

TBT

The Test Ban Treaty

On 5 August, 1963,
the Test Ban Treaty was signed in Moscow, banning nuclear weapon tests in the atmosphere,
in outer space and under water.

Ratification, accession or notification of accession has up to the present been deposited by:

Afghanistan	Gambia, The	Malawi	Sudan
Australia	Germany, Dem. Rep. of	Malaysia	Swaziland
Austria	Germany, Fed. Rep. of	Malta	Sweden
Belgium	Ghana	Mauritania	Switzerland
Bolivia	Greece	Mauritius	Syrian Arab Rep.
Botswana	Guatemala	Mexico	Tanzania,
Brazil	Honduras	Mongolia	United Rep. of
Bulgaria	Hungary	Morocco	Thailand
Burma	Iceland	Nepal	Togo
Byelorussian Soviet -Socialist Republic-	India	Netherlands	Tonga
Canada	Indonesia	New Zealand	Trinidad and Tobago
Central African Republic	Iran	Nicaragua	Tunisia
Chad	Iraq	Niger	Turkey
Chile	Ireland	Nigeria	Uganda
China	Israel	Norway	Ukrainian Soviet Socialist Rep.
Costa Rica	Italy	Panama	Union of Soviet Socialist Republics
Cyprus	Ivory Coast	Peru	United Kingdom
Czechoslovakia	Japan	Philippines	United States of America
Dahomey	Jordan	Poland	Uruguay
Denmark	Kenya	Romania	Venezuela
Dominican Republic	Korea, Rep. of	Rwanda	Western Samoa
Ecuador	Kuwait	San Marino	Yugoslavia
Egypt, Arab Rep. of	Laos	Senegal	Zaire, Rep. of
El Salvador	Lebanon	Sierra Leone	Zambia
Finland	Liberia	Singapore	
Gabon	Libya	South Africa	
	Luxembourg	Spain	
	Madagascar	Sri Lanka	

In the following pages is a series of articles which have been written for the IAEA Bulletin,
commemorating the 10th anniversary of the signing of the Treaty.



TBT

by G.C. Delcoigne

On the 10th anniversary of the signature of the Moscow Treaty banning all nuclear tests except underground, it may be of interest to recall some points which have become part of contemporary history.

The historical background to the Treaty has been discussed in many works which relate 17 years of negotiations between the USSR and the Western World. Efforts to limit the testing of nuclear weapons through international agreement began as far back as 1946 when the United Nations set up an atomic energy commission to prepare specific proposals for the purpose of controlling atomic energy, such as the Baruch plan.

During these 17 years the USSR and the United States alternated in submitting proposals for the control or the abolition of atomic weapons. In August 1957 in an attempt to break the deadlock, the United States presented a package deal: Cessation of testing and production of nuclear weapons, the reduction of stock piles through conversion of fissionable materials to peaceful uses and certain limitations both on conventional arms and forces. When this proposal was rejected, the United States decided to resume nuclear testing in 1958.

On 31 March 1958 just after the USSR had completed a nuclear test series and just before the United States began its own test series, the Soviet Union announced that it was unilaterally suspending further testing. On August 22 the United States and Great Britain announced they would suspend testing for one year beginning October 1, 1958, provided negotiations were started for the suspension of nuclear tests and the establishment of an international control system.

It was during these negotiations that for the first time the United States agreed to separate the consideration of prohibiting nuclear testing from broader disarmament proposals.

In April 1959 the UK and the US proposed as a first step towards a comprehensive test ban treaty that an agreement be concluded which would ban only atmospheric and under-water testing. In February 1960 the US proposed an uninspected test ban, i.e. all nuclear testing in the atmosphere, under-water, in space and under-ground, except for small explosions, should be banned.

From 1960 to 1963 negotiations proceeded slowly and were interrupted by several international crises.

In August 1962 the US and the UK tabled two proposals: one for a ban on all nuclear testing safeguarded by a system of international supervision control and on-site inspections, and a second which called for the uninspected prohibition of testing in all environments except under-ground.

It was only in December 1962 that Premier Khrushchev indicated in a letter to President Kennedy that the USSR might accept a test ban agreement on the basis of 2 or 3 inspections a year. Negotiations resumed in January 1963 and were promptly dead-locked over the issue of onsite inspection.

The three power talks were then suspended and the matter turned over to the 18 Nations Disarmament Committee (ENDC)¹ which was to reconvene in Geneva in February 1963. But the ENDC also came to an impasse over the inspection issue. At the end of May, 34 US senators proposed a resolution urging a partial test ban treaty and suggesting that, if the offer was rejected, the US should nevertheless unilaterally suspend both atmospheric and under-water nuclear testing.

This step initiated a series of public speeches which started a dialogue between President Kennedy, Harold Wilson and Premier Khrushchev, as a result of which three power talks started in Moscow on 15 July, the American delegation being led by W. Averell Harriman, the British by Viscount Hailsham, and the Soviet Delegation by Premier Khrushchev and Foreign Minister Gromyko. On 5 August the Treaty was formally signed in Moscow by Dean Rusk, the British Secretary of State for Foreign Affairs Lord Hume, and Soviet Foreign Minister Gromyko.

