

ment in 1990.

A CTBT could also enhance the prospects for progress on other non-proliferation items, such as a ban on the production of fissile material for weapons purposes.

Verification

The question of whether and how a ban on testing could be adequately verified has been a major stumbling block in past testing negotiations and is likely to be at the heart of any new ones. The smaller the stocks of nuclear weapons, the greater the worry that even a little cheating could upset the balance.

A verification system for a CTBT would have two basic purposes: 1) to provide confidence that parties are obeying their treaty obligations; and 2) to deter parties from clandestine activities violating the treaty. A verification system must provide a high capability to detect and identify clandestine activities. It must further limit the risk of creating false alarms by misinterpreting naturally occurring events — such as earthquakes — as clandestine activities. A large number of false alarms would reduce the credibility of the verification system and thus of the treaty itself.

It is generally agreed that seismic monitoring will play a central role in CTBT verification. Seismic monitors, or seismographs, detect vibrations in the earth's crust, which can be caused by underground nuclear explosions, earthquakes or lesser tremors. When a sufficiently large number of suitably located seismographs sense the same event, it is often possible to compare their findings and determine with a fair degree of certainty the nature of the event causing the vibrations, its location, its depth below the surface and the approximate amount of energy involved. (For a more detailed discussion of seismic verification, see "Focus" in *The Disarmament Bulletin* No. 11, Fall 1989.)

Through the Conference on Disarmament, an *ad hoc* Group of Scientific Experts (GSE) was established in 1976 with a mandate to devise a conceptual design for an international seismic data exchange system and to test its various components. The GSE is open to all CD member states as well as to non-member states on request. Over the years, experts and representatives from 35 countries have participated in the work of the GSE.

The GSE has held two international seismic data exchange experiments, in

1984 and 1991, and has developed and refined a series of concepts that would form the backbone of a future international seismic verification network. It has also looked at such things as communications procedures and joint analysis of seismic data. The GSE is now starting to implement the results of its studies, to the level of selecting the seismograph stations that should be included in a global network and investigating sites in regions that will require new stations. The GSE has set a target date of January 1, 1995 to have enough of a global system in place to begin full-scale testing.

The system developed by the GSE is intended to be a service to those countries that are parties to a CTBT, by providing them with easily accessible information derived from globally collected data. The judgement as to whether a nuclear explosion has taken place would be left to the individual states parties.

Although seismic events can be monitored with considerable accuracy, there are some problems with relying solely on seismology to verify a CTBT. For example, countries can try to hide nuclear explosions by testing devices in an area that is prone to earthquakes, or by disguising the wave pattern of the nuclear test so that it blends in with the seismic background noise usually found in the area. It may be particularly difficult for seismologists to detect and pinpoint tests of relatively small nuclear explosive devices. In addition, the sheer number of seismic events occurring each year — over 10,000 — may make it impractical to monitor and analyze all of them, and then re-analyze the ones that look suspicious using additional data from other sources. On the other hand, the attempt to do so could well discourage illegal nuclear testing by providing a good chance that potential treaty offenders would be caught.

Seismic verification of a CTBT is likely to be supplemented by other measures. These might include:

- aerial and space surveillance;
- collection and analysis of atmospheric radionuclides; and
- on-site inspection.

CTBT Prospects

With the extension of the US moratorium and the agreement to negotiate a CTBT in the CD, prospects have never been better for a legally-binding global

ban on nuclear testing. Russia has been observing a moratorium on testing since October 1991 and France since April 1992. Since the UK tests only in the US, the American moratorium has meant an involuntary moratorium for that country as well. That leaves China as the sole declared nuclear weapon state that continues to reserve the option to test.

In making his July 3 announcement, President Clinton indicated the US willingness to proceed with CTBT negotiations. Russia is strongly in favour of a CTBT and has made clear its willingness to participate in negotiations. France has said that it would support a CTBT as long as the treaty is universal and verifiable. The UK has in the past expressed the view that as long as its security depends on deterrence based, in part, on nuclear weapons, there will be a continuing requirement to conduct underground nuclear tests to ensure that its nuclear weapons remain effective and up to date. China has indicated that it favours a prohibition on nuclear tests within the framework of complete prohibition and thorough destruction of nuclear weapons. Whether this means negotiations on the former would be contingent on parallel negotiations on the latter is unclear.

In 1990, the CD established an *ad hoc* committee to initiate substantive work on specific and interrelated test ban issues, including the structure and scope of a treaty as well as verification and compliance. Further to the CD's August 1993 decision to give this committee a general CTBT negotiating mandate, members are now consulting on the specific mandate for and the organization of negotiations. Consultations will continue until January 17, 1994, with the hope of beginning negotiations shortly thereafter. All nuclear weapon states are members of the CD.

Canada and a CTBT

Canada has been a long-standing and vocal advocate of a CTBT and has undertaken landmark research in seismic verification of nuclear tests. Canada plays an active role in consideration of a CTBT at the UN General Assembly, being among the members of a "core group" of countries that has, in the past, drafted a traditional resolution on this issue. In addition, Canada participates in the CD's *Ad Hoc* Committee on a Nuclear Test Ban. A Canadian coordinated the GSE's second global seis-