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DISARMAMENT



Towards a Nuclear-Test Ban



United Nations

PREFACE

The cover reproduces the emblem of the United Nations and the emblem of the United Nations World Disarmament Campaign, launched by the General Assembly in 1982 at its second special session devoted to disarmament. The Campaign has three primary purposes: to inform, to educate and to generate public understanding and support for the objectives of the United Nations in the field of arms limitation and disarmament. In order to achieve those goals, the Campaign is carried out in all regions of the world in a balanced, factual and objective manner.

As part of Campaign activities, the Department for Disarmament Affairs provides information materials on arms limitation and disarmament issues to the non-specialized reader. Such materials cover, in an easily accessible style, issues which may be of particular interest to the constituencies of the World Disarmament Campaign. This is one such publication. It is published in the official languages of the United Nations and intended for world-wide dissemination free of charge.

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Background

There are five nuclear-weapon States in the world today. The United States was the first to conduct a nuclear-weapon test in 1945, followed by the Soviet Union in 1949, the United Kingdom in 1952, France in 1960 and China in 1964. In 1974 India carried out an underground explosion of a nuclear device, stating that the explosion took place for only peaceful purposes.

Tests are conducted to develop and refine the design of nuclear weapons and to check their reliability.

From 1945 until the end of 1987 1,741 nuclear tests were carried out in all environments - in the atmosphere, in outer space, under water and underground - 899 by the United States, 620 by the Soviet Union, 151 by France, 41 by the United Kingdom, and 30 by China.*

The unprecedented scale of destructiveness of the two bombs that exploded over Hiroshima and Nagasaki in August 1945 (200,000 persons died within the first five months, another 100,000 were injured

* SIPRI Yearbook, 1988 (Oxford, Oxford University Press, 1988), p. 74.

and an indeterminate number were victims of long-term radiation effects) and the hazardous radioactive fall-out from tests, particularly atmospheric tests carried out in the 1950s, caused mounting concern throughout the world. A number of incidents around testing sites increased the international community's awareness of the spread of radioactive nuclear fall-out and of the mechanisms by which radioactive substances are transferred to body tissues through the food chain. The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), which was set up in 1955, concluded that the only way to prevent the danger of hazardous radioactive fall-out was to ban all nuclear-test explosions. A ban on the testing of nuclear weapons was suggested, either as an independent measure or as one element in an agreement on more comprehensive measures of disarmament.

In the following decades, discussions on - and sometimes negotiations on - a comprehensive test ban have been held in various forums: at the trilateral Conference on the Discontinuance of Nuclear Weapon Tests in Geneva, from 1958 to 1962, which involved the Soviet Union, the United Kingdom and the United States; in the Eighteen-Nation Committee on Disarmament in Geneva and its successor bodies for disarmament negotiations (today known as the Conference on Disarmament); at the trilateral negotiations from 1977 to 1980 between the Soviet Union, the United States and the United Kingdom; at the General Assembly of the United Nations and its three special sessions devoted to disarmament; and at the bilateral negotiations on nuclear testing between the Soviet Union and the United States that began in November 1987.

The Partial Test Ban

By the end of 1956, the different approaches of States to the issue of a ban on nuclear testing had become quite clear: the Soviet Union and India advocated an early and separate agreement on a ban on all nuclear tests without international verification, maintaining that no significant testing could go undetected; Yugoslavia, representing the view of an emerging group of non-aligned States, urged an agreement with such control as might prove necessary; and the Western countries regarded the limitation of and eventual ban on nuclear testing, with adequate verification, as part of a comprehensive disarmament process.

Following a conference of experts from Eastern European and Western States held in 1958, which concluded that it would be technically feasible to establish a workable and effective control system to detect violations of an eventual agreement on the suspension of nuclear tests, the Soviet Union, the United Kingdom and the United States began negotiations on a test ban in Geneva (the Conference on the Discontinuance of Nuclear Weapon Tests). They also suspended their testing and maintained that voluntary ban for about three years. In the course of the negotiations the positions of the two sides came closer than they had been at any previous time. As a result of increased tensions in the overall relationship between the three Powers, however, the negotiations adjourned in 1962 and were not resumed. Nevertheless, the momentum that had been built upon the issue of a nuclear-test ban did not entirely dissipate.