Careful reading of President Kennedy's address concerning the test ban treaty in his message to the Senate indicates that he thought of it as a symbol, a limited step, an "opportunity to reduce tension" but also as "an opening wedge". He was careful to point out the limitations of the treaty. In fact he quoted no less than 13 of them. It is interesting to note that among the political differences quoted were Berlin, The Congo, Cuba, Viet-Nam and the German question².

Nevertheless President Kennedy outlined 4 political advantages. The treaty would be a step towards:

1. reducing world tension.
2. freeing the world of fears and dangers of radio-active fall-out.
3. preventing the spread of nuclear weapons, and
4. a limitation to the nuclear arms race.

Judgements on the results achieved have varied throughout the years. At the time of the signature, the Treaty was opposed by some circles in the US, even by such distinguished scholars as Professors Shulman and Strausz-Hupé, at that time Director of the Foreign Policy Research Institute. But in 1973 we see that many of the obstacles which stood in the way of a détente and which were mentioned by the President himself have been or are on the verge of being overcome.

¹ In 1963 the Eighteen Nation Disarmament Committee (ENDC) was composed of Brazil, Bulgaria, Burma, Canada, Czechoslovakia, Egypt, Ethiopia, France, India, Italy, Mexico, Nigeria, Poland, Romania, Sweden, U.S.S.R., U.K., U.S.A. In 1969 the Conference of the Committee on Disarmament (CCD) was composed of the above plus Argentina, Hungary, Japan, Mongolia, Morocco, Netherlands, Pakistan, Yugoslavia. France has never occupied its seat.

² see speech to the UN 20 September 1963.



These Treaties have already been signed in the field of Nuclear Arms Control:

1. Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (Moscow Test Ban Treaty)

5 August, 1963, Moscow

2. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty)

27 January, 1967, London, Moscow, Washington

3. Treaty for the Prohibition of Nuclear Weapons in Latin America (Tlatelolco Treaty)

14 February, 1967, Mexico City

4. Treaty on the Non-Proliferation of Nuclear Weapons (NPT)

1 July 1968, London, Moscow, Washington

5. Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-Bed and the Ocean Floor and in the Subsoil thereof

11 February, 1971, London, Moscow, Washington

"I view them [these agreements] as an initial achievement in a continuing process" U.N. Secretary-General K. Waldheim, in a message to the Conference of the Committee on Disarmament of 20 February, 1973.

▲ (ABOVE): Signing the triplicate copies of the three-nation limited nuclear Test Ban Treaty at the Kremlin, Moscow, on August 5 are, from left: U.S. Secretary of State Dean Rusk, Soviet Foreign Minister Andrei A. Gromyko and British Foreign Secretary Lord Home. Among those viewing the ceremony, standing, front row, from left, are: Adlai E. Stevenson, U.S. Ambassador to the United Nations; U Thant, U.N. Secretary-General; and the Russian Premier Krushchev.

◀ (BELOW): The Republic of Niger was the 100th nation to sign the Test Ban Treaty, in Washington on September 24, 1963. Ambassador Abdou Sidikou signs on behalf of this country.

The dangers of radioactive fall-out were vigorously debated, particularly during the US Senate hearings *inter alia* by Dr. Seaborg, Dr. Foster, Dr. Bradbury and Dr. Teller. Be it as it may, the fact remains that before the Treaty almost 200 tons of radio-active debris had found its way into the atmosphere from atomic blasts³ whereas in 1970 the amount of Strontium-90 deposits on the earth was only 5% of the amount that fell in 1963.

The Treaty was also meant to prevent the spread of nuclear weapons. While this point was very much under controversy at the time, the case against proliferation was well presented by President Kennedy himself in his 21 March 1963 press conference, where he admitted being haunted by the feeling that "by 1970, unless the test ban treaty was signed, there may be 10 nuclear powers instead of four, by 1975, 15 or 20". And this he regarded as the greatest possible danger and hazard.

Ten years after this anguished warning, what is the situation? The Non-Proliferation Treaty which was signed in 1968 and came into force on 5 March 1970, has today been signed by 98 states and already ratified by 78. In Latin America, the Tlatelolco Treaty which provides for the denuclearization of the area has been ratified by 19 states. The signing of an agreement between the European Community and the IAEA for the implementation of NPT has been an important step in this direction. However two nuclear powers have not joined the NPT, nor have certain important non-nuclear weapon states.

Nevertheless the NPT remains "the key element of the efforts of the international community to keep nuclear arms under control"⁴ – and the wedge opened in 1963 can be said to have borne fruit. The measure of its success cannot yet be fully assessed: we see for instance that the undertaking of the original parties to the Moscow Treaty to refrain from encouraging or participating in the carrying out of any nuclear weapon test explosion has developed in a more forceful obligation in Art.1 of NPT. However the aim of a complete Test Ban, inscribed in 1963 and repeated in 1968 has not yet been achieved.

The problem is of course a very complex one. It is said that technical progress as a result of intensive Research and Development efforts is such in the interpretation of teleseismic data as to permit a CTB without on site inspection. But this view is contended and the controversy still exists. Moreover only three nuclear powers have committed themselves to this aim. This aim, if and when achieved, is only a step in the overall quest for "a general and complete disarmament under strict international control", to use United Nations phraseology. Such a far-reaching proposition, however, can only be undertaken if all of the parties mainly concerned co-operate and history shows very few examples of self-imposed obligations without any counterparts. Moreover a modification of the Partial Test Ban Treaty would have to take account of the possibility of peaceful nuclear explosions projects (PNE). In one of his conferences on America and Russia in a Changing World⁵, W.A. Harriman shows that this possibility was envisaged at the time by the negotiators of the Partial Test Ban Treaty.

