CD/53
Appendix III/Vol.II
14 August 1979
ENGLISH
Original: ENGLISH/
FRENCH/
RUSSIAN/
SPANISH

COMMITTEE ON DISARMAMENT

REPORT OF THE COMMITTEE ON DISARMAMENT

APPENDIX III

VOLUME II

List and text of documents issued by the Committee on Disarmament

GE.79-63702

CD/31
9 July 1979

ENGLISH
Original: RUSSIAN

LETTER DATED 9 JULY 1979 ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT FROM THE REPRESENTATIVE OF THE UNION OF SOVIET SOCIALIST REPUBLICS TRANSMITTING A DOCUMENT ENTITLED "AGREED JOINT USSR-UNITED STATES PROPOSAL ON MAJOR ELEMENTS OF A TREATY PROHIBITING THE DEVELOPMENT, PRODUCTION, STOCKPILING AND USE OF RADIOLOGICAL WEAPONS"

I am submitting a document entitled "Joint USSR-United States proposal on major elements of a treaty prohibiting the development, production, stockpiling and use of radiological weapons".

I should be grateful if you would arrange to have this document distributed to the members of the Committee on Disarmament.

(Signed): V.L. ISSRAELYAN

USSR Representative to the
Committee on Disarmament

GE.79-62313

AGREED JOINT USSR-UNITED STATES PROPOSAL ON MAJOR ELEMENTS OF A TREATY PROHIBITING THE DEVELOPMENT, PRODUCTION, STOCKPILING AND USE OF RADIOLOGICAL WEAPONS

I

Each State Party to the Treaty undertakes not to develop, produce, stockpile, otherwise acquire or possess, or use radiological weapons.

II

For the purpose of the Treaty, the term "radiological weapon" means:

1. Any device, including any weapon or equipment, other than a nuclear explosive device, specifically designed to employ radioactive material by disseminating it to cause destruction, damage or injury by means of the radiation produced by the decay of such material.

2. Any radioactive material, other than that produced, by a nuclear explosive device, specifically designed for employment, by its dissemination, to cause destruction, damage or injury by means of the radiation produced by the decay of such material.

III

Each State Party to the Treaty also undertakes not to employ deliberately, by its dissemination, any radioactive material not defined as a radiological weapon in paragraph II, subparagraph 2, and not produced by a nuclear explosive device, to cause destruction, damage or injury by means of the radiation produced by the decay of such material.

IV

Each State Party to the Treaty undertakes not to assist, encourage, or induce any person, State, group of States or international organization to engage in any of the activities which the Parties to the Treaty have undertaken not to engage in under the provisions of paragraphs I and III.

V

Provisions of the Treaty shall not hinder the use of sources of radiation from radioactive decay for peaceful purposes and shall be without prejudice to any generally recognized principles and applicable rules of international law concerning such use.

VI

Each State Party to the Treaty undertakes, in accordance with its constitutional procedures, to take any measures which it deems necessary to prevent loss of and to prohibit and prevent diversion of radioactive materials that might be used in radiological weapons and any activities contrary to the provisions of the Treaty in its territory or at any place under its jurisdiction or under its control.

VII

Nothing in the Treaty shall be interpreted as in any way limiting or detracting from the obligations assumed by any State under the Treaty on the Non-Proliferation of Nuclear Weapons, the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, signed at Geneva on 17 June 1925, or any existing rules of international law governing armed conflict.

VIII

1. The States Parties to the Treaty undertake to consult one another and to co-operate in solving any problems which may arise in relation to the objectives of, or in the application of the provisions of, the Treaty. Consultation and co-operation pursuant to this paragraph may also be undertaken through appropriate international procedures within the framework of the United Nations and in accordance with its Charter. These international procedures may include the services of appropriate international organizations, as well as of a Consultative Committee of Experts as provided for in subparagraph 2 of this paragraph.

2. For the purposes set forth in subparagraph 1 of this paragraph, the Depositary shall, within one month of the receipt of a request from any State Party, convene a Consultative Committee of Experts. Any State Party may appoint an expert to this Committee, whose functions and rules of procedure are set out in the Annex, which constitutes an integral part of the Treaty. The Committee shall transmit to the Depositary a summary of its findings of fact, incorporating all views and information presented to the Committee during its proceedings. The Depositary shall distribute the summary to all States Parties.

3. Any State Party to the Treaty which has reasons to believe that any other State Party is acting in breach of obligations deriving from the provisions of the Treaty may lodge a complaint with the Security Council of the United Nations. Such a complaint should include all relevant information as well as all possible evidence supporting its validity.

4. Any State Party to the Treaty undertakes to co-operate in carrying out any investigation which the Security Council may initiate, in accordance with the provisions of the Charter of the United Nations, on the basis of the complaint received by the Council. The Security Council shall inform the States Parties to the Treaty of the results of the investigation.

5. Each State Party to the Treaty undertakes to provide or support assistance, in accordance with the provisions of the Charter of the United Nations, to any Party to the Treaty which so requests, if the Security Council decides that such Party has been harmed or is likely to be harmed as a result of violation of the Treaty.

IX

1. A State Party may propose amendments to the Treaty. Each proposed amendment shall be submitted to the Depositary, which shall promptly transmit it to all States Parties.

2. An amendment shall enter into force for each State Party accepting the amendment after the deposit with the Depositary of documents of acceptance by a majority of the States Parties. Thereafter, the amendment shall enter into force for each remaining State Party on the date of the deposit by it of the acceptance document.

X

1. The Treaty shall be of unlimited duration.

2. Each State Party to the Treaty shall in exercising its national sovereignty have the right to withdraw from the Treaty if it decides that extraordinary events, related to the subject matter of the Treaty, have jeopardized the supreme interest of its country. It shall give notice of such withdrawal to all other States Parties to the Treaty and to the United Nations Security Council three months in advance. Such notice shall include a statement of the extraordinary events it regards as having jeopardized its supreme interests.

XI

1. Ten years after entry into force of the Treaty, or earlier if requested by a majority of States Parties, a conference of States Parties should be convened to review the operation of the Treaty, with a view to assuring that the purposes of the preamble and the provisions of the Treaty are being realized. Such review should take into account any new scientific and technological developments relevant to the Treaty.

2. Thereafter, a majority of the States Parties could obtain the convening of a conference with the same objectives.

3. If no review conference has been convened within (blank) years following the conclusion of a previous review conference, the Depositary should solicit the views of all States Parties on the holding of such a conference. If (blank fraction) or (blank number) of the States Parties, whichever number is less, respond affirmatively, the Depositary should take immediate steps to convene the conference.

XII

1. The Treaty shall be open to all States for signature. A State which does not sign the Treaty before its entry into force in accordance with subparagraph 3 of this paragraph may accede to it at any time.

2. The Treaty shall be subject to ratification by signatory States. Instruments of ratification and accession shall be deposited with the Secretary-General of the United Nations.

3. The Treaty shall enter into force upon the deposit of the instruments of ratification by (blank) Governments in accordance with subparagraph 2 of this paragraph.

4. For States whose instruments of ratification or accession are deposited subsequent to the entry into force of the Treaty, it shall enter into force on the date of the deposit of their instruments of ratification or accession.

5. The Depositary shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification or accession and the date of entry into force of the Treaty, as well as of any amendment to it and of the receipt of other notices.

6. The Treaty shall be registered by the Depositary pursuant to Article 102 of the Charter of the United Nations.

XIII

The Treaty, the Arabic, Chinese, English, French, Russian and Spanish texts of which are equally authentic, shall be deposited with the Secretary-General of the United Nations, who shall transmit duly certified copies of the Treaty to the Governments of the signatory and acceding States.

Annex to the Treaty

Consultative Committee of Experts

1. The Consultative Committee of Experts shall undertake to make appropriate findings of fact and provide expert views relevant to any problem raised pursuant to paragraph VIII, subparagraph 1, of the Treaty by the State Party requesting the convening of the Committee.

2. The work of the Consultative Committee of Experts shall be organized in such a way as to permit it to perform the functions set forth in paragraph 1 of this Annex. The Committee shall decide procedural questions relative to the organization of its work, where possible by consensus, but otherwise by a majority of those present and voting. There shall be no voting on matters of substance.

3. The Depositary or his representative shall serve as the Chairman of the Committee.

4. Each expert may be assisted at meetings by one or more advisers.

5. Each expert shall have the right, through the Chairman, to request from States, and from international organizations, such information and assistance as the expert considers desirable for the accomplishment of the Committee's work.

CD/32
9 July 1979

Original: ENGLISH

LETTER DATED 9 JULY 1979 ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT FROM THE REPRESENTATIVE OF THE UNITED STATES OF AMERICA TRANSMITTING A DOCUMENT ENTITLED "AGREED JOINT US-USSR PROPOSAL ON MAJOR ELEMENTS OF A TREATY PROHIBITING THE DEVELOPMENT, PRODUCTION, STOCKPILING AND USE OF RADIOLOGICAL WEAPONS

I am transmitting herewith a document entitled 'Agreed Joint US-USSR Proposal on Major Elements of a Treaty Prohibiting the Development, Production, Stockpiling and Use of Radiological Weapons'.

I respectfully request that this document be circulated among the members of the Committee on Disarmament.

(Signed). Adrian S. Fisher
United States Representative
to the Committee on
Disarmament

Agreed Joint US-USSR Proposal on Major Elements of a Treaty Prohibiting the Development, Production, Stockpiling and Use of Radiological Weapons

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Each State Party to the Treaty also undertakes not to employ deliberately, by its dissemination, any radioactive material not defined as a radiological weapon in Paragraph II, Subparagraph 2, and not produced by a nuclear explosive device, to cause destruction, damage or injury by means of the radiation produced by the decay of such material.

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Each State Party to the Treaty undertakes not to assist, encourage, or induce any person, State, group of States or international organization to engage in any of the activities which the Parties to the Treaty have undertaken not to engage in under the provisions of Paragraphs I and III.

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Provisions of the Treaty shall not hinder the use of sources of radiation from radioactive decay for peaceful purposes and shall be without prejudice to any generally recognized principles and applicable rules of international law concerning such use.

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1. The States Parties to the Treaty undertake to consult one another and to co-operate in solving any problems which may arise in relation to the objectives of, or in the application of the provisions of, the Treaty. Consultation and co-operation pursuant to this Paragraph may also be undertaken through appropriate international procedures within the framework of the United Nations and in accordance with its Charter. These international procedures may include the services of appropriate international organizations, as well as of a Consultative Committee of Experts as provided for in Subparagraph 2 of this Paragraph.

2. For the purposes set forth in Subparagraph 1 of this Paragraph, the Depositary shall, within one month of the receipt of a request from any State Party, convene a Consultative Committee of Experts. Any State Party may appoint an expert to this Committee, whose functions and rules of procedure are set out in the Annex, which constitutes an integral part of the Treaty. The Committee shall transmit to the Depositary a summary of its findings of fact, incorporating all views and information presented to the Committee during its proceedings. The Depositary shall distribute the summary to all States Parties.

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2. Thereafter, a majority of the States Parties could obtain the convening of a conference with the same objectives.

3. If no review conference has been convened within (blank) years following the conclusion of a previous review conference, the Depositary should solicit the views of all States Parties on the holding of such a conference. If (blank fraction) or (blank number) of the States Parties, whichever number is less, respond affirmatively, the Depositary should take immediate steps to convene the conference.

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3. The Depositary or his representative shall serve as the Chairman of the Committee.

4. Each expert may be assisted at meetings by one or more advisers.

5. Each expert shall have the right, through the Chairman, to request from States, and from international organizations, such information and assistance as the expert considers desirable for the accomplishment of the Committee's work.

CD/33
10 July 1979

ENGLISH
Original: FRENCH

ITALY

LETTER DATED 6 JULY 1979 FROM THE PERMANENT REPRESENTATIVE OF ITALY TO THE UNITED NATIONS OFFICE AT GENEVA ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT TRANSMITTING THE TEXT OF A LETTER FROM THE PRESIDENT OF THE COUNCIL OF MINISTERS OF THE ITALIAN REPUBLIC TO THE PRESIDENT OF THE UNITED STATES OF AMERICA AND THE CHAIRMAN OF THE PRESIDIUM OF THE SUPREME SOVIET OF THE UNION OF SOVIET SOCIALIST REPUBLICS

I have the honour to transmit the enclosed letter addressed on 22 June 1979 by Mr. Giulio ANDREOTTI, President of the Council of Ministers of the Italian Republic, to Mr. J. Carter, President of the United States of America, and to Mr. L. Brezhnev, President of the Presidium of the Supreme Soviet of the Union of Soviet Socialist Republics, on the occasion of the signature of the SALT II agreements.

I should be grateful if you would arrange to have this letter circulated as an official document of the Committee on Disarmament.

(Signed) Vittorio Cordero di Montezemolo
Ambassador,
Permanent Representative.

GE.79-62379

Letter dated 22 June 1979 addressed by Mr. Giulio Andreotti, President of the Council of Ministers of the Italian Republic, to Mr. J. Carter, President of the United States of America, and to Mr. L. Brezhnev, President of the Presidium of the Supreme Soviet of the Union of Soviet Socialist Republics, on the occasion of the signature of the SALT II agreements

On behalf of the Italian Government and people, I wish to express to you my deepest satisfaction with the signature of the SALT II agreements, which marks the positive conclusion of long and delicate negotiations. This result meets the wish I expressed to you as well as to the President (of the United States of America/ of the USSR) in my message emphasizing the importance which Italy attaches to this fundamental step forward on the path towards arms reductions.

The establishment of a more stable strategic relationship allows us to hope that the correct application of the SALT II agreements will ensure the necessary balance of forces and will halt the trend towards the uncontrolled stockpiling of arms on a world-wide scale.

The Italian Government and people ardently hope that the signature of SALT II will not only mark the beginning of a process of effective arms reductions but also, within a broader framework influence relations as a whole between the United States and the Soviet Union and have major implications for the process of détente.

Italy also awaits with great interest the beginning of the SALT III negotiations which have been announced, and hopes that they will lead to the establishment of a real and effective nuclear arms balance not only at the intercontinental level but also at the European level and to a progres ive and substantial reduction of existing arsenals as part of a co-ordinated effort, imbued with good will, towards world peace.

CD/54
10 July 1979

ENGLISH
Original: SPANISH

LETTER DATED 9 JULY 1979 FROM THE PERMANENT REPRESENTATIVE OF SPAIN TO THE UNITED NATIONS OFFICE AT GENEVA ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT CONCERNING ARTICLE 34 OF THE RULES OF PROCEDURE

On the instructions of my Government, I have the honour to inform you that, in accordance with the provisions of paragraph 120 (h) of the Final Document of the tenth special session of the General Assembly devoted to disarmament, and of paragraph 34 of the Committee's rules of procedure, the Spanish Government, through its representative, Ambassador Don Eduardo de Laiglesia, Marquis of Villafranca de Ebro, would like to have the opportunity of briefly stating its position when the Committee of which you are Chairman takes up the question of chemical weapons.

I hope that the Committee will be able to give due consideration to this request.

Accept, Sir, the assurances of my highest consideration.

(Signed) Fernando Benito
Ambassador
Permanent Representative

GE.79-62383

CD/35
10 July 1979

ENGLISH
Original: RUSSIAN

LETTER DATED 10 JULY 1979 FROM THE REPRESENTATIVE OF THE UNION OF SOVIET SOCIALIST REPUBLICS TO THE COMMITTEE ON DISARMAMENT ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT ON THE NEGOTIATIONS ON THE QUESTION OF THE PROHIBITION OF NEW TYPES OF WEAPONS OF MASS DESTRUCTION AND NEW SYSTEMS OF SUCH WEAPONS

I am submitting a document entitled "Negotiations on the question of the prohibition of new types of weapons of mass destruction and new systems of such weapons".

I should be grateful if you would arrange to have this document distributed to the members of the Committee on Disarmament.

(Signed) V.L. ISSRAELYAN

Representative of the USSR
to the Committee on Disarmament

GE.79-62387

UNION OF SOVIET SOCIALIST REPUBLICS

Negotiations on the question of the prohibition of new types of weapons of mass destruction and new systems of such weapons

In the context of the current scientific and technological revolution and the unprecedented increase in the role of science in accelerating the general progress of mankind, there is, quite objectively, a growing danger of scientific and technological achievements being used to develop new weapons and, what is particularly dangerous, to develop new types and systems of weapons of mass destruction. As everyone knows, the process by which new weapons are developed -- once started -- is extremely difficult to stop. It is therefore vitally important, without waiting for any such irreversible turn of events, to obviate the very possibility of new types of weapons of mass destruction being developed.

To this end, the Soviet Union submitted a draft "agreement on the prohibition of the development and manufacture of new types of weapons of mass destruction and new systems of such weapons" to the General Assembly of the United Nations in 1975. The General Assembly requested the Committee on Disarmament to work out the text of a draft international agreement on this question.

Subject of negotiations

Taking account of the progress made in the discussion of this draft agreement, the Soviet Union submitted an expanded draft agreement on the prohibition of the development and manufacture of new types of weapons of mass destruction and new systems of such weapons to the Committee on Disarmament in August 1977 (CCD/511/Rev.1). In this document, the Soviet Union drew attention to the question that must be resolved before all others, namely, that of the subject and scope of the prohibition.

The expanded Soviet draft agreement envisages a definition of new types and systems of weapons of mass destruction that is as close as possible to the 1948 formula on which there is already broad agreement among many States.

In order to make it easier to arrive at a generally-acceptable solution to the question of the scope of the prohibition, the Soviet Union considered that it would be useful for the agreement to contain both a general definition of the new types of weapons of mass destruction to be prohibited and a list of the specific types and systems of such weapons. This approach is reflected in the expanded draft agreement, the annex to which contains an approximate list of types and systems of weapons of mass destruction, including:

(1) Radiological means acting with the aid of radioactive materials;

(2) Technical means of inflicting radiation injury based on the use of charged or neutral particles to affect biological targets;

(3) Infrasonic means using acoustic radiation to affect biological targets;

(4) Means using electromagnetic radiation to affect biological targets.

In order to accommodate the views of members of the Committee on Disarmament, the Soviet side had the expanded draft agreement provide for the possibility, should the need arise, of prohibiting specific new types and systems of weapons of mass destruction on the basis of separate agreements.

Thus, the proposals of the USSR on the scope and subject of the prohibition provide for: (a) The conclusion of a comprehensive agreement on the prohibition of the development and manufacture of new types and systems of weapons of mass destruction, with a list of specific types of weapons to be prohibited; (b) The possibility of supplementing the list of prohibited new types of weapons of mass destruction in the future; and (c). The possibility of concluding separate agreements on specific new types of weapons of mass destruction.

Scientific and technical basis for the possible development of certain new types of weapons of mass destruction

The approximate list of possible new types and systems of weapons of mass destruction covers physical effects, the harmful or fatal consequences of which for the human organism have already been thoroughly investigated; the general level and orientations of the corresponding fields of science and technology are such that these physical effects might find a practical application in real weapons in the foreseeable future.

1. Radiological weapons

The danger of radiological weapons being developed is based on the existence in principle of the possibility of using radioactive materials in order to injure, damage or cause harm by means of the radioactive radiation produced when such materials decay.

The way in which radioactive materials affect human beings has been adequately studied and consists in the destruction of biological structures under the influence of the ionizing radiation resulting from the radioactive decay of such materials. There

is every reason to believe that the effects of radiological weapons, should they be developed, would be similar to the effects of the radioactive materials which are formed in nuclear explosions and which cause the radioactive contamination of the area. The danger of radiological weapons appearing is increased by the rapid development of nuclear industry and technology in many countries of the world; this creates the objective conditions necessary for the widespread dissemination of radioactive materials and increases the potential danger of such materials being used to develop radiological weapons.

There is broad international agreement on the question of the need to prevent the possible emergence of radiological weapons. The joint USSR-United States negotiations on major elements of a treaty prohibiting the development, production, stockpiling and use of radiological weapons have now been successfully completed and the agreed proposals on this question have been submitted to the Committee on Disarmament for consideration.

2. Technical means of inflicting radiation injury based on the use of charged or neutral particles to affect biological targets

The danger with regard to the development of technical means of inflicting radiation injury based on the use of charged or neutral particles lies in the existence of the possibility of in principle using bundles of charged or neutral particles (electrons, protons, neutral atoms, etc.) to cause injury to biological targets, and in the existence -- even now -- of the scientific and technological basis for the possible future development of sources of such particles that could be used for these purposes. It has been established with a considerable degree of certainty that the way in which the particles that can be used for such purposes cause injury is in many respects similar to the way in which the radiation from a nuclear explosion causes injury.

Sufficiently powerful bundles of charged or neutral particles can now be produced in, for example, the accelerators which are being widely used both for research on high-energy physics and the atomic nucleus and for work in other fields of science and technology, including agriculture and medicine. Several

countries are already operating or installing proton accelerators in which the energy of the accelerated particles attains hundreds of millions of electron volts, high-current accelerators of the meson facility type and high-current continuous or pulsed electron accelerators. Several countries are carrying out intensive work on the development of fundamentally new methods of accelerating charged particles, and, taken together with the success achieved with regard to the development of superconducting materials, this opens up real possibilities of reducing the size and weight of accelerator systems and the sources of energy used to operate them and, in theory, paves the way in the foreseeable future for the development of powerful accelerator devices -- whose weight and dimensions could permit their use as weapons. Direct confirmation of the possibility of this happening is provided by the programme of work being carried out in the United States with a view to developing weapons using bundles of accelerated charged or neutral particles, as may be seen from published accounts of hearings in the United States Congress and other material that has appeared in the United States press.

3. Infrasonic means using acoustic radiation to affect biological targets

Weapons based on the utilization of the radiation of acoustic generators in the infrasonic range may become one of the possible new types of weapons of mass destruction. Data to be found in scientific literature convincingly demonstrate the existence of a wide spectrum of damaging effects of infrasonic oscillations on the human organism and other biological targets. The mechanism of such effects can be of the most widely varying kind -- mechanical, biological or neurochemical. Evidence of the danger of the damaging effects of such oscillations on human beings is, in particular, offered by the fact that many countries have already introduced health regulations in respect of maximum admissible acoustic effects. Particular concern is caused by available data concerning the harmful effects of low-power infrasonic oscillations on biocurrents of the brain and the nervous system as a whole and, thereby, on the psychic condition and intellect of human beings. In assessing the potential danger of the utilization of infrasound as a weapon of mass destruction, great importance attaches to its basic physical property -- that of practically unimpeded propagation over large distances without noticeable attenuation. The development of powerful engines in connexion with advances in rocket technology, supersonic aircraft and in other areas of technology offers a technical basis for the creation of powerful long-range installations with characteristics which may make such installations suitable for use as infrasonic weapons.

4. Means using electromagnetic radiation to affect biological targets

As a result of research into the effects of electromagnetic radiation on biological targets, the existence of harmful effects of radio-frequency radiations within a wide range of frequencies on such vitally important organs of the human body as the heart, the brain and the central nervous system may now be regarded as a firmly established fact. Assessments quoted in international literature of the potential danger of the development of a new weapon of mass destruction are based on the results of research into the so-called "non-thermal" effects of electromagnetic radiation on biological targets. These effects may take the form of damage to or disruption of the functioning of the internal organs and systems of the human organism or of changes in its functioning.

As regards the possibility of devising technical means of generating electromagnetic radiation, many countries already have a highly developed technical base in the field of radio engineering and radio electronics. Powerful high-frequency generators, radar devices and other radio engineering installations

serving various purposes have been developed and brought into use. The development of these means reflects a common trend in that efforts are being made to improve their characteristics, increase their efficiency and reduce their dimensions. Data available in the scientific literature show that the peak capacity of electromagnetic radiation generators has increased almost a hundredfold during the past four years alone. It is expected that, in the next five or six years, means capable of the directional transmission of electromagnetic radiation of enormous power over distances of several hundred kilometres will be devised. In this connexion it is anticipated that levels of electromagnetic radiation density in excess of known safety standards will be attainable in areas measuring dozens of square kilometres.

It is therefore to be expected that, taking into account further achievements in science and technology, it may be possible in time to devise means of generating powerful electromagnetic oscillations whose parameters could make those means suitable for use as a new type of weapon of mass destruction.

During the course of the discussion in the Committee on Disarmament of the question of the prohibition of new types and systems of weapons of mass destruction, Soviet experts as well as experts from a number of other countries adduced concrete scientific data and facts which convincingly demonstrate that, in view of the present level of science and technology in certain areas, it is scientifically justified to speak of the possibility of developing corresponding new types of weapons of mass destruction, and in particular those listed in the annex to the expanded draft agreement. It is practically no longer possible at the present time to dispute the fact that the possibility of developing new types and systems of weapons of mass destruction -- the consequences of whose emergence are as yet difficult to foresee -- exists, and that the problem of the comprehensive prohibition of the development, manufacture and stockpiling of new types and systems of such weapons is therefore a pressing one.

Organizational measures

Taking into account the approach adopted by the Western countries to the solution of the problem of the prohibition of new types and systems of weapons of mass destruction, the Soviet Union took yet another constructive step, and on 28 March 1978 proposed the establishment, under the auspices of the Committee on Disarmament, of an ad hoc group of qualified governmental experts to consider the question of possible areas of the development of new types and systems of weapons of mass destruction to be included in the initial list of the types of such weapons to be prohibited under a comprehensive agreement. This would ensure an even more

comprehensive study and identification of potentially dangerous areas as regards the development of new types of weapons of mass destruction. A group of this kind could continuously observe developments in this field and, at the very earliest stage of the possible emergence of new types of weapons of mass destruction, make appropriate recommendations to the Committee on Disarmament.

Other negotiations

The conduct of negotiations on the prohibition of new types of weapons of mass destruction and new systems of such weapons will be without prejudice to bilateral and multilateral negotiations relating to various aspects of arms limitation and disarmament.

* * *

The world's concern at the danger of the development of weapons of mass destruction is reflected in paragraph 39 of the Final Document adopted by the special session of the United Nations General Assembly in 1978, which emphasizes that:

> "Qualitative and quantitative disarmament measures are both important for halting the arms race. Efforts to that end must include negotiations on the limitation and cessation of the qualitative improvement of armaments, especially weapons of mass destruction and the development of new means of warfare so that ultimately scientific and technological achievements may be used solely for peaceful purposes".

The decision proposed by the Soviet Union makes it possible to achieve the prohibition of the development and manufacture of new types and systems of weapons of mass destruction in potentially dangerous areas already detected and also, in principle, to erect a barrier against the possible emergence of such weapons as a result of progress in other spheres of science and technology.

CD/36/Rev.1
12 July 1979
Original: ENGLISH

GROUP OF 21

Working Paper on Cessation of Nuclear Arms Race and Nuclear Disarmament

In view of the highest priority expressly attributed by the General Assembly to the cessation of the nuclear arms race and nuclear disarmament and bearing in mind the prominent place that this question has in the agenda of the Committee on Disarmament, the Group of 21 deems it its duty to put on record how it considers that the matter should be approached in order to get the Committee engaged in actual negotiation.

The Group of 21 has in this context noted with satisfaction the initiative of the seven socialist states in CD/4 entitled "Negotiations on ending the production of all types of nuclear weapons and gradually reducing their stockpiles until they have been completely destroyed". While maintaining their full adherence to the programme of action outlined in paragraph 50 of the Final Document, the Group believes that such initiative may become a stimulus to begin exploratory consultations which could lead to effective negotiations on nuclear disarmament.

The Group of 21 is of the view that the Committee on Disarmament is the most suitable forum for the preparation and conduct of such negotiations.

The question of the scope of the negotiations in this Committee has to be solved in preliminary negotiations concerning organizational matters.

Although other negotiations could and should go in parallel with multilateral negotiations within the CD, thereby complementing each other to the benefit of both, the Group of 21 believes that negotiations conducted outside the CD should not in any way hinder negotiations agreed upon to be conducted within the Committee.

GE.79-62485

The need for undiminished security of States in meaningful disarmament negotiations has been recognized by all States. Agreements and measures included in paragraph 50 as part of the process of nuclear disarmament are closely linked. This relationship together with the inherent complexity of all relevant provisions will undoubtedly make their faithful implementation particularly difficult. Paragraph 50 is, however, one of the key paragraphs of the Programme of Action approved by consensus by the first special session of the General Assembly devoted to disarmament and could not be ignored as unfortunately was the case with all measures of nuclear disarmament in the proceedings of the CCD.

The Group of 21 therefore proposes that the Committee on Disarmament, as a first step to be taken at its present session, endeavour, in informal meetings and consultations, to identify the prerequisites and elements for multilateral negotiations on nuclear disarmament and to delineate the course of action for the achievement of the objective pursued. On the basis of the progress which may thus be achieved in the Committee, the establishment of a working group for negotiation of agreements and concrete measures in the field of nuclear disarmament may then be envisaged.

CD/37
12 July 1979
Original: ENGLISH

FEDERAL REPUBLIC OF GERMANY

Working Paper on some aspects of international verification of non-production of chemical weapons: Experience gained in the Federal Republic of Germany

1. In the negotiations on a convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction the most difficult problem is that of verification. Adequate verification of a CW-ban must cover the following areas in particular:

(a) destruction of existing stocks of chemical weapons,

(b) destruction or shut-down of existing production facilities for such weapons,

(c) control of current production of sensitive chemical agents to the extent necessary for the observance of a production ban.

2. This working paper is a contribution to the discussion of the item referred to under (c). Part I describes practices and principles of effective and economically unharmful control in the light of the Federal Republic of Germany's experience with the surveillance of its undertaking not to manufacture chemical weapons. Part II is a summary of the results of the international workshop on the verification of the non-production of chemical weapons held in the Federal Republic of Germany from 12 to 14 March 1979. Part III puts forward for discussion ensuing principles for verifying a chemical weapons production ban.

I

The Federal Republic of Germany, already a party to the Geneva Protocol of 1925, which prohibits the use of biological and chemical weapons in war, undertook as early as 23 October 1954 not to manufacture nuclear, biological and chemical weapons and thereby agreed to controls by the Armaments Control Agency of the Western European Union to ensure that this undertaking was being observed.

The Armaments Control Agency established by the revised Brussels Treaty of 23 October 1954, has been monitoring the non-production of chemical weapons in the Federal Republic of Germany since 1957/58. Controls consist of the evaluation of written information, supplied upon request, of visits and on-site inspections. The experience which the Federal Republic of Germany has gained from WEU controls demonstrates that the practices outlined below could be useful in establishing effective and economically unharmful verification of a world-wide ban on the manufacture of chemical weapons.

1. Controls are extended to all substances specified in a list together with their chemical formulae. The list is continuously reviewed by experts and modified or supplemented as necessary.

2. Excluded from controls are all apparatus, parts, equipment, installations, substances and organisms which are used for civilian purposes or for scientific, medical and industrial research in the field of pure and applied science. This affects not only those chemical products used primarily for civilian purposes (e.g. hydrocyanic acid and cyanogen chloride) and intermediate and end-items not suited to military purposes, but also, for example, small and therefore militarily irrelevant quantities of substances which are recognized as warfare agents. Such minimal quantities are required for medical purposes and for the research, development and testing of chemical defence equipment and techniques.

3. Production controls are applied to end-items and not to manufacturing processes. Accordingly chemical factories as a whole are not subject to control but rather individual substances of military relevance.

4. Non-production controls are applied to substances with characteristics which have been defined as necessary for the production of chemical weapons. These "characteristic substances" are not chemical warfare agents but are deemed to be initial or key products without which prohibited warfare agents could not be manufactured. Depending on which other chemical substances are added to them, they are suitable for the production of end-items for civilian purposes or for the chemical warfare agents on a prohibited list. The aim of controls at production plants is therefore to ensure that such substances are not used for the production of the prohibited chemical warfare agents.

5. Controls are carried out in the decisive phase of reaction, the so-called controllable stage. The starting point for non-production control of chemical warfare agents is defined as follows:

> "Controls in factories regarding a chemical product (chemical weapons) on the list approved by the council, can take, as their starting point, the chemical reaction or reactions immediately preceding the possible creation of the product on the list, in whatever form it may be".

Thus the controllable stage starts with the phase of production which, during the full production process, immediately precedes the completion of the end-item. This is the only stage at which controls at production plants can be carried out.

6. Chemical substances which can be used for both military and civilian purposes are not deemed to be chemical warfare agents if the quantities produced do not exceed peaceful civilian requirements. The controls determine whether the quantities produced do in fact exceed those requirements.

7. The initiative for on-site inspections lies with the Armaments Control Agency of the WEU. The director of the agency appoints two to four officials of different nationality, one of them a national of the country in which the inspection is to be carried out. A representative of the competent national authority assists the agency in the execution of its controls.

During such controls the representatives of the agency enquire about the organization, operation and production programme of the plant.

The subsequent visit to the production plant covers only those departments dealing with the decisive phase of reaction. The inspectors are shown built-in measuring instruments so that they can verify the quantities of the pre-products employed in the production of a substance and the final output. If further clarification is required, the findings are compared with the factory's records or books.

8. The inspectors pay special attention to the factory's safety precautions. These are always clearly visible and cannot be concealed and together with the lack of special equipment and installations, provide the clearest possible indication that no chemical warfare agents are being produced in the plant.

9. In special cases sampling as a means of control is useful and effective for identifying specific substances and determining whether they are prohibited warfare agents. The high degree of toxicity of most of these substances poses the problem of liability in the case of accidents or damage caused or suffered by inspectors.

10. The inspection is carried out in stages in order to avoid, as far as possible, any interference with the civilian sector. As soon as the inspectors are satisfied that the non-production pledge is being kept, the control must cease. If the visit to the production plant, including the inspection of special safety precautions (first control measure), is not deemed to be sufficient, the control may be extended to the employment of initial and intermediate products in the controllable stage (second control measure). If there is still no certainty that chemical weapons are not being produced, the factory's records may be checked against the instrument readings (third control measure). Samples may be taken as the fourth and last measure.

11. After each on-site inspection the inspectors report orally to the director of the agency. They also prepare a written classified report which remains in the agency's files. It may not be brought to the notice of any person outside the agency. Neither the factory concerned nor the competent national authority is consulted in the preparation of the report.

The representative of the national authority who has taken part in the inspection also prepares a report so that the authority concerned may have its own documents available in the event of recurrent inspections. This report is transmitted to the management of the factory concerned.

12. The staff of the Armaments Control Agency are international officials. They must in no circumstances whatever reveal to third parties information obtained as the result of their official tasks. Special protection is accorded to industrial, economic, commercial and scientific information, whether classified or not.

13. The Armaments Control Agency submits annual reports to the Council of the Western European Union. These reports contain the number of controls, the names of the companies concerned, and the results, stating such difficulties or problems that may have occurred without, however, going into detail.

II

1. The workshop held in the Federal Republic of Germany from 12 to 14 March 1979 served the purpose of illustrating to an international audience of experts, by means of practical examples, the experience gained from WEU controls.

The objection occasionally raised to on-site inspections as a means of controlling current production in civilian chemical plants is that they would be intrusive and liable to harm the legitimate interests of the producers since they would involve the disclosure of classified information of a technological and economic nature.

The Federal Republic of Germany fully acknowledges the need to protect production secrets; being a country with a highly developed chemical industry it has itself an interest in such protection. It is, however, convinced that it is possible for on-site inspections to prove, without disclosing any classified information on the production process, that chemical warfare agents are not being produced. Warfare agents are distinguished from compounds for peaceful uses by their considerably higher degree of toxicity. Consequently, the production of highly toxic substances on a scale required for military use necessitates safety precautions which are visible in certain constructional features of the production facilities. The absence of such safety precautions is easily seen during the course of a plant inspection and provides evidence that no highly toxic compounds are being produced. Even where safety precautions are continually improved, as existing facilities are developed or new facilities established, they will fall far short of the protection technology required in factories producing warfare agents. Hence, this method of verification does not require the disclosure of any production secrets.

2. In the light of experience gained from this international verification, the purpose of the workshop held in the Federal Republic of Germany was therefore to show:

- that international on-site inspections of the current production of substances which, by their chemical structure are related to warfare agents, are an effective means of verification of a production ban and
- that such inspections can be carried out without any impairment of the factory's industrial processes and legitimate commercial interests.

This was the aim of the invitation Federal Chancellor Schmidt made to member States of the United Nations at the Special Session of the United Nations General Assembly devoted to disarmament in May 1978 to participate in a workshop in the Federal Republic of Germany. The State Secretary of the Federal Foreign Office, Herr van Well, renewed this invitation on 26 January 1979 at the opening session of the Committee on Disarmament. 55 experts took part in the workshop coming from Australia, Belgium, Canada, Denmark, Egypt, Finland, France, the Federal Republic of Germany, Greece, Indonesia, Iran, Italy, Japan, Kuwait, Mexico, the Netherlands, Pakistan, Romania, Spain, Sweden, Switzerland, the United Kingdom, United States of America and Yugoslavia. A representative of the United Nations Secretary-General also attended the workshop.

The programme, co-ordinated with the Federation of Chemical Industries offered the participants, after an introductory meeting in Bonn, the opportunity to visit the production plant of one of the three biggest chemical companies of their choice; either the hostathion and afugan production in the Knapsack plant of Hoechst A.G., or the parathion and azinphos production of Bayer, A.G. at their plant-protection factory in Dormagen, or the thion acide ester plant of BASF Aktiengesellschaft in Ludwigshafen, i.e. in each case, the production of insecticides on a phosphorous basis. Phosphorous insecticides are, in their chemical structure and reactions -- and in this aspect only -- related to warfare agents.

The participants had the opportunity to get acquainted with the practice of international on-site inspection. The main purpose of this exercise was to demonstrate that

- in the absence of safety precautions no supertoxic compounds can be manufactured in the production plants at present available to the chemical industry,
- the absence of such safety precautions is perceivable in the course of a plant inspection and thus to prove the non-production of warfare agents,

- a rapid conversion of available production plants into plants producing warfare agents is technically not possible, and that
- the chemical industry in the Federal Republic of Germany does not object to controls of its production plants with regard to the possible production of warfare agents or of characteristic pre-products of warfare agents.

The final discussion on the workshop showed that it served its purpose.

3. It became apparent that any effective verification of a chemical weapons ban must include the application of international control measures. Naturally they can and should be combined with national ones. Regular on-site inspections carried out by an international control authority should, however, be an indispensable component of any international control measures designed to ensure the non-production of chemical weapons as laid down in a convention. Other international control measures such as near-site inspections (emission analyses), satellite monitoring, statistical control of production figures, and the consumption of raw materials and basic chemicals do not suffice to replace on-site inspection, nor can off-site inspections and the opto-electronic sealing of shut-down factories be a satisfactory substitute.

III

For the practical verification of a world-wide ban on the production of chemical weapons, the following principles can be drawn from this experience:

- effective verification of a production ban necessitates adequate on-site inspections of current production,
- such inspections can be carried out without any impairment of the industrial processes and legitimate commercial interests of the plant concerned.

The necessary prerequisites are that

- chemical weapons be precisely defined, and existing lists be modified and/or supplemented,
- the fields of pure and applied research and of civilian use should be excluded from controls,
- information be furnished in reply to an annual request by a verification authority in respect of chemical weapons; this would ease the task of selecting those factories which were eligible for non-production controls,
- the controllable stages be defined; specific characteristic substances would have to be defined as initial products,
- principles should be worked out for the gradual implementation of non-production controls and that
- the civil peaceful requirements of specific (ambivalent) chemical substances on the prohibited list should be roughly estimated; they would have to be reported regularly each year.

CD/38
12 July 1979
Original: ENGLISH

LETTER DATED 10 JULY 1979 ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT FROM THE PERMANENT REPRESENTATIVE OF DENMARK TO THE UNITED NATIONS OFFICE AT GENEVA CONCERNING RULES 34 AND 35 OF THE RULES OF PROCEDURE

On the instructions of my Government, I have the honour to ask Your Excellency, in accordance with article 120 (h) of the final document of the tenth special session of the General Assembly of the United Nations and paragraphs 34 and 35 of the rules of procedure of the Committee, to make due arrangements to allow the Danish delegation to participate in the discussion of the subject-matter of chemical weapons which will take place in the Committee on Disarmament from 16 to 27 July 1979, as well as on other occasions when this subject is discussed in the Committee and such subsidiary bodies as may be set up.

At a later stage my Government may wish to circulate a working document on the above-mentioned subject in accordance with article 120 (g) of the final document of the tenth special session and paragraph 33 of the said rules of procedure.

(Signed): H.E. Kastoft
Ambassador
Permanent Representative
of Denmark

GE.79-62481

CD/39*
16 July 1979

Original: ENGLISH

LETTER DATED 16 JULY 1979 FROM THE AMBASSADOR (POLITICAL AFFAIRS) OF THE PERMANENT MISSION OF FINLAND TO THE UNITED NATIONS OFFICE AT GENEVA ADDRESSED TO THE SECRETARY OF THE COMMITTEE ON DISARMAMENT AND PERSONAL REPRESENTATIVE OF THE SECRETARY-GENERAL OF THE UNITED NATIONS CONCERNING THE IDENTIFICATION OF POTENTIAL ORGANOPHOSPHORUS WARFARE AGENTS - AN APPROACH FOR THE STANDARDIZATION OF TECHNIQUES AND REFERENCE DATA

Upon the instructions of my Government, I have the honour to forward to you herewith a study entitled "Identification of Potential Organophosphorus Warfare Agents - An Approach for the Standardization of Techniques and Reference Data" prepared at the request of the Ministry for Foreign Affairs of Finland. I would be most grateful, if you could take appropriate steps to have this study distributed as an official document of the Committee on Disarmament.

(Signed) Esko Rajakoski
Ambassador

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* A limited distribution of this document in English has been made to the members of the Committee on Disarmament. Additional copies are available from the Foreign Ministry of Finland in Helsinki.