Although differing positions on the question of on-site inspection made an underground test ban impossible, in 1963 the Soviet Union, the United Kingdom and the United States were able to agree on a partial approach, signing the Treaty banning nuclear-weapon tests in the atmosphere, in outer space and under water, but not underground (partial test-ban Treaty). Hence no nuclear tests in the atmosphere, in outer space or under water have been carried out by them since 1963. It is estimated that from 1963 to 1987 the United States conducted 568 underground tests, the Soviet Union 435, and the United Kingdom 18. France and China have not become parties to the Treaty. France announced in 1974 that it would refrain from conducting further atmospheric tests. Since then it has carried out 93 underground tests. China conducted its last atmospheric test in 1980; in March 1986, it confirmed that it would not conduct atmospheric tests in the future. China has conducted 4 underground tests since 1980.* Today 117 States adhere to the Treaty.

The partial test-ban Treaty was the first international agreement of world-wide scope reached in the field of nuclear-arms limitation. At the time, its conclusion was hailed as an event of historic significance that marked the beginning of the curbing of the nuclear-arms race. Indeed, it helped to create a climate that facilitated negotiations for other agreements, notably the Treaty on the

* SIPRI Yearbook, 1988 (covering the period up to the end of 1987), p.74.

Non-Proliferation of Nuclear Weapons, and it has also greatly contributed to reducing radioactive pollution and to lessening international tensions.

The Threshold Test-Ban Treaty and the Peaceful Nuclear Explosions Treaty

In the partial test-ban Treaty, States parties expressed their determination to pursue further negotiations aimed at the discontinuance of all test explosions of nuclear weapons in all environments for all time. Such negotiations were held during the 1960s and 1970s at the multilateral level, in the Geneva Committee on Disarmament; at the bilateral level, between the Soviet Union and the United States; and at the trilateral level, between the Soviet Union, the United Kingdom and the United States. The major obstacle in all those negotiations continued to be the question whether a total ban on testing could be adequately verified and whether verification would require on-site inspection.

As a result of their bilateral negotiations on the banning of all nuclear testing, the Soviet Union and the United States, in 1974, signed the Treaty on the Limitation of Underground Nuclear Weapon Tests, commonly referred to as the threshold test-ban Treaty. This Treaty prohibits any underground nuclear-weapon test having a yield in excess of 150 kilotons and restricts testing to specified areas. Each party agreed to use its national technical means of verification and not to

interfere with the means of verification of the other party. The parties also agreed to exchange information necessary to improve the assessments of the yields of explosions. The threshold test-ban Treaty does not, however, cover underground nuclear explosions for peaceful purposes. Negotiations continued, therefore, on this question.

In 1976 the two States signed the Treaty on Underground Nuclear Explosions for Peaceful Purposes. This Treaty regulates the explosions which they may conduct outside their nuclear-weapon test sites and which may, therefore, be presumed to be for peaceful purposes. To ensure that explosions announced as peaceful would not provide weapon-related benefits that could not be obtained from weapon-testing prohibited by the threshold test-ban Treaty, the new Treaty established the same yield threshold for explosions for peaceful applications as that which had been imposed on weapon tests, namely, 150 kilotons. Any group explosion is also limited to 150 kilotons unless each of its individual explosions can be identified and its yield determined to be not more than 150 kilotons, and its aggregate yield does not exceed 1 1/2 megatons. In a Protocol containing specific operational arrangements, the two parties committed themselves to provide detailed information on their explosions for peaceful purposes and even to permit designated personnel of the other party to come within the area of explosion for observation purposes. Those provisions were considered as representing a significant advance in verification procedures.

The Treaties have not been ratified and have not, therefore, entered into force. Both parties have stated that they will, nevertheless, observe the limitations set by the Treaties.