³ see Nature of 12 November 1971.

⁴ UN Secretary General K. Waldheim in a speech to the CCD, 20 February 1973.

⁵ 'A Half Century of Personal Observation', Doubleday and Co. Inc., New York 1971.

The last point concerns the limitation to the nuclear arms race. In 1972 we have witnessed the signature of the SALT agreements, two of which, the Treaty on Limitation of ABMs and the Interim Agreement on Offensive Weapons are important steps towards the halting of the nuclear arms race and also towards the fulfilment of the obligations of Art.VI of the NPT.

In a space of 10 years we have seen what progress has been made in each of the four directions mentioned by President Kennedy — and this without prejudice to the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies, and the 1972 Treaty on the Prohibition of the Emplacement of Nuclear Weapons and other weapons of Mass Destruction on the Seabed and the Ocean Floor.

These steps already taken can today be viewed as the initial achievements of a continuing process which really began in 1963.

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by Sir Michael Wright, GCNG, U.K. Delegate to the Geneva Conference of 1959-62 on the Cessation of Nuclear Tests

Two facts stand out about the Partial Test Ban Treaty. Agreement was only reached after four years of grinding negotiations at Geneva between the United States, the Soviet Union and the United Kingdom, with the Experts' Report of 1958 as the starting point; and final impulsion to a treaty between the three was given by the shock caused, to the nuclear as well as to non-nuclear powers, by the Cuban crisis.

Now, over a decade later, it is hard even for a participant in those fluctuating talks to relive the atmosphere of concentrated effort, of alternating hope and disappointment, that went into the sustained attempt in 1958-63 to secure a ban on all nuclear testing, or failing that on testing other than underground. Perhaps it could best be summed up in Hank Ketchum's cartoon of the small boy, Dennis the Menace, kneeling in his pyjamas for his evening prayers and saying "Please God, don't let them destroy the world until I have had time to see it". Or in another cartoon when the U2 incident was followed by the failure of the Paris Summit to agree on the hoped for outline of a total test ban, and the Warsaw Pact Delegations walked out of the Ten-Power Disarmament Conference leaving only the three nuclear Delegations in negotiating session. The floor sweepers walk in to clear up the débris-littered floor of the abandoned conference room and exclaim in astonishment — "Youse guys still here? "! Youse guys — Jerry Wadsworth and Arthur Dean, Tsarapkin and Zorin, David Ormsby Gore (Lord Harlech) and Joe Godber, with flights of scientists, strategists, specialists and political and public figures of all sorts from Hubert Humphrey to Canon Collins drifting in and out. Dag Hammarskjöld, too, and his representative Mr Narayanan of India. Behind them Khrushchev, Eisenhower, Kennedy, Macmillan, Selwyn Lloyd and Alec Home weighing the risks of failure against the dangers of inspection, of lack of inspection, of proliferation, and of mounting pollution.

The verbatim records of the hundreds of meetings show the U turns of policy of both the United States and the Soviet Union. They show the Soviet Union at one time accepting Western control posts on Soviet territory (we inspect you, you inspect us), and later rejecting even neutral monitoring; walking out of the talks to embark on a major series of atmospheric tests; and three times rejecting a partial test ban, but finally accepting one. They show the United States accepting the whole of the Experts' Report, then reneging on essential parts of it. Between the lines can be read the marks of the struggles behind the scenes between the hawks and doves both in Moscow and Washington. The records also reveal with clarity the real sticking points — acceptance of control, and maintenance of the power of veto by the Soviet Union in the Security Council. From the British point of view, an illuminating account is given in Harold Macmillan's memoirs, which perhaps only fail in not giving due credit to his vision and persistence in seeking a full test ban,

and in securing — half a non-nuclear loaf being better than wholly nuclear bread — an agreement that would at least arrest the rising curve of pollution. Pollution which, if continued until now, might have interfered fatally with the earth's atmospheric covering and the survival of life in it.

Within the conference room the delegates maintained and developed considerable restraint and urbanity, even if a British representative was once moved to protest to Zorin, "If you will cease referring to my delegation as an Imperialist circle, I will refrain from referring to you as a Red square"!

Outside the conference room brooded public opinion across the world, and the non-nuclear powers. Letters from the public streamed in by tens of thousands. Mostly they wished success or made dire forecasts of the results of failure. Occasionally more original, perhaps more spontaneous comment, crept in. "In my country we would like to see a total nuclear ban — not because we dislike war, only that we think nuclear weapons take all the fun out of war." "If the Great Powers are to disarm, is there any chance my country might be able to buy a second-hand cruiser on the cheap?" "Please stop the horror. Even the elk are becoming radio-active and we can no longer eat them."

Then the non-nuclear powers. All of them urged a total ban on nuclear testing and weapons. But their deepest concern was less that the Russians or Americans or British should give them up, than that their close neighbours or rivals should acquire them. Hence the mounting pressure, fostered by non-nuclear powers, for a Non-Proliferation Treaty.

