http://oregon state.edu/Dept/pol_sci/fac/sahr/ cf16652014.pdf.

'The CTBTO has begun to develop relationships with other international and regional organisations in a bid to make its data available to the wider international community'

12. Including the African Union (AU), the Agency for the Prohibition of Nuclear Weapons in Latin America (OPANAL), the Caribbean Community, the International Atomic Energy Agency (IAEA), the International Telecommunications Union, the League of Arab States, the Organisation for the Prohibition of Chemical Weapons (OPCW), the Organization of American States (OAS), the Pacific Islands Forum, the United Nations, the World Health Organization and the World Meteorological Organization (WMO).

Scientific and other civil uses

The data derived from the IMS is in fact likely to have substantial scientific and civil utility beyond verification. Such uses are becoming more apparent the more the issue is studied and the faster the scientific community gains access to the data. Member states, with PTS assistance, have already held two meetings to discuss civil and scientific applications of CTBT verification technologies and data. These workshops, held in London in May 2002 and in Sopron, Hungary, in September 2003, have identified a wide range of uses. A third workshop is to be held in Berlin, Germany, in May 2004.

The most obvious function is the detection and possible prediction of earthquakes, using seismological and other waveform networks. Other uses identified to date include improved early warning and forecasting of weather fronts, typhoons, volcanic eruptions and tidal waves. The data may also be used after the event, such as prompt provision of information on the location of aircraft and submarine accidents. Radionuclide stations can supply information on radioactivity in the environment due to natural or human causes.

Seismic monitoring stations will provide data that helps to assess geophysical hazards and to identify safe locations for installations, such as dams, power stations, deep-shaft mines, harbours and building complexes. Such data will also improve knowledge of the earth's crust and tectonic plates and may enable states to exploit their natural resources more effectively.

Infrasound stations may provide information on weather fronts, volcanic eruptions and shear conditions (which cause atmospheric turbulence). Such data are vital early warning tools in civil aviation.

Hydroacoustic technologies might offer evidence of global warming, assist in locating submarine accidents and in detecting whales. The IMS might be used to identify whale species from their song, which could be significant in monitoring populations and therefore for conservation efforts. Whale signals have already been detected by the IMS using data from hydrophones at stations on the Chagos Archipelago (British Indian Ocean Territory) and at Cape Leeuwin, Australia.

The CTBTO has begun to develop relationships with other international and regional organisations in a bid to make its data available to the wider international community.[12] Notably, the CTBTO is sharing information with the International Seismological Centre (ISC), a UK-based inter-governmental organisation, to help it to improve its research and to develop new ways of detecting nuclear tests and earthquakes.

The PTS will also provide the World Meteorological Organization (WMO) with weather data from the IMS under an agreement that entered into force in 2003. The CTBTO PrepCom and the WMO agreed to cooperate closely on meteorological issues, including the exchange of weather observations. All 80 IMS radionuclide stations collect basic data on local weather factors, including wind, temperature, humidity and rainfall. The CTBTO is able to contribute valuable data because of the remote and otherwise inaccessible locations of many IMS stations. In return, WMO Monitoring Centres, which specialise in atmospheric transport modelling (ATM), can assist the CTBTO. Such modelling can help to determine the source of radionuclides in the atmosphere, which may help identify the location of a possible nuclear test and of the perpetrator of a treaty violation. ATM can also aid in understanding uncertainties in the behaviour of the atmosphere which may help pinpoint the site of a nuclear explosion.

In March 2003, the CTBTO PrepCom and the WMO cooperated in the first global experiment in reverse transport modelling (backtracking). Atmospheric transport modelling data from the World Meteorological Organization was used in the experiment to help identify the source of a hypothetical nuclear explosion.

Conclusion: non-entry into force and verification

The effect that non-entry into force may have on the CTBT's verification system and vice versa is complex. The treaty clearly provides in Article IV that 'at entry into force of this Treaty, the verification regime shall be capable of meeting the verification requirements of this Treaty'. Taken literally, this means that the IMS and other components of the verification system should be ready on the day that the accord enters into force.