Bilateral Negotiations

In connection with a new round of negotiations on nuclear and space arms, the Soviet Union and the United States, in 1986, began substantive discussions on issues related to nuclear testing. Full-scale stage-by-stage negotiations on nuclear testing started in November 1987. The United States and the Soviet Union stated that, as a first step in their negotiations, they would agree upon effective verification measures which would make it possible to ratify the 1974 threshold test-ban Treaty and the 1976 peaceful nuclear explosions Treaty, and proceed to negotiating further intermediate limitations leading to the ultimate objective of the complete cessation of nuclear testing as part of an effective disarmament process. Among other things, this process would pursue, as its first priority, the reduction of nuclear weapons and, ultimately, their elimination. In implementing the first objective of these negotiations - agreement on effective verification measures for the threshold test-ban Treaty - the two sides agreed to design and conduct a joint verification experiment at each other's test sites.

Accordingly, in 1988 the Soviet Union and the United States carried out joint verification experiments at their respective test sites in Semipalatinsk and Nevada, comparing hydrodynamic verification equipment directly on-site and seismometric verification instruments at different off-site locations.

At the heart of the present discussions and the joint test measurement experiment is the question: to what extent do off-site seismic measuring devices need to be supplemented by a more intrusive on-site monitoring method? In the American view, seismometric measuring cannot replace on-site monitoring. The American side has, therefore, suggested that all nuclear-test explosions above a yield of 50 kilotons should be verified by the other party through the hydrodynamic or "CORRTEX" method, whereby a cable is inserted into a parallel shaft very close to the shaft containing the nuclear device and the explosive yield is determined by measuring the speed with which the cable is crushed. In discussing the relative merits of the hydrodynamic and seismometric methods for measuring explosive yields, Soviet experts have expressed the opinion that, although the accuracy of CORRTEX measurements can be fairly high if no special measures to distort (camouflage) the explosive yield have been taken in designing the container holding the nuclear charge, the hydrodynamic method requires more extensive and lengthy preparations than does seismic monitoring and does not result in measurements of much greater accuracy. The former method would also entail the risk of obtaining technical information not directly relating to the yield of the explosion. The Soviet side therefore favours relying on seismic monitoring at a distance from the test site, possibly supplemented by a limited number of on-site measuring operations to calibrate and assure the accuracy of the seismic techniques.

The Soviet Union and the United States consider that their joint tests of the two methods have reduced differences between them

regarding the requirements for adequate measuring of underground nuclear-test explosions. They have stated that verification measures for the threshold test-ban Treaty agreed to as a result of the joint experiments will, to the extent appropriate, be used in nuclear-test limitation agreements that they may conclude in the future.

Multilateral Discussions

Faced with continuing nuclear testing, the international community has sought, throughout the years, to take effective measures that would lead to a comprehensive test ban. Multilateral efforts to achieve this objective have intensified, in particular in the Conference on Disarmament and its predecessors. A number of concrete proposals, including texts for a draft treaty by Sweden and by the Soviet Union, have been submitted in the course of these discussions.

The Final Document of the first special session of the General Assembly devoted to disarmament, held in 1978, recognized that the cessation of nuclear-weapon testing would make an important contribution to the goal of ending the qualitative improvement of nuclear weapons and the development of new types of such weapons, and of preventing their proliferation.

The divergence of views among the nuclear-weapon States on the question of a comprehensive test ban has made it, however,

impossible for the Geneva negotiating body to start substantive negotiations on the issue, despite numerous requests by the General Assembly

In July 1980, for the first time since they had begun trilateral negotiations on a comprehensive test ban, in 1977, the Soviet Union, the United States and the United Kingdom reported to the Committee on Disarmament that they had agreed that a treaty would require each party to prohibit, prevent and not carry out any nuclear-weapon test explosion at any place or in any environment under its jurisdiction; that a protocol on nuclear explosions for peaceful purposes would be an integral part of a test-ban treaty, establishing a moratorium on such explosions until arrangements for conducting them had been worked out; and that national technical means of verification would be used. Each party would undertake not to interfere with such means of verification. International seismic data centres would be established in agreed locations to permit an international exchange of seismic data. The treaty would also allow a party, after stating its reasons, to request an on-site inspection for the purpose of ascertaining whether or not an event was a nuclear explosion. The three Powers concluded their report by stating that they were determined to exert their best efforts to bring the negotiations to an early and successful conclusion.