Today, twelve years later, two new nuclear powers have arisen, China and France. Subsidiary agreements in the field of arms control have been concluded, and a Non-Proliferation Treaty signed as a follow-up to the Partial Test Ban Treaty. But there has been a slackening of the major impulse towards the only safe kind of world — a world with international control, limitation and verification (veto-free) of nuclear and other arms production.

I am aware, too, that with the passage of time even the Partial Test Ban has come to be appraised by some people as almost more an environmental measure than strictly an arms control one — we are all familiar with the witticism describing it as tantamount to a 'clean air bill'. I will not deny for a moment that there is something in this approach, which also accords with our current preoccupations about pollution. At the time however we did I think most of us see it as an arms control issue, both in itself and as a step towards other, more far-reaching measures. Above all, it broke the ice. And it can still justly be regarded as the first significant international agreement for the control of nuclear weapons.

Looking back to it, what lessons are to be drawn in 1973 from the partial progress of 1958-63?

First, that if the ground is thoroughly and persistently cleared and differences narrowed to slender margins of disagreement, however wearisome and frustrating the process, the moment is apt to come as it did after the Cuban crisis, when men look into the brink of the abyss and say, we can no longer afford not to progress towards agreement. It was a sequel of Cuba that after three earlier refusals the Soviet Union agreed to a partial test ban. In other words the winds of change blow sooner or later even through the major

capitals, and the soil should be ready tilled. Second, outside events — noises off — such as the U2 incident, crises in Eastern Europe, Africa, Asia or where will you should never be permitted to afford a pretext for breaking off the search for permanent security. Other confrontations pass, the nuclear balance remains precarious; it can be upset at any moment by scientific breakthrough or by human failure. It is not a plateau on which a reliable structure of lasting peace can rest.

Thirdly, of special interest at the time, as well as for the future, was the role of the scientists of the three countries. It became evident that political control of the expression of scientific opinion was sometimes exercised. In the opposite case, scientific advisers at times reported independently of the leaders of their delegations to departments or establishments at home, differed openly among themselves, and on occasion appeared hazy about the borderline between politics and science. In London I think I can say that there seemed to be less friction, fewer entrenched positions, and greater singleness of purpose, albeit less weight of power. In any case the notion that scientists, if left to themselves, could solve international political differences more readily than non-scientists was not altogether supported by events. This may have been largely due to an inescapable dilemma. A scientist, if true to science, must base his advice to his Government on an objective assessment of all available data. But since in a period of intensive research new data were constantly emerging — whether in seismology or other fields — the advice, if honest, was bound to change with the data. So that statesmen had to try and formulate enduring policies on shifting scientific advice, quite apart from their perennial problem of deciding which among differing scientists was most like to prove right!

And finally, above the doorway to the negotiating chamber of any disarmament discussion should be engraved the Chinese proverb quoted by President Kennedy when the Partial Test Ban Treaty was signed — “Even a journey of a thousand miles begins with a single step”.





BEFORE THE PARTIAL TEST BAN

The first nuclear weapon test was performed on 16 July 1945 in New Mexico, USA. The treaty banning nuclear weapon tests in the atmosphere, in outer space and under water, called the Partial Test Ban Treaty (PTBT), was signed in Moscow on 5 August 1963. During the intervening eighteen years 499 nuclear explosions are known to have been made; 304 by the USA, 164 by the Soviet Union, 23 by the United Kingdom and 8 by France. 379 of these were made in the atmosphere; the other 120 were underground or under water.

By the end of 1954, the three powers then testing nuclear weapons (the USA, the USSR and the UK) had exploded a total of 51 nuclear devices, all but two of them in the atmosphere. By the end of 1958, this number had grown to 285. 1959 and 1960 were the years of the moratorium on nuclear tests but France began testing in 1960 with three nuclear explosions in the atmosphere over the Sahara. In 1961, the USA and USSR began testing again and at least 43 nuclear explosions were conducted during this year.

On 30 October 1961, the Soviet Union set off the largest nuclear device ever exploded in the world – a 58 Mt thermonuclear explosion in the atmosphere at Novaya Zemlja. This event followed several other large Soviet nuclear explosions, including a 25 Mt device exploded in the atmosphere and a device of about 20 Mt exploded under water, both set off on 23 October 1961.

But the peak year for nuclear testing was 1962. In this year, a total of at least 133 tests are known to have been performed by the USA, USSR, UK and France, involving a wide range of nuclear devices with explosive powers up to 30 Mt. Seventy-nine of these tests were conducted in the atmosphere.

WHY THE PTBT WAS NEGOTIATED¹

There is little doubt that public concern over the contamination of Man's environment by radioactive substances was a factor which led the UK, the USA and the USSR to agree to discontinue tests in the atmosphere, in outer space and under water. These powers stated, however, that they were also influenced by a number of arms control considerations. The ban, they claimed, would slow down the general nuclear arms race by limiting the further development of nuclear weapons significantly, it would help prevent the

¹ A more complete analysis of the PTBT is given in SIPRI research report No.11 "Ten Years of the Partial Test Ban Treaty, 1963-1973", SIPRI, Stockholm, 1973.

proliferation of nuclear weapons to other nations; and it would assist progress towards nuclear disarmament. But subsequent events indicate that the negotiation of the agreement at that particular time was stimulated mainly by the need to improve American-Soviet relations which had been severely strained by the 1962 Cuban-missile crisis. The test ban was considered to be a useful psychological instrument for this purpose because the radioactive contamination issue was causing such widespread public concern.