GE.79-62570

CD/40
23 July 1979
Original: ENGLISH

HUNGARY

Working paper on the draft preambular part of the Treaty on the Prohibition of the Development, Manufacture, Stockpiling and use of Radiological Weapons

The States Parties to this Treaty,

Determined to further enhance international peace and security and to save mankind from the danger of the use of new means of warfare and to contribute to the cause of the cessation of the arms race with the final goal of achieving general and complete disarmament under strict and effective international control and to continue negotiations to achieve further progress in the disarmament field,

Convinced of the importance of adopting effective measures to prevent the use of scientific and technological achievements for developing new types and systems of weapons of mass destruction including radiological weapons,

Realizing the threatening possibility of the development and deployment of radiological weapons in the arsenal of armed forces of States

Recalling that the General Assembly of the United Nations called for the prohibition of development, production, stockpiling and use of radiological weapons,

Conscious that the use of radiological weapons would have devastating consequences for mankind,

Convinced that the prohibition of radiological weapons will contribute to the preservation of the natural environment for the present and future generations,

Recognizing the need for peaceful uses of sources of radiation from radioactive decay in different fields of human activities,

Desiring to further confidence and peaceful relations among States and to improve international atmosphere in accordance with the purposes and principles of the Charter of the United Nations

Have agreed on the following:

CD/41
25 July 1979

Original: ENGLISH

THE NETHERLANDS

Working paper containing questions
relevant to a Convention prohibiting chemical weapons

Scope

1. Q: Can we agree that a CW-ban will be comprehensive, i.e. that it will cover the whole CW-problem and will therefore not imply a partial approach? (This is not withstanding the fact that the destruction of existing CW-stockpiles will take considerable time for technical reasons.)

2. Q: If the answer is yes, what will the ban exactly cover:
   (a) banning the development of CW-agents and weapon systems?
   (b) banning the production of all single-purpose agents, including single-purpose precursors?
   (c) banning the production for CW-purposes of dual-purpose agents (including dual purpose precursors?)? Does it cover only lethal agents or also incapacitants? Tear gas? Herbicides and defoliants?
   (d) the destruction of existing stockpiles of CW-agents and weapon systems? What is the time limit?
   (e) the dismantling of existing CW-production facilities, or the "moth-balling" of CW-plants, or the conversion of existing facilities to those for peaceful use?
   (f) banning the production of CW-munitions, equipment and means of delivery?
   (g) banning planning, organization and training for offensive chemical warfare?
   (h) not banning protection against C-warfare?
   (i) banning the use? (relationship with Convention of 1925)
   (j) banning the transfer and acquisition of CW?

3. Q: What are the exemptions on the production ban? (medical purposes, protection, military toxic materials which cannot be used for chemical warfare etc.)

4. Q: (a) Can it be concluded that the main elements for the definition of banned CW-agents are the general purpose criterion and toxicity?

(b) Can it also be concluded that other criteria play a role in the verification and licensing process, such as structural formulae and criteria for the usefulness of agents for C-warfare?

(c) Are complete lists of banned or allowed agents necessary or are examples sufficient?

Verification

5. Q: Can it be concluded that in the context of a CW-ban, parties need a national system of control (or at least parties with a chemical industry) for the implementation of internal legislation and as liaison for international verification procedures?

6. Q: Can it be assumed that part of the international verification measures will be based on the concept of "verification by challenge" while other international verification measures will be of a more systematic character?

7. Q: If the answer is yes, can it be assumed that systematic international verification measures will be concentrated on:

(a) The destruction of existing stockpiles of CW-agents (and munition?)?

(b) The dismantling of existing CW-production plants, or that "moth-balled" plants are not used, or that plants are converted to peaceful activities.

(c) The non-production of single-purpose highly toxic (mainly nerve) agents, including single-purpose precursors?

8. Q: What kind of structure does one need for the different international verification tasks? What kind of support could such a structure give to the national control agencies?

9. Q: Is it conceivable that, complementary to a world-wide ban, in certain regions countries may decide to accept more stringent regional verification measures?

Confidence building measures

10. Q: Would it be helpful if States would:

(a) declare their stocks and production facilities after signing but before entry into force of a convention? Before signing?

(b) organize technical exchange visits?

(c) co-operate in protection measures against C-warfare?

CD/42
25 July 1979

Original: ENGLISH

GERMAN DEMOCRATIC REPUBLIC

Working paper on draft paragraph XI, subparagraph 3, and paragraph XII, subparagraph 3, of the Treaty on the Prohibition of the Development, Manufacture, Stockpiling and Use of Radiological Weapons

Paragraph XI, subparagraph 3

If no review conference has been convened within ten years following the conclusion of a previous review conference, the Depositary should solicit the views of all States Parties on the holding of such a conference. If one-third or ten of the States Parties, whichever number is less, respond affirmatively, the Depositary should take immediate steps to convene the conference.

Paragraph XII, subparagraph 3

The Treaty shall enter into force upon the deposit of the instruments of ratification by 25 Governments (including the nuclear-weapon States) in accordance with subparagraph 2 of this paragraph.

GE.79-63003

CD/43
25 July 1979

Original: ENGLISH

LETTER DATED 25 JULY 1979 FROM THE CHAIRMAN OF THE AD HOC GROUP OF SCIENTIFIC EXPERTS TO CONSIDER INTERNATIONAL CO-OPERATIVE MEASURES TO DETECT AND IDENTIFY SEISMIC EVENTS TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT TRANSMITTING THE SECOND REPORT OF THE AD HOC GROUP

I have the honour to forward to you, in your capacity as Chairman of the Committee on Disarmament, the Second Report of the Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events. This Report was prepared pursuant to the decision of the Conference of the Committee on Disarmament of 9 July 1978, arrangements for which were maintained by the Committee on Disarmament by its decision of 15 February 1979.

The Ad Hoc Group would like to note, with appreciation, the assistance which the Secretariat of the United Nations provided to it.

The Ad Hoc Group of Experts requested me, as its Chairman, to transmit on its behalf, the report which was adopted unanimously.

(Signed) Ulf Ericsson
Chairman

GE.79-65121

SECOND REPORT OF THE AD HOC GROUP OF SCIENTIFIC EXPERTS TO CONSIDER INTERNATIONAL CO-OPERATIVE MEASURES TO DETECT AND IDENTIFY SEISMIC EVENTS

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CHAPTER I

Summary

On 15 February 1979 the Committee on Disarmament (the CD) decided, inter alia, that the arrangements for the Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events, as originally established on 22 July 1976 by the Conference of the Committee on Disarmament (the CCD) to facilitate the monitoring of a comprehensive test ban, should be maintained (CD/PV.11). On that occasion the CD also decided that the Group should remain open also to States not Members of the Committee.

For its second report, summarized here, the Ad Hoc group had been given the following terms of reference (CCD/570 of 9 May 1978):

> Recognizing the valuable and important work carried out by the Ad Hoc Group and presented to the CCD in its report of 14 March 1978 (CCD/558); taking note of the suggestion by the Ad Hoc Group that it conduct additional work and also of a similar suggestion by the Japanese delegation (CCD/PV.776) the CCD decides that the Ad Hoc Group should continue its work by studying the scientific and methodological principles of a possible experimental test of a global network of seismological stations of the kind which might be established in the future for the international exchange of seismological data under a treaty prohibiting nuclear weapons test, and a protocol covering nuclear explosions for peaceful purposes which would be an integral part of the treaty.
>
> The studies should include the elaboration of instructions and specifications for the following items
>
> - data to be routinely produced at participating stations (Level 1 data)
> - data format and procedures for Level 1 data transmission through the IMO communication network
> - procedures to be used for data analysis at data centers
> - format and procedures for the exchange of waveform data (Level 2 data)
>
> The organization and procedures of the work of this group shall remain the same as those defined by the decision of the Committee of 22 July 1976. The Ad Hoc Group will hold its first meeting under its new mandate during the week beginning 24 July 1978. The group should present a progress report after each of its sessions. The group should report the results of its work to the Committee during its spring session of 1979. After considering the final report of the Ad Hoc Group the committee will consider the questions of desirability of carrying out an experimental exercise.

By its decision on 26 April 1979 (CD/PV.31) the Committee on Disarmament decided that the third session of the Group under its present mandate be held from 16-27 July 1979, thereby providing the Group with sufficient time for the preparation of its second report.

The present second consensus report elaborates on certain matters in the Ad Hoc Group's first report (CCD/558) on how seismological science can be applied in a co-operative international effort to facilitate the international exchange of seismological data under a treaty prohibiting nuclear weapon tests, and a protocol covering nuclear explosions for peaceful purposes which would be an integral part of the treaty. The co-operative international effort described in the first report would have three elements: a systematic improvement of procedures at seismological observatories around the globe, an international exchange of seismic data over the global telecommunications system (GTS) of the World Meteorological Organization (WMO), and processing of the data at special international data centers for the use of participant States. That report also considered an experimental exercise to assist the establishment of such a co-operative data exchange system.

The second report of the Ad Hoc Group has seven chapters, written in a generally non-technical language in order to facilitate its reading by non-specialists in the field of seismology. Technical material is presented in separate appendices. The report was built on more than fifty informal working papers submitted by the participating experts. These were deposited with and can be obtained from the CD secretariat. Some of them have been issued also as formal CCD or CD documents or have been published elsewhere.

This summary is intended to be a useful short version of the body of the second report and to give indications as to what further steps might have to be taken to achieve the co-operative measures envisaged. The wide area of consensus reached by the experts in their first report has been maintained also in this second report. This report is the result of a combined effort in which all of the experts participated equally.

Chapter 2 of this report presents the background and terms of reference for the continued work of the Ad Hoc Group. The organization and composition of the Group are described and its program and method of work are outlined. A reference to the co-operation with the WMO is also made.

Chapter 3 gives instructions and specifications for data to be routinely produced at participating stations (Level 1 data). In summary:

Existing seismograph stations that may be included in a global network do not at present have standardized equipment. However, in most cases only minor modifications would be needed to make participation in the network feasible. The Ad Hoc Group strongly recommends that all network stations be equipped with modern

seismograph systems capable of continuous recording of data in digital form. While highly desirable, this is not, however, considered essential for the successful conduct of an experimental exercise.

Operational procedures at seismic stations are today not identical from one country to another. Nonetheless, the Ad Hoc Group considers that instrumental observations should in general be carried out in accordance with existing practice, while taking into account standardization work going on within the seismological community. More stringent requirements will, however, apply as to scope and consistency of reporting as well as to equipment reliability and precision of calibration measurements.

Parameters to be reported are specified in Tables 3.1 and 3.2. Detailed instructions for their measurement are provided in separate appendices. In view of the lack of standardized procedures for automated measurements, the Ad Hoc Group considers that, at the present stage, parameters should primarily be measured manually. Any measurement made automatically from digital recordings should be subjected to visual control.

All seismic events registered by any station in the global network should be reported by that station in terms of the specified Level 1 parameters. However, in order to keep the volume of data at an acceptable level, the Ad Hoc Group recommends an abbreviated form of reporting that would be allowable for events classified by the station's analyst as:

- Local earthquakes or quarry blasts
- Events belonging to an earthquake sequence (e.g. more than 10 events a day from the same place).

The stations are, however, obliged to supply the complete Level 1 data on such a particular event if asked to do so by an international data center or by any participating country.

Chapter 4 discusses data format and procedures for Level 1 data transmission through the WMO communications network. In summary, the Ad Hoc Group recommends that the International Seismic Code be chosen as the basic format for Level 1 data transmission. This code is already used by some ten countries to transmit limited seismic data through the WMO/GTS. Its use for the proposed Level 1 parameters will necessitate only a few relatively minor extensions. The most significant change will be the inclusion of a number of new types of indices in the format. The details of these changes will need to be agreed with other users of the WMO/GTS and also approved by the WMO prior to implementation in the proposed global data exchange.

In order to ensure the reliability of seismic data transmission on the GTS, formal arrangements similar to those now in effect for meteorological data will be needed. The lack of such arrangements is the main reason why significant data loss now occurs when transmitting seismic data on the GTS.

In view of the low error rates and the flexible provisions for retransmission of messages on the GTS, there will be no need for redundancy checks in the seismic data messages on the high speed circuits. On the low speed circuits, the error rates are higher, and the question of redundancy checks there should be studied further. A regular time schedule should be established for Level 1 data transmissions, avoiding the peak load hours for meteorological data.

A study conducted by the WMO on the expected capacity of the GTS to handle the envisaged Level 1 data transmission concluded that:

(i) Few problems are expected to arise in transmitting Level 1 data on the high-speed circuits of the GTS.

(ii) Difficulties are foreseen during days of peak load on certain low-speed circuits in parts of South America, Africa, South-western Asia and South-west Pacific.

It should be noted that the WMO study was based on a seismic transmission peak load expected to occur only a few times per year, as estimated by the Ad Hoc Group, and that the expected average load is much lower. The Ad Hoc Group emphasizes the need for it to further study this problem, both with the aim to give the WMO more accurate estimates of future transmission loads and also to take into account future developments within the WMO/GTS network.

Chapter 5 concerns format and procedures for the exchange of waveform data (Level 2 data). The global network will be composed of stations of heterogenous data recording systems. Several different methods to implement waveform exchanges might therefore be applied, e.g.:

(i) facsimile transmission of graphical recordings

(ii) transmission of data in numerical form over commerical telex, WMO/GTS or other data links

(iii) air mail delivery of magnetic tapes or seismograms (by scheduled air services or by International Data Post).

During an experimental exercise, all of these should be tested. If a global network comes into operation in the future, it would be necessary to concentrate on the speedy methods of communication (i) and (ii), using mail services only as a last resort.

At present, the WMO/GTS does not have the capacity to handle extensive Level 2 data exchange, and its use for this purpose in the future calls for careful study.

This chapter also specifies a recommended minimum volume of waveform data which might be requested for a seismic event. Each waveform transmission should be accompanied by the necessary technical descriptions of type of data, format and calibration information.

Data recording media and formats that might be encountered in a global network are described in a separate appendix to this chapter (Appendix 5.3). Data centers should be equipped to handle waveform data supplied in any reasonable format.

Chapter 6 describes procedures to be used for data analysis at International Data Centers. The purpose of the proposed International Data Centers would be to provide the States participating in the international data exchange with easily accessible data on seismic events for national assessments.

Data analysis at the centers should as a rule be performed using well-defined, automatic procedures. If considered necessary to improve the results, occasional interaction by a seismologist would be allowable. However, all such manual intervention would be documented alongside the results. Detailed technical procedures for seismic phase association, event location, depth estimation and magnitude determination are described in separate appendices to this chapter.

Identification data should be compiled and associated to each appropriate event. However, the centers would not make any assessment as to the nature of any event.

Results of the analyses should be reported preferably via the WMO/GTS, but this network could also be supplemented by bilateral or multilateral arrangements between States. The Data Centers would distribute preliminary bulletins as soon as the available data allow an event to be located. Final, detailed results should be distributed within one week of the event occurrence.

A data bank should be established at each International Data Center. The proposed file structures of such banks as well as the expected data volume are specified in detail in separate appendices. The files comprise, inter alia:

- complete Level 1 data as reported by the stations
- event analysis results as given in the bulletins
- unassociated detections (i.e station reports not found to correspond to any located event)
- complete records of requested Level 2 data.

All of these data files should be stored permanently. On request, the data centers would supply any data from these files in an agreed format, possibly through a computer-based information retrieval system.

Though the centers would normally conduct their tasks independently of one another, co-ordination of their activities is necessary. Furthermore, each center should regularly check its data files against those of the other centers, and any inconsistency should be resolved. These matters merit further study.

The Ad Hoc Group recommends that further study be undertaken with the aim to incorporate new research results into the procedures to be employed at the international data centers.

Chapter 7 contains the recommendations by the Ad Hoc Group. In summary they are:

(a) that the Ad Hoc Group be given a new mandate
- to continue the elaboration of detailed instructions for an experimental test of the global system with its second report as a basis;
- to continue its work on the further development of the scientific and technical aspects of international co-operative measures to detect and identify seismic events;
- to co-operate in the review and analysis of national investigations.

(b) that investigations, on a national level,
- into the conditions for using the WMO Global Telecommunication System for seismic data exchange;
- into procedures to obtain desired data at individual stations under various conditions;
- into analysis and data handling procedures at the envisaged data centers; and
- into methods of rapid exchange waveform data

be encouraged.

(c) that the Ad Hoc Group report thereupon to the CD

(d) that the CD invite the WMO to continue its co-operation with the Ad Hoc Group

CHAPTER 2

Introduction

Summary

The background and terms of reference for the continued work of the Ad Hoc group are presented. The organization and composition of the group are described and its program and method of work are outlined. A reference to the cooperation with the WMO is also made.

2.1 Background

On 22 July 1976 the Conference of the Committee on Disarmament (the CCD) established an Ad Hoc group of Government-appointed experts to consider and report on international co-operative measures to detect and identify seismic events, so as to facilitate the monitoring of a comprehensive test ban.

On 14 March 1978 the Ad Hoc group submitted its consensus report to the CCD (CCD/558), in which the group proposed the establishment of a global network of stations for the international exchange of seismological data. Its main elements would be:

a. A systematic improvement in the observations reported from more than fifty seismological observatories around the globe. Data would be reported in standard form in two levels:

   - Level 1: Routine reporting, with minimum delay, of basic parameters of detected seismic signals
   - Level 2: Data transmitted as response to requests for additional information, mainly waveforms for events of particular interest.

b. An international exchange of these data via appropriate channels. For Level 1 data, use of the Global Telecommunications System of the World Meteorological Organization was recommended. For Level 2 data, several possible data exchange media were considered.

c. Processing of the data at special international data centers for the use of participant States. These centers would (i) receive data at Levels 1 and 2, (ii) apply agreed analysis procedures to the available data and (iii) distribute complete results of these analyses, but without interpretation of identification parameters.

In addition, the report considered an experimental exercise, which would provide a test of the overall functioning of the proposed co-operative data exchange system.

2.2 Terms of reference for the continued work of the Ad Hoc group

On 9 May 1978 the CCD decided as follows (CCD/570):

> "Recognizing the valuable and important work carried out by the Ad Hoc group and presented to the CCD in its report of 14 March 1978 (CCD/558), taking note of the suggestion by the Ad Hoc group that it conduct additional work and also of a similar suggestion by the Japanese delegation (CCD/PV.776) the CCD decides that the Ad Hoc group should continue its work by studying the scientific and methodological principles of a possible experimental test of a global network of seismological stations of the kind which might be established in the future for the international exchange of seismological data under a treaty prohibiting nuclear weapon tests, and a protocol covering nuclear explosions for peaceful purposes which would be an integral part of the treaty.
>
> The studies should include the elaboration of instructions and specifications for the following items
>
> - data to be routinely produced at participating stations (Level 1 data)
> - data format and procedures for Level 1 data transmission through the WMO communication network
> - procedures to be used for data analysis at data centers
> - format and procedures for the exchange of waveform data (Level 2 data).
>
> The organization and procedures of the work of this group shall remain the same as those defined by the decision of the Committee of 22 July 1976. The Ad Hoc group will hold its first meeting under its new mandate during the week beginning 24 July 1978. The group should present a progress report after each of its sessions. The group should report the results of its work to the Committee during its spring session of 1979. After considering the final report of the Ad Hoc group the Committee will consider the question of desirability of carrying out an experimental exercise."

On 15 February 1979 the Committee on Disarmament (the CD) decided inter alia that the arrangements for the Ad Hoc group should be maintained (CD/PV.11).

By its decision of 26 April 1979 (CD/PV.31) the Committee on Disarmament decided that the third session of the group under its present mandate be held 16-27 July 1979, thereby providing the group with sufficient time for the preparation of its second report.

2.3 Co-operation with the World Meteorological Organization (WMO)

The Eighth Congress of the WMO (1979) considered a document submitted by its Secretary-General, containing a summary of the report of the Ad Hoc Group of Scientific Experts set up by the Conference of the Committee on Disarmament (the CCD) to consider international co-operative measures to detect and identify seismic events. In its decision, 8.6, on the use of the Global Telecommunication System (GTS) for the routine transmission of seismic events, the Eighth Congress agreed, in principle, that the WMO should assist the United Nations in this matter, and directed the Executive Committee, inter alia, to study the matter.

2.4 Organization and composition of the Ad Hoc group

By the decision of the Committee on Disarmament (CD/PV.11) of 15 February 1979, the Ad Hoc group, which is open to all Members of the Committee on Disarmament, remained open also to States Members of the United Nations not represented in the CD, upon invitation by the Committee. Altogether, scientific experts and representatives from twenty-two Member States of the CD and from six other States participated in the continued work of the Ad Hoc group.

Upon suggestion by the Ad Hoc group, the Committee on Disarmament agreed to invite a representative of the World Meteorological Organization (WMO) to participate informally in the group's work. Accordingly, WMO representatives attended the seventh and eighth sessions of the Ad Hoc group.

Dr. Ulf Ericsson of Sweden served as chairman and Dr. Frode Ringdal of Norway as scientific secretary of the Ad Hoc group. During the sixth session, Mrs. L. Waldheim-Natural, Chief, Geneva Unit, United Nations Centre for Disarmament, served as secretary for the group. For the seventh and eighth sessions, Mr. P. Csillag, Chief of Information and Research section of the United Nations Centre for Disarmament, served as the secretary.

The names of the participating scientific experts and representatives are listed at the end of this report. A number of experts acted, during and between sessions, as convenors of temporary working groups, and, together with other experts, as contributors of the substantial parts of the report.

2.5 Program and method of work

Under its continued mandate, the Ad Hoc group met in three sessions at Geneva (its sixth, seventh and eighth sessions overall) on the following dates:

6th session: 24-28 July 1978
7th session: 19 February - 1 March 1979
8th session: 16-27 July 1979

The group's second report was to be presented to the CD following the eighth session. The method of work was informal, with appointed convenors and working parties preparing drafts of chapters between sessions, review of these drafts at plenary sessions and finally redrafting and editing by the scientific secretary, aimed at obtaining a consensus report, in generally understandable terms and with technical material in separate appendices. The entire draft report was reviewed and finalized in its present form during the eighth session of the group.

During the continued work of the Ad Hoc group, more than fifty informal scientific working papers were contributed. These were all deposited with and can be obtained from the CD secretariat. Some of these working papers have also been made into formal CCD or CD documents or have been made public elsewhere. Conference Room Papers produced by the Ad Hoc group during its sessions were also deposited with the secretariat. Progress reports to the CCD and CD, submitted after the sixth and seventh sessions, were reproduced as documents CCD/576 and CD/18, respectively.

In its present report, the Ad Hoc group provides specific, detailed material addressing the topics given in the terms of reference for its continued work. However, the Ad Hoc group recognizes that it has not exhausted the problems under study, and that further work would be required for a more complete elaboration of the methodological and technical aspects involved.

CHAPTER 3

Instructions and specifications for data to be routinely produced at participating stations (Level 1 Data)

Summary

Existing seismograph stations that may be included in a global network do not at present have standardized equipment. However, in most cases only minor modifications would be needed to make participation in the network feasible. The Ad Hoc group strongly recommends that all network stations be equipped with modern seismograph systems capable of continuous recording of data in digital form. While highly desirable, this is not, however, considered essential for the successful conduct of an experimental exercise.

Operational procedures at seismic stations are today not identical from one country to another. Nonetheless, the Ad Hoc group considers that instrumental observations should in general be carried out in accordance with existing practice, while taking into account standardization work going on within the seismological community. More stringent requirements will, however, apply as to scope and consistency of reporting as well as to equipment reliability and precision of calibration measurements.

Parameters to be reported are specified in Tables 3.1 and 3.2. Detailed instructions for their measurement are provided in separate appendices. In view of the lack of standardized procedures for automated measurements, the Ad Hoc group considers that, at the present stage, parameters should primarily be measured manually. Any measurement made automatically from digital recordings should be subjected to visual control.

All seismic events registered by any station in the global network should be reported by that station in terms of the specified Level 1 parameters. However, in order to keep the volume of data at an acceptable level, the Ad Hoc group recommends an abbreviated form of reporting that would be allowable for events classified by the station's analyst as:

- Local earthquakes or quarry blasts
- Events belonging to an earthquake sequence (e.g. more than 10 events a day from the same place).

The stations are, however, obliged to supply the complete Level 1 data on such a particular event if asked to do so by an international data center or by any participating country.

3.1 Introduction

Level 1 data are basic parameters of detected seismic signals which will be routinely reported with minimum delay within the proposed global system. The existing seismic networks are primarily aimed at detecting and locating events; however, the global system has an additional task in providing identification data. It is therefore necessary to extend the established seismological practice towards the determination of identification parameters and to a rapid dissemination of data. In addition, the procedures for extracting data within the global system must by necessity be more strict and more precisely defined than those currently in use by seismological stations.

The Ad Hoc group's report CCD/558 gives the background of the procedures for extracting and reporting data, on the instrumentation and other related topics, therefore this information will not be repeated here. However, some important points relating to station equipment and operation will be briefly addressed below before we proceed to give instructions for extracting Level 1 data. The instructions and specifications of this chapter have been compiled with the understanding that improvements and revisions may be necessary in the future in the light of operational experience and new research results.

3.2 Operation of stations in the global network

Instrumentation

The basic instrumental components of the proposed global co-operative system are described in Chapter 8 of the report CCD/558. As was noted in that report, stations that may be included in the global network do not at present have standardized equipment. (See also Appendix 5.3.) It is convenient to separate existing stations into three basic types:

- Type I: stations equipped with 3-component short-period (SP) and long-period (LP) seismometers with graphic recording of seismic events on paper.

- Type II: stations equipped with 3-component SP and LP seismometers with digital or analog recording of data on magnetic tape.
- Type III: stations with arrays of vertical SP and/or 3-component LP seismometers with digital or analog recording of data on magnetic tape.

About half the stations considered in CCD/558 belong to type I and therefore require extensive manual processing of graphic recordings of seismic signals. The need to convert the older equipment to modern, digitally recording seismographs in the system is strongly emphasized. The instruments should be standardized as far as possible. This allows for a more accurate determination of the parameters of seismic events.

At present, some stations of the digital type store short period data only during time intervals for which an automatic detector indicates that a seismic signal is present. Nonetheless, continuous recording is very desirable and should be implemented at all network stations, if possible. For example, so-called 'negative evidence' (indicating the absence of a seismic signal) is often important and furthermore an experienced analyst may often identify onsets that are missed by an automatic detector.

Operation and maintenance

The proposed international data exchange is a decentralized system. Each station should prepare and edit its own data as carefully and completely as possible. Tasks at each station thus include among others:

- Determination of arrival times of seismic phases in Universal Co-ordinated Time (UTC)
- Reading and interpreting seismic phases
- Correcting for time drifting of the clock
- Correcting for instrument response
- Maintaining and ensuring calibration integrity
- Responding promptly to requests from an international data center
- Keeping all data at least one year at each station.

Operational procedures at seismic stations are today not identical from one country to another. Nonetheless, the Ad Hoc group considers that instrumental observations at stations of the global network should in general be conducted in accordance with existing practice. In view, however, of the specific nature of the tasks imposed on the global system, certain functions will be particularly important in station operation. These are:

- Duplicating those instrumental components most likely to break down
- Carrying out calibration measurements at least twice a year
- Providing adequate connection to the WMO communication channels for Level 1 data transmission
- Installing appropriate facilities to copy seismic waveforms for the purpose of Level 2 data exchange.

It is important that all stations operating within the system should maintain control of instrumental constants and provide the data centers with information on response characteristics, recording media and time service. Any change should be announced. The date and time of the interruption of operation of a station or of any individual instrument necessary for the normal analysis at the station should be reported.

3.3 Principles for reporting Level 1 data

In Tables 3.1, 3.2 the proposed Level 1 data are listed. A distinction is made between standard parameters that should be reported uniformly by each station and additional standard parameters that would be reported only by seismic array stations. Most of standard parameters can be obtained at all seismological stations whereas some can be obtained only at stations having special capabilities. The general principles in the report CCD/558 concerning the Level 1 data are that:

(a) All recorded events should be reported from the participating stations with minimum delay.

(b) Each reporting should consist of a complete set of parameters (specified in Tables 3.1 and 3.2) to the extent that these parameters are measurable.

(c) For some of the specialized parameters in Tables 3.1 and 3.2 (such as items 9 and 10 of Table 3.1), some stations might prefer, for practical reasons, to transmit these data to the international centers on a weekly or monthly basis as agreed, or possibly only on request.

The first requirement (a) above applies without any exception. For practical reasons of handling a manageable amount of data the second requirement (b) can be relaxed in certain cases. Thus, for events classified by the station analyst

(i) Local earthquakes or quarry blasts

(ii) Belonging to an earthquake sequence (e.g. more than 10 events a day from the same place)

an abbreviated report would be allowable. This would comprise reportings of P and S arrivals, maximum amplitude within the first six seconds, the associated period and, for earthquake sequences, an association of the arrival to the specific sequence. If more convenient, a 'local magnitude' M_L or the signal duration DUR in the short period recording may be reported as well as amplitude and period of local events. (See Appendix 3.2) The stations are obliged to supply the remaining Level 1 data in the cases described above when asked to do so by an international data center or by any participating country.

The term 'local earthquake' as used here refers to an event within an estimated distance of about 150 km from the reporting station.

During an especially large local earthquake sequence, it would be allowable to give a general description of the seismic field, such as 'A local sequence took place between (time A) and (time B)', without supplying individual readings at Level 1. Even then an indication of the sizes of the largest events would be desired. The Ad Hoc group considers, however, that this point requires further study.

It must be pointed out that during periods of high seismicity in a given region, such as an aftershock sequence consisting of hundreds of events per day, the detection and interpretation of events not associated with the sequence may be difficult at many of the stations of the global network. However, in the context of a co-operative global network of the type described in CCD/558, these periods of high seismicity are very important. Although reporting of events belonging to the sequence must be relaxed to prevent saturation of the data-handling facilities, increased attention must be given to the study of the data at individual stations in order to report seismic events not associated with the earthquake sequence in progress.

Stations of the global network should, as a rule, report only their own readings. However, if, at the time of reporting, additional information is available, e.g. from a local network, or if information on quarry blasts, etc., can be obtained from local authorities, it should be included as 'comments' in the stations report.

3.4 Procedures for extracting Level 1 parameters at seismic stations

The Level 1 data as specified in Tables 3.1 and 3.2 comprise a number of new parameters compared to what is routinely measured at seismic stations today. Detailed technical instructions on how to extract these parameters are presented in Appendix 3.1. The most important points to note are summarized below, and concern the measurements of the basic seismological parameters signal arrival time, first motion, amplitude, period and magnitude:

Signal arrival time

On a graphic record, a signal arrival is defined as a marked change in amplitude or phase. The corresponding time reading is reported in Universal Co-ordinated Time (UTC), to the nearest 0.1 seconds for short period recordings and to the nearest 1.0 second on long period recordings. Each station must maintain a timing accuracy to within a tenth of a second relative to UTC.

First-motion sign and clarity

Direction (or sign) of the first-motion on short- and long-period instruments, vertical and horizontal components should be reported if readable. Standardized notation (see Appendix 3.1) should be used. Note that for complicated or weak signals, the direction of the first-motion may be in doubt. If so, it is not to be reported. The reported first motions on short- and long-period instruments do not need to agree.

The clarity parameter is used to indicate whether a recorded seismic signal represents a clear onset. If the signal onset can be identified within $\pm$0.2 seconds for P waves or $\pm$1 second for S waves, the clarity notation i is used, while if the onset identification is less accurate, the clarity notation e is used.

Signal amplitude measurements

Amplitude is determined from the maximum signal deflection on the seismogram trace (in mm on graphic records or in quantum units on digital records) and then converted to ground motion using the instrument response or amplification curve. Trace amplitude is measured as the center-to-peak (or trough) deflection from the median line, or alternatively, for symmetric signals, by halving peak-to-trough deflection. For short period signals, amplitudes are measured to a precision of 0.1 nm (i.e. 10^{-10}m), for long-period signals to 1 nm.

Signal period measurements

Signal period corresponding to each amplitude observation is measured at median line crossings or between neighbouring peaks or troughs. This parameter is reported to the nearest 0.1 seconds and 1 second on short- and long-period instruments, respectively.

Noise amplitude and noise period measurements

The earth is never completely ' at rest' and the corresponding slight ground movements are manifested as background noise on a seismogram. For each event, the maximum noise amplitude at a frequency close to that of the signal should be measured and converted to ground amplitude in nm. This maximum is selected over a time interval preceding the first signal onset and covering 30 seconds for short-period records and 1 or 5 minutes (depending upon the type of phase) for long-period records.

At stations with data digitizing capability, the noise amplitude at a specified frequency could be determined by calculating the noise power spectrum over a representative time segment of the recording.

Magnitudes

Magnitudes are determined using the procedure recommended by the IASPEI Commission on Practice (Appendix 3.2). Measurements should be made directly from amplitude and period without application of station corrections.

Precision of measurements

Parameters should in general be reported to the precision actually obtained in each given situation. The precision of measurements quoted in Tables 3.1 and 3.2 are intended to be guidelines in this respect, and should usually be followed unless there are particular reasons not to do so. Such might be the case, e.g. when an event location estimate by an array is considered much more uncertain than the quoted precision level of 0.1°.

Measurements at digital stations

At stations with digital recordings and access to a computer, the potential exists to perform automated measurements of Level 1 parameters. Such techniques have in fact been experimentally tested at several existing seismic stations and centers. However, no standards exist today for the automatic measurement of such basic parameters as arrival time, amplitude and period of seismic signals. Awaiting developments toward such standardization, the Ad Hoc group considers that within the global system, the basic Level 1 parameters should preferably be measured manually, and in accordance with established seismological practice. Any measurement made automatically from digital recordings should be subjected to visual control.

The Ad Hoc group considers automatic extraction of seismic parameters to be a very desirable goal, and recommends that further work be undertaken by the group with the aim to develop standardized procedures in this field.

Table 3.1

Standard parameters obtained with short-period instruments at stations of types I, II and III

Type of Wave	Component	Parameter	Unit of Measurement	Precision of Measurement	Volume of data (computer words - 16 bits)
P	Vertical	(a) Standard parameters - stations of types I, II and III			
		1. Arrival time	h,min,s	0.1 s	3
		2. First-motion sign and clarity (if readable)	±i, e		1
		3. */ Amplitudes A_i (i=1, ..., 4)	nm **/	0.1 nm	4
		4. Arrival times corresponding to each A_i	min, s	0.1 s	8
		5. Periods corresponding to each A_i	s	0.1 s	4
		6. Noise amplitude, A_N	nm	0.1 nm	1
		7. Period corresponding to A_N	s	0.1 s	1
		8. Secondary phase description:			
		Amplitude	nm	0.1 nm	1) per
		Period	s	0.1 s	1) phase
		Arrival time	h,min,s	0.1 s	3)
		9. ***/ Complexity			)variable
		10. ***/ Spectral moment, ratio or vector			)variable
S	Horizontal	11. Arrival time	h,min,s	0.1 s	3
		12. First-motion clarity	i, e		1
		13. Maximum amplitude, A_M on each horizontal component	nm	0.1 nm	2
		14. Arrival times corresponding to each A_M	h,min,s	0.1 s	6
		15. Periods corresponding to each A_M	s	0.1 s	2
		16. Secondary phase description:			
		Amplitude	nm	0.1 nm	1) per
		Period	s	0.1 s	1) phase
		Arrival time	h,min,s	0.1 s	3)

Table 3.1 (cont.)

Type of Wave	Component	Parameter	Unit of Measurement	Precision of Measurement	Volume of data (computer words-16 bits)
P	Vertical	(b) Additional standard parameters (type III stations only)			
		17. Apparent slowness	s/degree	0.1 s/degree	1
		18. Epicenter azimuth and distance	degree	0.1 degrees	2
		19. Epicenter latitude and longitude	degree	0.1 degrees	2
		20. Origin time	h,min,s	1 s	3
		21. Magnitude m_b		0.1 unit	1

*/ The A_i, i=1, 2,...,4, correspond to maximum amplitudes in the intervals 0-6 seconds, 6-12 seconds, 12-18 seconds, and 18-300 seconds after P-wave arrival, respectively.

**/ For photographic SP-instrument recordings, signal amplitudes are measured with a precision of 0.1 mm, and are then converted to ground displacement with a precision of 0.1 nanometres.

***/ The complexity parameter and the spectral ratio, moment or vector will only be reported by certain digital stations with specialized capabilities.

Note

Phase identifications according to the International Seismic Code will be included for each wave type. Also note that the sequence in which the parameters will be transmitted from each station needs not be identical to the sequence in the table.

Table 3.2

Standard parameters obtained with long-period instruments at stations of types I, II and III

Type of Wave	Component	Parameter	Unit of Measurement	Precision of Measurement	Volume of Data (Computer words - 16 bits)
P	Vertical	(a) Standard parameters - stations of types I, II and III			
		22. Arrival time	h,min,s	0.1 s	3
		23. First-motion sign and clarity	±i, e		1
		24. Maximum amplitude, A_M	nm*	1 nm	1
		25. Arrival time corresponding to A_M	h,min,s	1 s	3
		26. Period corresponding to A_M	s	0.1 s	1
		27. Noise amplitude, A_N	nm	1 nm	1
		28. Period corresponding to A_N	s	0.1 s	1
		29. Secondary-phase description:			
		Amplitude	nm	1 nm	1)
		Period	s	0.1 s	1) per phase
		Arrival time	h,min,s	1 s	3)
S	Horizontal	30. Arrival time	h,min,s	1 s	3
		31. First-motion clarity	i, e		1
		32. Maximum amplitude, A_M on each horizontal component	nm	1 nm	2
		33. Arrival times corresponding to each A_M	h,min,s	1 s	6
		34. Periods corresponding to each A_M	s	0.1 s	2
		35. Secondary-phase description:			
		Amplitude	nm	1 nm	1)
		Period	s	0.1 s	1) per phase
		Arrival time	h,min,s	1 s	3)

Table 3.2 (cont.)

Type of Wave	Component	Parameter	Unit of Measurement	Precision of Measurement	Volume of Data (Computer words - 16 bits)
LR	Vertical	36. Arrival time	h,min,s	1 s	3
		37. Maximum amplitude, A_M	nm	1 nm	1
		38. Arrival time corresponding to A_M	h,min,s	1 s	3
		39. Period corresponding to A_M	s	1 s	1
		40. Maximum amplitudes for periods near 10, 20, 30 and 40 s	nm	1 nm	4
		41. Arrival time corresponding to amplitudes for the above periods	h,min,s	1 s	12
		42. Actual observed periods (item 40)	s	1 s	4
		43. Noise amplitude, A_N	nm	1 nm	1
		44. Period corresponding to A_N	s	1 s	1
LQ	Horizontal	45. Arrival time	h,min,s	1 s	3
		46. Maximum amplitude, A_M on each horizontal component	nm	1 nm	2
		47. Arrival times corresponding to each A_M	h,min,s	1 s	6
		48. Periods corresponding to each A_M	s	1 s	2
		(b) Standard parameters - type III stations only			
P	Vertical	49. Apparent slowness	s/degree	0.1 s/degree	1
		50. Epicenter azimuth	degree	1 degree	1
LR	Vertical	51. Magnitude M_L	-	0.1 unit	1
S	Horizontal	52. Magnitude m_{SH}	-	0.1 unit	1

* For photographic LP-instrument recordings amplitudes are measured with a precision of 0.1 mm and then converted to ground displacement with a precision of 1 nm.

Note: Phase identifications according to the International Seismic Code will be included for each wave type. Also note that the sequence in which the parameters will be transmitted from each station needs not be identical to the sequence in the table.

CHAPTER 4

Data format and procedures for Level 1 data transmission through the WMO communications network

Summary

The Ad Hoc group recommends that the International Seismic Code be chosen as the basic format for Level 1 data transmission. This code is already used by some ten countries to transmit limited seismic data through the WMO/GTS. Its use for the proposed Level 1 parameters will necessitate only a few relatively minor extensions. The most significant change will be the inclusion of a number of new types of indices in the format. The details of these changes will need to be agreed with other users of the WMO/GTS and also approved by the WMO prior to implementation in the proposed global data exchange.

In order to ensure the reliability of seismic data transmission on the GTS, formal arrangements similar to those now in effect for meteorological data will be needed. The lack of such arrangements is the main reason why significant data loss now occurs when transmitting seismic data on the GTS.

In view of the low error rates and the flexible provisions for retransmission of messages on the GTS, there will be no need for redundancy checks in the seismic data messages on the high-speed circuits. On the low-speed circuits, the error rates are higher, and the question of redundancy checks there should be studied further. A regular time schedule should be established for Level 1 data transmissions, avoiding the peak load hours for meteorological data.

A study conducted by the WMO on the expected capacity of the GTS to handle the envisaged Level 1 data transmission concluded that:

(i) Few problems are expected to arise in transmitting Level 1 data on the high-speed circuits of the GTS.

(ii) Difficulties are foreseen during days of peak load on certain low-speed circuits in parts of South America, Africa, South-western Asia and South-west Pacific.

It should be noted that the WMO study was based on a seismic transmission peak load expected to occur only a few times per year, as estimated by the Ad Hoc group, and that the expected average load is much lower. The Ad Hoc group emphasizes the need for it to further study this problem, both with the aim to give the WMO more accurate estimates of future transmission loads and also to take into account future developments within the WMO/GTS network.

4.1 Introduction

In its report CCD/558, the Ad Hoc group arrived at the consensus that for the exchange of Level 1 seismic data between the stations of the global network and the international data centers, use should be made of the Global Telecommunication System (GTS) of the World Meteorological Organization (WMO) because of its global availability, proven operation and low cost.

GTS is jointly operated and maintained by all Member States of WMO, and its task is to collect, exchange and distribute mainly meteorological data between national, regional and world meteorological centres. In 1970 it was decided to allow the use of the WMO/GTS system for transmission of seismic data, and some 10 countries are now using it for this purpose.

This chapter and its appendices discuss from a technical viewpoint the format and procedures that would apply to data transmission at Level 1. A study undertaken by the WMO on the capacity of the GTS to accommodate the envisaged data exchange is presented in Appendix 4.2.

4.2 Format for transmission of Level 1 data from stations to international data centers

In its report (CCD/558) the Ad Hoc group recommended, for transmission of Level 1 data, the International Seismic Code developed by the United States Geological Survey. This code has now been included as a special appendix in the WMO Manual on Codes, Volume I, following a decision by the WMO Commission for Basic Systems in November 1978. The recommended format has the following advantages:

- It is designed for telex transmission and can thus be used both in the WMO/GTS system and in commercial telex;
- It has already been in use successfully for a number of years for seismic data transmission;
- It is easily adaptable for transmission of more voluminous data.

The main purpose of the International Seismic Code has been to provide a means for rapid location of earthquakes.