However, no further talks were held between them after the United States announced, in 1982, its decision not to resume the trilateral negotiations on a test-ban treaty. The United States held that any consideration of a complete cessation of testing must be

related to the ability of Western nations to maintain credible deterrent forces and, while a test ban remained an element in its full range of long-term arms control objectives, the United States did not believe that, under the current circumstances, a comprehensive test ban would help to reduce the threat of nuclear weapons or to maintain the stability of the nuclear balance.

A compromise was reached in the Committee on Disarmament in 1982, when an ad hoc working group was established "to discuss and define, through substantive examination, issues relating to verification and compliance with a view to making further progress towards a nuclear-test ban". China and France, however, made it known that they would not participate in the Working Group. In the course of subsequent deliberations, further treaty proposals were presented: by the Soviet Union in the General Assembly in 1982 and by Sweden in the Conference on Disarmament in 1983. Since 1984 the Conference on Disarmament has been unable to agree on the terms of reference for a new working group, namely, whether it should be mandated to begin substantive multilateral negotiations. Apart from informal consultations, the issue has, therefore, been discussed only in plenary meetings of the Conference.

The importance that Member States continue to attach to a comprehensive nuclear-test ban is reflected in various initiatives that they have taken.

On 6 August 1985, the Soviet Union publicly declared and put into effect a unilateral moratorium on all nuclear tests. The moratorium lasted, with four renewals, until 26 February 1987. The Soviet Union, at

that time, announced its willingness to resume a moratorium if the United States would do the same.

In a document adopted in 1986 in Mexico, the members of the Six-Nation Initiative - Argentina, Greece, India, Mexico, Sweden and the United Republic of Tanzania - offered to assist in monitoring a moratorium or ban on nuclear-weapons tests. They proposed that they, in co-operation with the United States and the Soviet Union, establish and operate, first on a temporary and later on a permanent basis, monitoring stations at existing test sites, and that they "internationalize" a number of selected stations in each of the two nuclear-weapon countries by placing observers there.

Another approach towards concluding a comprehensive test-ban treaty has been taken by a group of non-aligned countries, which, since 1985, has proposed that a conference be convened to consider converting the partial test-ban Treaty into a comprehensive one. The 1963 Treaty stipulates that its depositary Governments (USSR, United Kingdom and United States) must convene a conference to discuss an amendment if at least one third of the States parties request it, and that any amendment must be approved by a majority of all the parties including the three depositaries. The General Assembly in 1988 adopted a resolution supporting that request. The Soviet Union welcomed the idea of expanding the scope of the 1963 Treaty. The United Kingdom and the United States have indicated that, although they will comply with the request in accordance with their duty as depositaries, they do not support the proposed conversion. By early 1989, the required number of States

parties (39) calling for the convening of such a conference was reached. The possibility of holding it in 1990 is now being discussed.

Furthermore, in 1986 and 1987 the General Assembly adopted resolutions by which it called on States conducting nuclear-test explosions to notify the Secretary-General, within one week of each explosion, of the time, place, yield and site characteristics of the test and also invited all other States to provide any such data on nuclear explosions that they might have. It also requested the Secretary-General to make available an annual register, based on the information provided. So far, only Australia, New Zealand and the Soviet Union have furnished such information.

Member States in the Conference on Disarmament and in the General Assembly remain divided on the issue of a comprehensive nuclear-test ban. Non-aligned and socialist States continue to stress the urgent need to negotiate and conclude such a treaty and for that purpose call for the establishment of a subsidiary body with a negotiating mandate in the Conference. Members of the Group of Western States argue that it is necessary to further examine specific issues relating to a nuclear-test ban, in particular the questions of scope and of verification and compliance. They also maintain that a stage-by-stage approach would offer the best chance for early progress on the issue.