The fact that underground nuclear testing had become feasible by this time considerably reduced the mutual sacrifice made by the United States and the Soviet Union. Nevertheless, the treaty was received with satisfaction by most governments and it entered into force very rapidly, on 10 October 1963. And by 1 January 1973 it had been adhered to by as many as 106 states, making it by far the most popular of the arms control agreements so far negotiated.

Within a week of the treaty being signed the Americans began a substantial series of underground tests at Nevada. By the end of the year, at least 15 underground tests had been conducted by the Americans. And, on 15 March 1964, the Soviet Union is known to have recommenced underground nuclear testing. This process has continued ever since the PTB and a total of about 380 underground tests have been performed by these two powers during this time.

MAIN COMMITMENTS UNDER THE PTB

The PTB was drawn up as a transitional arrangement. The preamble, for example, commits the "original parties" — the UK, the USA and the USSR — to seek "to achieve the discontinuance of all test explosions of nuclear weapons for all time". Moreover, Article 1 commits these powers to conclude a treaty "resulting in the permanent banning of all nuclear test explosions, including all such explosions underground".

The PTB prohibits nuclear-weapon test explosions and any other nuclear explosions (whatever the yield) in the three specified environments at any place under the jurisdiction or control of the parties. The term "other" was inserted to prevent circumvention of the treaty by an explosion of a tested nuclear weapon, and also to prevent nuclear explosions for peaceful purposes (including tests of such devices) in the specified environments because of the difficulty of differentiating between military and peaceful explosions without special controls. The use of nuclear weapons in armed hostilities is not restricted, irrespective of whether or not such use is considered to be already prohibited under international law.

There is no generally accepted definition of atmosphere and outer space and no agreement on where the one ends and the other begins. The two environments are, therefore, considered, for the purposes of the PTB, as one continuous environment without interruption or limit.

It should be noted that the outer space treaty, signed in 1967, explicitly bans the testing of any type of weapon on celestial bodies. The underwater environment is also understood comprehensively. All bodies of water are included in the ban, both inland waters (lakes and rivers) and the seas.

UNDERGROUND NUCLEAR TESTS

All types of underground tests are permissible under the treaty, provided that radioactive debris is not caused to be present outside the territorial limits of the state under whose jurisdiction or control the explosion is conducted.

There may be some controversy over whether the term “radioactive debris” in the treaty is limited to “fall-out”. The Russian language version of the text appears to be more restrictive than the English version. But if the PTB were to prohibit the presence of radioactive debris, not just fall-out, beyond the borders of the state conducting the nuclear explosion, underground explosions could be carried out by the nuclear-weapon powers only on their own territories. Nuclear explosions on the territory of other states would be forbidden since these would inevitably produce radioactive debris beyond the boundaries of the state controlling the explosion, even if all the debris was contained below ground. This interpretation of the PTB would nullify the commitment of the nuclear-weapon powers, under the Non-Proliferation Treaty of 1968, to make nuclear explosions for peaceful purposes available to non-nuclear-weapon powers — a commitment which has not as yet been acted upon. However, no such request has yet been made.

In practice, almost all underground nuclear explosions release some radioactive contamination into the atmosphere. This may cross the border and may or may not be detected. But the question which remains unanswered in the PTB is precisely what constitutes a violation. Would any quantity of radioactive material suffice or must a dangerous amount be involved? In the latter case the threshold of radiation hazard would have to be defined. Some countries have complained about radioactive leakages spreading outside the territory of the testing state party to the PTB, and have taken exception to the events, even though the violations were unintentional.

Assistance to other countries in carrying out their own underground nuclear tests is not prohibited by the PTB so long as these tests would not produce the effects described above. But the Non-Proliferation Treaty has excluded this kind of assistance so far as the non-nuclear-weapon states are concerned. Nuclear-weapon powers are now not permitted to assist non-nuclear-weapon states in any way in the manufacture of nuclear weapons or other nuclear explosive devices.

Cooperation between nuclear-weapon states in underground testing remains not prohibited. They can help each other in developing or improving the techniques for such tests without violating their international obligations. A treaty prohibiting underground tests would have to close this gap.

PEACEFUL NUCLEAR EXPLOSIONS

If a future ban on underground tests makes an exception for peaceful nuclear explosions under appropriate supervision, and if an international régime such as that envisaged in the Non-Proliferation Treaty is eventually set up for this purpose, the Partial Test Ban Treaty will have to be suitably modified. It will have to be made clear that the presence of radioactive debris caused by peaceful nuclear explosions beyond the boundaries of the nuclear-weapon state conducting the explosion is not illegal.

The parties may, of course, decide that the economic benefits of peaceful nuclear explosions are so doubtful, and the environmental and safety problems are so great, that

it would be better to forego them altogether. But it is unlikely that they would agree to their continuation without any control because this would leave a loophole for the pursuit of military applications under the guise of "peaceful purposes"

VERIFICATION

The PTB did not establish an international mechanism to determine whether or not the commitments are being complied with. Nuclear-weapon powers must have been confident that their national means of verification were adequate to make improbable the evasion of detection and identification of clandestine tests.