In the existing seismic data exchange on the WMO/GTS, a short report of a seismic event will contain the identifier SEISMO, the serial number of the message, the station identifier for the seismic observatory, a seismic phase description and the precise time of occurrence. Longer messages may contain additional information, e.g. on secondary phases, amplitudes and periods of recorded signals and additional plain language information.

Level 1 data, which must be transmitted from stations in the global network to international data centers, are much more voluminous and contain new parameters compared to the seismic data now being transmitted on the GTS. Consequently it has been necessary to expand somewhat the existing format.

Appendix 4.1 provides a detailed description of the proposed expanded seismic format, and also gives an example of its actual use in the case of a strong seismic event recorded at an array station. Briefly, the necessary changes comprise:

- An expansion of the message numbering field
- Introduction of a number of new allowable identifiers of seismic parameters
- Allowing for amplitude/period information to follow later phases in a way similar to what is now done for first phases.

It is emphasized that the proposed format will need to be agreed with other users of the WMO/GTS facilities and modified if necessary. Approval by the WMO will also be required prior to its actual use in the proposed global data exchange.

Further studies will be desirable in order to make the transmission formats more flexible and in particular to reduce the volume of data transmitted for large events.

4.3 Reliability of Level 1 data transmission on the GTS

Data loss on the GTS

An observation made in CCD/558 and confirmed through more recent experience is that at present a significant amount of data loss (as much as 25%) occurs when using the GTS circuits for seismic data transmission. Information

obtained from WMO representatives indicates that data loss is mainly due to undefined recipients and happens because seismic data at present are being exchanged by bilateral or multilateral agreements and are not transmitted globally in an organized fashion like the meteorological data. If the proposed global network comes into operation, the necessary formal arrangements would be made, including proper training of operators at relaying centres. The seismic data would then be handled in the same way as meteorological data, and the reliability should become satisfactory.

Error rates

The GTS is operated with automatic error detection and correction procedures and the nominal transmission error rate on a GTS high-speed circuit is 10^{-7}. Thus, there is no need for redundancy checks in the transmitted data on the high-speed circuits. Error rates on the low-speed circuits are, however, higher and the question of redundancy checks there needs to be studied further. The GTS performance is periodically monitored, and statistics on seismic data transmission can be provided in the future.

Retransmission

By numbering messages sent from each station, a feature which is also provided in the GTS procedures, a request for retransmission of a specific message can be issued when a loss is detected. GTS procedures exist for such requests.

Times of transmission

The peak load for meteorological data occurs at 00, 06, 12 and 18 hours UTC each day, when regular global exchanges are initiated. (The heavy load usually lasts for 1-2 hours.) In order to obtain improved reliability the seismic stations should avoid these hours for data transmission. It is desirable that a regular time schedule be established for seismic data, at least for the daily routine transmission.

4.4 Capacity of the GTS for Level 1 transmission

The WMO/GTS network employs telecommunication lines of highly varying capacity. Present transmission rate on the Main Trunk Circuit (Appendix 4.3) is mainly 2400 or 1200 bps, while on remote connections it seldom exceeds 50 baud. On days of high seismic activity, the Level 1 data may become a significant load factor on some of the GTS circuits.

Based on estimates provided by the Ad Hoc group of the expected Level 1 data volume to be transmitted from stations of the global network, a study was conducted by WMO to assess the current capacity of the GTS circuits to handle this data flow. The results of the study are presented in Appendix 4.3; the main conclusions are:

(i) For those stations which will transmit their data on high-speed circuits (either 2400 or 1200 bps) it appears that few problems will arise even during days of peak load (i.e. days of exceptionally high seismic activity).

(ii) Difficulties are foreseen during days of peak load in transmitting seismic data over certain low-speed GTS circuits operating with the modulation rate of 50 or 75 bauds. In particular, relaying of seismic data from one GTS center to another will cause a considerable handling time at certain manually operated centres. These problem areas could be summarized as follows (for details, see Appendix 4.2.):

  (a) Western and southern parts of Africa, e.g. Central African Empire, Ivory Coast, Ethiopia, Kenya and Southern Rhodesia;

  (b) South-western part of Asia, e.g. Afghanistan and Iran;

  (c) Some parts of South America;

  (d) Some parts of the South-west Pacific region, e.g. New Zealand and Indonesia.

It should be noted that the WMO study was based on a seismic transmission peak load expected to occur only a few times per year, and that the Ad Hoc group expects the average load to be much lower. The Ad Hoc group emphasizes the need for it to study this problem further, both with the aim to give the WMO more accurate estimates of future transmission loads and also to take into account future developments within the WMO/GTS network.

4.5. Other considerations

National arrangements for use of the WMO/GTS

The telecommunications arrangements and other relevant organizational procedures between the national meteorological center and the authorities responsible for the seismic data are entirely a national matter. Each State should organize this connection in the best way to suit its available national facilities.

Distribution of seismic bulletins compiled by the International Data Centres

With a proper set-up, it is feasible to distribute bulletins from the international centers to the participating states via the GTS depending on the capacity of the circuits they are operating (high, medium or low speed circuit). The contents of such bulletins will be addressed in Chapter 6.

Use of other transmission media

The general use of the WMO/GTS for transmission of Level 1 seismic data should not preclude the supplementary use of other communications systems where these can provide efficient means of bilateral data exchange.

CHAPTER 5

Format and procedures for the exchange of waveform data (Level 2 data)

Summary

The global network will be composed of stations of heterogeneous data recording systems. Several different methods to implement waveform exchanges might therefore be applied, e.g.

(i) facsimile transmission of graphical recordings

(ii) transmission of data in numerical form over commercial telex, WMO/GTS or other data links

(iii) air mail delivery of magnetic tapes or seismograms (by scheduled air services or by International Data Post).

During an experimental exercise, all of these should be tested. If a global network comes into operation in the future, it would be necessary to concentrate on the speedy methods of communication (i) and (ii), using mail services only as a last resort.

At present, the WMO/GTS does not have the capacity to handle extensive Level 2 data exchange, and its use for this purpose in the future calls for careful study.

This chapter also specifies a recommended minimum volume of waveform data which might be requested for a seismic event. Each waveform transmission should be accompanied by the necessary technical descriptions of type of data, format and calibration information.

Data recording media and formats that might be encountered in a global network are described in a separate appendix to this chapter (Appendix 5.3).

Data centers should be equipped to handle waveform data supplied in any reasonable format.

5.1 Introduction

The Ad Hoc group's report CCD/558 defined Level 2 data as essentially waveforms but also included reviews of Level 1 data and special analysis of, for example, array data. The latter categories overlap with Level 1 procedures and consequently may be transmitted within a few days of a request being received.

Waveforms were recognized by the Ad Hoc group to be in a different category because they were generated in a variety of formats, all of which required processing before Level 1 methods for transmission, the WMO/GTS for example, could be used. Recognizing also that some stations may not be equipped for rapidly converting waveforms for this purpose, the Ad Hoc group proposed an interval of 4-6 weeks following a request (a 'worst-case' to allow for scheduled postal deliveries) but urged participants to make efforts to reduce the interval.

Members of the Ad Hoc group have in fact foreseen that long delays in receiving Level 2 data will be unacceptable on certain occasions and that it would be necessary to have agreed arrangements for dealing with urgent requests. The use of the fastest means of transmission at the participants' disposal would be invited in such cases. Existing procedures whereby the reduction in the time interval of waveform exchanges may be achieved are presented below before taking up the problem of formats.

5.2 Methods of implementing waveform exchanges

Scheduled air services could deliver original or copied waveforms to data centers within 14 days of posting from almost any station in the world. Countries co-operating in International Data Post would reduce this to 5 days. These countries are listed in Appendix 5.1.

Tests with facsimile transmissions using material recorded only ingraphical form indicate that the loss of resolution makes little or no difference to the analysis of the recording (though it may not be advisable for data centers to re-distribute data by the same method). In any case, experience shows that little is to be gained from digitizing an original paper seismogram. A facsimile installation can be employed at any station connected to a public telephone system and the time for getting requested waveform data to data centers thereby reduced to a day.

The recommended minimum volume of waveform data which might be requested from any station for a given seismic event is:

- 90 seconds of short period vertical component P-wave data (30 seconds of noise and 60 seconds of signal) at 20 samples a second

- 25 minutes of three-component long period recordings (5 minutes of noise and 20 minutes of signal) at 1 sample a second.

Longer data records should be supplied upon request. Some stations might be capable of recording digital data at a higher sampling rate, and such developments are encouraged by the Ad Hoc group.

Experiments have demonstrated the feasibility of converting short digital recordings to punched paper tape and then transmitting over the commercial telex or WMO/GTS. Stations having this capability would record digitally and be equipped with a small computer. Note, however, that at present the WMO/GTS does not have the capacity to handle extensive Level 2 data exchange, and its use for this purpose in the future calls for careful study.

The last method of transmitting digital data continuously as recorded (or as requested) to data centers via commercial communication satellites is worth mentioning because it also has been demonstrated to be feasible and reliable in practice.

To summarize, there is a variety of methods open to participants in an experimental exercise, the slowest and least expensive of which would ensure waveform data reaching data centers within 14 days of the requested data being dispatched. Every transmission would be accompanied by a complete specification of the recording media, formats and time corrections as well as instrument calibration information (Appendix 5.2).

If the global network comes into operation in the future, it would be necessary, in the interest of its efficient operation, to concentrate on speedy methods of communication, using mail services only as a last resort.

5.3 Recording media and formats of waveform data

Though the Ad Hoc group is agreed that a standard recording format is desirable, it recognizes that this ideal will not be achieved for the purpose of an experimental exercise and that one purpose of the exercise is to test the efficiency of a network composed of the existing heterogeneous recording systems. The group agreed that data centers should be equipped to handle waveform data supplied in any reasonable format.
Descriptions of these submitted by members of the Ad Hoc group are given in Appendix 5.3.

There are two main classes of recording media:

- graphic charts written by photographic, heat stylus or pen-and-ink methods
- magnetic tape, recorded by a frequency modulated analog or a digital system.

Graphic charts

One of the most widespread formats for chart recorders is that selected for the World Wide Standard Stations (WWSS) of which over 100 are installed worldwide. Recording is by galvanometric deflection of a light spot on photographic paper measuring 90 cm x 30 cm. The short period recording drum rotates once every 15 minutes and the long period drum once every hour. Each chart carries 24 hours of continuous data.

The standard stations of the Soviet Union have a similar recording format.

Waveform data recorded in this way have been exchanged bilaterally for many decades. More recently the data have been made accessible multilaterally by establishing World Data Centers A and B in the USA and the Soviet Union, respectively.

World Data Center A, for example, arranges for all co-operating WWSS and similar recordings to be sent for copying photographically to a standard microfilm with no discernible loss of resolution. Users simply buy the reproductions they require and study them at leisure with the aid of a film viewer.

In order to meet the requests of participants, data centers should be similarly equipped with facilities either for direct copying or for the production of reduced size film copies. The latter option is preferable since the most convenient and economical way of archiving paper chart records for the purpose of the exercise is on microfilm, the associated Level 1 data being stored digitally.

Analog recordings on magnetic tape

This type of recording is being replaced by digital recording on magnetic tape, but a few stations may transmit Level 2 data in this form. The format of these recordings is often to the standards set by Inter-Range Instrumentation Group (IRIG). Some analog systems, whichwere designed before these standards became widely adopted, do not follow convention in respect of the number of signal channels or tracks for a given tape width, but it is a simple matter to convert from one to the other.

Digital recording on magnetic tape

About half of the stations listed in Table 4.1 of CCD/558 use digital tape as their recording medium. Data recorded in this way are by far the most useful because they can be so readily handled and processed by computers. At the time of writing there are no internationally agreed standards for the properties, dimensions, labelling and formatting of digital tapes, but as common usage seems to be favouring two or three categories, it would not be too expensive or difficult for data centers to equip themselves with the facilities to read and transcribe accurately specified digital data tapes. The table given in Appendix 5.3 lists the specifications of digital data that might be encountered if the experimental exercise is implemented.

Data copying facilities differ considerably among existing digital stations. Some stations are capable of producing digital copies of waveforms almost immediately upon request. Others, e.g. the SRO stations, do not at present have provisions for magnetic tape copying, and this may cause delays in obtaining requested Level 2 data.

Data centers would distribute requests from stations in a form appropriate to the facilities of the stations of the global network and before the experimental exercise begins would declare for which of the listed formats they do not have appropriate facilities for handling. Specifications for digital data tapes which are in common use today are noted in Appendix 5.4.

CHAPTER 6

Procedures to be used for data analysis at International Data Centers

Summary

The purpose of the proposed International Data Centers would be to provide the States participating in the international data exchange with easily accessible data on seismic events for national assessments.

Data analysis at the centers should as a rule be performed using well-defined, automatic procedures. If considered necessary to improve the results, occasional interaction by a seismologist would be allowable. However, all such manual intervention would be documented alongside the results. Detailed technical procedures for seismic phase association, event location, depth estimation and magnitude determination are described in separate appendices to this chapter.

Identification data should be compiled and associated to each appropriate event. However, the centers would not make any assessment as to the nature of any event.

Results of the analyses should be reported preferably via the WMO/GTS, but this network could also be supplemented by bilateral or multilateral arrangements between States. The Data Centers would distribute preliminary bulletins as soon as the available data allow an event to be located. Final, detailed results should be distributed within one week of the event occurrence.

A data bank should be established at each International Data Center. The proposed file structures of such banks as well as the expected data volume are specified in detail in separate appendices. The files comprise inter alia:

- complete Level 1 data as reported by the stations
- event analysis results as given in the bulletins

- unassociated detections (i.e. station reports not found to correspond to any located event)
- complete records of requested Level 2 data.

All of these data files should be stored permanently. On request, the data centers would supply any data from these files in an agreed format, possibly through a computer-based information retrieval system.

Though the centers would normally conduct their tasks independently of one another, coordination of their activities is necessary. Furthermore, each center should regularly check its data files against those of the other centers, and any inconsistency should be resolved. These matters merit further study.

The Ad Hoc group recommends that further study be undertaken with the aim to incorporate new research results into the procedures to be employed at the international data centers.

6.1 Introduction

In its report to the CCD (CCD/558) the Ad Hoc group has recommended that more than one special International Data Center should be established for the global network. Such centers should be regarded as service facilities for the countries participating in the international data exchange, by providing these countries with easily accessible data for national assessment. The Ad Hoc group considers the main tasks for such international data centers to be: to receive data of Levels 1 and 2, to estimate origin time, location, depth and magnitude of seismic events from reported data, to associate reported identification parameters without interpretation of seismic events, to distribute the results of the analyses, and to act as archives for reported data and results of their analyses. Proposals for additional computations and data compilations relevant in this context, should be examined by participating countries before being put into practice. No assessment as to the nature of any event should be made at any International Center.

The main differences between these new seismological data centers and existing ones are that the new centers should work within short response time, that they should compile reported long and short period identification data, that they should give increased attention to the location of smaller events and that they should take part in the exchange of Level 2 data.

Furthermore, the operational procedures at the new data centers must, by necessity, be more strict and more precisely defined than those employed at the seismological data centers in operation today.

6.2 Organization of the data centers

In order to achieve a reliability acceptable to all, the Ad Hoc group proposed that more than one standardized international data center should be established. Each center would be required to provide free and easy access to all facilities designated 'international'. The procedures to be used at such centers should be agreed upon on the basis of the recommendations in this report. These procedures may be revised in the light of the experience gained through the operation of the international cooperative measures and also in view of new research results.

6.3 Procedures to be used for the estimation of origin time, location, depth and magnitude of seismic events

Association of arrival times and event definition

The association of arrival times should be carried out in a way that maximizes the probability of defining new events. The possibility that an arrival time might be associated with more than one event should be observed. An event should be defined from teleseismic P-waves and local P- and S-waves only. Other phases might be associated with the event but should not influence the decision whether an event should be accepted as such or not. A detailed description of the proposed association procedure is given in Appendix 6.1.

A key question is whether the association of arrival times and the definition of the events should be a purely automatic process or if a seismologist should be allowed to assist in the process. A purely automatic process would give identical results at all centers whereas a process involving subjective judgement by seismologists would not. At presently operating data centers the results of fairly straightforward association schemes are reviewed by seismologists.

The capability to establish a fully automatic process that will maintain a quality comparable to that obtained by the interaction by seismologists has not yet been demonstrated. Therefore, the following procedure is recommended: an automatic assocation and event definition program is used which takes into account not only

information from stations which have reported signals but also the fact that other stations have not detected any signals. This information is compared with a priori estimates of detection capabilities of the individual stations for events in various regions, to establish whether or not a certain association of arrival times fulfills a preset probabilistic requirement of defining an event. This procedure is described in Appendix 6.1.

Such an automatic processing should be the basic process at all the data centers. The results of an automatic process should however be reviewed at each data center by seismologists to ensure that a high quality seismic bulletin is compiled. If a seismologist has interacted with the automatic process, this should be indicated in the bulletin so that all manual intervention is documented.

Event location

Event locations should be carried out using primarily P-arrival times and a 3-dimensional (in space) location procedure described in detail in Appendix 6.1. For stations at short distances from the epicenter P- and S-times could be used if local travel times are available. For events where data from four or fewer stations are available directions and distances estimated by array stations should be used.

The minimum number of stations necessary to define and locate an event is:

Four single stations, not more than two of which are local stations.
One array station at teleseismic distance, and two single stations (with no restriction on distance).
Two array stations at teleseismic distances.

The Jeffreys-Bullen travel time curve should be used until an improved velocity model becomes available through the Standard Earth Model Committee of IUGG.

Local travel time curves related to the individual stations of the network should be used when available and necessary. Examples of such local travel time curves and the regions and distance intervals in which they are applicable are given in Appendix 6.2.

Data centers should be able to recompute locations if found necessary, e.g. if new data comes in or if an error is detected. Standard operating procedures should be established to cover such cases.

Depth estimation

Depth should primarily be estimated by the 3-dimensional location procedure described above. If later phases at at least 3 stations could be confidently interpreted as pP or sP, a depth estimation should be made and reported in addition to the 3-dimensional location. If the 3-dimensional location fails to estimate a depth, depth estimated from pP or sP should be given instead of the 3-dimensional. If readings from a local network are available, depths may also be based on data from at least 3 local P and S readings or a combination of data from at least 2 local and 3 teleseismic stations. If no depth could be estimated by either of these procedures, location may be made using a depth considered normal for that region. It should then be noted in the bulletin that the depth has been set to a predefined value. These matters require further study.

Short period magnitude estimates

Magnitudes based on reported short period P-wave amplitude (A) and periods (T) should be computed for all located events using the formula (Δ = distance in degrees).

$$m_b = \log \frac{A}{T} + f(\Delta)$$

where $f(\Delta)$ is given in Appendix 6.3.

Magnitudes should be reported as individual station values and average values. Magnitude estimates obtained by other procedures such as those described in Appendix 6.4, should be given further study.

Unassociated data

All reported arrival times and the additional data belonging to these phases, which cannot be confidently associated with any event, are called unassociated data. Such data are also reported and will be stored at the data centers.

6.4 Procedures and parameters to be used for the analysis of reported long period data

Association of long period data with located events

The task here is to associate the reported Level 1 Rayleigh and Love wave data with the events defined from short period data. Expected arrival times of Rayleigh and Love waves from all events to all long period stations are estimated for the periods 10, 20, 30 or 40 seconds at which the surface wave data are reported. These arrival times are estimated using two velocity models, one for continents and one for oceans. The velocities at the various periods for the two models and the two wave types are given in Appendix 6.5. This Appendix also specifies continental and oceanic areas.

The association of a reported Rayleigh or Love wave arrival with an event is made using basically the arrival time information estimated as above. At present, a difference of up to 5 minutes between observed and estimated times is acceptable for an observation. To establish that surface waves have been observed for a certain event, signals should be associated at not less than (i) 3 single stations, (ii) 2 single stations and 1 LP-array with the capability of estimating direction of arriving LP signals or (iii) at 2 LP arrays both having the capability of estimating the direction of the arriving LP signals. These matters merit further study.

To further avoid misassociation of surface wave data an automatic process should be used to assess according to a special procedure described in Appendix 6.6 whether or not a time association should be accepted or, in case of two or more possible time associations, choose the most likely one. In this procedure, the reported amplitude information and also the fact that certain stations may not have reported any arrival is used. As in the case of a similar program for the analysis of short period data, the results should be reviewed by a seismologist and when any manual intervention has been made, this should be noted in the bulletin.

Unassociated data

Long period data which cannot be associated with any short period event are regarded as unassociated and will be reported and stored as such.

Surface wave magnitude estimates

Magnitudes M_s based on reported long period Rayleigh wave (vertical component) zero-to-peak amplitudes (A) in nanometers and periods (T) in seconds should be computed for all events to which Rayleigh wave observations have been associated by the above procedure. The following formula should be used for distances ( ) greater than 20 degrees:

$$M_s = \log\left(\frac{A}{T}\right) + 1.66 \log\Delta + 0.3$$

At shorter distances, regionally dependent formulae would be needed and this will require further studies. Magnitudes should be reported as individual station magnitudes and average magnitudes. Procedures for estimating surface wave magnitudes and upper bounds on such magnitudes, as described in Appendix 6.4, should be given further study. Note: The present International Seismic Code requires surface wave amplitudes to be measured in micrometers, while the unit nanometer is recommended here.

6.5 Data to be used and information to be reported from data centers to the authorized government facility of each State as a result of their analysis of Level 1 data

Data received within 5 days after the occurrence of an event will be used in the analysis of the event. Later incoming data will not be used in the analysis unless a participating country requests a new computation. If a station of the network has not reported all Level 1 data for an event, a data center could make a request for additional data needed for its computations. Similarly, if gross errors in data reported by a station appear to have occurred, a data center could request a confirmation of the earlier reported data.

Hypocenter computations should be carried out daily, using the data available at that time. Preliminary bulletins containing basic information only (see below) should be distributed as soon as available data allow an event to be defined. These computations should be upgraded daily as more data become available. The final results should be distributed within one week of the occurrence of the event and contain both the basic and the detailed information.

The results should be reported preferably using the WMO network. The individual data centers might also have computer-based systems for the retrieval of this information so that countries seeking special agreements could get the processed

data over telephone lines by dialing a special number. Special communication arrangements might also be made between the various data centers. The following information should be reported for each event to the authorized government facility of each country:

Basic information

Date)
Origin time)
Latitude) + error estimates
Longitude)
Depth)

Depth estimation method should be indicated. Events assigned a **predefined depth** could be marked with a special symbol. The error estimates should not reflect the fit of the data to the computational model but rather indicate the actual uncertainty involved.

Average m_b and M_s value, and corresponding standard deviations.

All reported identification data. The compilation and presentation of such data should be given further study.

Number of stations used in the location and in the estimation of the other parameters.

An example of a possible format of a bulletin from an international data center is shown in Appendix 6.7.

Detailed information

For each station associated with the event:

Reported arrival time and difference between this and the time predicted from the hypocentral solution

Reported amplitude, period and identification data

Reported additional phases and associated information

Estimated short- and long-period magnitudes for each station.

Proposals for compilations based on reported Level 1 data requested by participating countries must be examined and agreed to by all participants before implementation.

Unassociated data could either be reported on a corresponding regular basis or could be made available on request.

6.6 Data banks for reported Level 1 data and analyzed data to be established at the international data centers

All data that have been received at the data centers should be stored in an input data file. The results of the computations as given in the bulletin should be stored together with all the unassociated data in an output data file. This file will also contain the additional computations and compilations that have been requested. The process carried out at each data center will be recorded on an internal 'book-keeping' file. The content and format of the data files are addressed in Appendix 6.7.

Data should be made available from these files either in the form of alphanumeric printouts or on digital magnetic tape in the specified format. Data centers might in addition also provide the data through a computer-based information retrieval system.

All these files should be kept indefinitely. The integrity and redundancy of the data should be ensured by having data stored on at least two physically different recordings, e.g., two magnetic tapes stored at different places. The quality of the data should be controlled annually.

6.7 The tasks of the international data centers in connection with Level 2 data

Requests for Level 2 data should be made by the authorized government facility (AGF) of the requesting country through one of the data centers to the authorized government facility in the country from which data is requested. Responses to requests for Level 2 data should also be made through the actual data center. Data centers should register all requests and responses to requests and also notify the other data centers and the participating countries through their AGF's.

The actual handling of Level 2 data at the data center has so far been only briefly discussed in the Ad Hoc group. As far as digital data on magnetic tape are concerned it seems to be reasonable that such data could be compiled at data centers onto event tapes in a way similar to the present compilation of the SRO tapes. Data centers could also produce and provide plots of data as requested. An archive for such requested data could be established at the data centers. It might also be possible that one or more data centers are equipped to receive and to transmit Level 2 data by high-speed computer communication systems and to store these data in such a way that they are accessible by the individual AGF through a computer-based information retrieval system.

For data which are not in digital form, e.g., analog tapes and conventional seismograms, it might be technically difficult to involve the data center in the compilation or reformatting of such data. Data centers might rather only forward such data to the requesting country after microfilming the visual recordings.

6.8 Technical interaction between the data centers

Communication and interaction during the processing of Level 1 data

As all Level 1 data are sent to all international data centers and as the processing of these data is carried out using a well-defined procedure, there should be no need for any continuous communication between the centers, during the processing of these data. Data missing at one center may, however, be retrieved at another center. Bulletins produced at the individual centers should be sent also to the other data centers.

Coordination of the Level 1 data banks

The input data files, which should be identical at all data centers, should be checked regularly, e.g., once per year, against each other by exchange of magnetic tapes or by other technical arrangements that might be appropriate for the individual centers. The original bulletin files of the individual centers might differ somewhat for the events which have been processed by analyst interaction. For such events the centers should exchange the results. The final bulletin files should be identical at all the centers and all different solutions of an event should be included in the files. Also these output files should be checked regularly between the centers in the same way as the input data files.

Coordination of the Level 2 data exchange

A center receiving a request for Level 2 data should notify the other centers of that request. Level 2 data received by one data center as a result of a request should be forwarded also to the other centers. The Level 2 data bank, obtained as a result of the responses to requests by individual countries, at each center should be identical and checked regularly in the same way as for the other data files.

6.9 Data volumes and equipment at Data Centers

Data volume at Level 1

The number of events recorded by stations in the global network, which again determines the volume of Level 1 data, depends on a number of geophysical and other factors. The basic factors are:

- The level of seismic activity at the time
- The level of seismic noise normally occurring at the station
- The location of a station relative to the highly active seismic zones
- The sensitivity of the equipment and the manner in which it is installed in the station
- The methods used to distinguish signals from noise.

The number of signals recorded at individual stations over a 24-hour period may vary considerably from a few to 100 or more, depending on the factors listed above. For the sake of simplicity in calculating the data flow from stations to a center, we will here assume that over a 24-hour period each station records an average of 50 signals. In practice, this will give an upper bound on the expected data volume, since the actual average number of reported events will probably be lower.

The calculation is summarized in Appendix 6.8, and shows an expected volume of Level 1 data of approximately 160,000 computer words (16 bit) per day to be received at each international data center. In addition to storing these data, the centers would need to store results of their analyses of each event as well as certain book-keeping information (Appendix 6.7, 6.8). This additional information is much less voluminous and a rough estimate of the total Level 1 data volume stored per day at each data center is 200,000 words. In a year this would amount to about 75 million computer words. Fifteen digital magnetic tapes (1600 bpi) would be sufficient to store this information, and thus long-term archival storage of all Level 1 data would not represent a problem for a modern computer installation.

Volume of digital data at Level 2

There is at present little experience on the amount of Level 2 data to be requested. We will here assume that 60 events are requested annually from each of 25 digitally recording stations and that short period vertical and 3-component long period data are of primary interest. We further assume that 90 sec of short period (20 Hz sampling rate) and 25 minutes of long period records (1 Hz sampling data) are requested from each station for each event. The expected annual Level 2 data volume would then be around 8 million 16-bit words. This corresponds to about two 1600 bpi digital magnetic tapes per year. Even if the actual amount of Level 2 data increases substantially above this estimate, it would still be small compared to the data volumes handled at digital seismograph stations today.

Equipment at data centers

In CCD/558, Chapter 8c, the computer facilities needed to carry out the analysis and handling of Level 1 data are described. To handle the copying of Level 2 digital data, a small computer equipped with a number of magnetic tape stations would be needed.

A possible configuration of the computer equipment at a data center is given in Appendix 6.9.

CHAPTER 7

Conclusions and Recommendations

In its first report, CCD/558 of 14 March 1978, the Ad Hoc group pointed out that essential aspects of the proposed data exchange would be new to current seismological practice and that it therefore did see a need for experimental investigation of these aspects. For this purpose, the Ad Hoc group described, in Chapter 9 of CCD/558, the scope and duration of an experimental exercise to test the functioning of the whole system.

In this the second report by the Ad Hoc group, important aspects of the envisaged data exchange are elaborated and reproduced in Chapters 3, 4, 5 and 6. The chapters contain a discussion and a technical description of data centers and their functions and of the parameters to be exchanged. Furthermore, there is an investigation of the capabilities of the WMO/GTS network to transmit seismic data in various parts of the world. This material provided a basis for detailed discussion in the Ad Hoc group of the scientific and methodological principles of a possible experimental test of a global network of stations for the international exchange of seismological data.

In regard to the full scale experiment already discussed in the first report of the Ad Hoc group, there was as before, general agreement in the group on the technical content required for such a joint and global exercise. However, a number of questions need further study.

The implementation of a joint and global test or exercise of essentially all the functions of the data exchange would require considerable physical and political commitments by States. These matters are outside the scope of the present mandate of the Ad Hoc group.

The Ad Hoc group was also informed about experiments involving international co-operation between States on a scale smaller than that of the whole data exchange system. On this scale essential matters are outside the scope of the present mandate of the group.

The Ad Hoc group came to the conclusion that national investigations of essential aspects of the envisaged data exchange system be encouraged. In particular the group sees a need for investigations on how best to deal with the increased speed and volume of data and analyses at stations, into the conditions for the use of the WMO Global Telecommunications System network for data exchange of analysis and data handling programs to be used at the envisaged data centers and into methods of rapid exchange of waveform data.

In summary, the Ad Hoc group recommends:

(a) that the Ad Hoc group be given a new mandate

- to continue the elaboration of detailed instructions for an experimental test of the global system with its second report as a basis;

- to continue its work on the further development of the scientific and technical aspects of international cooperative measures to detect and identify seismic events;

- to cooperate in the review and analysis of national investigations;

(b) that investigations, on a national level,

- into the conditions for using the WMO Global Telecommunication System for seismic data exchange;

- into procedures to obtain desired data at individual stations under various conditions;

- into analysis and data handling procedures at the envisaged data centers; and

- into methods of rapid exchange waveform data

be encouraged;

(c) that the Ad Hoc group report thereupon to the CD;

(d) that the CD invite the WMO to continue its cooperation with the Ad Hoc group.

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CD/43/Add.1
25 July 1979
Original: ENGLISH

SECOND REPORT OF THE AD HOC GROUP OF SCIENTIFIC EXPERTS TO CONSIDER INTERNATIONAL CO-OPERATIVE MEASURES TO DETECT AND IDENTIFY SEISMIC EVENTS

Appendices

GE.79-63155

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APPENDICES TO CHAPTER 3

APPENDIX 3.1

Technical instructions for extracting Level 1 parameters at seismic stations

In this appendix a detailed description is given of how Level 1 data should be extracted from SP and LP instrument recordings at stations of the global network. Reference is made throughout to parameters specified in Tables 3.1 and 3.2. By necessity, this appendix is written in a rather technical language, and the reader is referred to Chapter 3 of CCD/558 for a non-technical description of the basic principles involved.

A3.1.1 General specifications

(i) Time

Most modern seismograph stations maintain a timing accuracy of 0.1 seconds; however, it may become temporarily more uncertain. In that case the timing uncertainty should be reported. Because of the high accuracy of time measurements the problem of instrumental time delays must be noted. For WWSSN-SP instruments at 1 Hz: phase delay time is about 0.3 s, group delay time is about 0.4 s.

(ii) Seismographs are roughly divided into two classes:

1. Short period (SP) instruments having peak response at periods of the order of 1 second or less;
2. Long period (LP) systems with peak response at longer periods, up to 30 s or more; long-period instruments are here taken to include also those generally termed medium-period or broad band.

Note, however, that modern digital broad band stations have the capability of extracting signals in both the SP and LP bands.

(iii) Seismic noise is measured in the different period ranges corresponding approximately to the frequencies of main seismic signals, i.e., on records of SP seismographs (T = 0.2 - 1.0 s) and on records of LP seismographs (T = 2 - 8 s and T = 10 - 30 s, respectively). All measurements are made in the section of the recording preceding the first arrival.

A3.1.2 Standard parameters reported by participating staitions from short-period vertical seismographs

1. First arrival

On a visual record first arrivals are defined by a certain change in amplitude or phase. The time reading, after being corrected, is given in hour, minute, second and tenth of a second in Universal Coordinated Time (UTC). Some stations may be able to report one-hundredth of a second. If the applied time correction is uncertain (clock problems) by more than ±0.1 s it must be reported in qualitative remarks. The first arrival should always be identified, if possible, by one of the standard symbols. The symbols (phase codes) used by the Interantioanl Seismological Centre are recommended.

2. First motion sign and clarity

The clarity of the phase should be denoted by i if it is readable to an accuracy of at least ±0.2 s, and by e if it is more uncertain, between ±(0.2 and 1.0) s. Note that e and i denote the accuracy of the timing rather than the character of the recording which may depend on the paper or film speed. If the uncertainty in the onset of the first arrival is greater than ±1.0 s, (e) should be used.

Direction (or sign) of the first motion on the vertical SP and LP components (C or D, U or R) should be reported (see also subitem 23 below). In cases of complicated wave patterns (small onsets followed by large onsets) the first visible motion is read. Do not report the direction if in doubt. If possible the first motion on the LP horizontal components should also be reported. First motion notations:

C short-period compression
D short-period dilation
U long-period compression
R long-period dilation
V long-period movement on the NS component, direction to the North (the code N cannot be used because PN would then be ambiguous)
Y ibid., direction to the south
E E-W component, direction to the east
W ibid., direction to the west.

The clarity index precedes the phase identification, the first motion index follows it. The first motions from SP and LP instruments do not need to agree.

3. P-wave amplitudes

Ground amplitudes A_i of the first phase are to be determined from maximum trace amplitudes using the instrument's response curve. Trace amplitude is measured as the center-to-peak deflection from the median line or may be obtained by halving peak-to-trough deflection of symmetrical waves.

The ground amplitudes are reported to a precision of 0.1 nanometers (i.e., 10^{-10} meters). Since the upper limit for an absolute calibration of seismographs is 5-10%, it is understood that the amplitude cannot be measured with a better accuracy. The amplitudes for the first phase should be measured to the maximum deflection within the intervals, 0-6 s, 6-12 s, 12-18 s and 18-300 s, according to the duration of the wave group.

4. Associated times

The time associated with each reading of amplitude and period is reported; it should be measured as illustrated in Figure A3.1.1.

5. Associated periods

Periods corresponding to each A_i are measured at zero crossings or between two neighboring peaks or troughs. Periods should be read to one-tenth of a second.

6. Seismic noise amplitude

The maximum noise amplitude at a frequency close to that of the signal should be measured and converted to ground amplitude in nm. This amplitude is measured within 30 seconds before the first onset and reported for each event. The signal-to-noise ratios can then be determined using A_i (sub-item 3) at data centers.

7. Noise period

The period corresponding to the maximum noise amplitude is measured in a way similar to that described under 5.

8. Secondary phases

A standard notation for all phases is that used by the International Seismological Centre. Arrival times of identified but also clear unidentified secondary phases should be reported. Hour is reported only if it is not the same as the hour of the preceding phase. Identification of phases is more confidently carried out at data centers; however, advantage should be taken of experienced interpreters at individual stations. For the clarity i or e are used. Measurements of arrival time, maximum recorded amplitude and corresponding period of secondary phases follow the same rules as mentioned under 1, 3, 5; however, only one maximum amplitude is measured. It is important that among secondary phases pP and sP are reported.

9. Complexity

10. Spectral moment, ratio or vector

There are no standards for calculating the parameters under 9 and 10. Before a universal agreement is reached, it is recommended that stations computing these parameters should describe the procedure they use. Note that the complexity and spectral ratio parameters will be reported only by certain stations of specialized capabilities within the global system.

43.1.3 Standard parameters to be reported from short period horizontal seismographs

11. Phase identification and arrival time of the S wave

The time is reported to 0.1 s.

12. Clarity of the S phase

Reported as 1 if readable to an accuracy of 1.0 s or better, as e otherwise. Note that the S phase onset is seldom, if ever, legible to within the + 0.2 s required for using clarity index 1 for P-waves.

13. Maximum amplitude of short period S

Measured within the first 10 seconds of the S wave for both the NS and EW components. The respective arrival times should not differ by more than one half signal period, so that the amplitudes can be combined vectorially.

14. Corresponding arrival time

Reported for both components in hours, min, s.

15. Corresponding period

Reported to 0.1 s precision.

16. Secondary phase descriptions

Reported as under item 8.

43.1.4 Additional standard parameters from arrays of short period vertical seismographs

This category of parameters concerns arrays of vertical short period seismographs, including arrays of digital broad ban seismographs with short period filtering capability.

Each array station reporting the following parameters (17, 18, 19, 20, 21), should publish a description of its procedures of determining these quantities before standardized guidelines are elaborated. The parameters nos. 17 and 18 will be used for locating events at the data centers, using an agreed travel-time

derivative table for this purpose, it is therefore not essential for each array station to produce and report the parameters under 19 and 20.

17. Apparent slowness

Determined with the precision 0.1 s/deg. At medium aperture arrays the slowness and direction of an arriving P wave could be obtained as a least squares fit of arrival times, or time differences, to a wave front. It can also be obtained with lower accuracy by fixed search programs.

18. Epicenter azimuth and distance

Reported to 0.1° or to the accuracy that is judged to be realistic in each case. Note that the asimuth corresponds to the station to epicenter direction.

19. Epicenter latitude and longitude

The epicenter coordinates should be reported to 0.1° or to the accuracy that is judged to be realistic in each case.

20. Origin time

Estimated and reported as hours, minutes, seconds.

21. Magnitude

Whenever epicenter distance is known, magnitudes will be determined using the vertical component short period P waves and the procedure recommended by the IASPEI Commission on Practice (Appendix 3.2).

A3.1.5 Standard parameters to be reported from long-period seismographs

Reporting should preferably be grouped by event, rather than by instrument and readings of a particular phase from different instruments should be grouped together.

Long-period P - vertical component

22. Phase identification and arrival time

Phase identification, arrival time and clarity (i or e) should be given even if a short-period initial arrival is reported. In order to avoid separate reporting of long-period arrival times being treated as a new event if different from short-period arrival time, one must indicate that the same arrival is referred to. (Grouping of the reportings for the same event would usually take care of this.)

23. First-motion sign and clarity

The comments under 2 apply here. Note that first-motion readings are desirable also on the LP horizontal components.

24. Maximum amplitude A_M

For long-period P, only one amplitude measurement (the maximum one) is required. Reporting precision is 1 nm.

25. Arrival time corresponding to A_M

Reported to a precision of 0.1 seconds.

26. Period corresponding to A_M

Reported to a precision of 0.1 seconds.

27. Noise amplitude A_N

The maximum noise amplitude is measured within 1 minute before the first onset on the vertical component, converted to ground amplitude in nm and reported for each P-wave reading. Period range 2-8 seconds.

28. Period corresponding to A_N

The period in seconds corresponding to the maximum noise amplitude is reported.

29. Secondary phase description

See subitem 8.

Long-period S - horizontal components

30. Arrival time

Phase identification and arrival time (to a precision of 1 second) are reported for one component.

31. First-motion clarity

See subitem 12.

32. Maximum amplitudes A_H

Measured separately on each horizontal component, within the first 40-60 seconds of the S wave. The measurements should be carried out at times differing by no more than one half signal period.

33. Arrival times corresponding to each A_H

Reported for both components in hour, min, s.

34. Period corresponding to each A_H

Reported to 0.1 s precision.

35. Secondary phase description

Reported as under item 8.

Rayleigh waves - vertical components

36. Arrival time of LR

The onset time of LR is hard to read and the clarity is strongly dependent on signal-to-noise ratio. The onset time is specified to the nearest second, but must usually be considered very uncertain.

37. Maximum amplitude A_M

Amplitude of the maximum deflection is measured on the vertical component and reported in nm.

38. Arrival time corresponding to A_M

Indicated in hour, min, second.

39. Period corresponding to A_M

Reported to a precision of 1 second.

40. Other maxima A_{max}(LR)

Maximum amplitudes A_{max}(LR) with periods of 10, 20, 30 and 40 seconds (within $\pm$ 10%) on the vertical component; reported in nm.

41. Times of the maxima A_{max}(LR)

Times are given corresponding to the four different maxima, with a precision of 1 second.

42. Corresponding periods

The actually observed periods of the other maxima of LR waves are reported in seconds.

43. Seismic noise amplitude, A_N

Largest amplitude of seismic noise with period between 10-30 seconds is measured on the vertical component within 5 minutes of the section of the record preceding the event. The ground amplitudes in nm are reported.

44. Noise period corresponding to A_N

The period is reported to a precision of 1 second. Note, however, that the long-period noise may be irregular and it is often difficult to determine the period accurately.

Love waves - horizontal components

45. Arrival time of LQ

Reported to a precision of 1 second on one of the horizontal components. Note that in the same way as for LR (item 36), LQ onsets are hard to determine accurately.

46. Maximum amplitudes A_M

Maximum ground amplitudes of LQ on the NS and EW components are reported in nm. The respective time of measurements should not differ by more than one half signal period.

47. Arrival times of A_M

The respective times of A_M on the two components are reported to a precision of 1 second.

48. Periods corresponding to A_M

Reported for each horizontal component; precision 1 second.

A3.1.6 Additional standard parameters from arrays of long-period seismographs

49. Apparent slowness

Reported for the vertical component of the P-wave only. Precision 0.1 s/deg, see also no. 17.

50. Azimuth

Azimuth can be determined not only for large arrays with digital recordings, but also for small arrays by measuring the time difference on and analog recording between the arrivals of the same wave peak in a wave train at all stations (this applies also to No. 49). The parameter helps to associate LP with SP data.