In discussing nuclear testing in the General Assembly in 1988, the United States focused on its step-by-step negotiations with the Soviet Union and on their joint verification experiments. The Soviet Union, noting the bilateral commitment to achieve further intermediate

limitations on nuclear testing as a step on the way to achieving the ultimate objective of the complete cessation of testing, argued that complementary practical work on the issue in the Conference on Disarmament was especially urgent. It felt that the joint verification experiments would be useful for the multilateral negotiations as well, and reaffirmed its readiness to use the services offered in the Six-Nations Initiative regarding the monitoring of the non-conduct of tests.

The United Kingdom, for its part, endorsed the bilateral negotiations and their step-by-step approach. China continued to maintain that the Soviet Union and the United States must take the lead in stopping the testing, production and deployment of nuclear weapons and in reducing and eliminating them.

France, for its part, expressed the view that while the banning of nuclear tests was important to those aspiring to denuclearization, the reduction and cessation of tests could only be the consequence, rather than the cause, of a cut in arms. In that regard, it noted the linkage in the bilateral talks between reductions in arsenals and limitations on tests. As its own nuclear arsenal was already at the strictly essential level, it could not feel bound by any limitations that might be agreed upon by the major Powers. Out of concern for openness, however, it had decided to provide a yearly statement of the number of tests it carried out. This would allow a more accurate assessment of its actual testing activity and its logic in the context of effective deterrence than was possible from information circulated by third States.

As was the case in the bilateral and trilateral negotiations, the question of adequate verification procedures has remained one of the major problems in the multilateral considerations on a comprehensive test ban. Over the years, a number of proposals have been made in order to solve the issue, in particular by Sweden and by the Soviet Union.

Upon a proposal by Sweden, based on the assumption that adequate means to deter any clandestine testing under an agreement could be provided by a global seismic monitoring system, the Conference of the Committee on Disarmament set up in 1976 an ad hoc group of scientific experts to study that possibility.

The Group of Scientific Experts designed an international system for the rapid exchange of waveform (Level II) and parameter (Level I) data, and for their processing at designated international data centres. In 1984 it conducted a technical test exercise to help develop the concept further. Relying on advances in digital seismometry, computer technology and data transmission, the system is based on four international data centres and a global network of nationally operated seismic stations using up-to-date communication methods, including satellite links.

In 1988 the four experimental data centres, situated in Canberra, Moscow, Stockholm and Washington, carried out separate and joint experiments in analysis methodology. Communication techniques

between the four international data centres and a number of national seismological stations were also tested. In addition, a global data-gathering experiment was conducted, resulting in the creation of an initial research data base at the experimental data centre in Canberra. Further technical experiments are planned for 1989, and in 1990 a large-scale experiment in data exchange and analysis, involving up to a hundred seismological stations globally and lasting several months, is foreseen.

A Nuclear-Test Ban and the Question of the Non-Proliferation of Nuclear Weapons

In the preamble to the 1963 partial test-ban Treaty, the three negotiating parties - the Soviet Union, the United Kingdom and the United States - committed themselves to seek to achieve the discontinuance of all test explosions of nuclear weapons for all time, and expressed their determination to continue negotiations to that end. In the preamble to their 1974 threshold test-ban Treaty, the United States and the Soviet Union made a specific reference to that declaration of intention.

During discussions in the mid-1960s on the prevention of the further proliferation of nuclear weapons, there was a general feeling among the non-aligned members of the negotiating body in Geneva that a non-proliferation treaty should offer a balance of responsibilities and

obligations between the nuclear and the non-nuclear-weapon States, and that it should either become a part of a wider disarmament programme or be followed by an early halt in the production of nuclear weapons and a reduction in the stockpiles of the nuclear-weapon States. To meet this particular concern, the final joint Soviet-American draft treaty, submitted in 1968, contained a provision under which all parties to the treaty would undertake 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. The draft also included, in the preamble, a reference to the declared intention of the depositaries of the 1963 partial test-ban Treaty to seek the discontinuance of all test explosions of nuclear weapons for all time and to continue negotiations to that end.