In practice, the prohibition on testing in the prohibited environments is self-enforceable. Any signatory nuclear-weapon nation that decided to resume testing in these environments would probably use the escape clause rather than embark on secret tests. Concealment would be extremely difficult, expensive and highly uncertain. Moreover, these powers can continue the development of nuclear weapons by underground nuclear explosions. The potential gains from atmospheric nuclear explosions are very limited. If any other state party to the treaty decided to test, it would probably prefer to do so openly, rather than clandestinely, to demonstrate its nuclear capability to a potential enemy. But the absence of an international control agency to evaluate events according to specified criteria makes it difficult to substantiate an allegation that radioactive substances from an underground nuclear explosion have crossed the national borders of the testing country.

UNIVERSAL NATURE OF PTB

The opening of the PTB for signature to all states, without reservation, was a progressive step. The original parties thereby admitted that by its very nature the PTB ought to have universal application. Those who opposed the "all states" approach argued that by the act of subscribing to a treaty, an entity or a régime may gain recognition as a state or a government by parties that do not, at that time, recognize it. But it is an established proposition of international law that participation with an unrecognized state in a multilateral treaty open for general adherence does not give rise to recognition or even to the implication of recognition. In fact, since recognition cannot be gained automatically and is primarily a matter of intent of the recognizing state, the latter could even have dealings with a non-recognized régime, within the framework of multilateral treaties, without thereby recognizing it. It was purely for political reasons — related to cold war controversies rather than to the contents of the PTB — that it was decided that contracts between the depositary governments and unrecognized régimes should be kept an absolute minimum, if not reduced to zero. For this reason, a novel feature was introduced into international transactions; as distinct from previous treaties, which provided for a single depositary, the PTB provided for three depositaries — the UK, USA and the USSR.

WITHDRAWAL FROM THE PTB

The treaty is of unlimited duration, but each party has the right to withdraw from it, if "extraordinary events, related to the subject matter of this treaty, have jeopardized the supreme interest of its country". The parties alone decide if and when such events occur and they need not justify their action to any specified authority. A simple notice addressed to all other parties to the PTB, three months in advance, would suffice.

A material breach of the PTB would give any party the right to start, or to resume testing, in the prohibited environments. But the right to withdraw is applicable also if "extraordinary events" other than a material breach takes place. A possible event of this type would be the conduct of nuclear tests in the prohibited environments by countries which are not parties to the PTB. This would affect primarily those countries which had decided to forego a nuclear-weapon option on the condition that their adversaries act likewise. But it could hardly jeopardize the "supreme interest" of the original parties to the PTB because of the overwhelming nuclear superiority of the latter over all other countries and their, as yet, unrestricted right to continue testing underground. It is inconceivable that the UK, the USA or the USSR would need to resume testing in the atmosphere in order to redress a possible imbalance created by a nascent nuclear-weapon power, be it a party to the treaty or not.

The right to withdraw from an arms control agreement has to be recognized. But the ease with which parties to the PTB can withdraw from their contractual obligations seems excessive. Attempts to tighten the withdrawal clause in subsequent arms control agreements have been only partly successful. Under these agreements, a notice to withdraw must be given to other parties and to the UN Security Council, and the notice should contain a statement of the "extraordinary events" the withdrawing party regards as having jeopardized its "supreme interests". If a similar provision is included in a future underground test ban treaty it would be desirable that "the extraordinary events" justifying withdrawal are spelled out in the treaty so that the margin of possible arbitrary action is narrowed.

COMPLIANCE WITH PTB

The record of compliance with the PTB is generally considered to be good. There has so far been no complaint of a significant breach by any party. In a few incidents in which radioactive substances released from underground explosions crossed the state boundaries of the USA and the USSR, the affected parties preferred to treat the occurrences only as "technical" violations.

It is, however, very debatable whether the pledge given by the UK, the USA and the USSR to negotiate the discontinuance of all test explosions of nuclear weapons is being fulfilled. During the past decade there have been no substantial negotiations on the subject of underground tests. Verification is ostensibly the main stumbling block to reaching a comprehensive agreement but the positions of the main parties on this issue have remained unchanged since 1963. Meanwhile, great technical progress has been made in seismological methods of detection and, from a political point of view, verification need no longer be considered a serious barrier to the negotiation of a comprehensive ban. And other provisions of the agreement have not even been meaningfully discussed. Thus, the USA and the USSR have not, as yet, specified in treaty language the terms which would be acceptable to either of them for the prohibition of underground nuclear weapon tests.

ADHERENCE TO THE PTB

The adherence to the PTB, although wide, is not universal. A few militarily important countries, such as Argentina and Pakistan, and especially China and France, have not joined the treaty. China and France have been testing nuclear weapons in the

atmosphere in spite of vigorous objections and protests by many governments. It is conceivable that as a result of an international campaign against atmospheric tests, now growing in intensity, both of these powers may feel compelled, at some future time, to conduct all of their nuclear explosions underground. They could then unilaterally undertake not to resume atmospheric testing. But the prospect of their formally joining the PTB seems slim in view of the privileged position which the UK, the USA and the USSR have secured for themselves under the treaty.