The Executive Secretary and the PTS are therefore correct in seeking continued political and financial support for the progressive establishment of the verification system for when entry into force happens. Although the treaty may not enter into force by 2007, it is essential for planning purposes that the PrepCom permit the PTS to work towards that goal.

Some observers have called for consideration to be given to provisional entry into force of the CTBT, both for its own sake and to allow the verification system to become fully functional and useable. From a verification perspective it would be preferable for the verification system to be used in an official, legally binding way.

Yet, in a sense, provisional implementation of significant elements of the regime is already a reality. The nascent verification body, the forerunner of the CTBTO, is in place, the monitoring system is increasingly functional, and states are already receiving data from the system.

States can use such information[13] unilaterally or collectively to uncover a nuclear test. If, for instance, North Korea was to follow through on its threat to conduct a nuclear test, there is a good chance that the IMS would detect it. There is also nothing to prevent any state from seeking bilateral consultations with other states about a compliance question or indeed a meeting of the PrepCom if it feels that a nuclear test has been carried out, whether by a state signatory, a ratifier or a non-signatory (states that sign a treaty are expected not to undermine its object and purpose—in this case surely that means refraining from conducting a nuclear test[14]).

Moreover, the PrepCom could decide to become involved in a compliance issue if enough signatories so wished. If that did not work any state could apprise the United Nations Security Council of the matter. So strong is the taboo against nuclear testing that entry into force of the treaty—while highly desirable—may not be absolutely necessary for the verification system to function virtually as planned.

However, some states are beginning to question whether, in light of the protracted, and, to some extent, unanticipated, delay in achieving entry into force, work should continue at the same pace as in the past on establishing the CTBT's verification system.

While this might be understandable given the myriad financial pressures on states arising from their international treaty commitments alone (much less their domestic ones), it would surely be absurd to impose an artificial restraint on the growth of a system that will not only provide verification benefits before entry into force, but also, increasingly, valuable scientific and civil benefits. Moreover, the cost of the system may drop when it is fully operational and efficiencies resulting from synergies can be identified.

It is in the interest of all states that have ratified or signed the CTBT, together with the PrepCom collectively, that the verification system be fully established as soon as possible, not only to encourage entry into force, but also to refute claims by some that the test ban is unverifiable. Politically, completing the verification system as envisaged will send a powerful signal to treaty hold-outs that CTBT supporters are intent on seeing the treaty's promise realised.

'It is in the interest of all states that have ratified or signed the CTBT, together with the PrepCom collectively, that the verification system be fully established as soon as possible'

13. In addition to information derived from NTM, which includes, in this case, non-IMS monitoring stations of various kinds, as well as satellite imagery, signals intelligence (SIGINT) and human intelligence (HUMINT).

14. Even though the CTBT has not entered into force, states signatories have signalled their willingness to comply with the accord by participating in and funding the verification system. In addition they should start to put in place national implementation legislation to ensure that they can meet all of their treaty commitments following entry into force. Such legislation would, arguably, oblige them to fulfil their treaty obligations even in the absence of entry into force.

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About this paper

Ben Mines provides a progress report on the establishment of the verification regime for the 1996 Comprehensive Nuclear Test Ban Treaty banning nuclear tests in all environments. The paper reveals the steady development of a system which promises significantly greater verifiability than that envisaged by its designers. Dr Mines argues that full implementation of all aspects of the verification system should be pursued, even without entry into force of the treaty, in order to help refute claims that the treaty is unverifiable and to signal to treaty hold-outs that its supporters are intent on seeing its promise realised.

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VERTIC is the Verification Research, Training and Information Centre, an independent, non-profit making, non-governmental organisation. Its mission is to promote effective and efficient verification as a means of ensuring confidence in the implementation of international agreements and intra-national agreements with international involvement. VERTIC aims to achieve its mission through research, training, dissemination of information, and interaction with the relevant political, diplomatic, technical, scientific and non-governmental communities.

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