**Conference on
Disarmament**

(Called the Committee on Disarmament between 1979 and 1983) is the multilateral negotiating body of the international community. Its membership of 40 States includes all five nuclear-weapon States. The Conference was constituted in this form in 1978 and held its first session in 1979 carrying on the negotiating efforts of its predecessors, the Ten-Nation Committee on Disarmament (1959 - 1960), the Eighteen-Nation Committee on Disarmament (1962 - 1969), and the Conference of the Committee on Disarmament, comprising 30 Member States (1969 - 1978). It has a unique relationship with the United Nations. It defines its own rules of procedure and develops its own agenda, taking into account the recommendations made by the General Assembly and reports to the General Assembly annually, or more frequently, as may be appropriate. The Secretary-General of the Conference is appointed by the Secretary-General of the United Nations and acts as his personal representative. In 1979, the Committee on Disarmament agreed on a permanent agenda consisting of ten subject areas from which it adopts its annual agenda and programme of work.

- CCD** Conference of the Committee on Disarmament (see Conference on Disarmament).
- CORRTEX** Continuous reflectometry for radius versus time experiment.
- ENDC** Eighteen-Nation Committee on Disarmament (see Conference on Disarmament).
- Fission** The splitting of the atomic nuclei of certain heavy elements (such as uranium and plutonium), which results in the immediate release of great energy, as in a fission-type nuclear weapon (atomic bomb).
- Fusion** The process whereby the nuclei of light elements, especially those of isotopes of hydrogen, combine to form the nucleus of a heavier element, resulting in the immediate release of great energy. This process constitutes the basis of the thermonuclear weapon (hydrogen bomb), which can be vastly more powerful than the fission-type or atomic nuclear weapon.
- Kiloton** A measure of the yield of a nuclear detonation. One kiloton is equivalent to 1,000 tons of TNT. TNT is the universally used acronym for the chemical explosive trinitrotoluene.

**National technical
means of verification**

Techniques by which a State monitors weapons of another State. This includes one State monitoring compliance by another State to ensure implementation of the provisions of a treaty to which they are both parties. Reconnaissance satellites are the most widely used means for this form of verification.

NPT

Treaty on the Non-Proliferation of Nuclear Weapons. The Treaty was opened for signature on 1 July 1968 and entered into force on 5 March 1970. It aims at preventing the spread of nuclear weapons from nuclear-weapon States to non-nuclear weapon States, at promoting the process of nuclear disarmament and at facilitating access to nuclear technology for peaceful purposes. The Treaty defines the obligations of both nuclear-weapon and non-nuclear-weapon States parties regarding the prevention of the further spread of nuclear weapons. It further commits both nuclear-weapon and non-nuclear-weapon States to pursue negotiations, in good faith, on nuclear disarmament and the cessation of the nuclear arms race. The Treaty also provides for safeguards to be administered by the International Atomic Energy Agency to prevent diversion of nuclear material from peaceful to weapons uses.

Nuclear explosive device

Any nuclear explosive. The term is most frequently used to indicate that a nuclear explosion from such a device would not have a military purpose.

Nuclear weapons

A collective term for atomic and hydrogen weapons of all types and their delivery systems.

PNE

Nuclear explosions for peaceful purposes. Test or applied nuclear explosions intended for peaceful engineering projects, such as making underground minerals accessible, or major construction projects involving topographical alteration.

Plutonium

In the context of weapons, plutonium usually refers to the fissile isotope plutonium-239, which occurs in nature only in minute quantities. It is manufactured artificially when an extra neutron is added to uranium-238 through irradiation. It is used, as an alternative to highly-enriched uranium, for the core of atomic bombs.

Treaty A treaty, whatever its particular designation, is an international agreement concluded in written form between two or more States (bilateral or multilateral treaties) and governed by international law. It may be embodied in a single original instrument or in two or more related instruments.

Uranium A radioactive element (atomic number 92) with an average atomic weight, in natural ore, of 238. The two principal natural isotopes are uranium-235 (0.7 per cent of natural uranium), which is fissionable, and uranium-238 (99.3 per cent of natural uranium), which is fertile, i.e., readily absorbs neutrons through irradiation to produce the fissionable material plutonium-239. Uranium-238 alone cannot sustain a chain reaction.

Yield The energy released in the detonation of a nuclear weapon, measured in terms of kilotons or megatons of TNT required to produce the same energy release.

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