CONCLUSIONS

The PTB undoubtedly helped to reduce the radioactive contamination of the atmosphere. It was politically successful in bringing about some relaxation of international tension. Without the PTB it is doubtful whether the Non-Proliferation Treaty would have been negotiated.

But the PTB has not visibly slowed down the nuclear arms race between the USA and the USSR, except for restrictions on the development of very large thermonuclear weapons. The military usefulness of such weapons is, however, doubtful.

Between the signing of the PTB and 1 July 1973, 437 nuclear explosions are known to have been carried out, that is, almost one-half of the total of 936 announced and presumed nuclear explosions conducted since 1945. China and France account for only 53 explosions since 1963, of which 43 were carried out in the atmosphere.

A complete cessation of nuclear testing is widely regarded as an essential step, urgently required, towards nuclear disarmament.

A comprehensive test ban is clearly desirable to reinforce the Non-Proliferation Treaty. The nuclear-weapon parties are committed under the Non-Proliferation Treaty to pursue negotiations on effective measures for nuclear disarmament and this treaty obligation can only be fulfilled by negotiations of a CTB.

A comprehensive test ban, agreed by the UK, the USA and the USSR, and many other nations, would make it much more difficult politically for China and France, then isolated, to continue testing.

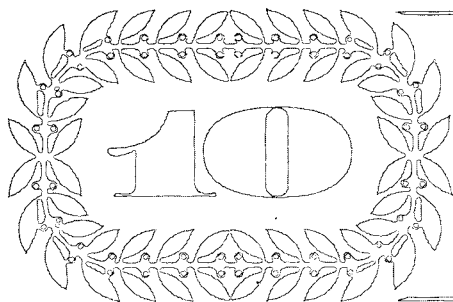
The PTB could serve as a model for a comprehensive test ban treaty, but only to a limited extent. New substantial provisions will be needed. In particular, it will be necessary to provide for verification of compliance and for dealing with allegations of violations. And a regimen for the use of nuclear explosions for peaceful purposes may have to be formulated. Furthermore, under present political conditions, most of the formal causes of the PTB seem obsolete and these will need revision. Withdrawal from the treaty should be made more difficult to ensure durability of the obligations. It will not be enough simply to extend the scope of the prohibition under the PTB by adding one more environment and to provide for some verification. Greater account will have to be taken of the interests of the non-nuclear-weapon states and of the nuclear-weapon states which may join the treaty in the future.

ANNOUNCED AND PRESUMED NUCLEAR EXPLOSIONS JULY 1945 - JULY 1973*

Period	Environment	USA	USSR	UK	France	China	Total
16th July	atmosphere	193	161	21	4	0	379
1945 - 4th August	underground and underwater	111	3	2	4	0	120
1963	total	304	164	23	8	0	499
5th August	atmosphere	0	0	0	29	14	43
1963 - 1st July	underground and underwater	261	121	2	9	1	394
1973	total	261	121	2	38	15	437
16th July	atmosphere	193	161	21	33	14	422
1945 - 1st July	underground and underwater	372 ¹	124	4	13	1	514
1973	total	565	285	25	46	15	936

* The data in this table is based on: I. Zander and R. Araskog: Kärnladdningsexplosioner 1945 - 1972 grunddata, Försvarets Forskningsanstalt Rapport A 4505-A1, Stockholm, April 1973.

¹ 23 of these American underground tests were made between 15 September 1961 and 20 August 1963 but the exact date of each explosion is not specified in the lists available. At least one was conducted after 5 August 1963. It is assumed here that the other 22 were conducted before this date.



TNBT

by Philip J. Farley, former Deputy Director,
U.S. Arms Control and Disarmament Agency

In commemorating the tenth anniversary of the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Under Water, it is worth recalling President Kennedy's remarks on the day after the treaty was signed: *"First," he said, "this treaty can be a step toward reduced world tension and broader areas of agreement ... No one can predict with certainty ... what further agreements, if any, can be built on the foundations of this one ... The important point is that efforts to seek new agreements will go forward."* He noted that *"A journey of a thousand miles must begin with a single step,"* and hailed the treaty as just such a first step.

While it is obviously premature to predict the full extent of that journey, there can be little doubt that the achievement of the Limited Test Ban Treaty contributed significantly to East-West detente, and did much to help the international community to reach such further milestones as the Outer Space Treaty, the Treaty for the Prohibition of Nuclear Weapons in Latin America, the Nuclear Non-Proliferation Treaty, the Seabeds Arms Control Treaty, the Biological Weapons Convention, and the SALT agreements. Hopefully, these will be followed by further steps which make even greater contributions to reducing world tensions and curbing weapons of mass destruction.