51. Surface wave magnitude M_S

Magnitude based on vertical LR waves determined using the procedure recommended by the IASPEI Commission on Practice, precision 0.1 unit. Measurements should be made directly from amplitude and period without application of station corrections.

52. Magnitude M_{SH}

Magnitude M_{SH} based on short or long period horizontal component S measurements is determined.

A3.1.7 Qualitative remarks

It is very important that the report is accompanied by remarks of the experienced analyst qualifying, if possible, the character of the event as seen from the visual inspection of the record or by a more sophisticated analysis. The following remarks are suggested:

Local: event judged to be within approximately 150 km of the station.

Regional: event judged to be within approximately 800 km (excepting local events)

Quarry blast: event announced by responsible authorities as a quarry blast, total charge in tons and coordinates should be indicated if known; events having a record typical for blasts according to the analyst's experience should be also indicated by 'possibly quarry blast' even if no official announcement is available.

Rock burst: event announced by authorities or qualified to this category by a typical wave pattern.

Mixed events: two events overlapping and causing some confusion in reading an interpretation; if possible, they should be identified (local, distant, etc.).

Multiple (double) event: complex wave pattern particularly in the P-wave group justifying such statement according to the analyst's experience.

Deeper than normal, intermediate: qualification made by the analyst if the wave pattern and amplitude ratios of main phases warrant it.

Uncertain time: if the time correction is uncertain by more than $\pm$ 0.1 because of clock problems.

The above parameters are transmitted within double parentheses according to the International Telegraphic Seismic Code (see Chapter 4).

A3.1.8 Signal duration DUR and local magnitude M_L

In case of local and regional events, these parameters, as measured on short period recordings, may be reported as well as amplitude and period.

A3.1.9 Down-time information

It is very important to keep records of the time intervals when a station has been out of operation, and such information should be communicated when applicable.

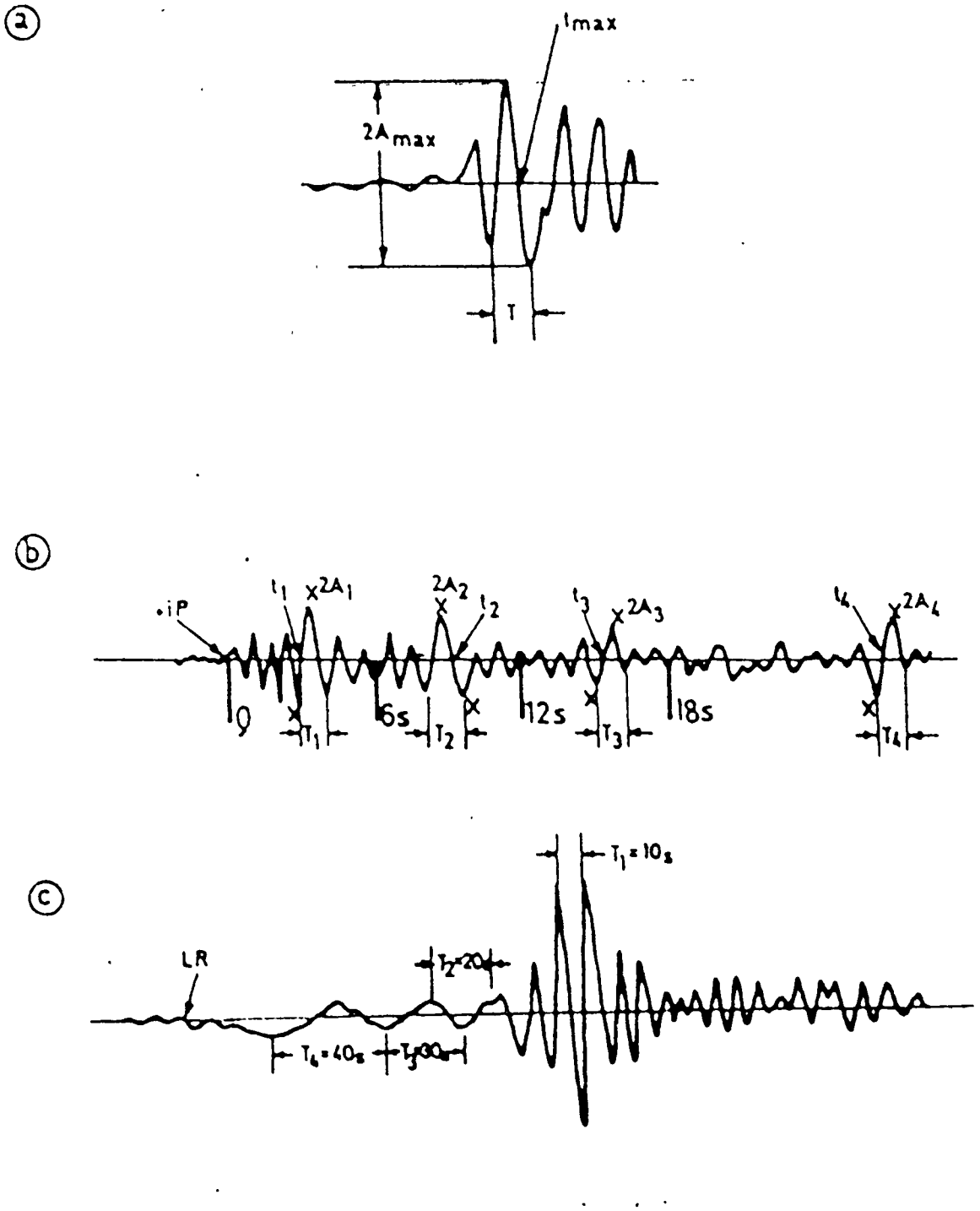


Figure A3.1.1 Illustration of rules for measuring wave amplitude, period and time of maximum oscillation (a), kinematic and dynamic parameters of SP records (b) and spectral parameters of LP records (c).

APPENDIX 3.2

Instructions for measuring amplitudes and periods for magnitude determination from observations at regional and teleseismic distances

IASPEI COMMISSION ON PRACTICE
SUBCOMMISSION ON MAGNITUDE

Revised draft, September 1978

Note: These instructions have been included only as a reference to ongoing standardization work in the seismological community, and should not be interpreted as necessarily representing the views of the Ad Hoc group

The determination of earthquake magnitude is based on observations of amplitude A and period T of seismic waves. It is essential for subsequent earthquake studies to report the time that an observation of A and T is made.

The amplitude of a seismic signal on a record is defined as its deflection from the base-line. It is important that A, T, and the time of the observation should be measured for each of the phases P, S, and L waves.

For many phases, and particularly surface waves, the record is symmetrical about the base-line and amplitude may be determined either by direct measurement from the base-line or by halving the peak-to-trough deflection. For phases that are strongly asymmetrical the amplitude should be measured as the maximum deflection from the base-line.

The amplitude and period from the vertical component is the most important. If horizontal components are available, readings from these should also be reported. They should be measured at the same time on the record so that the amplitudes can be combined vectorially.

The period T corresponding to the amplitude A is measured in seconds between two neighboring peaks, or two neighboring troughs, or ideally from trace crossings of the base-line.

P-Waves

The P-wave amplitude measured should be that of the maximum trace deflection usually within the first 25 seconds of the first onset, but this interval may be extended up to 60 seconds for large earthquakes recorded on broad-band

instruments. When more than one component is available, the amplitude from each should be reported separately.

The observation time should always be measured as the time to the first peak or trough of the trace cycle being measured. This need only be estimated to the nearest 1 to 2 seconds.

The amplitude measured on the record should be converted to ground motion in nanometers using the amplitude-period response curve of the instrument. When several instruments of the same type operate at the same station or when several instruments of different frequency response are available, the amplitude and period from each should be reported separately.

S-Waves

The measurement of amplitudes and periods on the seismograms is performed as described above. It is recommended that if possible the beginning of the S-wave be checked against travel-time tables. The amplitude and period should be selected in the interval up to 40-60 seconds after the beginning of S-waves.

L-Waves

The measurement of amplitudes, periods and times of observation on records is performed as described above for the maximum deflection and for the largest amplitude in the 17-23 second period range of the surface wave train.

The measurements for horizontal components should be carried out at the same time of arrival allowing for a difference of less than one period.

For large earthquakes when mantle waves are often recorded, amplitudes and periods of the vertical and horizontal components with the period of about 200 seconds should also be measured.

The observations of A and T for all phases mentioned above should be included in station reports. Itg is essential in reporting such observations that the type of instrument used is clearly stated. For this, the classification given in the 'Manual of Seismological Observatory Practice' may be

used. Broad-band instruments are preferred for all measurements of amplitude and period.

Note: Seismograms can be very complicated and, ultimately, the selection of a particular measurement must be left to the observer's experience.

Instructions for measuring amplitudes and signal durations for magnitude determination of local earthquakes

Amplitude measurements

For local earthquakes, i.e., those where the S-P interval is less than 2 minutes recorded on short-period instruments, it is not always possible to measure the period of seismic waves so the maximum trace deflection (converted to ground motion) and time of observation should be reported.

Duration measurement

For local earthquakes, stations should report the signal duration defined as: the time in seconds between the first onset and the time the trace never again exceeds twice the noise level which existed immediately prior to the first onset. Very often local earthquake recordings will cause high-gain, short-period instruments to saturate, thereby making an amplitude reading impossible even for small seismic disturbances. Therefore, to provide the data with which to derive relations for duration magnitudes that are based on signal amplitude magnitudes, both types of observations should be made on as many of the same earthquakes as possible.

As with regional and teleseismic data, the type of instrument and where possible the period of the peak of the response curve used should be clearly stated.

APPENDIX 3.3

Example of a bulletin from a seismic station

Table A3.3.1 shows a possible format of a seismic bulletin and at the same time gives an example of how it should be completed when processing a recording of a strong seismic event. The format of a special bulletin used at seismic stations in the USSR has been used as the basis. In the proposed global system, the time period covered by each bulletin would normally be one day. The table should be considered only as an example, and further work is required for the development of a final bulletin format.

Each sheet of the bulletin carries the name of the station, the month and year, the number of the bulletin (bulletins are numbered in sequence for each year) and the page number. In addition, the time interval of the reporting period, the geographical co-ordinates of the station and its altitude above sea level are entered on the first sheet of each bulletin.

In column 1, the numbers of all the seismograms are given (a single numbering system is used for all types of instruments installed at the station). If no earthquakes are identified in the seismogram, the words 'No earthquakes noted' are entered under the seismogram number.

In column 2, the serial numbers of the recorded seismic signals in the seismograms are listed. Signals are numbered in sequence during each year.

In column 3, the date of each signal is shown.

In column 4, the type of wave recorded and the first-motion sign and clarity are given. If the type of wave is not precisely determined, the designation of the wave is placed in brackets. Clear first motion is designated by the letter 'i' and an unclear first motion by the letter 'e'. In the event of first arrival of the signal, the first arrival sign is indicated. A '+' sign corresponds to upward motion (compression phase) on the vertical component and to N and E on the horizontal components; a '-' sign corresponds to downward motion (dilatation phase) on the vertical component and to S and W on the horizontal components.

In column 5, the abbreviated designation of the instrument and of the component for which the wave arrival time is determined are given.

In column 6, the wave arrival time (hour, minute and second) is given. The precision of measurement of the arrival time is to 0.1 s with an SP instrument and to 1 s with an LP instrument.

In column 7, the single (0-P) amplitude of the recorded oscillation in the wave in question is shown in millimeters. The mesurement precision with an SP instrument is to 0.1 mm and with an LP instrument to 1 mm.

In column 8, the displacement amplitude for the wave whose recorded amplitude is shown in column 7 is given in nanometers. The precision of measurement is to 0.1 nm.

In column 9, the period for the wave amplitude indicated in column 7 is shown in seconds. The precision of measurement for body-wave periods by both SP and LP instruments is to 0.1 s and for surface waves with LP instruments to 1 s.

In column 10, the noise amplitude for the instrument and component in question is shown in nanometers. The precision of measurement is to 0.1 nm.

In column 11, the noise period is shown in seconds, with precision to 0.1 s for an SP instrument and to 1 s for an LP instrument.

In column 12, the apparent velocity determined for P and LR waves is given in km/s, with precision to 0.1 km/s.

In column 13, the azimuth from the station to the epicenter of the event is shown in degrees, with precision to 0.1 degrees.

In column 14, the epicentral distance is shown in degrees, with precision to 0.1 degrees.

In column 15, the value for the magnitude m_b is shown in the line where the value of the maximum P-wave amplitude recorded with an SP instrument

(vertical component) is entered; the value of magnitude M_{SH} in the line where the value of the S-wave A_M recorded with an SP instrument (horizontal component) is entered, and the value of magnitude M_L in the line where the value of the L-wave A_M recorded with an LP instrument (vertical component) is entered. The magnitude values are determined with precision to 0.1 units.

In columns 16 and 17 the values of the co-ordinates of the epicenter - latitude (ϕ) and longitude (λ) - are given in degrees, with precision to 0.1 degrees.

In column 18, the time at the focus when the event originated (hour, minute, second) is given with precision to 1 s.

Column 19 is provided for analyst remarks. If possible, the type of the event recorded ('local earthquake', 'quarry explosion', 'mixed with another event', etc.) should be indicated under this heading.

Columns 1 to 11 contain data compulsory for all types of stations, and columns 12 to 18 data which can be obtained only at type-III stations.

BULLETIN No.

Table A3.3.1

From 22 September 00 hrs to 23 September 00 hrs 1978

Seismic station "_____"

φ = λ = H =

Subsoil _____

No. of seismogram	No. of seismic signal	Date	Type of wave, first-motion clarity	Type of instrument, component	Arrival time (h, min, s)	Amplitude, Arrival time (mm)	(nm)	Period (s)	A_N (nm)	T (s)	Apparent velocity, km/s	Azimuth (degrees)	Epicentral distance (degrees)	Magnitude (m_b, M_S, M_{SH})	Epicentre co-ordinates φ (degrees)	λ (degrees)	Origin time (h, min, s)	OBSERVATIONS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1231	13528	22.09	+ 1P	SP-Z	19.19.02.0	+ 1P			5.1	1	23.1	226.4	94.2	m_b= 6.5	35.2 S	120.3 W	19.05.41	
			A_1	SP-Z	19.03.5	3.6	60	3										
			A_2	SP-Z	19.11.2	3.2	55.1	3.2										
			A_3	SP-Z	19.16.0	1.5	29.8	3.5										
			A_4	SP-Z	19.23.3	1.4	27.2	3.5										
			e(PP)	SP-Z	22.47.0	0.9	18.2	3.6										
			e S	SP-E	30.02.6													
			S max	SP-E	30.08.0	3.0	75.2	4										
			-"-	SP-N	-"-	2.4	61.0	4						M_{SH} = 6.3				
			e(SS)	SP-E	37.11.0	1.8	61.7	4.7										
			+ 1P	LP-Z	19.19.02.0				12.0	20								
			P max	LP-Z	19.06.0	0.3	144	6						m_b = 6.7				
			e(PP)	LP-Z	22.49.0	0.3	102	8										
			1S	LP-E	30.04.3													
			S max	LP-E	30.09.0	0.6	216	9										
			-"-	LP-Z	-"-	0.4	135	9						M_{SH} = 6.4				
			E(SS)	LP-E	37.12.0	0.7	192	12										
			LQ	LP-E	42.51													
			LQ max	LP-E	43.02	1.1	220	21										
			-"-	LP-N	-"-	0.9	172	21										
			LR	LP-Z	48.41						3.12	221.1		M_S = 6.6				
			LR max	LP-Z	54.07	1.4	271	22										
			L_1	LP-Z	56.37	0.5	135	10										
			L_2	LP-Z	53.11	1.0	200	20										
			L_3	LP-Z	52.03	0.5	105	30										
			L_4	LP-Z	50.12	0.5	98	40										

APPENDICES TO CHAPTER 4

APPENDIX 4.1

Proposed Coding formats for Level 1 data

This appendix gives a detailed description of the proposed transmission format for Level 1 data. It is intended to supplement the International Seismic Code published in the WMO Manual on Codes, Vol. I, as a special appendix. Since the proposed Level 1 format is an extension of that Code, only features which are new in relation to the Code are described. An example of the full text of a Level 1 report for a strong earthquake recorded at an array station is included. Note that this example represents maximum processing in the case of a major seismic event. In most cases, however, the text will be considerably shorter, and will only provide data on the P wave recorded on a vertical short-period seismograph.

Description of the format

The proposed format, which is described in detail in Tables A4.1.1 through A4.1.4, is in most respects identical to the International Seismic Code. However, the following deviations should be noted:

1. Numbering

The messages originating from each national facility will be consecutively numbered starting at the beginning of each calendar year. The general form of the number is Nyn where N is a prefix, y is the last digit of the calendar year and n is a number of 1 to 5 digits. (The present code allows for a maximum of 3 digits).

2. Additional phase identifiers

As described in detail in Tables A4.1.1 and A4.1.2, several new phase identifiers will be needed compared to the International Seismic Code. Each of these is to be followed by the corresponding arrival time, period and amplitude in accordance with standard practice. Note that all the amplitudes of these new phases will be quoted in nanometers (nm).

3. Identifiers for parameters

Again referring to the tables A4.1.1 and A4.1.2, a number of new identifiers corresponding to specific computed parameters will be needed.

4. Later phase information

For each later phase, the maximum amplitude (quoted in nm) and corresponding period that is associated to the phase will be reported. (This is not currently provided for in the International Seismic Code.) For horizontal instruments the component on which the measurements were made might be specified as a suffix (E or N) immediately following the phase identifier. However, care must be taken not to exceed the maximum length (5 characters) of a phase identifier.

Additional comments

5. Grouping of readings

Readings from short and long period instruments for the same phase should be grouped together. When the time of arrival is determined more accurately on the SP instrument, the arrival time on the LP instruments need not be given, but the long period maximum amplitude identifier should be followed, as usual by its associated arrival time, period and amplitude.

6. Reporting interval

The time interval covered by the transmitted message should be specified in a comment field as e.g.,

((BEG APR01 120000 END APR02 120000)).

Note: In case of a station transmitting a group of messages, e.g., once per day, the first message may contain the reporting interval for the entire group. If so, the number of messages (NM) in the group should be included as, e.g.,

((BEG APR01 120000 END APR02 120000 NM7)).

7. Down-time information

If a station has been out of operation, this time interval should be reported in a comment field as OUT (date, time) followed by TO (date, time). This reporting should be made as soon as possible after the station is back in operation.

Example: ((OUT SEP02 191530 TO SEP02 223515)).

Additional explanation may be included in the brackets as found necessary.

Concluding remarks

In conclusion the changes needed in the International Seismic Code in order to accommodate the envisaged data exchange are:

- expansion of the numbering field (item 1)
- addition of some 30 new allowable identifiers (items 2 and 3)
- allowing for amplitude/period information to follow later phases (item 4).

In addition, a number of new phase codes would be needed to allow for horizontal component specification (item 4). Likewise, the reporting of direction of first motion of horizontal components (Appendix 3.1, item 2) would necessitate several new allowable phase codes.

Items 6 and 7 above have in this proposal been included as comments, and will thus not necessitate any change in the established format. However, it would be desirable to agree upon a format in which these items could be reported using specific identifiers, and this should be given further study.

It is emphasized that the coding formats proposed here will need to be agreed with other users of the WMO/GTS and also approved by the WMO prior to implementation in the proposed data exchange. Further revision may therefore be necessary.

Table A4.1.1.

Proposed identifiers for Level 1 short period parameters

Type of Wave	Component	Parameter	Proposed Identifier
P	Vertical	(a) Standard parameters - stations of types I, II and III.	
		1. Arrival time	*
		2. First-motion sign and clarity (if readable)	*
		3. Amplitudes A_i ($i=1,\ldots,4$)	M1X, M2X, M3X, M4X**
		4. Arrival times corresponding to each A_i	
		5. Periods corresponding to each A_i	
		6. Noise amplitude, A_N	NA
		7. Period corresponding to A_N	NT
		8. Secondary phase description:	
		Amplitude	*
		Period	*
		Arrival time	*
		9. Complexity	CMPX
		10. Spectral moment, ratio or vector	SPMM, SPRT, SPVT
S	Horizontal	11. Arrival time	*
		12. First-motion clarity	*
		13. Maximum amplitude, A_M on each horizontal component	MSE, MSN**
		14. Arrival times corresponding to each A_M	
		15. Periods corresponding to each A_M	
		16. Secondary phase description:	
		Amplitude	*
		Period	*
		Arrival time	*

Table A4.1.1. (cont.)

Type of Wave	Component	Parameter	Proposed Identifier
P	Vertical	(b) Additional standard parameters (type III stations only)	
		17. Apparent slowness	*
		18. Epicenter azimuth and distance	*, DIS
		19. Epicenter latitude and longitude	LAT, LON
		20. Origin time	OT
		21. Magnitude m_b	MB

* Form employed in the International Seismic Code should be used.

** Each phase identifier is followed by arrival time, period (T) and amplitude (A) according to standard conventions.

Table A4.1.2

Proposed identifiers for Level 1 long period parameters

Type of Wave	Component	Parameter	Proposed Identifier
P	Vertical	(a) Standard parameters - stations of types I, II and III.	
		22. Arrival time	*
		23. First-motion sign and clarity	*
		24. Maximum Amplitude, A_M	MLP**
		25. Arrival time corresponding to A_M	
		26. Period corresponding to A_M	
		27. Noise amplitude, A_N	NLPA
		28. Period corresponding to A_N	NLPT
		29. Secondary phase description:	
		Amplitude	
		Period	
		Arrival time	
S	Horizontal	30. Arrival time	*
		31. First-motion clarity	*
		32. Maximum amplitude, A_M on each horizontal component	MSLPE, MSLPN**
		33. Arrival times corresponding to each A_M	
		34. Periods corresponding to each A_M	
		35. Secondary phase description:	
		Amplitude	*
		Period	*
		Arrival time	*

Table A4.1.2 (cont.)

Type of Wave	Component	Parameter	Proposed Identifier
LR	Vertical	36. Arrival time	LRZ
		37. Maximum amplitude, A_M	MLR**
		38. Arrival time corresponding to A_M	
		39. Period corresponding to A_M	
		40. Maximum amplitudes for periods near 10, 20, 30 and 40 s	M1L,M2L,M3L,M4L**
		41. Arrival time corresponding to amplitudes for the above periods	
		42. Actual observed periods (item 40)	
		43. Noise amplitude, A_N	NLPA
		44. Period corresponding to A_N	NLPT
LQ	Horizontal	45. Arrival time	LQ
		46. Maximum amplitude, A_M on each horizontal component	MLQE, MLQN**
		47. Arrival times corresponding to each A_M	
		48. Periods corresponding to each A_M	
		(b) Standard parameters - type III stations only.	
P	Vertical	49. Apparent slowness	SLOLP
		50. Epicenter azimuth	AZLP
LR	Vertical	51. Magnitude M_S	MS
S	Horizontal	52. Magnitude m_{SH}	MSH

* Form employed in the International Seismic Code should be used.

** Each phase identifier is followed by arrival time, period (T) and amplitude (A) according to standard conventions.

TABLE A4.1.3

Example of a telegraphic text transmitted from an array station for a large earthquake

SEISMO N82351 ((BEG SEP22 180000 END SEP23 180000 NMS))

ARR SEP22

IPCU 1919020

M1X19035 T3A60 M2X19112 T3.2 A53.1

M3X19160 T3.5A29.8 M4X19233 T3.5 A27.2

MLP19060 T6A144

NT1.0 NA5.1 NLPT8 NLPA15

E PP 2247 T3.6A18.2

T8 A108

ES 30025 MSE 30080 T4A75.2

MSN 30080 T4A61.0

MSLPE 30090 T9A216

MSLPN 30090 T9A135

ESS 3711 T4.7A61.7

T12 A192

LRZ 4841 MLR5407 T22A271

MIL5637 T10A135 M2L5311 T20A200

M3L5203 T30A105 M4L5012 T40A98

NLPT20 NLPA12

LQ 4251 MLQE4302 T21A220

MLQN4302 T21A172

CMPX 23.02 SPTM 2.45

SLO 4.8 AZ226 DIS94 LAT-35 LON-120 OT190541 MB6.5

SLOLP 4.8 AZLP221 MS6.4 MSH6.6

STOP

Table A4.1.4

Explanation of the text in Table A4.1.3

SEISMO identification of type of data (seismic)

M82351 - message no. 2351 during 1978 for the station(s)

((BEG SEP22 180000 END SEP23 180000 NM8)) - This is the first message in a group of 8 covering the time interval indicated (UTC).

ARR - station name

SEP22 - date of recorded event (22 September)

IPCU 1919020 - first-motion clarity (I), type of wave (P), direction of first motion (C - compression on short-period seismograph; U - compression on long-period seismograph), arrival time (19h19m02.0s) in component Z

MIZ19035 - time of arrival (19m03.5s) for P-wave first amplitude, A_1, in component Z

T3AC0 - period (3 seconds) and amplitude (60 nm) for amplitude A_1 in component Z

M2A19112 T3.2A53.1 - time of arrival, period and amplitude for amplitude A_2 in component Z

M3A19160 T3.5A29.8 - time of arrival, period and amplitude for amplitude A_3 in component Z

M4A19233 T3.5A27.2 - time of arrival, period and amplitude for amplitude A_4 in component Z

MLP19060 T6 A144 - time of arrival, period and amplitude on LP seismograph, component Z.

LT1.0 NA5.1 - period and amplitude of noise on short-period seismograph, corponent Z.

NLP1.0, NLPA15 - period and amplitude of noise on long-period seismograph, component Z

E PP 2247 T3.5A18.2)
T8 A108) - time of arrival, periods and amplitudes of secondary longitudinal PP wave in component Z (on short and long period instruments, respectively)

ES 30025 - first-motion clarity (E), wave type (S), arrival time, (component not indicated)

MSE 30080 T4A75.2 - time of arrival, period and amplitude for maximum amplitude of short period S wave in component E

MSN 30080 T4A61.0 - time of arrival, period and amplitude for maximum amplitude of short period S wave in component N

MSLE 30090 T9 A216 - time of arrival, period and amplitude for maximum amplitude of long period S-wave (component E)

MSLPN 30090 T9 A135 - time of arrival, period and amplitude for maximum amplitude of long period S-wave (component N)

Table A4.1.4 (cont.)

E SS 3711 T4.7A61.7)
T12 A192) - clarity and time of arrival, periods and amplitudes for secondary shear phase (SS) (component not indicated)

LRZ4841 - time of arrival of Rayleigh wave in component Z

MLR5407 T22A271 - time of arrival, period and amplitude of maximum phase in Rayleigh wave in component Z

M1L5637 T10A135 - time of arrival and amplitude in Rayleigh wave for 10 second period in component Z

M2L5311 T20A200)
M3L5203 T30A105) - arrival times and amplitudes in Rayleigh wave for, respectively, 20, 30 and 40 second periods in component Z
M4L5012 T40A98)

NT20 NA12 - amplitude of noise for 20-second period on long-period vertical seismograph

LQ 4251 - time of arrival of Love wave in component E

MLQE4302 T21A220 - time of arrival, period and amplitude of maximum phase in LQ wave in component E

MLQN4302 T21A172 - time of arrival, period and amplitude of maximum phase in LQ wave in component N

CMPX 23.02 - 'complexity' parameter in P wave recording

SPMM 2.45 - 'spectral moment' parameter for P waves

SLO 4.8 - apparent slowness (s/degree)

AZ226 - azimuth from station to epicenter (degrees)

DIS94 - epicentral distance (degrees)

LAT-35 - latitude (degrees) of epicenter (- = south)

LON-120 - longitude (degrees) of epicenter (- = west)

OT190541 - origin time (19h 05m 41s)

MB6.5 - magnitude, determined for short-period P wave

SLOLP 4.8 - apparent slowness of long period P (s/degree)

AZLP 221 - azimuth to epicenter from LP recordings (degrees)

MS 6.4 - Rayleigh wave magnitude on LPZ seismograph

MSH 6.6 - S-wave magnitude on long-period horizontal seismograph

STOP - end of communication

APPENDIX 4.2

A study by the WMO on the routing and transmission of seismic data (level 1) over the World Meteorological Organization Global Telecommunication System (WMO/GTS)

Background for the WMO study

Before presenting the study by the WMO, we give below a brief introduction and a description of the input data provided for the study by the Ad Hoc group.

In the Ad Hoc group's report CCD/558, four examples of seismic networks were considered, each corresponding to a different assumption regarding the availability of stations. Each network was restricted to 50 short period (SP) and 50 long period (LP) stations.

Table 4.2.1 lists the stations included in at least one of the four networks. The possible routing of Level 1 data through the GTS circuits is indicated for each station.

For the present study, it was considered desirable to get an assessment of the GTS routing of data from all of these stations but without having to make a separate study for each network. Therefore this study considers all stations taken together. The resulting 'network' of 76 SP and 76 LP stations is of course larger than any of the network examples and the conclusions of the study would be interpreted accordingly.

For example, the stations of this extended 'network' in North America and Europe are essentially those of Network I. The corresponding load on the regional GTS circuits would therefore be similar to what would happen if Network I were implemented.

On the other hand, for South America and Africa, the 'network' stations are essentially those of Network III. Therefore, the study of the line capacity in these areas would mainly be relevant for Network III and Network III (SRO).

The expected volume of data reported from each station is highly dependent on the seismic activity, which varies considerably from one day to another. The input to this study was taken to be a 'high' activity day, i.e. a volume of data that would typically occur only a few times per year. Information obtained from the experts of the Ad Hoc group indicated that a reasonable

estimate of such a load would be: 50 earthquakes for each station during a 24-hour period, 20 of which would be large enough for long period parameters to be reported.

At stations which employ an automatic detector there is the possibility of false detections being generated. It is at present not possible to accurately assess the volume of data generated by such false detections, but it is assumed here that this volume will be small in comparison to that generated by real events. This question does, however, merit further study.

We assume that each event is reported as a separate telegraphic message, and that the average length of each message is as follows (station designations refer to Table 4.2.1):

SP station (A)	200 ch/message	(50 messages/day)
LP station (B)	300 ch/message	(20 messages/day)
SP & LP station (C)	300 ch/message	(50 messages/day).

The WMO study is now presented.

Routing and transmission of seismic data (Level 1) over the World Meteorological Organization Global Telecommunication System (WMO/GTS)

1. According to the information available from the Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events, seismic data from stations of 50 different countries will have to be transmitted over the CTS. Each type of seismic station and the volume of data expected to be transmitted from each type of station, as well as number of each type of station, are as follows:

Station instrumentation	Volume of data	No. of stations
SP only	10.000 ch/day	19
LP only	6.000 ch/day	19
SP & LP	15.000 ch/day	57

This volume will not be constant and will on the average be much lower. However, it is assumed that the total daily volume of seismic data to be transmitted over the GTS would reach 1.159.000 characters.

2. In order to develop the routing arrangements for handling the required seismic data, the volume of data to be inserted by each GTS center and time required for transmitting data over the GTS circuits have been estimated. Table 4.2.2 shows the volume of data to be inserted by each GTS center as well as routing on the GTS, transmission speed and time in this respect. The routing arrangements have been developed taking into account the present routing of meteorological information on the GTS as prescribed in the Manual on the GTS. Each center on the Main Trunk Circuit (MTC) is responsible for collecting seismic data from the originating centers as listed in the table.

3. It should be noted that certain circuits might not be able to accommodate the required seismic data due to the heavy traffic of meteorological information which is already transmitted over the circuit concerned. Furthermore, some GTS centers which are not connected directly to a center on the MTC will transmit seismic data via other GTS centers. Therefore, the centers responsible for relaying information from other centers to the MTC center will handle a large amount of seismic data. Automated GTS centers will handle seismic data within a few minutes, but manually operated centers will take a longer time for relaying the data from other centers to the MTC centers. The relay time cannot be accurately estimated due to the various procedures employed by each particular center. Therefore, in such cases the term 'relay time' is mentioned together with the transmission time in the table.

4. For the purpose of this study, the WMCs Moscow and Washington were taken to be international seismic data centers; therefore, all available seismic data will have to be transmitted to these two WMCs. The routing plan on the MTC has been developed, taking into account the available high-speed MTC segments. In the table, the total volume of data inserted by the MTC center concerned is indicated together with the transmission time for a particular MTC center to the adjacent MTC centers. The total volume of data contains the accumulated volume which is transmitted from the upper-stream MTC center.

5. As seen from the table, difficulties are foreseen in transmitting seismic data over certain GTS circuits operating with the modulation rate 50 or 75 bauds, in particular relaying of seismic data from one center to another will cause considerable handling time at certain manually operated centers. These problem areas could be summarized as follows:

(a) Western and southern parts of Region I (Africa), e.g. Central African Empire, Ivory Coast, Ethiopia, Kenya and Southern Rhodesia;

(b) South-western part of Region II (Asia), e.g. Afghanistan and Iran;

(c) Some parts of Region III (South America);

(d) Some parts of Region V (South-west Pacific), e.g. New Zealand and Indonesia.

Table A4.2.1

Transmission of Level 1 data through the WMO/GTS

List of seismic stations, countries, possible routing through WMO/GTS and high speed center in the Main Trunk Circuit

Country	GSE Rep	Station	Designation	Possible Routing through the WMO/GTS	High Speed Centre in the Main Trunk Circuit
Afghanistan		KBL	B	Kabul - 50B - Tashkent - 1200b/s -	MOSCOW
Algeria		TAM	A	Oran - 2400 b/s -	PARIS
Argentina		LPA	B	Buenos Aires - 50B -	WASHINGTON
		MDZ	A		
Australia	*	ASP	A	Melbourne - 200B -	TOKYO
		CTA	C		
		MAW	A		
		NWAO	C		
		WRA	A		
Belgium	*	DOU	C	Brussels - 2400b/s -	PARIS
Bolivia		LPZ	B	La Paz - 50B - Buenos Aires - 50B -	WASHINGTON
		PNS	A		
Brazil		BDF	C	Brasilia - 50B -	WASHINGTON
Bulgaria	*	KDZ	C	Sofia - 1200b/s -	MOSCOW
Canada	*	ALE	C	Montreal/Toronto - 2400b/s -	WASHINGTON
		FFC	C		
		GACO	C		
		MBC	C		
		YKA	C		
Central Afr Rep		BNG	A	Bangui - 50B - Brazzaville - 50B - Dakar - 50BX2 -	PARIS
Chile		PEL	B	Santiago - 50B - Buenos Aires - 50B -	WASHINGTON
		TLL	A		
Colombia		BOCO	C	Bogota - 50B - Maracay - 50B - Brasilia - 50B -	WASHINGTON
Czechoslovakia	*	KHC	C		PRAGUE
Denmark	*	DAG	C	Copenhagen - 75B - Norrköping - 2400b/s -	OFFENBACH
		GDH	C		
		KTG	C		
Egypt	*	HLW	C	Cairo - 50B -	MOSCOW
Ethiopia		AAE	C	Addis Ababa - 50B(testing) - Nairobi - 50BX2 -	OFFENBACH
Finland	*	JYSA	A	Helsinki - 2400b/s - Norrköping - 2400b/s -	OFFENBACH
		KEV	C		
		KJF	B		

Country	GSE Rep	Station	Designation	Possible Routing through the WMO/GTS	High Speed Centre in the Main Trunk Circuit
France		LOR	C		PARIS
German Dem.Rep.	*	MOX	C	Potsdam - 50BX2 -	PRAGUE
Germany, Fed.Rep.	*	GRF	C		OFFENBACH
Hungary	*	BUD	C	Budapest - 1200b/s -	PRAGUE
India	*	GBA	C	New Delhi - 50BX4 -	MOSCOW
		HYB	C		
		KOD	B		
		NDI	C		
		SHIO	C		
Indonesia		LEM	B	Djakarta - Singapore - Kuala Lumpur - Bangkok - New Delhi -	MOSCOW
Iran		ILPA	B	Tehran - 50B -	MOSCOW
		MAIO	C		
		SHI	A		
Israel		EIL	B	Bet Dagan - 50B -	OFFENBACH
Italy	*	AQU	B	Rome - 2400b/s -	PARIS
		SAL	A		
Ivory Coast		KIC	A	Abidjan - 50B - Dakar - 50BX2 -	PARIS
Japan	*	MAT	C		TOKYO
Kenya		NIKO	C	Nairobi - 50BX2 -	OFFENBACH
Mexico	*	COM	A	Mexico City - 75B -	WASHINGTON
		UNM	B		
Morocco		IFR	A	Casablanca - 50B -	PARIS
		RBA	B		
Netherlands	*	DBN	B	De Bilt - 1200b/s -	BRACKNELL
		WTS	A		
New Zealand	*	AFI	A	Wellington - 50B - Melbourne - 200B -	TOKYO
		SBA	C		
		WEL	C		
Norway	*	NORSAR	C	Oslo - 1200b/s -	BRACKNELL
Pakistan	*	QUE	C	Karachi - 50B - Tehran - 50B -	MOSCOW
Peru		ARE	C	Lima - 50B - Buenos Aires - 50B -	WASHINGTON
Poland	*	KRA	B	Warsaw - 1200b/s -	MOSCOW
		NIE	A		

Country	GSE Rep	Station	Designation	Possible Routing through the WMO/GTS	High Speed Centre in the Main Trunk Circuit
Rhodesia		BUL	C	Salisbury - 75B - (Pretoria) - 75B - Nairobi - 50BX2 -	OFFENBACH
Romania	*	MLR	C	Bucarest - 1200b/s - Sofia - 1200b/s -	MOSCOW
South Africa		SNA	C	(Pretoria) - 75B - Nairobi - 50BX2 -	OFFENBACH
		WIN	B		
South Korea		KSRS	A	Seoul - 50B -	TOKYO
Spain		TOL	B	Madrid - 50BX4 -	PARIS
Sweden	*	HFS	C	Norrköping - 2400b/s -	OFFENBACH
Taiwan		TATO	C	(Taipei) - 75B -	TOKYO
Thailand		CMTO	C	Bangkok - 50B - New Delhi - 50BX4 -	MOSCOW
Turkey		ANTO	C	Ankara - 50B - Sofia - 1200b/s -	MOSCOW
		ISK	C		
Union Soviet SR	*	BOD	C		MOSCOW
		ELT	C		
		OBN	C		
		SVE	C		
		YAK	C		
United Kingdom	*	EKA	C		BRACKNELL
United States A	*	ALPA	B		WASHINGTON
		ANMO	C		
		COL	C		
		DUG	C		
		FVM	C		
		GUMO	C		
		KIP	B		
		LASA	C		
		OGD	B		
		SJG	C		
		SPA	C		
		WES	C		
Yugoslavia		LJU	B	Belgrade - 50B - Budapest - 1200b/s -	PRAGUE
		VAY	A		

Computerized Centers and Hubs

Washington, Bracknell, Paris, Offenbach, Norrköping, Oslo, Brussels, Copenhagen, De Bilt, Wien, Roma, Zürich, Budapest, Moscow, Tashkent, Novosibirsk, Khabarovsk, Helsinki, Tokyo, Peking, Hongkong, Melbourne, New Helhi, Montreal/Toronto, Oran.

Table A4.2.2

Estimated transmission time of seismic data from each centre of Global Telecommunication System (GTS)

MTC centre responsible for inserting data to MTC	Originating GTS centre	Volume of data (ch. per day)	Routing on the GTS	Transmission speed	Transmission time
Cairo	Cairo	15,000	Cairo-Moscow	50 bd.	37.5 min.
New Delhi	New Delhi	15,000x4+6,000 = 66,000	New Delhi-Moscow	1200 bit/s	7.3 min.
	Karachi	15,000	Karachi-New Delhi	50 bd	37.5 min.
Moscow	Kabul	6,000	Kabul-Tashkent Tashkent-Moscow	50 bd. 1200 bit/s	15 min. +0.7 min. +relay time
	Tehran	6,000+10,000+ 15,000=31,000	Tehran-Moscow	50 bd.	77.5 min.
	Sofia	15,000	Sofia-Moscow	1200 bit/s	1.7 min.
	Warsaw	6,000+10,000 =16,000	Warsaw-Moscow	1200 bit/s	1.8 min.
	Ankara	15,000x2=30,000	Ankara-Sofia Sofia-Moscow	50 bd. 1200 bit/s	75 min. +3.3 min. +relay time
	Moscow	15,000x5=75,000	-	-	-

MTC centre responsible for inserting data to MTC	Originating GTS centre	Volume of data (ch. per day)	Routing on the GTS	Transmission speed	Transmission time
Moscow(cont'd)	Belgrade	6,000+10,000 =16,000	Belgrade-Sofia Sofia-Moscow	50 bd. 1200 bit/s	40 min. +1.8 min. +relay time
Volume of data inserted by Moscow:		189,000 +			
relayed from Cairo:		15,000 +	Moscow-Prague	1200 bit/s	31.6 min.
relayed from New Delhi:		81,000			
Total		=285,000			
Prague	Prague	15,000	-	-	-
	Potsdam	15,000	Potsdam-Prague	50 bd. x 2	37.5 min.
	Budapest	15,000	Budapest-Prague	1200 bit/s	1.7 min.
	Bucarest	15,000	Bucarest-Budapest Budapest-Prague	50 bd. 1200 bit/s	37.5 min. +1.7 min. +relay time
Volume of data inserted by Prague:		60,000 +			
realyed from Moscow :		285,000	Prague-Offenbach	2400 bit/s	19.2 min.
Total from Prague to Offenbach		=345,000			
Volume of data inserted by Prague:		60,000 +			
relayed from Offenbach :		814,000	Prague-Moscow	1200 bit/s	97.1 min.
Total from Prague to Moscow		=874,000			
Offenbach	Nairobi	15,000	Nairobi-Offenbach	50 bd. x 2	37.5 min.
	Addis Abata	15,000	Addis Ababa-Nairobi Nairobi-Offenbach	50 bd. 50 bd.	37.5 min. +37.5 min. + relay time

MTC centre responsible for inserting data to MTC	Originating GTS centre	Volume of data (ch. per day)	Routing on the GTS	Transmission speed	Transmission time
Offenbach(cont'd)	Salisbury	15,000	Salisbury-Pretoria	75 bd.	25 min.
	Pretoria	+21,000	Pretoria-Nairobi	75 bd.	+60 min.
		=36,000	Nairobi-Offenbach	50 bd.	+90 min. + relay time
	Copenhagen	15,000x3	Copenhagen-Norrkoping	75 bd.	75 min.
		=45,000	Norrkoping-Offenbach	2400 bit/s	+2.5 min. +relay time
	Helsinki	6,000+15,000	Helsinki-Norrkoping	2400 bit/s	1.8 min.
		+10,000=31,000	Norrkoping-Offenbach	2400 bit/s	+1.8 min. +relay time
	Offenbach	15,000	-	-	-
	Bet Dagan	6,000	Bet Dagan-Offenbach	50 bd.	10 min.
	Norrkoping	15,000	Norrkoping-Offenbach	2400 bit/s	0.8 min.
Volume of data inserted by Offenbach		: 178,000 +			
relayed from Prague		: 345,000	Offenbach-Paris	2400 bit/s	29.1 min.
Total from Offenbach to Paris		:=523,000			
Volume of data inserted by Offenbach		: 178,000 +			
relayed from Paris		: 636,000	Offenbach-Prague	2400 bit/s	45.2 min.
Total from Offenbach to Prague		:=814,000			
Paris	Algiers	10,000	Algiers-Paris	2400 bit/s	0.6 min.