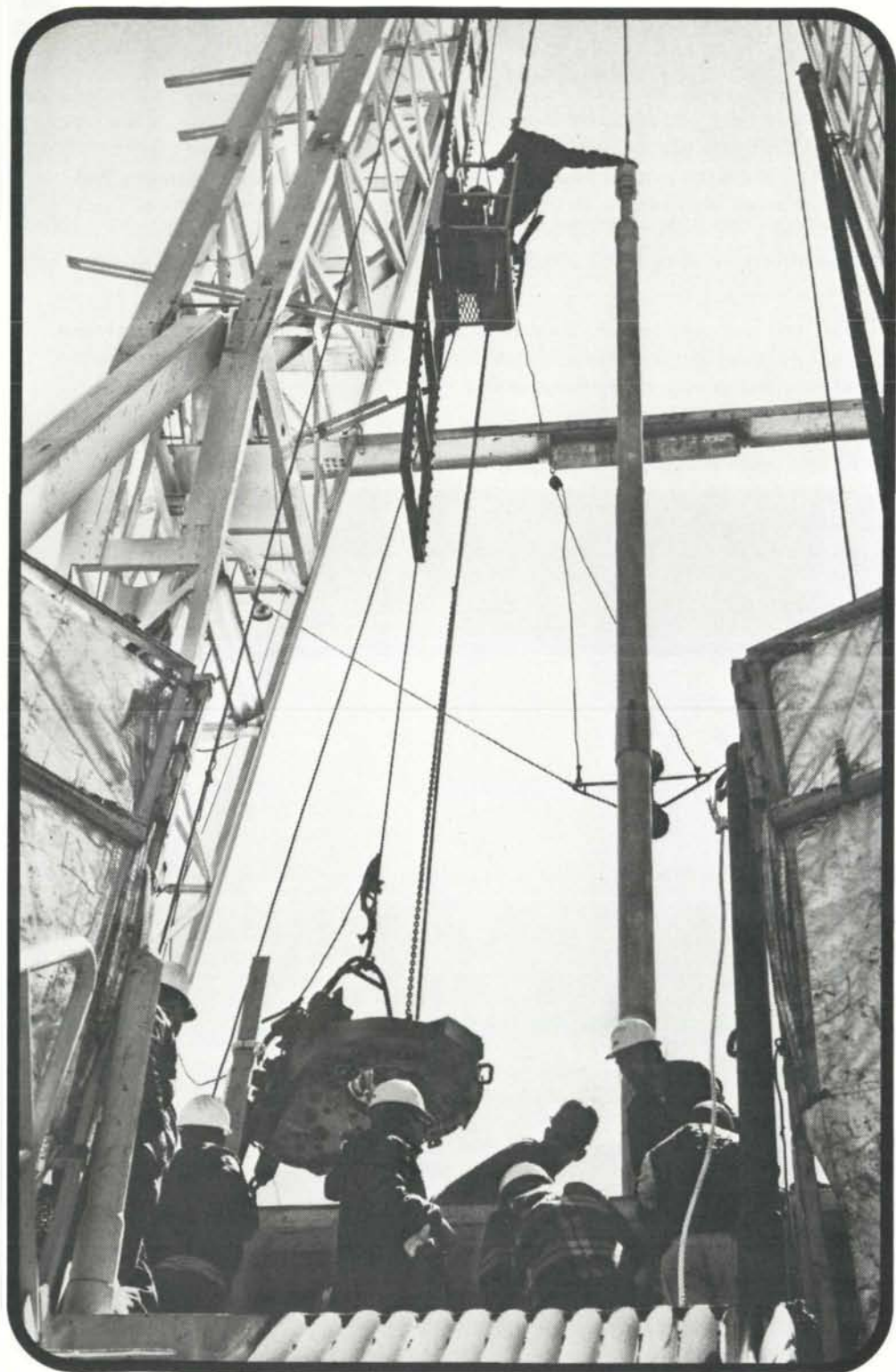
"Second," President Kennedy said, *"this treaty can be a step toward freeing the world from the fears and dangers of radioactive fallout ... Continued unrestricted testing ... will increasingly contaminate the air that all of us must breathe."*

The Treaty has made a major contribution to this objective. No atmospheric testing has been conducted by any party to the treaty since it was signed. Thus exposure to short-lived radionuclides from their tests has been eliminated. With respect to long-lived radionuclides, it is worth noting that the annual global deposition of Strontium 90 has decreased some 10-fold from what it was in 1963, and estimated whole body doses per capita from the inhalation of Strontium 90 have decreased more than 40-fold since that time.

But it is not enough to compare the present situation with that in 1963. For had the parties not agreed to stop atmospheric testing, the levels of radioactivity, and cumulative dosages, would be far higher than they were at that time.

"Third," President Kennedy said, *"this treaty can be a step toward preventing the spread of nuclear weapons to nations not now possessing them."* In this respect, it is significant





that well over 100 states including a number that are not yet parties to the Non-Proliferation Treaty or the Treaty of Tlatelolco have become parties to the Limited Test Ban Treaty, and have thus deliberately inhibited their ability to develop nuclear weapons.

"Fourth and finally," he said, "the treaty can limit the nuclear arms race ..." Here it can be argued, the treaty has not fully lived up to the hopes that were expressed for it. But the Treaty did not purport to prohibit underground testing, explicitly leaving that subject for future negotiations. In this connection, the United States favors the conclusion of a comprehensive test ban, adequately verified, and we have devoted intensive efforts including \$ 300,000,000 in research to improving our ability to verify such a treaty.

All in all, I believe the Limited Test Ban Treaty to be an agreement of great substantive, historical and symbolic importance, which is still very much in force, and I welcome this opportunity to celebrate its tenth anniversary.