MTC centre responsible for inserting data to MTC	Originating GTS centre	Volume of data (ch. per day)	Routing on the GTS	Transmission speed	Transmission time
Paris(cont'd)	Bangui	10,000	Bangui-Brazzaville Brazzaville-Dakar Dakar-Paris	50 bd. 50 bd. 50 bd. x 2	25 min. +25 min. +25 min. +relay time
	Abidjan	10,000	Abidjan-Dakar Dakar-Paris	50 bd. 50 bd.	25 min. +25 min. +relay time
	Casablanca	10,000+6,000 =16,000	Casablanca-Paris	50 bd.	40 min.
	Rome	10,000+6,000 =16,000	Rome-Paris	2400 bit/s	0.8 min.
	Brussels	15,000	Brussels-Paris	2400 bit/s	0.8 min.
	Paris	15,000	-	-	-
	Madrid	6,000	Madrid-Paris	50 bd. x 4	15 min.
Volume of data inserted by Paris : relayed from Offenbach : Total from Paris to Bracknell :		98,000 + 523,000 =621,000	Paris-Bracknell	2400 bit/s	34.5 min.
Volume of data inserted by Paris : relayed from Bracknell : Total from Paris to Offenbach :		98,000 + 538,000 =636,000	Paris-Offenbach	2400 bit/s	35.3 min.
Bracknell	De Bilt	10,000+6,000 =16,000	De Bilt-Bracknell	1200 bit/s	1.8 min.

MTC centre responsible for inserting data to MTC	Originating GTS centre	Volume of data (ch. per day)	Routing on the GTS	Transmission speed	Transmission time
Bracknell(cont'd)	Oslo	15,000	Oslo-Bracknell	1200 bit/s	1.7 min.
	Bracknell	15,000	-	-	-
Volume of data inserted by Bracknell : 46,000 + relayed from Paris : 621,000 Total from Bracknell to Washington : =667,000			Bracknell-Washington	2400 bit/s	37.1 min.
Volume of data inserted by Bracknell : 46,000 + relayed from Washington : 492,000 Total from Bracknell to Paris : =538,000			Bracknell-Paris	2400 bit/s	29.9min.
Washington	Buenos Aires	6,000+10,000 =16,000	Buenos Aires-Washington 50 bd.		40 min.
	La Paz	6,000+10,000 =16,000	La Paz-Buenos Aires 50 bd. Buenos Aires-Washington 50 bd.		40 min. +40 min. +relay time
	Lima	15,000	Lima-Buenos Aires 50 bd. Buenos Aires-Washington 50 bd.		37.5 min. 37.5 min.
	Brasilia	15,000	Brasilia-Washington 75 bd.		26.7 min.
	Santiago	6,000+10,000 =16,000	Santiago-Buenos Aires 50 bd. Buenos Aires-Washingotn 50 bd.		40 min. +40 min. +relay time
	Bogota	15,000	Bogota-Maracay 50 bd. Maracay-Brasilia 50 bd. Brasilia-Washington 75 bd.		37.5 min. +37.5 min. +26.7 min. +relay time

MTC centre responsible for inserting data to MTC	Originating GTS centre	Volume of data (ch. per day)	Routing on the GTS	Transmission speed	Transmission time
Washington (cont'd)	Montreal/Toronto	15,000x5 =75,000	Montreal/Toronto-Washington	2400 bit/s	4.2 min.
	Mexico City	6,000+10,000 =16,000	Mexico City-Washington	75 bd.	26.7 min.
	Washington	15,000x9+6,000x2 =147,000	-	-	-
Volume of data inserted by Washington : 331,000 +					
Volume of data relayed from Tokyo : 161,000					
Total from Washington to Bracknell		:= 492,000	Washington-Bracknell	2400 bit/s	27.3 min.
Tokyo	Seoul	10,000	Seoul-Tokyo	50 bd.	25 min.
	Peking	15,000	Peking-Tokyo	75 bd. x 5	25 min.
	Bangkok	15,000	Bangkok-Hong Kong	75 bd.	25 min.
			Hong Kong-Tokyo	75 bd.	+25 min. +relay time
	Jakarta	6,000	Jakarta-Singapore	50 bd.	15 min.
			Singapore-Kuala Lumpur	75 bd.	+10 min.
			Kuala Lumpur-Bangkok	75 bd.	+10 min.
			Bangkok-Hong Kong	75 bd.	+10 min.
			Hong Kong-Tokyo	75 bd.	+10 min. +relay time

MTC centre responsible for inserting data to MTC	Originating GTS centre	Volume of data (ch. per day)	Routing on the GTS	Transmission speed	Transmission time
Tokyo(cont'd)	Tokyo	15,000	-	-	-
Volume of data inserted by Tokyo :		61,000 +			
relayed from Melbourne :		100,000			
Total from Tokyo to Washington :		=161,000	Tokyo-Washington	2400 bit/s	8.9 min.
Melbourne	Wellington	10,000+15,000x2 =40,000	Wellington-Melbourne	50 bd.	100 min.
	Melbourne	10,000x3+15,000x2 =60,000	-	-	-
Volume of data inserted by Melbourne :		100,000	Melbourne-Tokyo	200 bit/s	83.3 min.

APPENDIX 4.3

Present state of the Global Telecommunication System (GTS) of the World Meteorological Organization (WMO)

The current state of the main trunk circuits of the GTS is shown in Figure A4.3.1.

The number of characters that can be transmitted on different speed circuits is shown in Table A4.3.1.

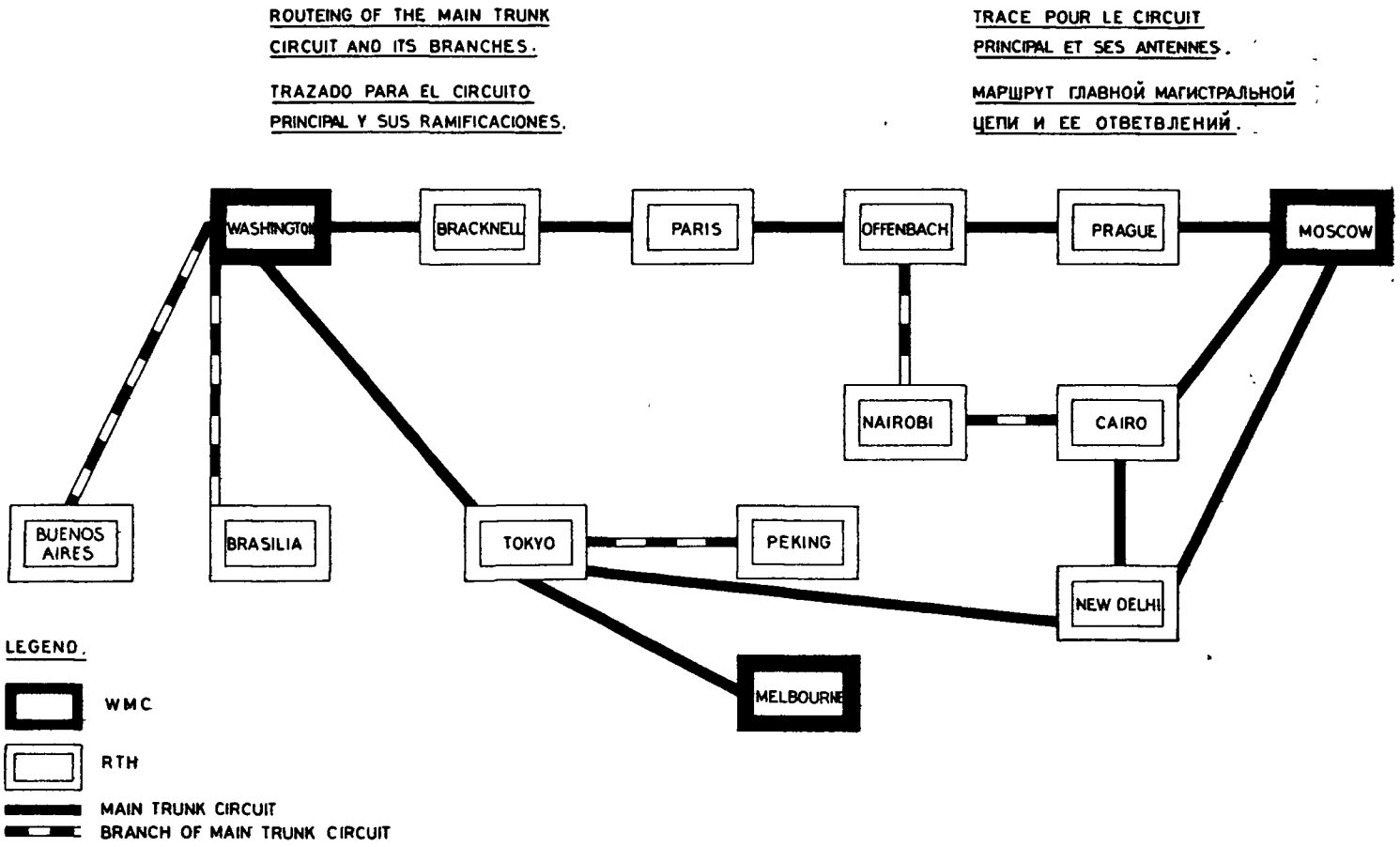


Figure A4.3.1 Schematic diagram of the Main Trunk Circuit of the WMO Global Telecommunication System

TABLE A4.3.1

Number of characters transmitted on different speed circuits

Modulation rate	Alphabet	b/ch	ch/sec.	ch/min.	ch/hr.	ch/day
50 bauds	No. 2	7.5	6.67	400	24,000	576,000
75 bauds	No. 2	7.5	10	600	36,000	864,000

Data signalling rate	Alphabet	b/ch	ch/sec.	ch/min.	ch/hr.	ch/day
200 bit/s	No. 5	10	20	1,200	72,000	$1,728 \times 10^3$
1200 bit/s	No. 5	8	150	9,000	540,000	$12,960 \times 10^3$
2400 bit/s	No. 5	8	300	18,000	1,080,000	$25,920 \times 10^3$
4800 bit/s	No. 5	8	600	36,000	2,160,000	$51,840 \times 10^3$
9600 bit/s	No.5	8	1200	72,000	4,320,000	$103,680 \times 10^3$

APPENDICES TO CHAPTER 5

APPENDIX 5.1

International Data Post

List of co-operating countries (February 1979)

Country	Type of Service	Internal Linking Service	
*ARGENTINA	S,D	PUERTA A PUERTA	Service of the Argentine Postal Administration
*AUSTRALIA	S,D	PRIORITY PAID	Service of the Australian Post Office
*BELGIUM	S	DATAPOST	Service of the Belgian Postal Administration
*BRAZIL	S	SERCA	Service of the Brazilian Postal Administration
*FRANCE	S	POSTADEX	Service of the French Postal Administration
*GERMANY (Federal Republic)	S	DATAPOST	Service of the German Postal Administration
HONG KONG	S,D	SPEEDPOST	Service of the Hong Kong Post Office
*JAPAN+	S,D	BUSINESS MAIL	Service of the Japanese Post Office
KUWAIT	S,D	MUMTAZPOST	Service of the Kuwait Postal Administration
*NETHERLANDS	S,D	EXPRESS MAIL	Service of the Netherlands Postal Administration
SINGAPORE	S,D	SPEEDPOST	Service of the Singapore Postal Administration
*SOUTH AFRICA	S	PRIORITY MAIL	Service of the South African Postal Administration
SWITZERLAND	S	SERVICE POSTALE RAPIDE	Service of the Swiss Postal Administration
*TAIWAN	S,D	SPEEDPOST	Service of the Taiwan Postal Administration
*UNITED KINGDOM	S,D	DATAPOST	Service of the British Post Office
*UNITED STATES	S,D	EXPRESS MAIL	Service of the United States Post Office
(*CANADA	-	-	Shortly to be linked)

* Listed in Table 4.1 of seismograph stations, CCD/558. +Tokyo and Osaka only.

Notes:

1. Type of service : International Datapost offers two kinds of service for business mail (which covers magnetic data tape): these are 'Scheduled' (S) or 'On-Demand' (D).

   The Scheduled service operates for regular, repetitive requirements on given dates and days and usually includes door-to-door collection and delivery in the collaborating countries. The On-Demand service caters for non-regular requirements; collection and delivery services are not usually provided and users hand in or collect items from nominated postal centers in each country.

2. Transit time : 1-3 days, depending on distances, etc., but next-day delivery is normal between major centers. As an example of a longer distance route over which seismological data is routinely sent, magnetic tapes posted in Brasilia on Monday evenings are delivered in Edinburgh, Scotland, on Thursday morning.

APPENDIX 5.2

Calibration data to be included with exchanged waveforms

All exchanged waveforms should in general be supplemented with sufficient information so that no misunderstanding can arise with respect to station identity, type of data, sampling rate, time and amplitude scale and time interval covered. The following calibration information should be transmitted with the waveform data.

1. For seismographs with analog galvanometric recording

   (a) Dimensionless magnification (displacement sensitivy) defined as the ratio of the peak trace amplitude to the peak amplitude of displacement of sinusoidal ground motion at a specified frequency. The frequency will typically be 1 Hz for short period instruments and 0.05 Hz for long period instruments.

   (b) Phase difference in seconds between peak trace amplitude and the corresponding peak ground displacement for the steady-state motion.

   (c) Time corrections relative to UTC at the beginning and end of the seismogram.

   (d) Direction of the trace deflection corresponding to ground movement in the direction up (on the vertical component) and to the north or east (on the corresponding horizontal component) should be marked directly on the seismogram.

2. For digital waveform records

   (a) Quantization factor (nanometers/digital unit), i.e. the ground displacement (at a specified frequency) corresponding to 1 digital unit.

   (b) Phase difference (in seconds) as under 1.

   (c) Time correction (relative to UTC) for the beginning of the record.

   (d) Polarity of the data (positive polarity means that the ground movement directions up, north and east correspond to positive numbers on the digital records).

Note:

Additional calibration information will be retained at each station and at the International Data Centers, including complete phase and amplitude response characteristics for all instruments. These files are updated regularly, as new calibration are performed, and the International Centers may request additional calibration measurements to be made as desired. It is therefore not considered necessary to transmit this complete calibration information with every requested waveform.

APPENDIX 5.3

Specification of waveform recording media at some seismological stations that may be included in a global network

Table 5.3.1 contains detailed specification of waveform recording media at most of the stations listed in Table 4.1 of CCD/558, as well as for some additional stations that may be included in a global network. Note that both the operational status and the type of equipment at these stations are subject to change.

Table 5.3.1

Station	Code	Type (see Chapter 3)	Specifications and formats of recording media
Albuquerque	ANMO	Seismic Research Observatory (SRO) (Type II)	Digital: Long period data, 3 components, sampled continuously at 1 sample per second. Short period data, vertical component, sampled at 20 samples per second for detected events only. Recording is on 0.5 in magnetic tape, 9 track, 800 bits per inch. A 16-bit word is used, 1 sign bit, 11 bits resolution (66 db) and 4 bits of gain ranging (60 db). Format is 2's complement with odd parity, record length 1000 words with 10 words of data. Analog: Continuous recording of 3 long period and vertical short period data by pen on 30 x 90 cm sheets.
Ankara	ANTO		
Bangui	BCAO		
Bogota	BOCO		
Chiang Mai	CMTO		
Guam	GUMO		
Mashad	MAIO		
Narrogin	NWAO		
Shillong	SHIO		
Taipei	TATO		
Addis Ababa	AAE	World-wide Standard Seismograph Network (WWSSN) (Type I)	Analog: Recording by galvanometric deflection of a light spot on photographically sensitive paper, 30 x 90 cm sheets. Three components long and short period, one sheet per component with 24 hours recording on each sheet. Recording drum rates: long period - 1 revolution per hour, short period - 1 revolution per 15 min.
Afiamalu	AFI		
l'Aquila	AQU		
Arequipa	ARE		
Bulawayo	BUL		
College	COL		
Danmarkshavn	DAG		
Dugway	DUG		
French Village	FVM		
Godhavn	GDH		
Helwan	HLW		
Kabul	KBL		
Kevo	KEV		
Kajaani	KJF		
Kodaikanel	KOD		
Kap Tobin	KTG		
Lembang	LEM		
Lormes	LOR		
La Plata	LPA		
New Delhi	NDI		
Peldehue	PEL		
Quetta	QUE		
Scott Base	SBA		
Shiraz	SHI		
Shillong	SHL		
San Juan	SJG		
Sanae	SNA		
South Pole	SPA		
Toledo	TOL		
Tepoztlan	TPM		
Wellington	WEL		
Weston	WES		
Windhoek	WIN		

Table 5.3.1 (continued)

Station	Code	Type (see Chapter 3)	Specifications and formats of recording media
Alaskan Long period array	ALPA	Long period array (Type III)	Long period data only. Digital: 0.5 in magnetic tape, 9-track binary, 1600 bits per inch (556 or 800 bits per inch with 7 tracks available). Data and identification information are in 65-word records, 32 bits per word. An identification record precedes, 21 (7 x 3) data records. Data is written in IBM floating point format.
Eilat Kipapa Ogdensburg Toledo	EIL KIP OGD TLO	High gain Long period (HGLP) (Type II)	Long period data only. Digital: Continuous sampling, 3 components, velocity (one sample per 5 records) and displacement (one sample per 5 records). Recording is on 0.5 in magnetic tape, 7 track binary, 556 bits per inch, 3 characters (18 bits) per sample, 15 bit resolution, 2000 samples per record. Analog: Recording is similar to WWSSN station, but the magnification is considerably higher.
Hagfors	HFS	Short period array with associated long period instruments (Type III)	Digital: Long period data, sampled continuously at one sample per second. Short period data are sampled at 20 samples per second for automatically detected events only. Recording is on 9 track, 800 bits per inch industry compatible tape.
Norwegian Seismic Array	NORSAR	Short period array with associated long period instruments (Type III)	Digital: Data continuously recorded on 9 track, 1600 bits per inch magnetic tape. Short period data are sampled at 20 Hz, long period data at 1 Hz. All data are retained for 1 year. Facilities exist for conversion to other formats.

Table 5.3.1 (continued)

Station	Code	Type (see Chapter 3)	Specifications and formats of recording media
Graefenberg	GRF	Broad-band array (Type III)	Digital: 9 track, 800 bits per inch (1600 bpi optional) magnetic tape. Format: each block contains 10 seconds of data. Sampling rate 20 samples per second.
Eskdalemuir	EKA	Short period array with associated long period instrument (Type III)	Digital: 0.5 in magnetic tape, 9 tracks, 800 bits per inch, IBM file structure. Short period data. Two partial array sums, for detected events only, sampled at 20 samples per second, or continuously recorded raw data from 20 array channels, digitized at 20 samples per second. Long period data. Continuously recorded, vertical component, digitized at 1 sample per second.
Finnish Seismic Array	JYSA	Short period array with associated long period instrument (Type III)	Digital: Short period data are continuously recorded on instrumental tape in serial form, one track, 2400 bits per inch, sampling rate 20 samples per second. Long period data digitized at 1 sample per second. Facilities exist for conversion to other formats, e.g. 9 track, 1600 bpi magnetic tape.
Alice Springs	ASP	Standard short period (similar to WWSSN) (Type I)	Analog: 3 components visible recording on heat sensitive paper 300 x 900 mm sheets at 60 mm/min.
Charter Towers Kabul Matsushiro	CTAO KBAO MATO	Abbreviated Seismic Research Observatory (ASRO) (Type II)	Digital: Converted HGLP - long period data, 3 components, sampled once per second. Recording is on 0.5 in magnetic tape, 800 bpi NRZI. Short period vertical component recording as for SRO. Analog: 3 LP components, visible recording on heat sensitive paper 300 x 900 mm sheets at 60 mm/min (SP) and 15 mm/min (LP).
Warramunga	WRA	Short period array with associated long period instrument (Type III)	Digital / Analog } See EKA

Table 5.3.1 (continued)

Station	Code	Type (see Chapter 3)	Specifications and formats of recording media
Alert Flin Flon Mould Bay	ALE FFC MBC	Canadian Standard Station (Type I)	Analog: Recording by galvanometric deflection of a light spot on photographically sensitive paper, 30 x 90 cm sheets. Three components long and short period, one sheet per component with 24-hour recording on each sheet. Recording drum rates: long period - 1 revolution per hour. short period - 1 revolution per 15 min.
Yellowknife	YKA	Short period array (Type III)	Digital: Data are sampled at 20 samples per second for automatically detected events only; recording on 9 track, 800 bpi industry compatible tape. Analog: Continuous short period data recorded on FM magnetic tape.
		Long period array (Type III)	Analog: Data are recorded continuously on FM magnetic tape. Digital: Digitized time segments would be available on request.
Glen Almond	GACO	SRO bore-hole components; Canadian recording formats (Type II)	Digital: Long period data, 3 components sampled continuously at 1 sample per second. (Short period 3-component digital data formats for automatically detected events under development).
de Bilt	DBN	Long period (ZNE) (Type I)	Analog: Recorded on 30 x 90 cm photographic paper.
		Broad band (Z) (Type II)	Analog: Recorded continuously on FM magnetic tape. Digital: (Projected for 1981) continuous recording on magnetic tape.
Winterswijk	WTS	Short period (Type I)	Analog: Recording by pen on 30 x 180 cm paper. Digital: (Projected for 1981) continuous recording on magnetic tape.

Table 5.3.1 (continued)

Station	Code	Type (see Chapter 3)	Specifications and formats of recording media
Gauribidanur	GBA	L-shapped array of SPZ instruments and a triangular array of LPZ instruments (Type III)	Analog: Recording on 1 in, 24-track magnetic tape with 20 channels of seismic record plus 1 channel for time. Similarly long period data are also recorded separately on analog tape. Facilities for hard copy of seismograms are available. Usually resolution of 0.1 sec is used for SP records and 1 sec for LP records. Digital: short period recording of frequency modulated signals at 20 HZ on 9-track 800 bpi magnetic tape.
Pavlikeni	PVL	Short and long period instruments (Type I)	Analog: 3 component photographic recording similar to WWSSN
Kasperské Hory	KHC	Broad band and short period (Type II)	Analog: Continuous recording of 2 vertical short period seismographs on photographic paper, 30 x 90 cm sheets per comp. per day, recording speed 60 mm/min. 3 broad band components recorded continuously on FM magnetic tape and on photographic paper, 30 x 90 cm sheet, recording speed 15 mm/min.
Cheia	MLR	Short and long period instruments (Type I)	Analog: continuous recording of 3-component short period seismographs on photographic paper. 3-component continous SP seismograph pen-recordings on paper (magnification 200k, recording speed 120 mm/min). 3-component SP seismograph recording on analog tape (detected events only), 3-component WWSSN LP seismograph continuously recording on photographic paper. Digital (planned for 1980) continuous recording of 3-component SP seismograph.

APPENDIX 5.4

Some Digital Tape Recording 'Standards'

The description 'Industry compatible tape' is commonly used. It means that data may be interchanged between computer systems of different manufacture as long as the tape used is to the same compatible standard. The standards for magnetic tape laid down by bodies such as European Computer Manufacturers Association (ECMA) and American National Standards Institute (ANSI) define the physical properties of tape such as spool dimensions, tape width and thickness, recording mode and density and positioning of reflective strips. They do not define tape codes or label and block formats. Two versions of digital tape in common use are:

9-track, 0.5 in width, 800 bits per inch (bpi) with non-return-to-zero inverted recording mode (NRZI), and

9-track, 0.5 in width, 1600 bpi with phase encoding recording mode (PE).

Standards for 7-track tapes also exist (for example, the high gain long period stations at Kipapa and Ogdensburg) but it is superseded by the 9-track standard and is not recommended.

Not all systems use the same tape code, but the most common ways of recording characters on digital tape are the IBM extended binary coded decimal interchange code (EBCDIC) or the American National Standard Code for Information Interchange (ASCII). Conversion routines convert one tape code to another.

The digital labelling of tapes is dependent on the file structure arrangements of the systems which handle them. Tapes may therefore be labelled according to some convention (e.g. IBM standard) or in some non-standard way, depending upon the requirements of a particular system.

Tapes which are used in applications not requiring a file-structured system (e.g. field data tapes) can be unlabelled.

The block format of the data recorded on digital tape is governed by the software of the recording system; reading the tape therefore requires appropriate software in the replaying system. Inter-block gaps on 800/1600 bpi nine-track tapes are nominally 0.6 in, block lengths are dependent on recording software parameters.

APPENDICES TO CHAPTER 6

APPENDICES TO CHAPTER 6

Introduction

These appendices should be considered as guidelines for the further detailed specification that has to be made of the procedures to be used at international data centers.

These detailed specifications necessary for the establishment of the international data centers should be worked out on the basis of the guidelines given in this report, past experience at existing data centers and ideas and results that might be obtained from studies performed in connection with the possible further work of the Ad Hoc group.

The specifications should include all necessary mathematical formulas and data handling routines and listings of the computer programs to be used. Travel time curves should be specified in detail, showing for example to which region and which signal frequency they apply. Also the various amplitude distance corrections to be used in magnitude calculations should be explicity given.

One of the appendices, Appendix 6.5, has been drafted to a high degree of detail to show, as an example, what such specifications might finally look like.

APPENDIX 6.1

Procedure for the association of short period Level 1 data for event definition and procedure for 3-dimensional event location

The automatic association of arrival times is the first important step in the event definition and location procedure. The association procedure involves a preliminary selection of those arrival times that appear to be associated with the same event. The sorting procedure is based primarily on teleseismic P-wave arrival times and preliminary locations obtained from array station data. The P-wave arrival times are associated either using a preliminary array location or using other P-wave arrival times occurring within a given time window. This time window is estimated from the Jeffreys-Bullen travel time model and depends on the geographical distribution of the reporting stations. Reported quantitative remarks such as "local" or "regional" are useful in this process. Also P and S readings reported from stations at local distances may be used provided local travel time curves are available.

The time association should be carried out according to a procedure which will need to be described explicitly and in detail. Certain time requirements should be specified for the acceptance of a group of associated phases as an event. Requirements should also be specified for the acceptance of the association of an individual station with an event.

A minimum number of stations are required to define an event as follows:

- Four single stations, not more than two of which are local stations
- One array station at teleseismic distance and two single stations (with no distance restriction)
- Two array stations at teleseismic distances

To further reduce the probability of making a wrong time association and thus create an artificial event from arrival times which happened to fit together, a special control procedure should be employed. This procedure should check that the stations which have defined an event also have a defined -- reasonable -- probability of detecting an event with the actual magnitude at the actual distances, based on a priori information on the detection capability of the stations. It should also be checked that the stations which have not reported an event do not have a high probability of detecting an event with the actual magnitude in the actual

region. A possible event should e.g. be declared as artificial and excluded if a certain number of stations with high detection probabilities did in fact not detect the event. A detailed description of this association control procedure will need to be worked out.

The final locations of the events should be carried out using a 3-dimensional location procedure similar to those used at existing seismological data centers. A detailed description of the location procedure including an estimate of the uncertainties in the estimated source parameters should be elaborated. The location procedure should allow for the use of data from local stations when appropriate local travel time curves are available.

APPENDIX 6.2

Local travel time curves and the regions and distance intervals in which they are applicable

To use stations at local distances from an event for the definition and location of the event, local travel time curves are needed. These curves should be tied to individual stations or group of stations and be defined in a certain distance interval. The travel times should be given as tables or as explicit expressions.

Examples of such local travel times are given below.

Region: Scandinavia lat. 55° - 70°N, long. 10° - 30°E.

Station: Hagfors (HFS)

Phase	Travel time (s)	Distance interval (km)
P_g	-0.8 + 0.167 d	115 - 490
P_n	8.5 + 0.121 d	235 - 1250
S_g	-1.2 + 0.283 d	115 - 1400
S_n	13.0 + 0.213 d	350 - 1360

d denotes distance (km) between source and receiver. The travel times refer to surface foci events.

APPENDIX 6.3

Amplitude distance correction for the estimation of body wave magnitude m_b

Body wave magnitude (m_b) should be computed using the formula

$$m_b = \log A/T + f(\Delta)$$

where A is zero-to-peak amplitude in nanometers, T is period in second and f (Δ) is a distance correction function. The Gutenberg and Richter (1956) amplitude-distance correction function should be used for distances (Δ) greater than 20 degrees. This function is shown for the PV wave in the particular case of shallow foci in Figure A6.3.1.

At distances below 20 degrees, further studies need to be carried out, and existing regional magnitude scales (e.g. see references below) should be studied as part of this effort.

References

Gutenberg, B., and C.F. Richter, 1956: Magnitude and energy of earthquakes. Ann. Geofisica, 9, 1-15.

A survey of practice in determining magnitude of near earthquakes: Summary report for networks in North, Central and South America compiled by W.H.K. Lee and R.J. Wetmiller, United States Geological Survey, Open-File Report 76-677, 1976.

Part 2: Europa, Asia, Africa, Australasia, the Pacific, compiled by R.D. Adams, World Data Center A for Solid Earth Geophysics, Report SE-8, 1977.

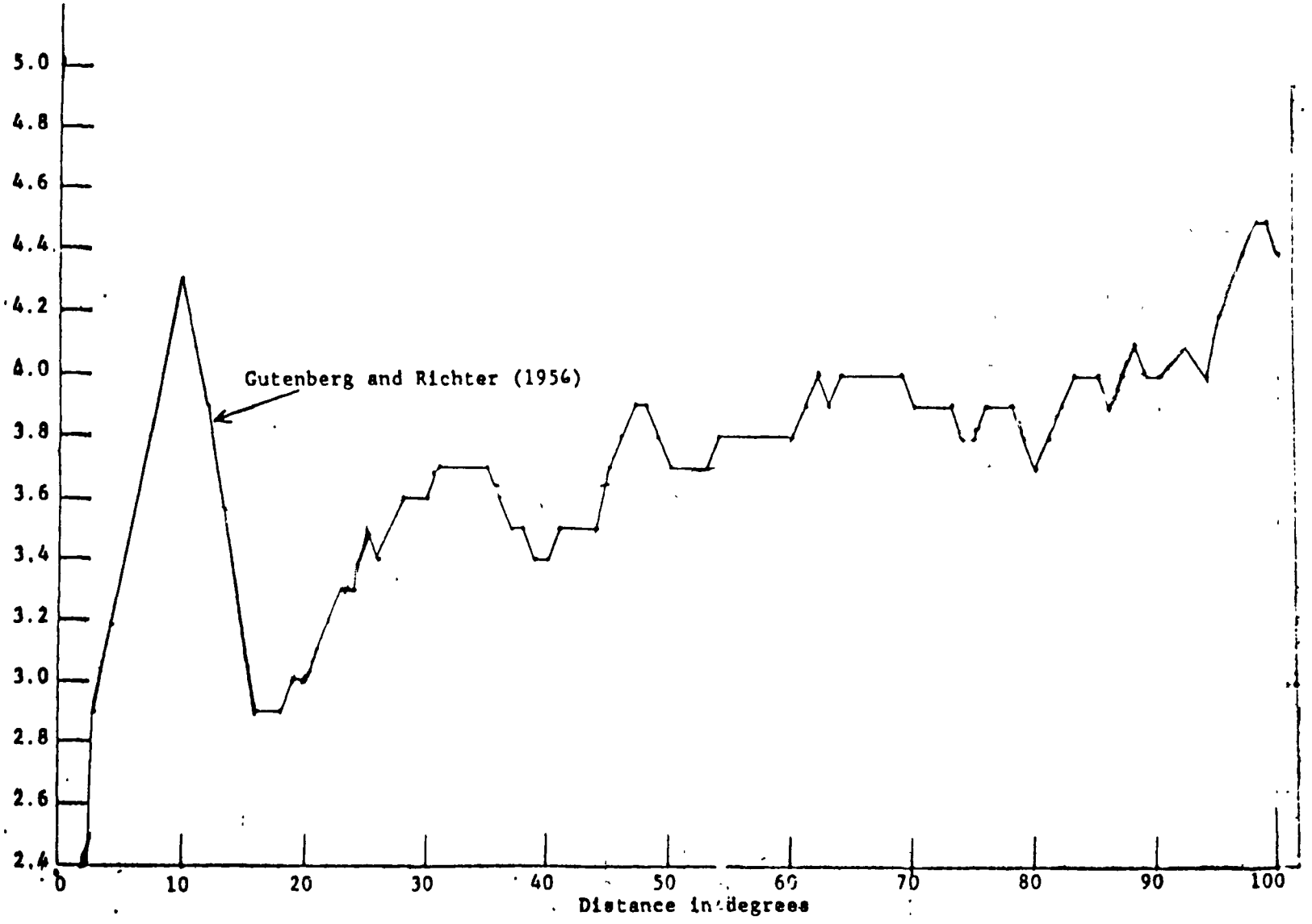


Figure A6.3.1 Magnitude (m_b) correction function $f(\Delta)$ for the PV wave in the case of shallow foci, after Gutenberg and Richter (1956)

APPENDIX 6.4

Calculation of magnitude

The discussion below is limited to the estimation of surface wave magnitude M_s, but the formulas and procedures are equally applicable to body wave magnitudes, m_b.

The most common way of calculating the magnitude of a seismic event is based on straight forward averaging. From the reported zero-to-peak amplitude (A) in nanometers and period (T) in seconds individual station magnitudes, M_{si}, are calculated according to the formula:

$$M_{si} = \log (A/T)_i + 1.66 \log (\Delta)_i + 0.3$$

where i denotes station index running from 1 to the total number of stations (N) having reported (A/T) values. A straight average value is then formed of the M_{si}. The standard deviation is also calculated as a measure of the data scatter. Values significantly deviating from the mean, e.g. by more than three times the standard deviation are sometimes discarded.

From a statistical point of view mean values formed in this way can be strongly biased. This could occur in particular for weak events with only a small number of observations of (A/T). In such cases this type of mean values become too large. Maximum likelihood methods, which reduce the bias, have been suggested by Ringdal (1976), Elvers (1978), von Seggern and Rivers (1978) and Ringdal (1978). These methods, which assume that observed station magnitudes are subject to normal distributions, combine reported amplitude period ratios with noise values at stations where no signals have been detected. It can be noted that noise amplitudes are included in the list of Level 1 data to be reported (Cf Chapter 3). An appropriate maximum likelihood method to be used for magnitude estimation at international data centers can therefore be specified. Methods have also to be developed that give estimates of upperbound surface wave magnitudes for events, for which body waves but not surface waves have been detected (Elvers, 1974). Specifications for making such upperbound estimates should also be given further study.

References

Ringdal, F, 1976
Maximum likelihood estimations of a seismic magnitude. Bull. Seism. Soc. Am., 66:789-802.

Elvers, E, 1978
Seismic magnitude estimates, with a minimum number of detections, FOA report April C 20234-T1. National Defense Research Institute, Stockholm.

Elvers, E, 1974
Seismic event identification by negative evidence. Bull. Seism. Soc. Am., 64:1671-1684.

Von Seggern, D and Rivers, D.W, 1978
Comments on the use of truncated distribution theory for improved magnitude estimation. Bull. Seism. Soc. Am., 68:1543-1546.

Ringdal, F, 1978
A reply to "Comments on the use of truncated distribution theory for improved estimation" by von Seggern and Rivers. Bull. Seism. Soc. Am., 68:1547-1548.

APPENDIX 6.5

Travel times for Rayleigh- and Love-waves for continental and oceanic structures

This appendix has been drafted to a high degree of detail to show, as an example, what the specifications of the procedures at international data centers might look like.

The appendix gives initially a brief description of the mathematical formulas used.

Table A6.5.1 gives the Rayleigh-wave group velocity (after Filson, 1974) for continental and oceanic structure to be used for estimating the arrival times of Rayleigh-waves at individual stations from events located from short period data.

The map shows in 5° x 5° areas the regions to which the two structures should be applied.

A listing of a computer program for the computation of Rayleigh-wave travel times from an epicenter to a recording station is given in subappendix 5A.

Data for Love-waves are not included in this example, but similar tables should be worked out for this type of wave.

Reference

Filson, J.R., 1974
Long period results from the International Seismic Month.
Lincoln Laboratory Report 1974-15, Massachusetts, USA.

Procedure for calculating surface-wave travel times

The surface waves are assumed to follow great circle paths from source to receiver (distance D). The distance D is divided into parts belonging to regions with different group velocity curves. This is made by a step procedure.

In the figure the line PQ denotes a great circle path between source and receiver. As is shown in the figure p and a are colatitude and longitude of P and c and b colatitude and longitude of Q. N is the north pole. A point M is moved from P to Q by increasing d in small steps. For each step the colatitude (m) and the longitude (a+n) of M are calculated. The following formula is used for calculating m:

$$\cos m = \cos d \cdot \cos p + \sin d \sin p \cos az$$

This is obtained from the spherical triangle PNM, where az is the azimuth to Q viewed from P (d, p and az are known). The same formula applied again to PNM gives n:

$$\cos d = \cos p \cos m + \sin p \cos m.\cos n$$

The correct solution of n (positive or negative value) is chosen depending on if az is greater than or less than 180°.

To avoid numerical problems care is taken to cases when P, Q or M are close to one of the poles or when D is close to 180°.

The earth is divided in a grid with r (longitude) times s (latitude) number of squares. The grid spacing is several times the increment of d. A matrix corresponding to the grid indicates which region each square in the grid belongs to. By transforming the coordinates of M to matrix indices

$$\text{index } 1 = \frac{a+n}{360} \cdot r + 1; \quad \text{index } 2 = \frac{m}{180} \cdot s + 1$$

the region in which M is situated is found. By summing up the number of steps taken in each region the distance D is divided into parts belonging to the various regions. The travel time is then calculated as the sum of the travel times within the different regions as follows:

$$T_t = \sum_i \frac{D}{k_i} \sum_i \frac{k_i}{v_{i,t}}$$

k_i = number of steps in region i

$v_{i,t}$ = group velocity in region i for waves with period t

T_t = travel time from source to receiver for waves with period t

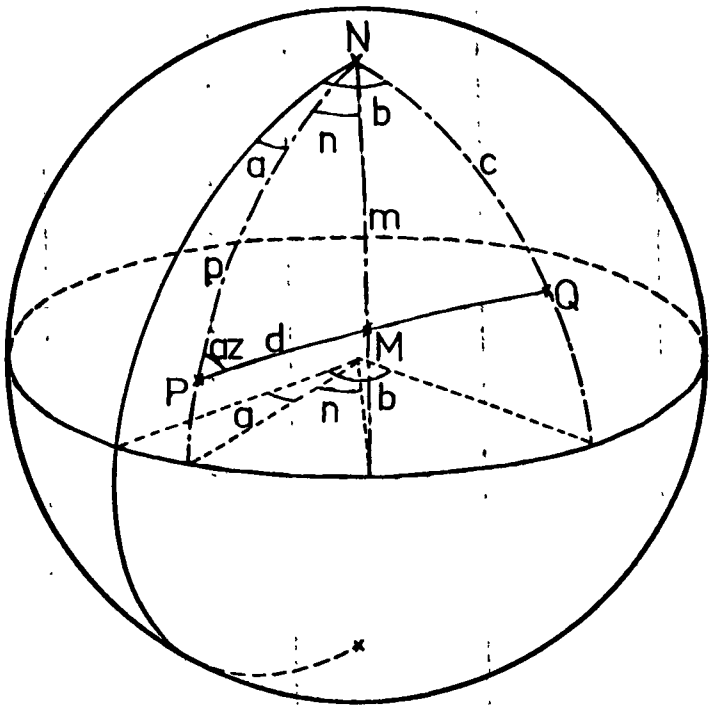
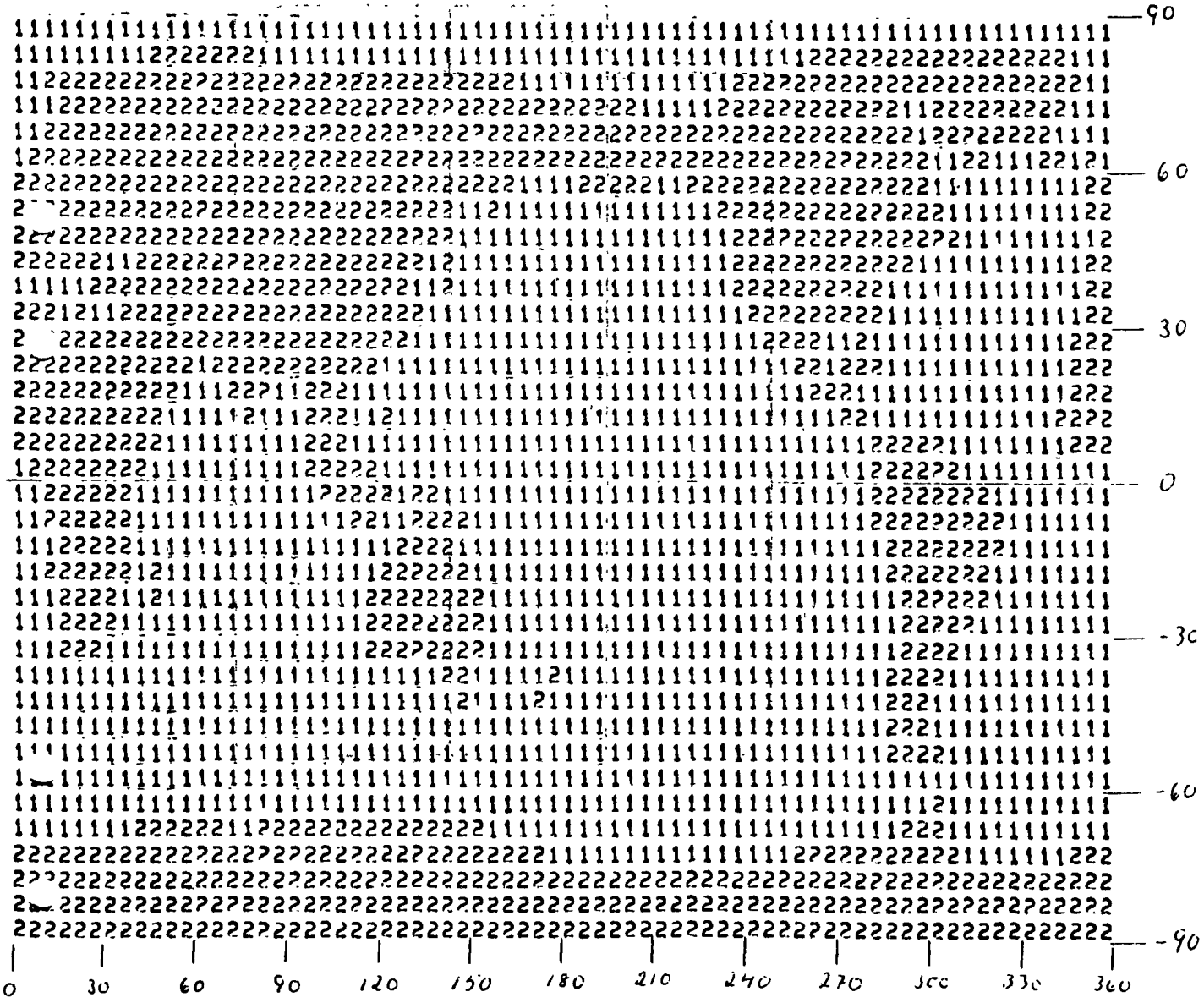


Table A6.5.1

Period (sec)	Group velocity (km/s)	
	Region 1 (Ocean)	Region 2 (Continent)
1	1.95	1.00
2	1.70	1.20
3	1.45	1.50
4	1.20	1.70
5	1.05	2.00
6	1.00	2.50
7	0.98	2.70
8	1.00	3.00
9	1.02	3.15
10	1.10	3.15
11	1.15	3.15
12	1.25	3.15
13	1.35	3.10
14	1.60	3.10
15	1.80	3.10
16	2.20	3.05
17	2.65	3.00
18	2.95	2.95
19	3.25	2.95
20	3.40	2.95
21	3.60	2.95
22	3.70	2.95
23	3.75	3.00
24	3.80	3.80
25	3.85	3.05
26	3.85	3.05
27	3.90	3.10
28	3.90	3.15
29	3.90	3.20
30	3.90	3.25
31	3.90	3.30
32	3.95	3.35

Table A6.5.1 (cont.)

Period (sec)	Group velocity (km/s)	
	Region 1 (Ocean)	Region 2 (Continent)
33	3.95	3.40
34	3.95	3.45
35	3.95	3.45
36	3.95	3.50
37	3.95	3.55
38	3.95	3.60
39	4.00	3.60
40	4.00	3.65
41	4.00	3.65
42	4.00	3.65
43	4.00	3.70
44	4.00	3.70
45	4.00	3.70
46	4.00	3.75
47	4.00	3.75
48	4.00	3.75


90
60
30
0
-30
-60
-90
0
30
60
90
120
150
180
210
240
270
300
330
360

```
      SUBROUTINE TTIME(COLAE, CLONE, AZS, DIST, TIM, PT, NL, IGV)
C
C* INGVAR JEPPSSON, FOA 202, 790109
C
C
C* THIS ROUTINE CALCULATES THE TRAVELTIMES FOR SURFACE WAVES FROM AN
C  EVENT TO A SEISMIC STATION.
C  TRAVELTIMES ARE CALCULATED FOR UP TO FOUR DIFFERENT SURFACE WAVE
C  PERIODS.
C
C  THE EARTH IS DIVIDED IN A NUMBER OF REGIONS, EACH REGION IS GIVEN
C  A NUMBER. TO EACH REGION BELONGS A GROUP VELOCITY CURVE WITH THE
C  SAME NUMBER AS THE REGION (THE GROUP VELOCITY GIVEN FOR PERIODS
C  BETWEEN 1 AND 48 SECONDS).
C
C  THE EARTH IS ALSO DIVIDED IN A GRID, AND TO THIS GRID CORRESPONDS
C  A MATRIX. EACH ELEMENT IN THE MATRIX CONTAINS A NUMBER EQUAL TO
C  THE NUMBER OF THE REGION THE CORRESPONDING SQUARE BELONGS TO.
C
C  THE TRAVELTIME IS CALCULATED AS THE TRAVELTIMES WITHIN
C  EACH REGION. SO, FIRST THE DISTANCE THE SURFACE WAVES TRAVEL WITHIN
C  EACH REGION IS CALCULATED, ASSUMING THE WAVE TRAIN TRAVELS ALONG A
C  GREAT CIRCLE PATH (NO REFRACTION OR MULTIPATHING). THIS IS MADE BY
C  A STEP PROCEDURE FROM EVENT TO STATION. THE NUMBER OF STEPS TAKEN IS
C  SUMMED UP FOR EACH REGION AND THE NUMBER OF STEPS IS THEN CONVERTED
C  TO DISTANCE.
C
C
C  NOTATION:
C  ALL ANGLES IS GIVEN IN RADIANS IF NOTHING ELSE IS STATED.
C
C  COLAE, CLONE = COLATITUDE AND LONGITUDE OF THE EVENT
C  COLA=COLAE, CLON=CLONE
C  AZS, DIST = AZIMUTH AND DISTANCE FROM EVENT TO STATION
C  AZ=AZS
C  TIM(J) = TRAVEL TIME FOR SURFACE WAVE WITH PERIOD PT(J)
C  PT(J) = SURFACE WAVE PERIOD (J=1 TO NL)
C  NL = NUMBER OF PERIODS FOR WHICH TRAVELTIMES SHALL BE CALCULATED
C     (NUMBER OF PERIOD MEASUREMENTS: MAX 4)
C  IGV = PARAMETER DENOTING TYPE OF WAVE PATH USED AT MAGNITUDE
C     DETERMINATION (IGV=1: MORE THAN 75% OCEANIC STRUCTURE:
C     IGV=3: MORE THAN 75% CONTINENTAL STRUCTURE: IGV=2: OTHERWISE)
C  IPEG(I1, I2) = MATRIX CONTAINING REGION NUMBERS FOR ALL SQUARES
C     IN THE GRID
C  I1M, I2M = MAXIMUM VALUES OF I1 AND I2 RESP. (I1M*I2M=NUMBER OF
C     SQUARES IN THE GRID)
C  GRIDC, GRIDL = LATITUDINAL AND LONGITUDINAL SIZE OF A SQUARE IN
C     THE GRID (IF I1M=36 AND I2M=72 A SQUARE IS 5*5 DEGREES)
C  NR = TOTAL NUMBER OF REGIONS (AND GROUP VELOCITY CURVES)
C  VELR(I, T) = GROUP VELOCITY CURVES. THE MATRIX CONTAINS THE GROUP
C     VELOCITY FOR SURFACE WAVES WITH PERIOD T IN REGION NUMBER I
C     (NR=MAX VALUE OF I)
C  I = REGION NUMBER
C  T = PERIOD OF SURFACE WAVE (INTEGER)
C  D = DISTANCE FROM THE EVENT TO A POINT M (IN DIRECTION AZS)
C  CM, LM = COLATITUDE AND LONGITUDE RESP. FOR POINT M
C  DM = DIFFERENCE IN LONGITUDE BETWEEN THE POINT M AND THE EVENT
C  DD = STEP SIZE
C  DDG = STEP SIZE IN DEGREES
C  P(I) = STEP COUNTER FOR REGION I
C  PP = TOTAL NUMBER OF STEPS (SUM OF ALL P(I) WHEN STATION IS REACHED)
C  PART(I) = DISTANCE IN REGION I OF THE SURFACE WAVE PATH
C  COCE, COAZ, COD, COCM, CODM = COS-VALUES OF COLA, AZ, D AND DM RESP.
C  SICE, SIAZ, SID, SICM = SIN-VALUES OF COLA, AZ, D AND CM RESP.
C  TWOPI = 2*PI
C  DEGKM = NUMBER OF KILOMETERS PER DEGREE.
C  IT = NUMBER OF OUTPUT UNIT FOR ERROR MESSAGES AND WARNINGS
```

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```
00650 C   DEGKM = NUMBER OF KILOMETERS PER DEGREE.
00660 C   IT = NUMBER OF OUTPUT UNIT FOR ERROR MESSAGES AND WARNINGS
00670 C
00680 C   ALL STATEMENTS ARE STANDARD FORTRAN EXCEPT THOSE PRECEDED BY A LINE
00690 C   BEGINNING WITH C***
00700 C
00710 C
00720       REAL PART(2), P(2), LM, CM, TIM(4), PT(4)
00730       INTEGER T
00740       COMMON /LP1/IREG(36,72), VELR(2,48)
00750       DATA IT/6/, NR/2/, DDG/1./, DEGKM/111.2/
00760       DATA PI/3.141593/, TIM/36/, T2M/72/, TWOPI/6.283186/
00770 C
00780 C   CHECK IF ANY OF THE PARAMETERS IN THE SUBROUTINE CALL STATEMENT
00790 C   IS OUT OF RANGE.
00800 C
00810       IF (COLAE.LT.0..OR.COLAE.GT.PI.OR.CLONE.LT.0..OR.
00820      *CLONE.GT.TWOPI.OR.AZS.GT.TWOPI.OR.
00830      *AZS.LT.0..OR.DIST.LT.0..OR.DIST.GT.PI) GO TO 500
00840 C
00850 C   SET CORRECT VALUES TO SOME PARAMETERS AND SET COUNTERS TO ZERO.
00860 C
00870     5 GRIDC=PI/FLOAT(TIM)
00880       GRIDL=TWOPI/FLOAT(T2M)
00890       DD=DDG*PI/180.
00900       D=0.
00910       DO 90 I=1,NR
00920    90 P(I)=0.
00930       COLA=COLAE
00940       CLON=CLONE
00950       AZ=AZS
00960 C
00970 C   GIVE AZ A WELL DEFINED VALUE IF DIST IS CLOSE TO 180 DEGREES.
00980 C
00990       IF (DIST.GT.(PI-0.001)) AZ=0.1
01000 C
01010 C   CHECK IF THE EVENT IS CLOSE TO ONE OF THE POLES.
01020 C
01030       IF (COLA.LT.0.001.OR.COLA.GT.(PI-0.001)) GO TO 650
01040 C
01050 C   CALCULATE FREQUENTLY USED SIN- AND COS-VALUES.
01060 C
01070   100 COCE=COS(COLA)
01080       SICE=SIN(COLA)
01090       COAZ=COS(AZ)
01100       SIAZ=SIN(AZ)
01110       CM=COLA
01120       LM=CLON
01130       GO TO 400
01140 C
01150 C   INCREASE DISTANCE D FROM EVENT TO POINT M WITH STEP DD.
01160 C
01170   150 D=D+DD
01180 C
01190 C   WAS THE STATION REACHED WITH THIS STEP?
01200 C
01210       IF (D.GT.DIST) GO TO 1000
01220 C
01230 C
01240 C
01250 C   CALCULATE THE COORDINATES (CM, LM) FOR POINT M.
01260 C
01270       COD=COS(D)
01280       SID=SIN(D)
01290       COCM=COCE*COD+SICE*SID*COAZ
```

```
01270         COD=COS(D)
01280         SID=SIN(D)
01290         COCM=COCE*COD+SICE*SID*COAZ
01300 C
01310 C   CHECK IF ARCCOS-ARGUMENT IS OUT OF RANGE.
01320 C
01330         IF (ABS(COCM).GT.1.0) GO TO 710
01340 C **
01350    340 CM=ARCOS(COCM)
01360 C
01370 C   CHECK IF M IS CLOSE TO ONE OF THE POLES.
01380 C
01390         IF (CM.LT.0.0001.OR.CM.GT.(PI-0.0001)) GO TO 720
01400         SICM=SIN(CM)
01410         CODM=(COD-COCE*COCM)/(SICE*SICM)
01420 C
01430 C   CHECK IF ARCCOS-ARGUMENT IS OUT OF RANGE.
01440 C
01450         IF (ABS(CODM).GT.1.0) GO TO 730
01460 C **
01470    350 DM=ARCOS(CODM)
01480 C
01490 C   CHOSE THE RIGHT SOLUTION OF DM DEPENDING ON AZIMUTH.
01500 C
01510    360 IF(AZ.GT.PI) DM=-DM
01520 C
01530 C   CALCULATE LONGITUDE OF POINT M AND CHOSE RIGHT INTERVAL.
01540 C
01550         LM=CLON+DM
01560         IF (LM.LT.0.) LM=LM+TWOPI
01570         IF (LM.GT.TWOPI) LM=LM-TWOPI
01580 C
01590 C
01600 C
01610 C   CALCULATE WHICH SQUARE THE POINT M (WITH COORDINATES CM, LM)
01620 C   FALLS WITHIN; THAT IS DETERMINE THE VALUES OF THE INDICES
01630 C   TO THE IREG-MATRIX AND DETERMINE WHAT REGION THE SQUARE
01640 C   BELONGS TO (REGION NUMBER=I). START WITH M = EVENT.
01650 C   INCREASE APPROPRIATE STEP COUNTER.
01660 C
01670    400 I1=IFIX(CM/GRIDC)+1
01680         I2=IFIX(LM/GRIDL)+1
01690         IF (I1.LT.1.OR.I1.GT.I1M.OR.I2.LT.1.OR.I2.GT.I2M) GO TO 700
01700         I=IREG(I1, I2)
01710         P(I)=P(I)+1.
01720         GO TO 150
01730 C
01740 C
01750 C
01760 C   OUTPUT OF ERROR AND WARNING MESSAGES.
01770 C
01780    500 WRITE(IT,501) COLAE, CLONE, AZS, DIST
01790    501 FORMAT(1X, '***WARNING: TTIME-ARGUMENT OUT OF RANGE:'/
01800       *1X, '   EVENT LAT, LONG  ', 2F8.5, 5X,
01810       *'   AZIMUTH, DISTANCE  ', 2F8.5)
01820 C
01830 C   NO CORRECTION OF THE ARGUMENTS IS MADE.
01840 C
01850         GO TO 85
01860 C
01870 C
01880    650 WRITE(IT, 651) COLA
01890    651 FORMAT(1X, '***EVENT CLOSE TO ONE OF THE POLES: COLA1=', F9.5)
01900 C
01910 C   MAY CAUSE NUMERICAL TROUBLE. SET NEW VALUE.
01920 C
01930         IF (COLA .LT.0.01) COLA=0.001
01940         IF(COLA.GT.(PI-0.001)) COLA=PI-0.001
01950         GO TO 100
```

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```
       IF(COLA.GT.(PI-0.001)) COLA=PI-0.001
       GO TO 100
C
C
   700 WRITE(IT, 701) I1, I2
   701 FORMAT(1X, '***IREG-ARGUMENT OUT OF RANGE: I1=', I3, '  I2=', I3)
C
C  IF IREG-ARGUMENT IS OUT OF RANGE THIS STEP IS IGNORED (NO STEP
C  COUNTER INCREASED).
C
       GO TO 150
C
C
   710 IF (ABS(COCM).LT.1.001) GO TO 715
C
C  NO MESSAGE IF ONLY TRUNCATION ERROR.
C
       WRITE(IT, 711) COCM
   711 FORMAT(1X, '***ARCCOS-ARGUMENT OUT OF RANGE: COCM=', F12.8)
C
C  IF ARCCOS-ARGUMENT IS OUT OF RANGE, IT IS CORRECTED TO +1. OR -1.
C  RESPECTIVELY INDEPENDENT OF THE ACTUAL VALUE, AND THE EXECUTION
C  IS CONTINUED.
C
   715 COCM=SIGN(1., COCM)
       GO TO 340
C
C
   720 WRITE(IT, 721) CM
   721 FORMAT(1X, '***M NEAR ONE OF THE POLES: COLAIM=', F12.8)
C
C  GIVE DM A WELL DEFINED VALUE.
C
       DM=0.
       GO TO 360
C
C
   730 IF (ABS(COM).LT.1.001) GO TO 735
C
C  NO MESSAGE IF ONLY TRUNCATION ERROR.
C
       WRITE(IT, 731) COM
   731 FORMAT(1X, '***ARCCOS-ARGUMENT OUT OF RANGE: COM', F12.8)
C
C  IF ARCCOS-ARGUMENT IS OUT OF RANGE, IT IS CORRECTED TO +1. OR -1.
C  RESPECTIVELY INDEPENDENT OF THE ACTUAL VALUE, AND THE EXECUTION
C  IS CONTINUED.
C
   735 COM=SIGN(1., COM)
       GO TO 350
C
C
C
C  CALCULATE THE DISTANCE IN DIFFERENT REGIONS OF THE WAVE PATH.
C  FIRST, SUM UP THE TOTAL NUMBER OF STEPS.
C
   000 PP=0.
       DO 1001 I=1,NR
   001 PP=PP+P(I)
       DO 1005 I=1,NR
   005 PART(I)=P(I)*DIST/PP
C
C
C
C* CALCULATE THE TRAVELTIME AS THE SUM OF THE TRAVELTIMES IN THE
C  DIFFERENT REGIONS, AND MULTIPLY BY A CONSTANT FACTOR TO GET THE
C  TIME IN SECONDS.
C
       DO [illegible]
```

```
02[illegible] C   DIFFERENT REGIONS, AND MULTIPLY BY A CONSTANT FACTOR TO GET THE
02600 C   TIME IN SECONDS.
02610 C
02620       DO 1100 J=1, 4
02630  1100 TIM(J)=0.
02640       DO 1155 J=1, NL
02650       I=IFIX(PI(J)+0.5)
02660       DO 1150 I=1, MP
02670  1150 TIM(J)=TIM(J)+PART(I)/VELR(I, I)
02680       TIM(J)=TIM(J)*DECKM*180./PI
02690  1155 CONTINUE
02700 C
02710 C
02720 C*  CONVERT TO TENTH OF SECONDS BY MULTIPLYING BY TEN.
02730 C
02740       DO 1160 J=1, NL
02750  1160 TIM(J)=TIM(J)*10.
02760 C
[illegible] C
[illegible] C*  CALCULATE VALUE OF IGV DEPENDING ON WAVE PATH.
02790 C       IGV=1 FOR MORE THAN 75% OCEANIC STRUCTURE
02800 C       IGV=3 FOR MORE THAN 75% CONTINENTAL STRUCTURE
02810 C       IGV=2 OTHERWISE
02820 C
02830       SPAPI=PART(1)/DIST
02840       IGV=2
02850       IF (SPAPI.GT.0.75) IGV=1
02860       IF (SPAPI.LT.0.25) IGV=3
02870 C
02880 C
[illegible]       RETURN
[illegible]       END
```

APPENDIX 6.6

Automatic process for the association of long-period surface wave data with events located from short-period observations

A procedure by which reported long-period surface wave data are associated with events located from short-period data should be used at international data centers.

The travel times for long-period Rayleigh and Love waves from an epicenter to the long-period stations are estimated using the travel times given in Appendix 6.5. Reported long-period surface wave data should be preliminary associated with an event if the estimated arrival times of surface waves at a certain period agree with those reported within a predetermined time interval. To reduce the probability of making a wrong association of surface waves, a procedure similar to that discussed for short-period signals in Appendix 6.1 could be applied. This procedure checks that stations to which surface waves have been associated also have a reasonable probability of detecting such signals from an event with the actual magnitude at the actual region. A detailed description of the association control procedure will need to be elaborated.

APPENDIX 6.7

Example of output bulletin and data file structures at International Data Centers

1. Example of a possible format of an output bulletin (containing basic information) from an International Data Center for one event

780120
002421.6 ± 7.3 9.6S ± 0.1 159.3E ± 0.1 28 km ± 10 BASED ON 12 STAT
SOLOMON ISLANDS
NUMBER OF ASSOC. SP-TIMES 34 NUMBER OF ASSOC. LP-TIMES 8
MB : 5.1 BASED ON 6 STAT STD : 0.30
MS : 5.0 BASED ON 7 STAT STD : 0.35
CMPX : 1.23 SPMM : 1.21 SPVT : 0 -9 -18 -13 -37 STAT : ARR.

Explanations

780120 = date of event

002421.6 ± 7.3 9.6S ± 0.1 159.3E ± 0.1 28 km ± 10 BASED ON 12 STAT
= origin time, epicenter, depth with associated error estimates and number of stations used for defining event

SOLOMON ISLANDS = region

NUMBER OF ASSOC. SP-TIMES 34 NUMBER OF ASSOC. LP-TIMES 8
= number of short period and long period arrival times that could be associated with the event

MB : 5.1 BASED ON 6 STAT STD : 0.30
= estimated bodywave magnitude based on amplitude and period measurements at 6 stations. Standard deviation among the individual station magnitudes is also given.

MS : 5.0 BASED ON 7 STAT STD : 0.35
= estimated surface wave magnitude based on amplitude and period measurement at 7 stations. Standard deviation among the individual station magnitudes is also given.

CMPX : 1.23 SPMM : 1.21 SPVT : 0 -9 -18 -13 -37 STAT : ARR.
= identification data for the event as reported from station ARR.

2. Data file formats

The data storage at the data centers could preferably be divided into several data files as follows:

- Station parameters and calibration data
- Input data reported from individual stations
- Output parameters obtained as a result of the processing at the centers
- Internal "book-keeping" files
- Level 2 data files.

These data files should be identical at the different data centers and they should be arranged so that data are easily accessible by modern computer techniques. Detailed specifications of the format used for the various data files will need to be elaborated. An example of a possible structure of data files at international data centers is given at the end of this appendix.

Station parameters and calibration data file

This file contains station parameters such as latitude, longitude, instrument and regularly updated calibration data. This file should also contain information about the time intervals during which any individual station has been out of operation.

Input data file

The file contains all the information that has been reported to the data centers via the WMO/GTS. The contents of this file depend on what actually are reported from the individual stations as discussed in chapters 3 and 4.

Output data files

These files should contain the parameters obtained as a result of the data processing at the centers. They should also contain all the individual station data that are associated with an event. The output file should furthermore contain all the unassociated data.

Internal "book-keeping" file

This file should contain a record of the processing that has been carried out at the individual centers. It is quite similar to the internal data files which are presently kept at large data centers.

Level 2 data file

This file would contain all the digital Level 2 data that have been forwarded to the data centers as results of requests. There will also be a need for archival storage of Level 2 data received on non-digital form.

3. An example of a possible structure of data files at International Data Centers

In the following, an example is given of a possible structure of data files at international data centers.

Structure and basic functions of data banks in international centres

The purpose of a data bank is:

To store all data received by the international centre from stations in the global network;

To store data processed in the centre;

To ensure the prompt supply of necessary information at the request of States parties to a treaty on the complete and general prohibition of nuclear-weapon tests.

Figure 6.7.1 gives a schematic view of a bank's structure. The data bank's information control system comprises the following main elements:

Input and output programmes;

Bank software (set of programmes);

Bank information fund;

Bank information retrieval language;

Information system hardware;

Information system service personnel.

The information fund can be divided into four large files, according to the nature of the data stored in it:

I. Focal parameters of events located by the centre;

II. Calibration data and particulars of stations;

III. Signal parameters (Level-1 data) from each individual station;

IV. Original recordings of P and L waves of events (Level-2 data) for each individual station;

The basic functions of a bank's information control system are as follows:

To record seismic data on machine carriers (files I-IV);

To store seismic data on the machine carriers for the regulation period;

To supply stored information upon request within the established time-limit and in a specially processed form.

Depending on the operational requirements of the international centre, the bank may be equipped with an automated data-control system ensuring the rapid retrieval and supply of required information.

The type of data to be stored in the bank can be seen in tables 6.7.1 - 6.7.5. Table 6.7.1 represents file I, which stores the focal parameters of seismic events located by the centre. Clearly, the format to be used for data in file I should be the same as that used for the bulletin of seismic events, which includes 22 parameters. Parameters 1 and 2 (number and date of event) should be used for information-retrieval purposes.

Figure 6.7.1 Example of Structure of the data bank of an international centre in the global network

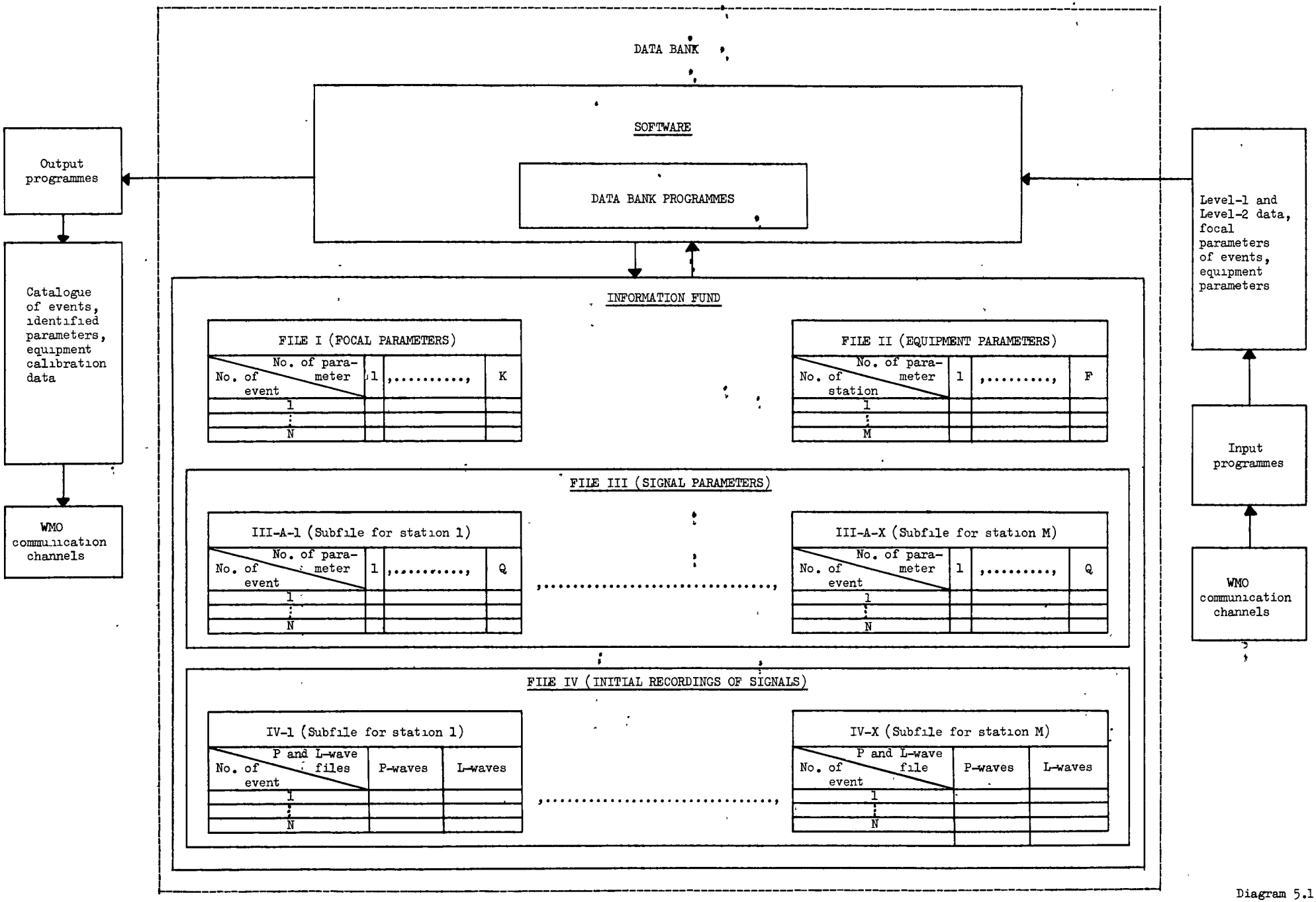

Diagram 5.1

Table 6.7.2 represents file II, which, in addition to the specifications of SP and LP instruments, gives some basic information about the stations (co-ordinates, soil conditions). File II has 11 parameters. Parameter 1 should be used for information retrieval.

Tables 6.7.3 and 6.7.4 represent file III - Level-1 data from all stations in the global network. This file is subdivided into two: file III-A and file III-B. File III-A (Table 6.7.3) is designed to store data that have been associated with located events; file III-B (Table 6.7.4) is designed to store "isolated signals", which, after appropriate processing in the centre, cannot be associated with a located focus. Each of the two files is in turn subdivided into M subfiles (M = number of stations). Each subfile in file III-A contains Level-1 information for each consecutive located event. Only the first five parameters are standard, and the remaining data can be sent from stations in telegraphic form. The volume of data sent in this manner will differ according to the nature of the signal recording. Parameters 1 and 2 can be used for information retrieval.

Each of the III-B subfiles stores Level-1 data related to "isolated" signals detected at a given station. In this case, the first three parameters are standard for all signals and may be used for information retrieval purposes. The texts of telegraphic communications from a given station could be stored with Level-1 parameters.

Table 6.7.5 represents file IV in station No.1. It contains segments of signals recorded on SP and LP instruments. The bank could store, for a set period, 60-second segments of P waves, 30 seconds of noise from SP vertical instruments, 20-minute segments of L waves from three-component LP instruments and 5 minutes of noise from vertical LP instruments. File IV is subdivided into M subfiles (M = number of stations). Each subfile stores information on each consecutive event in connexion with which one or another State has requested information from a station in the global network. Each event in the subfile is defined by 6 parameters, with parameters 1 and 2 being used for information-retrieval purposes.

Input and output programmes serve to enter into the bank Level-1 and Level-2 information and focal parameters obtained as a result of processing by the centre and to retrieve listed data when a request is submitted. Level-1 information and data from the catalogue of events should be transferred from the centre in the form of digital files. It is probable that, initially, at least for some of the stations, it will be in photocopy form only that Level-2 information can be transmitted to and from the centre.

Table 6.7.1

File I (focal parameters)

No. of parameter	Type of focal parameter	Unit of measurement	Accuracy of measurement	Volume of data (computer words 16-bits)
1	Number of seismic event			1
2	Date of event	year, day, month		1
3	Origin time (T_o)	hour, minute, second	0.1	1
4	Error in T_o	second	0.1	1
5	Epicentre latitude (φ)	degree	0.01	1
6	Error σ_φ	degree	0.01	1
7	Epicentre longitude (λ)	degree	0.01	1
8	Error σ_λ	degree	0.01	1
9	Magnitude M_6 (SP instrument)		0.1	1
10	Error σM_6		0.1	1
11	Magnitude M_6 (LP instrument)		0.1	1
12	Error σM_6		0.1	1
13	Magnitude M_{SH} (SP instrument)		0.1	1
14	Error σM_{SH}		0.1	1
15	Magnitude M_{SH} (LP instrument)		0.1	1
16	Error σM_{SH}		0.1	1
17	Magnitude M_S (LP instrument)		0.1	1
18	Error σM_S		0.1	1
19	Focal depth (h)	km	1	1
20	Error σ_h	km	0.1	1
21	Number of stations contributing to determination of epicentre			1
22	Comments			5

Table 6.7.2

File II (station parameters)

No. of parameter	Type of station parameter	Unit of measurement	Accuracy of measurement	Volume of data (computer words 16-bits)
1	Number of the station			1
2	Station latitude	degree	0.01	1
3	Station longitude	degree	0.01	1
4	Type of bedrock			1
5	Height above sea-level	metre		
	SP instrument frequency response:			
6	Z-component (0.25 - 10 Hz)	nm-Hz		30
7	NS-component (" ")	nm-Hz		30
8	EW-component (" ")	nm-Hz		30
	LP instrument frequency response:			
9	Z-component (1 - 100 secs)	nm-Hz		40
10	NS-component	nm-Hz		40
11	EW-component	nm-Hz		40
12	Date of last determination of instrument specifications			1

Table 6.7.3

File III-A-I (Station No. 1, identified signals from located events)

No. of parameter	Type of signal parameter (Level-1)	Unit of measurement	Accuracy of measurement	Volume of data (computer words - 16 bits)
1	Number of event (No. 1)			1
2	Date of event	year, day, month		1
3	Epicentre azimuth	degree	0.1	1
4	Epicentral distance	degree	0.1	1
5	Local station correction for travel time of P-wave	second	0.1	1
6	Focal correction for P-wave	second	0.1	1
7	Text of telegraphic message from station No.1 concerning event No.1 as detected on SP and LP instruments (Level-1 parameters)			
Q	SEISMO ..... STOP			
1	Number of event (No. X)			
Q	SEISMO ..... STOP			

Table 6.7.4

File III-B-I (Station No. 1, signals not identified with located events)

No. of parameter	Type of signal parameter (Level-1)	Unit of measurement	Accuracy of measurement	Volume of data (computer words - 16 bits)
1	Number of signal (No. 1)			1
2	Date of signal	year, month, day		1
3	Arrival time of P-wave	hour, minute, second	0.1	1
4	Text of communication from station No. 1 concerning signal No. 1 as detected on SP and LP instruments (Level-1 parameter)			
	SEISMO.....			
Q	... STOP			
1	Number of signal (No. N)			
Q	SEISMO ... STOP			

Table 6.7.5

File IV-I (Level-2 data at Station No. 1)

No. of parameter	Type of signal parameter (Level 2)	Length of signal (seconds)	Frequency of quantification	Volume of data (computer words - 16 bits)
1	Number of station (No. 1)			1
2	Number of event (No. 1)			1
3	Recording of P-waves on an SP instrument (Z-component)	90	20	1 800
4	Recording of L-waves on an LP instrument (Z-component)	1 500	1	1 500
5	Recording of L-waves on an LP instrument (NS-component)	1 200	1	1 200
6	Recording of L-waves on an LP instrument (EW-component)	1 200	1	1 200
.		.	.	.
.		.	.	.
.		.	.	.
1	Number of station (No. 1			
2	Number of event (No. N)			
.	.	.	.	.
.	.	.	.	.
6				

The bank software would consist of a set of information-fund control programmes and an information retrieval service. Data received for storage in the bank need not be subject to any additional processing or conversion. Thus, the bank software could be confined to data control and retrieval programmes.

The bank information retrieval language is the form in which seismic data are printed out. It must be based on parameters selected to suit each file in the information fund. The parameters selected for information-retrieval purposes play a particularly important role in the bank data-control process.

APPENDIX 6.8

Estimation of Level 1 and Level 2 data volumes
to be handled at International Data Centers

This appendix contains an estimate of the Level I and Level II data to be received and processed at the centers. The purpose of this estimate is to form a basis for a specification of the equipment needed at the international centers. Note that the estimates of data volumes at Level I given in this appendix are not directly comparable to those specified in Appendix 4.2 for data transmission on the WMO/GTS, since the coding procedures are entirely different.

Level I data

The structure of an international center and the organization of its work are closely linked with the size of the information flow into the center, and, consequently with the volume of the information to be stored in the data bank over long periods. Rough estimates of the flow and the volume of data to be stored in the center can be made on the basis of the number of computer words (16 bits each) required to describe a single event on SP or LP equipment at Level I (see Tables 3.1 and 3.2). Such an estimate is given in Table A6.8.1, for the purposes of which it was assumed that the global network will consist of 25 type-I stations, 15 type-II stations and 10 type-III stations.

The number of events recorded by stations in the global network depends on a number of geophysical and other factors. The basic factors are:
The level of seismic activity at the time.
The level of seismic noise normally detected by the stations.
The position of a station relatively to the high-seismic-activity zones.
The sensitivity of the equipment and the manner in which it is installed in the station.
The methods used to distinguish signals from noise.

The number of signals recorded at individual stations over a 24-hour period may vary considerably from a few to 100 or more, depending on the factors listed above. The wave configuration of the signals recorded at a given station is also governed by a number of geophysical factors (magnitude, focal depth, epicentral distance, etc.). Thus, in the case of weak events at teleseismic distances, SP instruments normally register only longitudinal wave groups. Deep-focus events are normally marked by an absence of surface waves.

Since most of the events recorded at any given station are small in magnitude and have their focus in the earth's crust, most signals consist of trains of longitudinal waves recorded on vertical SP instrument.

For the sake of simplicity in calculating the data flow from stations to a center, it is assumed that over a 24-hour period each station records an average of 50 signals, 30 of which consist only of longitudinal waves detected on SP instruments and the remaining 20 of which consist of P and S waves detected on SP instruments and P, S and L waves detected on LP instruments.

Table A6.8.1

Volume of Level 1 data from stations to an international center over a 24-hour period

Type of Station	Type of Equipment	Maximum Frequency Response (Hz)	Recorded Wave Types	Volume of Data (Computer Words) for Each Event	Number of Events in each 24-hour period	Data Flow (Computer Words per 24-hour per.)
I	SP	1	P	31	30	930
Analog	SP	1	P+S	45	20	900
Recording	LP	0.05	P+S+L	56	20	1 120
II	SP	1	P	31	30	930
Digital	SP	1	P+S	45	20	900
Recording	LP	0.05	P+S+L	56	20	1 120
III	SP	1	P	47	30	1 410
Array	SP	1	P+S	61	20	1 220
Station	LP	0.05	P+S+L	60	20	1 200

Using the data provided in Table A6.8.1, it is possible to calculate approximate over-all Level I data flow to a center from all 50 stations in the global network over a 24-hour period.

Type-I stations: 25 x (930 + 900 + 1,120) = 73,750

Type-II stations: 15 x (930 + 900 + 1,120) = 44,250

Type-III stations: 10 x (1,410 + 1,220 + 1,200) = 38,300

Thus, the over-all volume of data that will be received by a center over a 24-hour period amounts to: 73,750 + 44,250 + 38,300 = 156,300 computer words.

Level II data

The approximate volume of Level II data received by a center from stations in response to requests can be estimated on the basis of the assumption (which is of course highly uncertain) that information concerning five events characterized by P and L waves will be requested each month.

Previous calculations concerning the volume of Level II data (CCD/558) showed that a 60-second recording of P waves sampled 20 times per second on a vertical SP instrument would amount to 1,200 computer words, and a 20-minute three-component recording of surface waves sampled once a second would amount to 3,600 computer words. As an extension to the earlier recommendations, however, it would seem advisable to include, in addition to the waveforms of P and L waves, small segments of the noise preceding the signals. In the case of SPZ instruments, a 30-second noise segment should be taken, and in the case of LPZ instruments, a five-minute segment. In this case, a 90-second recording on a SP instrument together with a 25-minute recording on a Z component and a 20-minute recording on each of two horizontal LP instrument will amount to 5,700 words, or slightly more if auxiliary information is taken into account. Thus, the total volume of Level II data for five events per month from 25 stations equipped with digital recording devices would be approximately 712,500 words. The remaining 25 stations in the assumed global network do not have digital recording facilities and would therefore transmit Level II information in analog form and not over digital channels.

It is also possible to estimate the approximate volume of data to be stored in a center subsequent to the processing of Level I data.

In accordance with the proposed format for catalogues of seismic events, one event requires approximately 30 computer words. If it is assumed that, over a 24-hour period, a center detects 50 events, each of which is recorded by half the stations in the global network, i.e. 25 stations, the volume of focal-parameter data over a 24-hour period will be: 50 x 30 = 1,500 words. The volume of azimuth and epicentral distance data for the 50 events detected by array stations over a 24-hour period will be 50 x 25 x 2 = 2,500. Thus, the total volume will be 4,000 words.

If it is assumed that all Level I data received by a center are transferred to the bank for long-term storage (some of the data will be associated with located events, while the rest will consist of unassociated signals), the volume of data received by the bank over a 24-hour period will be: 156,300 + 4,000 = 160,300 words.

Since Level I data and the focal parameters of events will have to be stored in the center over a long period, an estimate should be made of the volume of data that may be expected in this connection.

In the course of one month, the total volume of Level I data, processed data and data concerning instrument calibration parameters would be approximately 5 million words, so that in the course of one year, the volume of data would be about 60 million words.

APPENDIX 6.9

Specification of the equipment to be used at International Data Centers

This appendix contains a brief description of the equipment needed at the individual international data centers to carry out the tasks specified for such centers. This question is also addressed in the first report of the Ad hoc group (CCD/558).

International centers in the global network must be equipped to receive data through WMO channels and to process, analyze and store both reported and processed data. In this connection, the centers must be provided with sufficiently powerful modern computers and communication equipment.

The report of the Ad hoc group (CCD/558) suggests that centers should be equipped as follows.

Each center should have a main computer, which would process Level I data, and two mini-computers, one of which would assure communication between the center and stations in the global network and between centers, and the other of which would perform back-up functions. The data center's main computer could include the following.

A central processor with a memory that can store at least 100,000 computer words and a calculating speed of at least one million instructions per second.

Mass storage on disk for data and programs, with a capacity of at least 50 million computer words.

Four magnetic tape transports for digital recording.

Three interactive terminals.

Access to a large back-up computer (either nearby or remote) in case of a system breakdown.

The data archive function will require another computer with a large memory.

CD/44
26 July 1979
Original: ENGLISH

POLAND

Outline of a convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction: working paper

In the process of formal and informal consultations between members of the Committee with a view to defining the most appropriate methods and forms of its work in order to accelerate progress towards an early agreement on the prohibition of chemical weapons, a wide area of agreement has emerged as to the need for its harmonization with the ongoing bilateral efforts in that area.

Bearing in mind the objective of working out a draft international convention on the prohibition of chemical weapons and the urgent need to pass from procedural to substantive considerations in that respect, it has been broadly agreed that the most useful course of action for the Committee to follow in the remaining time of its current session would be to proceed forthwith to the drafting of an outline of a possible convention. It is felt that such an outline should be based on the proposals and suggestions contained in the documents submitted so far, or to be submitted, to the Committee, in particular on the three drafts of a convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction, contained in documents CCD/361, CCD/420 and CCD/512, as well as document CCD/400.

Having analysed the above documents and having studied the informal working paper circulated on 13 July 1979 by the delegation of the Netherlands, the Polish delegation believes that in elaborating the said outline of a convention on the prohibition of chemical weapons, the Committee on Disarmament should take into account the following framework provisions:

1. Preamble: objective of convention - effective prohibition of chemical weapons contributing to (facilitating) achievement of general and complete disarmament, including, in particular, the prohibition of all types of weapons of mass destruction. Important significance of the Geneva Protocol of 1925, Convention on Prohibition of Bacteriological (Biological) Weapons and Convention on Prohibition of Military or any Other Hostile Use of Environmental Modification Techniques. The need of co-operation to contribute to easing international tension and to realization of purposes and principles of United Nations Charter.

GE.79-63134

2. Scope of prohibition: undertaking never in any circumstances to develop, produce, acquire, stockpile or retain agents of chemical warfare (chemical agents and munitions).

3. Prohibition of CW agents on the basis of purpose criterion (chemical agents of types and in quantities having no justification for technological, prophylactic, protective or other non-military purposes).

4. Additionally: purpose criterion supplemented with toxicity criterion.

5. Differentiation of chemical agents - levels of toxicity: highly toxic lethal chemical agents and lethal chemical agents.

6. Undertaking not to transfer to any State or organization CW agents and not to assist or encourage any State to pursue activities contrary to convention.

7. Declaring (after entry into force of convention) of stocks of CW agents and of CW agent production capacities.

8. Declaring of plans for destruction or conversion to peaceful purposes of declared stocks as well as plans for elimination or dismantling of production capacities. Specific time limits for execution of such undertakings.

9. Information about process of destruction of stocks of CW agents, about liquidation of CW agent production capacities as well as about completion of such processes.

10. Adoption of measures to protect civilians and environment during process of destruction of stocks of CW agents and the liquidation of their production capacities.

11. Provision for possibility of retention, production, acquisition and use of banned CW agents for legitimate technological, prophylactic or other peaceful purposes, including CW defense purposes. Procedures connected with limitation of types and quantities of such agents.

12. Adoption of internal measures to prohibit activities contrary to convention.

13. Control: Combination of national and international procedures.

14. Possibility of establishing national control organizations. Their functions. Undertaking not to interfere with use of national means of control.

15. Consultation and co-operation in solving problems arising from application of convention. Use of appropriate international procedures within the framework of United Nations as well as other international organizations.

16. Requests to other States Parties, in connexion with suspected violation of convention, for information or permission for on-site clarification of factual circumstances. Conditions and procedures of control.

17. Consultative Committee. Functions and procedures. Assistance in exchange of information, consultation and co-operation. Preparatory Committee (Commission).

18. Possibility of lodging complaints with United Nations Security Council. Co-operation in carrying out investigations.

19. Undertaking to provide and support assistance to any State Party threatened as a result of violation of convention.

20. Convention not to be interpreted as in any way limiting or detracting from obligations assumed under Geneva Protocol of 1925, Convention on Prohibition of Bacteriological (Biological) Weapons and Convention on Prohibition of Military or any Other Hostile Use of Environmental Modification Techniques.

21. Convention not to hamper economic and technological development of States Parties nor international co-operation.

22. Comprehensive character of convention. Participants.

23. Amendment procedure: convention review conference: withdrawal procedure: ratification: depositaries: entry into force: deposit of convention.

CD/45
30 July 1979
Original: ENGLISH

SWEDEN

Working paper on International Seismological Datacenter Demonstration Facilities in Sweden

INTRODUCTION

It is generally accepted that seismological verification is the key method to monitor compliance with a comprehensive test ban treaty (CTBT). Thus, to verify an international CTBT, a global seismological monitoring system is needed and the CD Ad Hoc Group of Seismic Experts has suggested that such a network could consist of:

- Some 50 globally distributed seismological stations
- Data communication over the World Meteorological Organization Global Telecommunication Network
- Specially established international seismological datacenters

International Datacenters are thus seen as an integral and important part of a global verification system. The main purpose with these Datacenters is to be service facilities for all the States parties to a CTBT and participating in the verification of the treaty. Datacenters should provide compiled seismological data ready for national assessment. The data provided by International Datacenters should be obtained through standardized analyses of data reported from a global network of seismological stations.

In order to demonstrate one possible way to carry out the main tasks of International Seismological Datacenters and to facilitate experimental studies in considerable technical and scientific detail of the functions to be performed at such centers temporary international datacenter facilities have been set up in Sweden. These facilities were demonstrated for representatives and experts from 26 countries and WMO on 12-14 July of this year.

This paper gives a short description of the facilities that were demonstrated and of the preliminary results so far obtained. More comprehensive technical documentation of the components of the demonstration facilities and of the results obtained are planned to be published in the beginning of 1980.

2. Tasks of International Datacenters

The International Datacenters have a number of tasks. One is to receive all so-called Level I data which are routinely transmitted from the contributing stations through the WMO global communication network and to store these data in computer readable form. In the next step the Datacenters would put together those data which seem to come from one and the same seismic event. Seismic events are then established from these associated arrival times, and their locations on the earth are estimated. This procedure is quite similar to the one carried out today at existing seismological datacenters, established for purely scientific purposes. An International Datacenter for test ban verification must, however, in addition to these functions also compile the reported identification data. Such data will make it possible for individual countries to assess the nature of the event, that is to judge whether it is an earthquake or an explosion. No such assessment should be made at the International Datacenters.

Surface waves, which are seismic waves that propagate along the surface of the earth, are generally recognized as important identifiers. The Datacenters should associate reported surface waves with located events and compile and report the results. Earthquakes and explosions can also be identified using the differences in the recorded so-called short period signals propagating through the interior of the earth. Such short period identification data are not reported today but are most important data for test ban verification. International Datacenters should also compile and report such identification data.

International Datacenters should carry out their analyses promptly and report the result of their analyses to the participating countries, using the WMO communication network, within a week of the occurrence of the event. The result of the analyses should also be stored at the Datacenters for possible future requests. The International Datacenters should also play a role in the exchange of complete record sections, known as Level II data. Request for such data from individual countries and the data received at Datacenters as the result of such requests, should be retransmitted and also stored at the Datacenters.

In addition to these tasks, International Datacenters should be able to conduct other service functions in connexion with test ban verification that might be demanded by the countries parties to a CTBT.

For co-ordinating the efforts of the individual Datacenters and ensuring that the tasks agreed upon are carried out properly, the service of an appropriate international body might be needed. This body could also from time to time review the procedures used at the Centers in the light of the experience gained through the operation of the international co-operative measures and also in the light of new research results.

3. Demonstration facilities

The purpose of the demonstration facilities established at the Hagfors Observatory of the National Defense Research Institute, as part of the research work there in detection seismology, was to demonstrate one possible way to carry out the main tasks of International Seismological Datacenters. The computational procedures and the data handling routines developed are only examples of such procedures and routines. The intention is that these examples will initiate and facilitate a detailed and thorough technical specification for the Datacenter procedures which are necessary for the preparation of the establishment of the International Datacenters. The temporary Datacenter facilities established include:

- A temporary computer connexion to the World Meteorological Organization global telecommunication network.
- Implementation on large computers at the Stockholm University Computer Center of quite extensive programs to carry out the main functions foreseen for the daily analyses at the International Datacenters.
- Compilation of an experimental data base containing information from earthquakes recorded during one week at 60 globally distributed seismological stations.

3.1. Connexion to WMO global telecommunication system

A temporary connexion to the WMO global telecommunication system has been established in co-operation with the Swedish Meteorological and Hydrological Institute. Technically, this connexion is a computer communication link between a small computer at the demonstration facility in Stockholm and the computer at the Swedish Meteorological and Hydrological Institute at Norrköping, some 200 kilometres from Stockholm. This latter computer is part of the WMO communication network. During the demonstration seismological data were transmitted from the WMO communication in Tokyo, Paris, Bracknell (outside London) and Offenbach in the Federal Republic of Germany and received in Stockholm. The data were transmitted as fairly comprehensive station bulletins similar to those foreseen to be transmitted from the stations in the monitoring systems. Analysed data, in a form of a Datacenter bulletin foreseen for the verification system, were also transmitted from the demonstration facility to the above-mentioned WMO communication centers.

3.2. Data analysis programs

The programs compiled for the analysis and handling of reported Level I data are designed to carry out a number of the tasks of an International Datacenter. The arrival times reported from individual stations are grouped by the computer in a systematic way to form potential seismic events. This procedure, by which potential seismic events are established from the individual station reports, is the fundamental process for further analysis at the Datacenters. It is, however, a procedure which sometimes can produce an unreal event. Once the individual station reports are associated with an event, the position of the event on the globe and its depth below the surface of the earth is estimated. The association and location procedures utilize the preliminary event location or, more specifically, the estimated azimuths and apparent velocities reported by array stations.

A special checking procedure has been developed by which the computer judges whether the established events are real or just the result of accidentally agreeing reports. Based on the expected sensitivity of the individual stations a likelihood judgement is made whether or not it is likely that the reporting stations, and no others, should have detected an event, if the event was real. It is indeed most important to prevent, in this way or by other methods, the introduction of unreal events that might create unfounded suspicions.

The reported long period surface wave data, which are essential for the identification of events, are associated with the located events by an automatic procedure. This takes into account not only the expected arrival time of the long period waves in relation to the observed times, but also the differences between the expected and observed arrival directions of the signals at individual stations. A computer program for the compilation of short period identification parameters, which should be reported in a verification system, has been developed.

One key question concerning International Datacenters and also one which has been extensively discussed in the CD seismic expert group, is whether the processing at International Datacenters should be fully automatic or whether interference or assistance by seismologists should be allowed. Fully automatic programs at International Datacenters could provide identical output bulletins which, however, might include spurious events, even if further developed checking routines might substantially reduce the probability of such mistakes. Analysis routines containing

judgement by analysis personnel would certainly reduce the number of spurious events but would, on the other hand, provide somewhat different outputs from the centers. To facilitate a thorough discussion of this important point, two analysis programs have been established, one fully automatic and one interactive, allowing the participating experts to interfere with the processing.

3.3. Experimental Data Base

To provide a data base for this demonstration the interval of one week -- 15-21 January 1978 -- was selected, and a global network of 60 seismological stations, corresponding as closely as possible to the network suggested by the CD seismic group. For most of the stations the compiled data were those reported from the individual stations to the United States Geological Survey and in widely distributed bulletins. These data contain the information for the definition, location and magnitude estimation of events but not for the identification of the events as earthquakes or explosions. Data for events identification were obtained from Grafenberg array station in the Federal Republic of Germany and from the Hagfors Observatory in Sweden. Original records were obtained from 11 so-called Seismic Research Observatories (SRO), established by the United States in co-operation with the host countries around the world. These records were analysed at the Hagfors Observatory for long period surface waves data and short period identification data. The data thus obtained correspond closely to those recommended by the CD seismic expert group.

Complete records, so-called Level II data, were compiled for the events recorded at the Hagfors Observatory and at the 11 SRO stations. Both the short period and the long period records are available on computer plotted paper records. The short period data are also available on the computer system, for presentation on a graphic display. The compilation of these Level II data was made rather to facilitate the interpretation of the Level I data than to demonstrate the handling procedure of Level II data at Datacenters.

4. Experience gained from the demonstration facilities

During the establishment and demonstration of the facilities in Stockholm experience has been gained on several problems connected with the establishment of International Datacenters and also with the verification system as a whole. This chapter gives a short summary of the experience gained so far.

4.1. Level I data

For the Level I data, which are to be routinely reported from the individual stations, there is a considerable difference between the data routinely reported today and the data that should be reported for test ban verification. This difference is specially pronounced for the long period surface waves and the short identification data, where today essentially no data are routinely reported. It is most important that procedures are developed at individual stations to extract and report those additional data, which are necessary for test ban verification. The analyses of the SRO data shows that this could be a quite extensive and tedious work.

Some of the data suggested to be reported by the CD seismic expert group turned out to be not as valuable in the Datacenters analysis as expected. Such data should be reconsidered or be replaced by others. One example is the so-called dispersion data for surface waves, which turned out to be of limited use in the analysis, whereas measurements giving the direction of the incoming surface waves were quite valuable for the proper association of the long period waves with events.

The information on the downtimes of the individual stations and of their detection capability or actual noise values proved to be of great importance and almost as essential as the reporting itself of observed signals.

4.2. Station network

The 60 station network turned out to be quite efficient in defining and locating seismic events. In all about 100 events were defined and located. Of in all about 4,000 reported seismic arrival times about 1,600 were associated with these events. About 2,400 signals or 60 per cent remained unassociated.

This is a high proportion but quite similar to those obtained by other Datacenters working with data from global networks with substantially more stations. Even though no data from other networks so far are available for this time period, our preliminary conclusion is that this test supports the conclusion of the Ad Hoc Group, that a network of some 50 to 60 globally distributed stations will make a global verification network of appropriate size.

In the location procedure the information by the array stations on preliminary locations of an event, based on the estimated azimuth and distance from the array station to the event, is most valuable for the correct association of the reported arrival times and for the definition of new events. Today only few azimuth and

distance data are routinely reported. For the test period such data were available only from Yellowknife in Canada, Norsar in Norway, Grafenberg in the Federal Republic of Germany and Hagfors in Sweden. Even though our experience so far is quite limited, we believe that the Datacenters would substantially improve their ability to associate short period signals and to define new events if preliminary location data were reported from the individual stations in the global monitoring network. This would mean that also rather small array stations having only three recording points separated by some 10-50 kilometres, would be of great value for a global network.

4.3. Location, checking and magnitude estimation procedures

In the location process it was found essential to allow for the possibility that a reported short period arrival time might be associated with more than one event. A clear difference must also be made between those station data which define an event and those which are only associated with an event. It is also most important that full use is made of the preliminary location data reported from array stations.

The results of the automatic checking procedures are still tentative and further development must be made. The preliminary results suggest, however, that the procedures developed so far and the reported amplitude and noise information can be used for the elimination of spurious events and mis-associated arrival times. This checking procedure can be used both for P-wave and surface wave data.

The implemented magnitude estimation procedure, which takes into account both the reported signal values and the noise values at those stations which have not seen the event, shows that for P-wave data this magnitude is substantially smaller than the magnitude estimated from reported signals only. For surface wave data the difference between the magnitudes estimated in the two ways is much less. One reason for this might be that the noise values for long period records were measured every hour, whereas the short period noise data employed were essentially those reported in the CD seismic expert group (CCD/558 1978), which appear to underestimate the actual noise values.

4.4. Long period data

The procedure for the automatic association of long period surface wave data with located events has given unexpected good results. The systematic search for long period surface waves turned out to give such bases for almost all detected events. Out of in all 344 long period arrival times measured during a four day

time period, 214 have been automatically associated with located events. About 80 other arrival times obviously belong to 17 seismic events from which no short period data have been detected. That leaves about 60 or less than 20 per cent of the long period data unassociated. Long period data are lacking for only 20 of the in all 72 events defined from short period data during the four day period. Thirteen other events have only one associated long period signal. This interesting result shows that routine analysis and reporting of long period surface waves are most valuable, as these data can be confidently associated with short period data. The results also show that this association can be carried out by an automatic process.

4.5. Short period identification data

The procedures to compile short period identification data are still tentative but it has been demonstrated that such data, obtained from a number of stations, can be compiled without assessing the nature of the event. Short period identification data were obtained for about 85 per cent of the events defined. Most of the events with no associated identification data were in the Southern Hemisphere. Further studies should, however, be carried out on a national level to estimate the identification capability and the applicability of such compiled data. The main obstacle here, as for the long period signals, is the present lack of routinely reported identification data.

4.6. Data handling and exchange

In writing the data handling routines it was found that general so-called data base systems for data handling, storage and retrieval are inferior to more specialized routines, developed for the specific purposes. The computer programs developed for this demonstration have been implemented on large computers, IBM 370 and DEC -10. The programs could, however, have been implemented on a specially designated computer of the size described in the first report of the Seismic Ad Hoc Group.

The connexion to the WMC was made possible through a close co-operation with the Swedish Meteorological and Hydrological Institute. No specific technical problems were encountered. The handling of seismic data is still unfamiliar to most operators on the WMO network and our experience is that testing, to familiarize these operators, is needed to get reliable data transmission. A substantial testing of the transmission of seismic data on WMO between institutes and stations is therefore needed in all parts of the world to obtain reliable and fast transmission also of seismic data.

The compilation of complete records of both short and long period, so-called Level II data, from the 11 SRO stations clearly show the value of having the full records obtained by the individual stations available, when assessing and interpreting a seismic event. It is therefore felt that there will be a need for a substantial exchange of such Level II data in a global verification system and that efficient routines for the exchange and compilation of such data should be established.

5. Future work

The temporary facilities established at the Hagfors Observatory for the purpose of the demonstration, will be maintained and developed. The intention is that these facilities will contribute to the work still to be done in specifying the data handling and analysis routines which should be implemented at International Datacenters. The facilities could be used to test, compare and develop methods and ideas put forward by interested seismological experts. It is also our hope that work will be carried out in close international co-operation.

A substantial amount of work remains to be done to prepare the final implementation of a global verification system. This work should be carried out in the individual countries as well as through international co-operation either bilaterally or multilaterally.

CD/46
31 July 1979

Original: ENGLISH

SWEDEN

Draft CD decision for a continued mandate to the Ad Hoc Group of Seismic Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events

1. Recognizing the valuable and important work carried out by the Ad Hoc Group in elaborating instructions and specifications for International Co-operative Measures to Detect and Identify Seismic Events, as presented to the CD in its report of July 1979, the CD decides that the Ad Hoc Group should continue its work on such measures, which might be established in the future for the international exchange of seismological data under a treaty prohibiting nuclear weapon tests covering nuclear explosions for peaceful purposes in a protocol which would be an integral part of the treaty.

2. This work should, inter alia, include

- further elaboration, with the second report of the group as a basis, of detailed instructions for an experimental test of the global system for international co-operative measures to detect and identify seismic events;

- further development of the scientific and technical aspects of the global system;

- co-operation in the review and analysis of national investigations into relevant matters such as:

  - the conditions for using the WMO Global Telecommunication System for seismic data exchange;

  - procedures to obtain desired data at individual stations under a range of conditions;

  - the analysis and data handling procedures at the envisaged data centres; and

  - methods of rapid exchange of waveform data.

3. The organization and procedures of work of the Group should remain the same as defined by the decision of the CCD on 22 July 1976 and maintained by the Committee on Disarmament by its decision of 15 February 1979. The Ad Hoc Group will hold its first meeting under its new mandate late in January or early in February 1980.

CD/47
7 August 1979

Original: ENGLISH

AD HOC WORKING GROUP TO CONSIDER, AND NEGOTIATE ON, EFFECTIVE INTERNATIONAL ARRANGEMENTS TO ASSURE NON-NUCLEAR-WEAPON STATES AGAINST THE USE OR THREAT OF USE OF NUCLEAR WEAPONS

Report to the Committee on Disarmament

1. In the course of consideration of item 3 of its 1979 agenda, entitled "Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons", the Committee, at its 59th meeting held on 5 July adopted the following decision

> "The Committee on Disarmament decides to establish, for the duration of its present session, an Ad Hoc Working Group open to all Member States of the Committee to consider, and negotiate on, effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons. The Ad Hoc Working Group will present a report to the Committee on Disarmament before the conclusion of the 1979 Session. The Committee further decides, in accordance with rule 32 of the Rules of Procedure, that representatives of non-member States shall have reserved seats in the conference room during the meetings of the Ad Hoc Working Group."

2. At the 41st meeting on 12 July the Committee elected the delegation of Egypt as Chairman of the Ad Hoc Working Group.

3. The Group held 7 meetings between 17 July and 2 August and conducted also informal consultations during that period.

4. In carrying out its mandate, the Ad Hoc Working Group took into account paragraph 59 of the Final Document of the Tenth Special Session of the General Assembly Devoted to Disarmament, where "the nuclear-weapon States are called upon to take steps to assure the non-nuclear-weapon States against the use or threat of use of nuclear weapons. The General Assembly notes the declarations made by the nuclear-weapon States and urges them to pursue efforts to conclude, as appropriate, effective arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.".

5. The Ad Hoc Working Group also took note of the Letter of the Secretary-General contained in document CD/1 transmitting resolutions adopted by the General Assembly at the thirty-third regular session and took note in particular of resolution 33/72 A and B.

CE.79-63439

Operative paragraphs 1 and 2 of resolution 33/72 A read as follows:

"1. Considers it necessary to take effective measures for the strengthening of the security of non-nuclear-weapon States through appropriate international arrangements;

2. Requests the Committee on Disarmament to consider, to that end, at the earliest possible date, the drafts of an international convention on the subject, submitted to the General Assembly at its thirty-third session, as well as all proposals and suggestions concerning effective political and legal measures at the international level to assure the non-nuclear-weapon States against the use or threat of use of nuclear weapons."

Operative paragraphs 1 and 2 of resolution 33/72 B read as follows:

"1. Urges that urgent efforts should be made to conclude effective arrangements, as appropriate, to assure the non-nuclear-weapon States against the use or threat of use of nuclear weapons, including consideration of an international convention and of alternative ways and means of achieving this objective;

2. Takes note of the proposals submitted and views expressed on this subject at its thirty-third session and recommends that the Committee on Disarmament should consider them and submit a progress report to the General Assembly at its thirty-fourth session."

6. In the conduct of its work it had before it the following four working papers which were introduced by their sponsors:

(a) a working paper by Pakistan, entitled "Conclusion of an international convention to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons" (CD/10),

(b) a working paper by Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Mongolia, Poland and the Union of Soviet Socialist Republics, entitled "Draft International Convention on the Strengthening of Guarantees of the Security of Non-Nuclear States" (CD/23),

(c) a working paper by Pakistan, entitled "Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons." (CD/25), and

(d) a working paper by the United States, entitled "Proposal for a CD Recommendation to the United Nations General Assembly Concerning the Security of Non-Nuclear-Weapon States Against Nuclear Attack" (CD/27).

7. Furthermore, the Secretariat, at the request of the Ad Hoc Working Group, prepared a compilation of material suggested by members of the Group. The Compilation was prepared on the understanding that it would be background material and that the material included therein would not prejudice the position of members of the Group on matters of substance.

8. From the outset there was an understanding that the work of the Group should be a step-by-step process, the first step being to identify the elements to be considered and negotiated on, the second the negotiation on these elements, and the third to reach agreement through consensus on effective international arrangements.

9. Extensive discussion took place on the elements to be considered and negotiated on. In this connexion discussions were held on the relationship of the non-use of nuclear weapons, nuclear disarmament, the non-use of force in international relations, as well as the overall question of strengthening of international peace and security, to the mandate of the group. There was broad agreement that these elements can be divided into two general categories:

A. Scope and nature of the arrangements, and

B. Form of the arrangements, their number and binding character.

10. There was agreement that the arrangements had to be effective and international in character. The question of rationale, scope and nature of the arrangements was discussed at length. There was also discussion on the question of definition of nuclear and non-nuclear-weapon States, the criteria to be applied in such definition and the prerequisites for the extension of the arrangements. In that respect a number of ideas were submitted such as the extension of arrangements to all non-nuclear-weapon States without any condition or limitations; to all non-nuclear-weapon States which are not parties to the nuclear security arrangements of some nuclear powers; to non-nuclear weapon States parties to the NPT or any other comparable internationally binding commitment not to acquire nuclear explosive devices (such as the Treaty of Tlatelolco), except in the case of an attack by such a State allied to a nuclear-weapons State or associated with a nuclear-weapons State in carrying out or sustaining the attack; to non-nuclear-weapon States which renounced the production and acquisition of nuclear weapons and which have no nuclear weapons on their territories or under their jurisdiction or control. Different related questions were raised and comments were made on these issues.

Discussion also took place on the question of the arrangements in relation to the non-nuclear weapon States parties to military alliances.

Similarly the question of the nature of the arrangements in relation to nuclear disarmament, the non-use of nuclear weapons as well as the non-use of force in international relations was raised. In that context the idea was discussed that, pending nuclear disarmament, a general ban on the use or the threat of use of nuclear weapons and the non-use of force in international relations would be the most effective guarantee for the security of non-nuclear-weapon States. The point was also raised that a general ban on the use of nuclear weapons can only be considered in the context of nuclear disarmament.

11. As regards the form, number and binding character of the arrangements, there was recognition that search should continue for a common approach acceptable to all which could be included in an international instrument of a legally binding character. In that connexion the question of an international Convention was widely discussed. There was no objection, in principle, to the idea of an international convention; however, the difficulties involved were also pointed out. There was also discussion on the question of a General Assembly resolution as well as reference to Security Council resolution and declarations to be deposited with the Secretary General of the United Nations as an interim arrangement.

CONCLUSION

12. There was wide recognition of the urgent need to reach agreement on effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons. The Group was able, in the short time available to it, to begin meaningful consideration of, and negotiate on, some of the elements which fell within its mandate. Preliminary exploration of areas of agreement and disagreement clarified issues and at the same time underlined the complexity of the elements which have to be further considered and negotiated on.

13. The Ad Hoc Working Group recommends that at the beginning of its 1980 session the Committee on Disarmament should continue negotiations on effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.

CD/48
7 August 1979
ENGLISH
Original: ENGLISH/RUSSIAN

LETTER DATED 7 AUGUST 1979 ADDRESSED TO THE CHAIRMAN OF THE COMMITTEE ON DISARMAMENT FROM THE REPRESENTATIVES OF THE USSR AND THE UNITED STATES TO THE COMMITTEE ON DISARMAMENT

We have the honour to transmit and to request, for the information of the Committee on Disarmament, the circulation of the following document entitled "USSR-United States Joint Report on Progress in the Bilateral Negotiations on the Prohibition of Chemical Weapons".

(Signed) V.L. ISSRAELYAN
Representative of the USSR to the Committee on Disarmament

(Signed) A.S. FISHER
Representative of the United States to the Committee on Disarmament

GE.79-63545

JOINT USSR-UNITED STATES REPORT ON PROGRESS IN THE BILATERAL NEGOTIATIONS ON THE PROHIBITION OF CHEMICAL WEAPONS

During the Vienna meeting of the leaders of the United States and the USSR in June 1979, both sides affirmed the importance of a general, complete, and verifiable prohibition of chemical weapons and agreed to intensify their efforts to prepare an agreed joint proposal for presentation to the Committee on Disarmament. The USSR and United States delegations are guided by this provision at the 10th series of the bilateral negotiations, which began on 16 July 1979.

In the negotiations, the United States and USSR delegations take into account the fact that prohibition of chemical weapons is, as was stressed in the Final Document of the United Nations General Assembly Special Session on Disarmament, one of the most urgent and vital problems in the area of disarmament. They are also guided by the requirement that a convention on the prohibition of chemical weapons, as any other international agreement in the field of arms control and disarmament, should enhance rather than diminish the security of the parties.

The USSR and United States delegations, taking into consideration the interest expressed by many delegations in the Committee on Disarmament concerning the status of the bilateral negotiations on a prohibition of chemical weapons, present the following Joint Report:

1. The two sides believe that the scope of the prohibition should be determined on the basis of a general purpose criterion. Parties to the convention should assume the obligation never in any circumstances to develop, produce, stockpile, otherwise acquire or possess, or retain super-toxic lethal chemicals, other lethal or highly toxic chemicals or their precursors, with the exception of chemicals intended for permitted purposes of such types and in such quantities as are appropriate to these purposes, as well as chemical munitions or other means of chemical warfare. Negotiations are continuing on several issues relating to the scope of prohibition.

2. Permitted purposes are understood to mean non-hostile purposes (industrial, research, medical, or other peaceful purposes, law-enforcement purposes, and purposes of development and testing of means of protection against chemical weapons), as well as military purposes not related to chemical warfare.

3. In order to facilitate verification, it would be appropriate to use, in addition to the general purpose criterion, toxicity criteria and certain other provisions.

4. Agreement has been reached on the following approximate values for the additional criteria of toxicity mentioned above:

(a) LCt_{50} = 2,000 mg min/m^3 for inhalation and/or
LD_{50} = 0.5 mg/kg for subcutaneous injections;

(b) LCt_{50} = 20,000 mg min/m^3 for inhalation and/or
LD_{50} = 10 mg/kg for subcutaneous injections.

On the basis of these criteria, it will be possible to separate chemicals into appropriate categories, to each of which the general purpose criterion would be applied.

5. Different degrees of prohibition and limitation as well as differentiated methods of verification would be applied on the basis of these toxicity criteria and certain other provisions. These issues continue to be subjects of negotiations.

6. Negotiations are also continuing on definition of terms and several other issues.

7. The two sides have agreed that parties to the convention should assume an obligation not to transfer to anyone, whether directly or indirectly, the means of chemical warfare, and not in any way to assist, encourage, or induce any State, group of States, or any organization to carry out activities which parties would undertake not to engage in pursuant to the convention.

8. The two sides have come to an understanding regarding the necessity for States to declare, immediately after they become parties to the convention, both the volumes of acquired stocks of means of chemical warfare and the means of production of chemical munitions and chemicals covered by the convention. Plans for destruction of declared stocks of chemical weapons should also be declared. These declarations should contain information on the volume and timetables for destruction of such stocks. Plans for destruction or dismantling of relevant means of production should also be declared. In the course of the bilateral negotiations, the two sides are continuing to make efforts to agree on the specific content of the declarations concerning stocks of means of chemical warfare and concerning means of production. In this connexion, the basic concept of means of production is also a subject that remains to be resolved.

9. Agreement has been reached that stocks of means for chemical warfare should be destroyed or diverted for permitted purposes within ten years after a State becomes a party. Means of production should be shut down and eventually destroyed or dismantled. The destruction or dismantling of means of production should begin not later than eight years, and should be completed not later than ten years, after a State becomes a party.

10. In this connexion, the United States and the USSR believe that a future convention should contain provisions in accordance with which parties would periodically exchange statements and notifications concerning: the progress of the destruction of stocks of means of chemical warfare or their diversion for permitted purposes, the progress of the destruction or dismantling of means of production of chemical munitions and chemicals covered by the convention, and of the completion of these processes.

11. The USSR and the United States believe that the fulfilment of the obligations assumed under the future convention should be subject to the important requirement of adequate verification. They also believe that measures with respect to such verification should be based on a combination of national and international measures.

12. International verification measures should include the creation of a consultative committee. This committee could be convened as appropriate by the depositary of the convention, as well as upon request of any party.

13. The activities of the consultative committee in the interval between meetings should be carried out by a secretariat. The mandate of the secretariat is a subject of negotiations.

14. The participants should exchange, through the consultative committee or bilaterally, certain data on super-toxic lethal chemicals produced, acquired, accumulated, and used for permitted purposes, as well as on important lethal chemicals and the most important precursors used for permitted purposes. To this end, it is envisaged to compile lists of the relevant chemicals and precursors. The two sides have reached a significant degree of mutual understanding in developing agreed approaches to the compilation of such lists. The scope of the data to be presented remains to be agreed.

15. Additional functions for the consultative committee remain under discussion.

16. In order to ensure the possibility of beginning the work of the consultative committee immediately after entry into force of the convention, the United States and the USSR believe it appropriate to begin the creation of a preparatory committee upon signature of the convention.

17. A convention should include provisions in accordance with which any party should have the right on a bilateral basis, or through the consultative committee, to request from another party with respect to which suspicions have arisen that it is acting in violation of obligations under the convention, relevant information on the actual state of affairs, as well as to request investigation of the actual state of affairs on site, providing appropriate reasons in support of the necessity of such an investigation.

18. A party may agree to such an on-site investigation or decide otherwise, providing appropriate explanations.

19. It should also be provided that any party could turn to the Security Council with a complaint which would include appropriate rationale. In case of suspicion regarding compliance with the convention, the consultative committee, upon request of any party, or of the Security Council of the United Nations, could also take steps to establish the actual state of affairs.

20. The question of other international verification measures remains unresolved.

21. National measures would include the use of national technical means of verification in a manner consistent with generally accepted principles of international law. In this connexion, parties should not impede, including through the use of deliberate concealment measures, the national technical means of other parties in carrying out the aforementioned verification functions.

22. The USSR and the United States believe that a future convention should reflect the obligation of each party to take appropriate internal measures in accordance with its constitutional procedures to prohibit and prevent any activity contrary to the provisions of the convention anywhere under its jurisdiction or control.

23. Possibilities for confidence-building measures are being explored.

24. A future chemical weapons convention should include a withdrawal provision of the type included in other arms control and disarmament agreements.

25. The question of the conditions for entry into force of the convention remains unagreed.

26. The two sides believe that an effective prohibition of chemical weapons will require working out a large number of technical questions which would be dealt with in annexes to the convention and which are now being studied.

* * *

The United States and the Soviet Union note the great importance attached to the elaboration of a convention by the General Assembly of the United Nations and the Committee on Disarmament which manifested itself, in particular, in the identification of the question of the prohibition of chemical weapons as one of the priority items on the agenda adopted for the current session of the Committee on Disarmament. Both sides will exert their best efforts to complete the bilateral negotiations and present a joint initiative to the Committee on Disarmament on this most important and extremely complex problem as soon as possible.

CD/49
8 August 1979
Original: ENGLISH

THE NETHERLANDS

Chemical weapons

Answers to questionnaire contained in CD/41

Question 1: Can we agree that a CW-ban will be comprehensive, i.e. that it will cover the whole CW-problem and will therefore not imply a partial approach? (This notwithstanding the fact that the destruction of existing CW-stockpiles will take considerable time for technical reasons.)

The answer is definitely yes. Only a comprehensive approach will provide a treaty that will be as free as possible from misunderstandings due to differences in interpretation.

Question 2: If the answer is yes, what will the ban exactly cover:

(a) banning the development of CW-agents and weapon system?

The answer is clearly yes.

(b) banning the production of all single-purpose agents, including single-purpose precursors?

The answer is yes.

(c) banning the production for CW-purposes of dual purpose agents (including dual purpose precursors?)?

Does it cover only lethal agents or also incapacitants? Tear gas? Herbicides and defoliants?

Dual purpose agents that are produced with the intention to use them as CW-agents should be prohibited. However, it will be difficult to prove such production since these agents -- like phosgene and hydrocyanid acid -- are identical for military or for peaceful uses. Incapacitating agents should be prohibited. Tear gas and herbicides can be considered as dual purpose agents. Production for chemical warfare purposes should be prohibited. (This does not exclude some specific military uses which cannot be considered as chemical warfare (such as riot control, e.g. in prisoner of war camps or clearing excessive vegetation around bases),).

(d) the destruction of existing stockpiles of CW-agents and weapon systems? What is the time limit?

Here the answer is again yes. It would not be attractive to the majority of nations to allow chemical weapon States to keep their stockpiles. Natural decay is a very slow process. The timeframe of the destruction will mainly be determined by the great care that has to be taken regarding the safety of the personnel involved and the impact upon the environment. One of the latest estimates is that it will be of the order of ten years.

(e) the dismantling of existing CW-production facilities, or the "moth-balling" of CW-plants, or the conversion of existing facilities to those for peaceful use?

The preference should be in the order of dismantling -- moth balling -- conversion as the latter would add greatly to the burden of verification. Moreover, it does not seem attractive from an economic point of view.

(f) banning the production of CW-munitions, equipment and means of delivery?

The answer is yes, keeping in mind that some of these munitions could be used for the dissemination of smoke.

(g) banning planning, organization and training for offensive chemical warfare?

This is a very important item and the answer should be definitely yes.

(h) not banning protection against C-warfare?

The answer is yes as the availability of a reasonable amount of protection will be a powerful dissuasive measure regarding infringements of a treaty.

(i) banning the use? (Relationship with Convention of 1925).

The answer is yes, provided this does in no way interfere with existing treaties and international law.

(j) banning the transfer and acquisition of CW?

The answer is yes. This item should not only include hardware but also know-how.

Question 3: What are the exemptions on the production ban? (Medical purposes, protection, military toxic materials which cannot be used for chemical warfare, etc.).

The three items mentioned are not equivalent. The first two are the actual chemical warfare agents. The amounts of course will vary considerably between the nations which are involved in research and development of protective systems. For a country like The Netherlands most of the needs can be covered by quantities of the order of 1 kilogramme per year, in fact a rather small amount.

The third category is something completely different. Here for instance missile and torpedo fuels are meant; some of these have a certain toxicity. As it does not seem very likely that these will be produced with the primary intention of being used as CW-agents, they need not be covered by a convention.

Question 4: (a) Can it be concluded that the main elements for the definition of banned CW-agents are the general purpose criterion and toxicity?

The answer here is that the only important criterion is the general purpose criterion. Toxicity can never play an important role here.

(b) Can it also be concluded that other criteria play a role in the verification and licensing process, such as structural formulae and criteria for the usefulness of agents for C-warfare?

Yes, these criteria, together with the toxicity criterion -- which is very important here -- will play a role.

(c) Are complete lists of banned or allowed agents necessary or are examples sufficient?

As a complete list of banned agents will be impossible to compose, as such a list proves extremely difficult to change and as a list always gives the impression that something not on the list is not prohibited, these lists will probably do more harm than good. On the other hand, a list of agents temporarily exempted could be very useful.

Question 5: Can it be concluded that in the context of a CW-ban, parties need a national system of control (or at least parties with a chemical industry) for the implementation of internal legislation and as liaison for international verification procedures?

The answer is yes.

Question 6: Can it be assumed that part of the international verification measures will be based on the concept of "verification by challenge" while other international verification measures will be of a more systematic character?

The answer is yes.

Question 7: If the answer is yes, can it be assumed that systematic international verification measures will be concentrated on:
(a) the destruction of existing stockpiles of CW-agents (and munition?)?
(b) the dismantling of existing CW-production plants, or that "moth-balled" plants are not used, or that plants are converted to peaceful activities.
(c) the non-production of single-purpose highly toxic (mainly nerve) agents, including single-purpose precursors?

The answer is yes in all three cases. As mentioned before, in the second case conversion will give much greater problems than dismantling.

Question 8: What kind of structure does one need for the different international verification tasks? What kind of support could such a structure give to the national control agencies?

This will -- of course -- depend on the tasks of this group, will it only be concerned with chemical weapons or will it also be involved with verification of other arms control and disarmament matters. The staff should be small and should mainly occupy itself with information gathering. There should, however, be a "roster of experts" from which scientists with laboratory facilities can be drawn that could be involved in the problems of near site and on-site inspections. Moreover, this group could also be of assistance to nations who may have difficulties in manning and equipping their national verification agencies.

Question 9: Is it conceivable that, complementary to a world-wide ban, in certain regions countries may decide to accept more stringent regional verification measures?

If the convention is comprehensive and unambiguous, there would be no need for additional measures. If not, then regional measures could strengthen confidence between parties in a particular region.

Question 10: Would it be helpful if States would:
(a) declare their stocks and production facilities after signing but before entry into force of a convention? Before signing?
(b) organize technical exchange visits?
(c) co-operate in protection measures against C-warfare?

The last two items of the question can be answered definitely in a positive sense. The last year or so have shown that there are a great many possibilities here, all giving rise to confidence building. Concerning the first part we have to assume that nations might not be willing to declare their stocks and production facilities before a treaty has been concluded. But at a later stage such declarations -- together with declarations by nations that they do not possess chemical warfare agents nor have the intention to acquire them -- might be very useful to build mutual trust.

CD/50
9 August 1979
Original: ENGLISH

STATEMENT OF THE GROUP OF 21 ON THE CONCLUSION OF THE ANNUAL SESSION OF THE COMMITTEE ON DISARMAMENT IN 1979

The Special Session of the United Nations General Assembly devoted to Disarmament recognized the inadequacy of the results of the then existing multilateral disarmament machinery and established, inter alia, the Committee on Disarmament, as a single multilateral negotiating body with a wider representative character, in order to revitalize disarmament negotiations. It was the expectation of the Group of 21 that this, together with the consensus adoption of the Programme of Action at the Special Session, would lead to concrete progress in disarmament negotiations particularly on the priority issues.

During this, its first annual session, the Committee on Disarmament worked intensively. In the light of past experience, the adoption by the Committee of its rules of procedure is a significant achievement. The discussions on this subject reflected the general desire of all States to participate effectively in the process of disarmament negotiations. Likewise, the adoption by the Committee of its agenda is an advance since it reflects a consensus of the Committee, on the one hand, regarding the broad framework of its responsibilities and, on the other, on those issues which require urgent negotiations by the Committee having been repeatedly so recommended by the United Nations General Assembly.

The Group reiterates the importance and urgency of concluding a comprehensive nuclear test ban treaty. Unfortunately, during its 1979 session, the Committee was unable to give substantive consideration to the question of a nuclear test ban despite the repeated resolutions by the United Nations General Assembly and its request that the Committee on Disarmament undertake negotiations on such a treaty as the highest priority item. This was due to the fact that member States engaged in the trilateral negotiations on the subject did not seem prepared to negotiate within the Committee on Disarmament.

GE.79-63588

The Group expresses its dissatisfaction with the report on the trilateral negotiations, conveyed at the very end of the Committee on Disarmament's session. The Group believes that it should have been possible for the States concerned to provide a comprehensive and detailed report on the status of these negotiations and of the areas of agreement and disagreement. However, it is apparent from the reported progress made in the trilateral negotiations, as indicated in the official statements of the States concerned, that there is no justification to delay any further the initiation of concrete negotiations in the Committee on Disarmament on a CTBT.

The Group, therefore, affirms that such negotiations should be initiated at the beginning of the next session of the Committee on Disarmament as the highest priority item.

The Group appreciates the work done by the Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events during the session and endorses its continuation.

The Group reiterates the consensus reached at the Special Session that nuclear disarmament has the highest priority among disarmament objectives. It, therefore, welcomed the initiative taken during 1979 to begin negotiations on the subject in the Committee on Disarmament. For its part, the Group submitted concrete proposals towards that objective.

The Group considers that the item on nuclear disarmament should be included on the agenda of the 1980 session of the Committee on Disarmament and that negotiations should be conducted in accordance with Paragraph 50 and other relevant provisions of the Final Document of the Special Session of the General Assembly devoted to Disarmament.

The Group believes that the most effective assurance of security against the use or threat of use of nuclear weapons is nuclear disarmament and prohibition of the use of nuclear weapons. The nuclear weapon States have an obligation to assure non-nuclear weapon States against the use or threat of use of nuclear weapons. The Group notes with satisfaction that the proposals for the conclusion of effective international arrangements on that subject were submitted by some of its members. In that context, it notes that there is no objection, in principle, within the Committee on Disarmament to the idea of an international convention. The Group welcomes the establishment of the Ad Hoc Working Group to consider and negotiate on this subject.

The Group believes that negotiations should be continued at the next session of the Committee in 1980, and that the mandate of the Ad Hoc Working Group should be renewed so as to continue the search for a common approach which could be included

in an effective international instrument to assure the non-nuclear weapon States against the use or threat of use of nuclear weapons.

The Thirty-Third Session of the General Assembly had, as a matter of high priority, requested the Committee on Disarmament to undertake at the beginning of its 1979 session negotiations with a view to elaborating an agreement on effective measures for the prohibition of the development, production and stockpiling of all chemical weapons and for their destruction. As apparent from the resolution of the General Assembly, the conclusion of the bilateral negotiations on the subject between the United States and the USSR should not be a prerequisite to the initiation of negotiations in the Committee on a CW convention. In conformity with the General Assembly's request and in view of the great importance it attaches to the matter, the Group early in the 1979 session of the Committee on Disarmament submitted a proposal to set up an Ad Hoc Working Group so that negotiations could be initiated. A number of other delegations made similar suggestions.

The Group regrets that despite near unanimous support in the Committee it was not possible to reach an agreement to set up the Ad Hoc Working Group in order to begin concrete negotiations on a CW convention without further delay.

The Group notes the relatively detailed information on the present status of the bilateral negotiations contained in the joint statement by the USSR and the United States. This information, as well as the contributions of other members, strengthens the conviction of the Group that there is need and sufficient basis for real and immediate negotiations in the Committee on Disarmament on a CW convention.

The Group reiterates that an Ad Hoc Working Group should be established at the beginning of the next session to negotiate on a CW convention.

The Group notes with satisfaction the submission of the agreed Joint United States-USSR proposal on Major Elements of a Treaty Prohibiting the Development, Production, Stockpiling and Use of Radiological Weapons. However, the Group felt that meaningful negotiations on the joint proposal should be initiated at an appropriate stage, since adequate time was necessary for examination of the text by their respective Governments.

In evaluating the first session of the Committee, the Group expresses its concern that despite intensive work in the Committee on some items, the Committee on Disarmament was unable to achieve concrete progress on the main items on its agenda. It is also disappointed with the way in which certain important questions were approached in this multilateral negotiating body.

The Group believes that the Committee on Disarmament should be engaged in concrete negotiations, rather than to limit itself to general discussions. Any negotiations which are conducted outside the Committee should not in any way constitute an impediment to multilateral negotiations within the Committee. Moreover, the Committee on Disarmament should be directly involved in all stages of negotiations on the issues on its agenda.

The Group would emphasize that since questions of disarmament are of direct concern to all States with special responsibilities on the nuclear-weapon States and militarily significant States, a new approach in the multilateral negotiations within the Committee on Disarmament is necessary. This new approach should ensure full participation of all member States to enable the Committee on Disarmament to effectively discharge its responsibilities. The Group looks forward to co-operating with all other delegations in the future work of the Committee to achieve that objective.

CD/51
10 August 1979
ENGLISH
Original: RUSSIAN

RESULTS OF THE 1979 SESSION OF THE COMMITTEE ON DISARMAMENT

Working paper submitted by the group of socialist States

The authors of this paper proceed from the assumption that the Committee on Disarmament, being an important organ for multilateral negotiations on the cessation of the arms race and on disarmament, has considerable opportunity for conducting negotiations on these matters and drafting corresponding international agreements.

With those aims in mind they devoted considerable efforts to ensuring that the 1979 session of the Committee on Disarmament would be distinguished by practical results, as expected by all peoples of the world. They called upon the Committee to concentrate on the substance of disarmament problems and not to lose time on protracted procedural discussions; they urged it to discuss the questions on its agenda in a business-like manner, and proposed that its 1979 session should be extended.

The authors consider that the working papers they submitted have furthered the work of the Committee and helped to launch or speed up negotiations on a number of substantive problems relating to the limitation of the arms race and disarmament. They include:

Document CD/4 entitled "Negotiations on ending the production of all types of nuclear weapons and gradually reducing their stockpiles until they have been completely destroyed", submitted by the socialist States under agenda item 2;

Document CD/13 entitled "Further measures in the field of disarmament for the prevention of an arms race on the sea-bed and the ocean floor", submitted by Poland;

Document CD/21 entitled "Prohibition of the development, production and stockpiling of all chemical weapons and their destruction", submitted by Poland under agenda item 4;

Document CD/23 entitled "Draft international convention on the strengthening of guarantees of the security of non-nuclear States", submitted by the socialist States under agenda item 3;

Document CD/35 entitled "Negotiations on the question of the prohibition of new types of weapons of mass destruction and new systems of such weapons", submitted by the USSR under agenda item 5;

Document CD/40 entitled "Working paper on the draft preambular part of the Treaty on the Prohibition of the Development, Manufacture, Stockpiling and Use of Radiological Weapons", submitted by Hungary under agenda item 5;

Document CD/42 entitled "Working paper on draft paragraph XI, subparagraph 3, and paragraph XII, subparagraph 3, of the Treaty on the Prohibition of the Development, Manufacture, Stockpiling and Use of Radiological Weapons", submitted by the German Democratic Republic under agenda item 5;

Document CD/44 entitled "Outline of a convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction", submitted by Poland under agenda item 4.

The delegations of the socialist countries have given detailed explanations of their proposals and have answered many questions from other delegations. They are gratified by the interest that has been shown in their proposals.

Although the discussion on disarmament questions that took place during the session and the proposals that were submitted provided a good basis for reaching substantive results on particular disarmament questions, it cannot but be regretted that there was no significant progress.

The authors consider that the Committee's discussion of their specific proposal for the start of negotiations on ending the production of nuclear weapons and on their destruction (CD/4) was useful. It contributed to preparations for such negotiations in the Committee on Disarmament, which would be a step towards implementation of paragraph 50 of the Final Document of the special session of the General Assembly devoted to disarmament. The authors answered many questions from other delegations with a view to establishing the prerequisites and elements for comprehensive negotiations on nuclear disarmament and indicating the course to be followed in order to achieve that end.

However, the authors consider it regrettable that negotiations were not begun on the substance of the matter in 1979, as they had proposed.

The authors welcome the recent signature in Vienna of the SALT II Treaty and other Soviet-United States documents. They consider that the conclusion of the SALT II Treaty is in the interests not just of the USSR and the United States, but of the peoples of the whole world, since it will lead to a strengthening of international security as a whole.

There was a useful discussion on the question of effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons. The authors note that the idea of concluding an international convention on this question gained wide support. They explained various aspects of the draft convention submitted by them (CD/23).

The group of socialist countries proceeds from the assumption that the negotiations on the conclusion of a convention on strengthening security guarantees for non-nuclear States will be continued at the beginning of the 1980 session of the Committee on Disarmament.

The authors express satisfaction that the USSR and the United States have submitted to the Committee on Disarmament an agreed joint proposal on major elements of a treaty prohibiting the development, production, stockpiling and use of radiological weapons (CD/31 and CD/32). The sponsors of the proposal have given useful explanations of particular provisions of their proposal, and this will enable members of the Committee to conduct more specific negotiations with the aim of drawing up the final text of a treaty as soon as possible. The delegations of Hungary and the German Democratic Republic submitted drafts of certain additional provisions (CD/40 and CD/42) to the Committee.

The group of socialist countries regrets that not all delegations were ready to discuss the Soviet-United States draft, and considers that negotiations with a view to reaching final agreement on the text of a treaty should be continued at the Committee's 1980 session and that a draft treaty prohibiting radiological weapons should be submitted to the General Assembly for approval at its thirty-fifth session.

Experts from certain socialist countries submitted supplementary information during discussion of the question of the prohibition of new types and systems of weapons of mass destruction. The authors of this paper consider it necessary to establish an ad hoc group of qualified government experts to examine the . . question of possible areas of the creation of new types and systems of weapons of mass destruction which should be included in the initial list of such types of weapons to be prohibited under a comprehensive agreement.

It is regrettable that the question as a whole, and in particular the question of the need for a comprehensive ban on the development of new types of weapons of mass destruction, could not be discussed in sufficient detail; its discussion should be continued next year.

The authors also emphasize the need for negotiations in the Committee on the prohibition of neutron weapons to start as soon as possible; a draft convention which they submitted in 1978 is on the negotiating table.

The Committee heard a joint report on the progress of negotiations between the United States, the USSR and the United Kingdom on a treaty prohibiting nuclear-weapon tests in all environments and a protocol to it concerning nuclear explosions for peaceful purposes.

The authors continue to believe that the problem of prohibiting nuclear-weapon tests is of paramount importance. The trilateral negotiations should be actively pursued; all participants in the negotiations should make efforts to bring about their speedy conclusion and submit their results to the Committee on Disarmament for consideration At the same time, they expressed the view that, because of the specific nature of the subject, consideration of this question in the Committee on Disarmament can start only after completion of the trilateral negotiations.

The authors of this paper consider that the work done by the Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events has been useful.

The group of socialist countries considers that the question of the prohibition of chemical weapons is extremely important and requires priority consideration, and it welcomes the Committee's more active examination of this matter. During

the session, those countries expressed their willingness to adopt a flexible approach to the search for mutually-acceptable organizational forms of work in the Committee on this matter, and in particular the establishment of a working group having regard to the importance of the relevant bilateral negotiations between the USSR and the United States.

The authors believe that, as a step towards the ultimate aim of preparing a draft international convention prohibiting chemical weapons, the Committee could, at the present stage, make a contribution to the drafting of major elements of a future convention. They note that a start was made at the informal meetings of the Committee on the consideration of these elements, during which further light was shed on various aspects of the problem of prohibiting chemical weapons. In their view, work should be continued in this direction at the Committee's next session.

The authors consider that the joint report by the USSR and the United States on progress in the bilateral negotiations on the question of the prohibition of chemical weapons, submitted on 31 July 1979, constituted a substantial contribution to the consideration of this question in the Committee and promoted a better understanding on the part of its members of the complex problems involved in the preparation of an international convention on this subject.

The authors express satisfaction that negotiations on a number of questions were begun in the Committee during its 1979 session, thus creating conditions for further progress.

At the same time, they regret that it was not possible to achieve more concrete results on certain questions, in particular the question of nuclear disarmament. They express the hope that the proposals submitted during the session will help to achieve more noticeable progress towards the Committee's goals of limiting the arms race and of disarmament, and to ensure that the next session will be more successful than the present one. This requires the joint efforts of all members of the Committee and the constructive manifestation of political will by the States participating in it.

CD/52
13 August 1979
Original: ENGLISH

FRANCE, ITALY AND THE NETHERLANDS

Chemical Weapons

Evaluation of the discussion in the Committee on Disarmament in 1979 with respect to prohibition of chemical weapons

Discussions on issues relating to a prohibition of chemical weapons were held in the Committee on Disarmament from 16-27 July, 1979, as well as after the presentation on 31 July of a substantial joint statement by the USSR and United States of America on their bilateral negotiations with respect to an intended joint initiative on chemical weapons (CD/48).

An exploratory discussion took place with respect to some elements of a prohibition of chemical weapons, including an outline for a convention on this question, in which several delegations participated, including some non-CD members. On certain issues similar views were brought forward while on others differences of view were apparent. The discussion also revealed that many technical and detailed problems had to be dealt with in the future. Although no consensus could be reached at this stage, the following could be tentatively distilled from the discussion.

(a) Views seemed to coincide that the objective is the general, complete and verifiable prohibition of chemical weapons. The development, production, stockpiling, acquisition, retention and transfer of chemicals for chemical weapons purposes, and of chemical weapons would be prohibited. Although it was recognized that a prohibition of chemical weapons should not detract from the obligations assumed by states under the Geneva Protocol of 1925[1/], there were different views expressed whether the use of chemical weapons should also be covered in a ban.

(b) The scope of the prohibition would be based on the general purpose criterion. Other additional criteria could be used, in particular toxicity. A distinction would have to be made between chemicals which are primarily useful for chemical weapons purposes and chemicals which have peaceful applications.

(c) Activities would be permitted for non-hostile purposes (industrial, research, medical, or other peaceful purposes, law-enforcement purposes and for the protection against chemical attack), as well as for military purposes not related to chemical warfare. Activities relating to offensive chemical warfare, including training, would not be permitted.

1/ Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or other Gases, and of Bacteriological Methods of Warfare.

(d) In the context of a prohibition of chemical weapons, there would be provisions for the declaration and destruction of existing stockpiles of chemicals acquired for chemical weapons purposes and of chemical weapons within a specific period. There would also be provisions for the declaration, shutting-down and destruction or dismantling of production facilities within a specific period. A period of ten years has been mentioned in this respect.

(e) The fulfilment of obligations under a prohibition of chemical weapons should be adequately verified. Verification should be based on a combination of national and international measures.

(f) International measures could include the creation of a consultative committee of parties to a ban, with a permanent secretariat, to help solve problems arising from the application of the prohibition of chemical weapons.

(g) Views seemed to differ under which circumstances and for what purposes international verification procedures would be employed, including on-site inspections. Although it was recognized that on-site inspections by challenge could form part of the verification arrangements, views were expressed that mandatory on-site inspections would be necessary with respect to certain activities.

(h) Parties to a ban should not impede the national technical means of verification of other parties.

(i) It was understood that there would be a need for national arrangements for the implementation of the States' obligations under a chemical weapons ban.

(j) A prohibition of chemical weapons should not interfere with permitted activities, such as the industrial development and peaceful international co-operation in the chemical field.

(k) It was recognized that measures to strengthen confidence could help in the bringing about and application of a ban on chemical weapons.

CD/53
14 August 1979
Original: ENGLISH

REPORT TO THE UNITED NATIONS GENERAL ASSEMBLY

APPENDICES

I. INTRODUCTION

1. Paragraph 120 of the Final Document[1/] of the first special session of the General Assembly devoted to disarmament stated the following:

"The General Assembly is conscious of the work that has been done by the international negotiating body that has been meeting since 14 March 1962 as well as the considerable and urgent work that remains to be accomplished in the field of disarmament. The Assembly is deeply aware of the continuing requirement for a single multilateral disarmament negotiating forum of limited size taking decisions on the basis of consensus. It attaches great importance to the participation of all the nuclear-weapon States in an appropriately constituted negotiating body, the Committee on Disarmament. The Assembly welcomes the agreement reached following appropriate consultations among the Member States during the special session of the General Assembly devoted to disarmament that the Committee on Disarmament will be open to the nuclear-weapon States, and thirty-two to thirty-five other States to be chosen in consultation with the President of the thirty-second session of the Assembly; that the membership of the Committee on Disarmament will be reviewed at regular intervals; that the Committee on Disarmament will be convened in Geneva not later than January 1979 by the country whose name appears first in the alphabetical list of membership; and that the Committee on Disarmament will:

(a) Conduct its work by consensus;

(b) Adopt its own rules of procedure;

(c) Request the Secretary-General of the United Nations, following consultations with the Committee on Disarmament, to appoint the Secretary of the Committee, who shall also act as his personal representative, to assist the Committee and its Chairman in organizing the business and time-tables of the Committee;

(d) Rotate the chairmanship of the Committee among all its members on a monthly basis;

(e) Adopt its own agenda taking into account the recommendations made to it by the General Assembly and the proposals presented by the members of the Committee;

1/ Official Records of the General Assembly: Tenth Special Session, Supplement No. 4 (A/S-10/4).

(f) Submit a report to the General Assembly annually, or more frequently as appropriate, and provide its formal and other relevant documents to the States Members of the United Nations on a regular basis;

(g) Make arrangements for interested States, not members of the Committee, to submit to the Committee written proposals or working documents on measures of disarmament that are the subject of negotiation in the Committee and to participate in the discussion of the subject-matter of such proposals or working documents;

(h) Invite States not members of the Committee, upon their request, to express views in the Committee when the particular concerns of those States are under discussion;

(i) Open its plenary meetings to the public unless otherwise decided."

2. The Committee on Disarmament is open to the nuclear-weapon States and to the following thirty-five States, whose names were announced, after exhaustive consultations with Member States, by the President of the 33rd session of the General Assembly:[2/] Algeria, Argentina, Australia, Belgium, Brazil, Bulgaria, Burma, Canada, Cuba, Czechoslovakia, Egypt, Ethiopia, German Democratic Republic, Germany, Federal Republic of, Hungary, India, Indonesia, Iran, Italy, Japan, Kenya, Mexico, Mongolia, Morocco, Netherlands, Nigeria, Pakistan, Peru, Poland, Romania, Sri Lanka, Sweden, Venezuela, Yugoslavia and Zaire.

3. The Committee on Disarmament submits to the thirty-fourth session of the United Nations General Assembly its annual report on its 1979 session, together with the pertinent documents and records. This report also includes an account of the organization of the Committee (part II) and of the Committee's work based on the agenda adopted for 1979 (part III).

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4. The Committee on Disarmament was convened by the Government of Algeria, and Mr. Abdelaziz Bouteflika, the Algerian Minister for Foreign Affairs, presided over the opening plenary meeting of the session, which took place on 24 January 1979. After hearing the Chairman's address, the Committee took note of the message from the Secretary-General of the United Nations, which was read out by the Director-General of the United Nations Office at Geneva.

2/ A/S-10/24

5. At the beginning of the session, the Committee on Disarmament received a message from Mr. L.I. Brezhnev, General Secretary of the Central Committee of the Communist Party of the Soviet Union and Chairman of the Presidium of the Supreme Soviet of the USSR (CD/3). The Committee also received messages from the Holy See, transmitted by its Secretary of State, as well as from Mr. Santiago Roel, Secretary for Foreign Affairs of Mexico and Mr. George M. Seignious II, Director of the Arms Control and Disarmament Agency of the United States of America.

6. During the first days of the session, statements were made by the representatives of the following member States, listed in the order of speaking: Mexico, France, Sri Lanka, Australia, Sweden, Soviet Union, United Kingdom, Yugoslavia, Italy, Pakistan, Venezuela, Belgium, Cuba, Canada, United States of America, Japan, Romania, Nigeria, Poland, Egypt, Ethiopia, Argentina, Federal Republic of Germany, German Democratic Republic, the Netherlands, Zaire, Kenya, Iran, Indonesia, Morocco and Czechoslovakia. Of these representatives, the following held the rank of Minister or Deputy Minister for Foreign Affairs: Mr. Andrew Peacock, Minister of Foreign Affairs of Australia, Mr. Henri Simonet, Minister for Foreign Affairs of Belgium, Mr. G.A.H. Pearson, Adviser on Disarmament and Arms Control of Canada, Dr. Pelegrín Torras, Deputy Minister for Foreign Affairs of Cuba, Mr. Jean François-Poncet, Minister of Foreign Affairs of France, Mr. Gunther van Well, State Secretary of the Federal Foreign Office of the Federal Republic of Germany, Mr. Luciano Radi, Under-Secretary for Foreign Affairs of Italy, Mr. Kasim Mwamzandi, Assistant Minister for Foreign Affairs of Kenya, Mr. Ilie Radulescu, Minister and Secretary of State at the Ministry of Foreign Affairs of Romania, Mr. A.C.S. Hameed, Minister of Foreign Affairs of Sri Lanka, Mr. Hans Blix, Minister for Foreign Affairs of Sweden, Lord Goronwy-Roberts, Minister of State at the Foreign and Commonwealth Office of the United Kingdom of Great Britain and Northern Ireland and Mr. Milorad Pesić, Deputy Federal Secretary for Foreign Affairs of Yugoslavia.

7. Later during the session, statements were also made in the Committee by the Deputy Minister for Foreign Affairs of Czechoslovakia, Mr. Milos Vejvoda; the Minister of State of External Affairs of India, Mr. Samarendra Kundu; the Minister of State for Foreign and Commonwealth Affairs of the United Kingdom of Great Britain and Northern Ireland, Mr. Douglas Hurd; and the Director of the Arms Control and Disarmament Agency of the United States of America, Mr. George M. Seignious II.

II. ORGANIZATION OF THE COMMITTEE

A. 1979 Session of the Committee

8. The Committee was in session from 24 January to 27 April and from 14 June to 14 August 1979. During this period, the Committee held fifty-two formal plenary meetings at which members set forth their Governments' views and recommendations on the questions before the Committee.

9. The Committee also held fifty informal meetings on various subjects, including its schedule of work, organization and procedures, as well as all items of the agenda considered by the Committee.

B. Participants in the Work of the Committee

10. Representatives of the following member States participated in the work of the Committee: Algeria, Argentina, Australia, Belgium, Brazil, Bulgaria, Burma, Canada, Cuba, Czechoslovakia, Egypt, Ethiopia, France, German Democratic Republic, Germany, Federal Republic of, Hungary, India, Indonesia, Iran, Italy, Japan, Kenya, Mexico, Mongolia, Morocco, Netherlands, Nigeria, Pakistan, Peru, Poland, Romania, Sri Lanka, Sweden, Union of Soviet Socialist Republics, United Kingdom of Great Britain and Northern Ireland, United States of America, Venezuela, Yugoslavia, Zaire.

C. Organizational Questions and Adoption of the Rules of Procedure

11. The Committee decided that its chairmanship should be rotated among all its members on a monthly basis, i.e. by the calendar month. The following member States assumed the Chairmanship of the Committee: Algeria for January, Argentina for February, Australia for March, Belgium for April and the recess between the first and second part of the 1979 session of the Committee, Brazil for the remainder of June, Bulgaria for July, and Burma for August and the recess until the 1980 session of the Committee.

12. The Secretary-General of the United Nations, after appropriate consultations, appointed, on 14 June 1979, Ambassador Rikhi Jaipal, former Permanent Representative of India to the United Nations, as Secretary of the Committee who shall act also as his Personal Representative.

13. The Committee also decided to admit representatives of non-member countries to plenary meetings in the Council Chamber where they might occupy the seats marked "government representatives" which would be reserved for them.

14. The Committee further decided to establish an ad hoc working group, open to the participation of any member State, to prepare draft rules of procedure for the Committee. The Committee also decided for that purpose that the ad hoc working group should take into account the various drafts circulated informally, as well as the views of delegations.

15. The ad hoc working group, under the Chairmanship of the representative of Argentina, who was also the Chairman of the Committee, held 17 meetings. At the 15th plenary meeting of the Committee the Chairman submitted the draft rules of procedure. The draft rules of procedure, as recommended by the ad hoc working group, were adopted by the Committee. In reference to these rules and before their adoption, the Chairman, as a result of consultations with the Committee, made an interpretative statement contained in Appendix I. Interpretative statements were also made by a number of delegations in connexion with the text adopted.

16. At its 26th plenary meeting the Committee also adopted annex I to its Rules of Procedure. The text of the Rules of Procedure and its annex I (document CD/8) appears in Appendix I to this report which is an integral part of the report of this Committee.

17. At the 11th meeting after informal consultations, the Chairman stated that the arrangements made by the Conference of the Committee on Disarmament, in connexion with the Ad Hoc Group of Scientific Experts to Consider International Co-operative measures to Detect and Identify Seismic Events, should be maintained. The Chairman also found general agreement that the Group, which is open to all members of the Committee on Disarmament, should remain open to States not members of the Committee. The Committee took note of the arrangements made by the Conference of the Committee on Disarmament and of the general agreement that wider participation in the Ad Hoc Group would be desirable.

D. Agenda for the 1979 Session and Programme of Work for the First and Second Parts of the Session

18. At its 10th plenary meeting the Committee decided to establish an ad hoc working group, open to the participation of all member States of the Committee, to consider questions relating to the preparation of the agenda and programme of work of the Committee, in order to enable the Chairman to draw up the provisional agenda and programme of work in conformity with rule 29 of the Rules of Procedure.

19. The ad hoc working group, under the Chairmanship of the representative of Australia, who was also the Chairman of the Committee, held eleven meetings.

20. During the 26th plenary meeting, some delegations made statements in connexion with the provisional agenda. At the 27th plenary meeting the Chairman introduced a proposal of the ad hoc working group indicating specific dates and items in the programme of work. The Committee then adopted the Agenda and Programme of Work which are reproduced below (CD/12):

"Agenda and Programme of Work of the Committee on Disarmament

(adopted at the 26th and 27th plenary meetings held on 10 and 11 April 1979)

The Committee on Disarmament, as the multilateral negotiating forum, shall promote the attainment of general and complete disarmament under effective international control.

The Committee, taking into account inter alia the relevant provisions of the Final Document of the first special session of the General Assembly devoted to disarmament, will deal with the cessation of the arms race and disarmament and other relevant measures in the following areas:

I. Nuclear weapons in all aspects;

II. Chemical weapons;

III. Other weapons of mass destruction;

IV. Conventional weapons;

V. Reduction of military budgets;

VI. Reduction of armed forces;

VII. Disarmament and Development;

VIII. Disarmament and international security;

IX. Collateral measures; confidence-building measures; effective verification methods in relation to appropriate disarmament measures, acceptable to all parties concerned;

X. Comprehensive Programme of Disarmament leading to general and complete disarmament under effective international control.

Within the above framework, the Committee on Disarmament adopts the following agenda for 1979 which includes items that, in conformity with the provisions of Section VIII of its Rules of Procedure, would be considered by the Committee:

1. Nuclear Test Ban.

2. Cessation of the nuclear arms race and nuclear disarmament.

3. Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.

4. Chemical weapons.

5. New types of weapons of mass destruction and new systems of such weapons; radiological weapons.

6. Consideration and adoption of the annual report and any other report as appropriate to the General Assembly of the United Nations.

In compliance with rule 28 of its Rules of Procedure, the Committee also adopts the following Programme of Work for the first part of its 1979 session:

PROGRAMME OF WORK

19 - 23 April: Cessation of the nuclear arms race and nuclear disarmament.

24 - 27 April: Chemical weapons.

In adopting its agenda and programme of work, the Committee has kept in mind the provisions of rules 30 and 31 of its Rules of Procedure."

21. At the 26th plenary meeting of the Committee the Chairman introduced document CD/L.2/Rev.1 on the provisional agenda and programme of work and announced the following understanding:

"In submitting the provisional agenda of the Committee on Disarmament, it is the understanding of all members of the Committee that heading IX, dealing inter alia with 'collateral measures', includes the following questions, to be considered by the Committee at the appropriate stages of its work:

1. Further prohibition of military or any other hostile use of environmental modification techniques;

2. Further measures in the field of disarmament to prevent an arms race on the sea-bed and the ocean floor and in the subsoil thereof;

3. Further measures to prevent an arms race in outer space."

22. During the second part of the 1979 session of the Committee, the question of the programme of work was considered, in accordance with rule 28 of the Rules of Procedure. The Chairman submitted at the 33rd plenary meeting a proposal on the programme of work for the second part of the session, which was adopted by the Committee. It read as follows:

"21-22 June:	Nuclear test ban.
25-29 June:	Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.
2-6 July:	Cessation of the nuclear arms race and nuclear disarmament.
10-13 July:	New types of weapons of mass destruction and new systems of such weapons; radiological weapons.
16-27 July:	Chemical weapons.
30 July - 3 August:	Nuclear test ban.
...	Consideration and adoption of the annual report to the General Assembly of the United Nations.*/

In adopting its Programme of Work, the Committee has kept in mind the provisions of rules 30 and 31 of its Rules of Procedure.

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*/ In accordance with rule 44 of the Rules of Procedure, the draft reports to the United Nations General Assembly shall be made available to all Member States of the Committee for consideration at least two weeks before the scheduled date for their adoption."

23. The Committee devoted the period 6-14 August 1979 to the consideration and adoption of its annual report to the General Assembly of the United Nations.

E. Participation by States not members of the Committee

24. The following States not members of the Committee communicated their intention to attend the plenary meetings of the Committee: Austria, Burundi, Chile, Denmark, Finland, Gabon, Greece, Guatemala, Honduras, Iraq, Ireland, Israel, Ivory Coast, Jordan, Kuwait, Malta, New Zealand, Norway, Portugal, Qatar, Senegal, Spain, Sudan, Switzerland, Turkey and Viet Nam.

25. The Committee on Disarmament received and considered requests to participate in its work (CD/14, 16, 26, 30, 34 and 38) from the following States not members of the Committee: Finland, Switzerland, Viet Nam, Spain and Denmark.

26. In accordance with its rules of procedure, and having received requests from Finland, Switzerland, Socialist Republic of Viet Nam, Spain and Denmark the Committee invited:

(a) the representative of Finland to participate in the work of the Committee during its 1979 session on chemical weapons, at both formal and informal meetings, in accordance with rules 33 and 35;

(b) the representative of Switzerland to make a statement in the Committee on the question of chemical weapons, in accordance with rule 34;

(c) the representative of the Socialist Republic of Viet Nam to participate in the work of the Committee during its 1979 session in the consideration of the question of effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons, both at its formal and at its informal meetings, in accordance with rules 33 to 35;

(d) an expert from Spain to participate in the Ad Hoc Group of Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events, pursuant to the decision adopted by the Committee on 15 February 1979;

(e) the representative of Spain to make a statement in the Committee when it took up the question of chemical weapons, in accordance with rule 34; and

(f) the representative of Denmark to participate in the work of the Committee during its 1979 session on chemical weapons, both at its formal and at its informal meetings, as well as in any subsidiary body that the Committee might establish on that question, in accordance with rules 33 to 35.

27. At its 43rd plenary meeting the Committee also decided, in accordance with rule 32 of the Rules of Procedure, that representatives of non-member States shall have reserved seats during informal meetings on chemical weapons.

F. Communications from Non-Governmental Organizations

28. In accordance with Article 42 of the Rules of Procedure, a list of all communications from non-governmental organizations was circulated to the Committee (CD/NGO 1).

III. WORK OF THE COMMITTEE DURING ITS 1979 SESSION

29. The work of the Committee during its 1979 session was based on its agenda and programme of work adopted for the year. The rules of procedure are in Appendix I and the list of documents issued by the Committee, as well as the texts of those documents, are included as Appendix III to the report. An index of the verbatim records by country and subject, listing the statements made by delegations during 1979, and the verbatim records of the meetings of the Committee are attached as Appendix IV to the report.

30. The Committee also had before it a letter dated 17 January 1979 from the Secretary-General of the United Nations (CD/1), transmitting all the resolutions on disarmament adopted by the General Assembly at its thirty-third session in 1978, in particular those entrusting specific responsibilities to the Committee on Disarmament, namely: resolution 33/59A, "Chemical and bacteriological (biological) weapons"; 33/60, "Implementation of General Assembly resolution 32/78"; 33/66A and B, "Prohibition of the development and manufacture of new types of weapons of mass destruction and new systems of such weapons"; 33/71F, H and L, "Review of the implementation of the recommendations and decisions adopted by the General Assembly at its tenth special session"; 33/72A and B, "Conclusion of an international convention on the strengthening of guarantees of the security of non-nuclear States"; and 33/91G and H, "General and complete disarmament".

31. In the same letter the Secretary-General drew attention, in particular, to the following provisions of those resolutions:

(a) In resolution 35/59A, operative paragraph 3 requests the Committee on Disarmament, as a matter of high priority, to undertake, at the beginning of its 1979 session, negotiations with a view to elaborating an agreement on effective measures for the prohibition of the development, production and stockpiling of all chemical weapons and for their destruction, taking into account all existing proposals and future initiatives; and operative paragraph 6 requests the Committee on Disarmament to report on the results of its negotiations to the General Assembly at its thirty-fourth session.

(b) In resolution 33/60, operative paragraph 6 requests the Committee on Disarmament to take up immediately the agreed text resulting from the negotiations referred to in paragraph 5 of the same resolution with a view to the submission as soon as possible of a draft test-ban treaty, which will attract the widest possible adherence, to a resumed thirty-third session of the General Assembly.

(c) In resolution 33/66A, operative paragraph 2 requests the Committee on Disarmament, while taking account of its existing priorities, to pursue its examination of the subject, with any appropriate expert assistance, with a view to reaching agreement on the prevention of the emergence of new weapons of mass destruction based on new scientific principles and achievements and the speedy preparation of specific agreements on individual types of weapons which may be identified; and operative paragraph 4 requests the Committee on Disarmament to report on its examination of the subject to the General Assembly at its thirty-fourth session.

(d) In resolution 33/66B, operative paragraph 1 requests the Committee on Disarmament, in the light of its existing priorities, actively to continue negotiations with the assistance of qualified governmental experts, with a view to reaching an agreement on the prohibition of the development and manufacture of new types of weapons of mass destruction and new systems of such weapons, and expedite the preparation of specific agreements on particular types of such weapons and operative paragraph 2 requests the Committee on Disarmament to submit a report on the results achieved to the General Assembly for consideration at its thirty-fourth session.

(e) In resolution 33/71F, operative paragraph 1 takes note with satisfaction of the measures adopted, or about to be adopted, to revitalize the multilateral disarmament machinery available to the United Nations among which, in particular, the fact that the Disarmament Commission has just held its first session on organizational matters and that the Committee on Disarmament is already properly constituted in conformity with the relevant provisions of the Final Document embodied in its General Assembly resolution S-10/2; and operative paragraph 2 expresses the hope that all nuclear-weapon States will participate in the Committee on Disarmament, and is confident that the Committee will include in its rules of procedure provisions to ensure that it may function effectively as a multilateral negotiating disarmament body.

(f) In resolution 33/71H, operative paragraph 1 of its section IV invites the Committee on Disarmament to take into account, when determining its priorities and programme of work, the priorities established in paragraph 45 of the Final Document of the Tenth Special Session of the General Assembly and the resolution adopted at the thirty-third session of the General Assembly; operative paragraph 2 requests the Committee on Disarmament to undertake, at its first session in January 1979, on a priority basis, negotiations on: (a) a treaty on the complete prohibition of nuclear-weapon tests; (b) a treaty or convention on the complete and effective prohibition of the development, production and stockpiling

of all types of chemical weapons and on their destruction; and operative paragraph 3 requests the Committee on Disarmament to submit reports to the General Assembly annually or more frequently, as appropriate, and provide its formal and other relevant documents to Member States on a regular basis.

(g) In resolution 33/71L, operative paragraph 2 requests the Committee on Disarmament to report to the General Assembly at its thirty-fifth session on the state of the consideration of all the proposals and suggestions listed in paragraph 125 of the Final Document of the tenth special session (A/RES/S-10/2).

(h) In resolution 33/72A, operative paragraph 2 requests the Committee on Disarmament, with a view to taking effective measures for the strengthening of the security of non-nuclear-weapon States through appropriate international arrangements, to consider, at the earliest possible date, the drafts of an international covention on the subject submitted to the General Assembly at its thirty-third session, as well as all proposals and suggestions on effective political and legal measures at the international level to assure the non-nuclear-weapon States against the use or threat of use of nuclear weapons.

(i) In resolution 33/72B, operative paragraph 2 takes note of the proposals submitted and views expressed on the subject at the thirty-third session of the General Assembly and recommends that the Committee on Disarmament should consider them and submit a progress report to the General Assembly at its thirty-fourth session.

(j) In resolution 33/91G, operative paragraph 2 requests the Committee on Disarmament to consider modalities of the review of the membership of the Committee and to report on this subject to the General Assembly at its thirty-fifth session; and operative paragraph 3 requests the Committee on Disarmament to make arrangements for interested States, not members of the Committee, to submit to the Committee written proposals or working documents on measures of disarmament that are the subject of negotiation in the Committee and to participate in the discussion of the subject-matter of such proposals or working documents; and operative paragraph 4 reaffirms that States not members of the Committee, upon their request, should be invited by it to express views in the Committee when the particular concerns of those States are under discussion.

(k) Resolution 33/91H requests the Committee on Disarmament, at an appropriate stage of its pursuit of proposals contained in the Programme of Action adopted by the tenth special session (A/RES/S-10/2), to consider urgently the question of an adequately verified cessation and prohibition of production of fissionable materials for weapons purposes and other nuclear explosive devices and to keep the General Assembly informed of the progress of that consideration.

32. The Committee received a letter dated 16 January 1979 from the Secretary-General of the United Nations (CD/2) transmitting the proposals and suggestions listed in paragraph 125 of the Final Document of the Tenth Special Session in accordance with General Assembly resolution 33/71L of 14 December 1978.

33. The Committee also received a letter dated 28 March 1979 from the Under-Secretary-General of the United Nations for Political and Security Council Affairs (CD/17) transmitting, on behalf of the Secretary-General, the report of the United Nations Seminar on Nuclear Collaboration with South Africa.

34. The Committee received the following documents:

(a) Document CD/20 submitted by the delegation of Hungary, dated 20 June 1979, transmitting the text of a communiqué adopted at the meeting of the Committee of the Ministers for Foreign Affairs of the Warsaw Treaty Member States held in Budapest on 14 and 15 May 1979 concerning the items under the headings "A. Nuclear Test Ban", "B. Cessation of the Nuclear Arms Race and Nuclear Disarmament" and "C. Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons", as well as section F. of the report entitled "Consideration of Other Areas Dealing with the Cessation of the Arms Race and Disarmament and Other Relevant Measures".

(b) Document CD/22, dated 20 June 1979, submitted by the delegation of Mongolia, transmitting the declaration by the Government of the Mongolian Peoples Republic, published in Ulan-Bator on the occasion of the signature of the Soviet-United States Strategic Arms Limitation Treaty (SALT II).

(c) Document CD/28, dated 27 June 1979, submitted by the delegations of the USSR and United States of America transmitting the Treaty and the Protocol to the Treaty on the Limitation of the Strategic Offensive Arms between the United States of America and the Union of Soviet Socialist Republics, the Joint Statement of Principles and Basic Guidelines for subsequent negotiations on the Limitation of Strategic Arms and the Joint USSR-United States of America Communiqué, concerning the items under the headings "A. Nuclear Test Ban", "B. Cessation of the Nuclear Arms Race and Nuclear Disarmament", "D. Chemical weapons" and "E. New Types of Weapons of Mass Destruction and New Systems of Such Weapons; Radiological Weapons", as well as section F. of the report entitled "Consideration of Other Areas Dealing with the Cessation of the Arms Race and Disarmament and Other Relevant Measures".

(d) Document CD/29, dated 2 July 1979, submitted by the delegation of the United States of America, transmitting additional documents relating to the treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Strategic Offensive Arms.

(e) Document CD/33, dated 10 July 1979, submitted by the delegation of Italy, transmitting the text of a letter from the President of the Council of Ministers of the Italian Republic to the President of the United States of America and the Chairman of the Presidium of the Supreme Soviet of the Union of Soviet Socialist Republics on the occasion of the signature of the SALT II agreements.

A. Nuclear Test Ban

35. The item of the agenda entitled "Nuclear Test Ban" was considered by the Committee, in accordance with its programme of work, from 21 to 22 June and from 30 July to 3 August 1979.

36. The Committee had before it a progress report on the Seventh Session of the Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events (CD/18) which met from 19 February to 2 March. It also had before it the Second Report of the Ad Hoc Group on its meeting from 16-27 July (document CD/43 and Addendum 1).

37. In addition to the reports submitted by the Ad Hoc Group, the following documents were before the Committee in connexion with the item:

(a) Document CD/7 dated 1 March 1979, submitted by the Netherlands, on the use of short-period initial motion data for discrimination purposes.

(b) Document CD/45, dated 30 July 1979, submitted by the delegation of Sweden, containing a working paper on International Seismological Datacenter Demonstration Facilities in Sweden.

(c) Document CD/46, dated 31 July 1979, also submitted by the delegation of Sweden, on a draft decision for a continued mandate to the Ad Hoc Group of Seismic Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events.

38. At the 46th plenary meeting of the Committee on 31 July 1979, the representative of the United Kingdom made a statement, also on behalf of the Union of Soviet Socialist Republics and the United States of America, concerning the tripartite negotiations on a treaty prohibiting nuclear-weapon tests in all environments and its protocol covering nuclear explosions for peaceful purposes.

39. Within the framework of the discussion of this agenda item the Committee examined the work of the Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events. The Committee expressed its appreciation to the Ad Hoc Group for its valuable and important work, believing that the recommendations of the group should be taken into account when the exchange of seismic data is implemented in practice.

At its 48th meeting held on 7 August 1979, the Committee approved the report of the Ad Hoc Group and decided to continue the mandate of the Ad Hoc Group, as well as to invite the World Meteorological Organization to continue to participate in the work of the Group.

40. The highest priority of the question of a nuclear test ban and the importance of the Committee's role in elaborating a treaty were generally stressed. To that end, the Committee will continue its work at its 1980 session.

The Committee urged the participants in the tripartite negotiations to make every effort to bring the negotiations to an early and successful conclusion and to transmit the results to the Committee on Disarmament for its consideration.

B. Cessation of the Nuclear Arms Race and Nuclear Disarmament

41. The item of the agenda entitled "Cessation of the Nuclear Arms Race and Nuclear Disarmament" was considered by the Committee, in accordance with its programme of work from 19 to 23 April and from 2 to 6 July 1979. In addition to its plenary meetings, the Committee held six informal meetings on the subject during and after the period allocated for the consideration of the item.

42. In connexion with the item, the following documents were before the Committee:

(a) Document CD/4, dated 1 February 1979, submitted by the delegations of Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Mongolia, Poland, and the Union of Soviet Socialist Republics, concerning negotiations on ending the production of all types of nuclear weapons and gradually reducing their stockpiles until they have been completely destroyed. Romania joined the co-sponsors of this document.

(b) Document CD/36/Rev.1, dated 12 July 1979, submitted by the Group of 21,*/ containing a working paper on Cessation of Nuclear Arms Race and Nuclear Disarmament.

43. The discussions on this item helped clarify the various approaches to the question of nuclear disarmament. Two documents containing proposals and suggestions were submitted to the Committee (CD/4 and CD/36/Rev.1). These documents contributed to an exploration of the possibility of effective negotiations in that respect. The co-sponsors of the submitted documents and other members of the Committee on Disarmament exchanged views on a number of specific questions in an effort to identify the prerequisites and elements for multilateral negotiations on nuclear disarmament and to delineate the course of action for the achievement of this objective.

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*/ Algeria, Argentina, Brazil, Burma, Cuba, Egypt, Ethiopia, India, Indonesia, Iran, Kenya, Mexico, Morocco, Nigeria, Pakistan, Peru, Sri Lanka, Sweden, Venezuela, Yugoslavia, Zaire.

The documents relating to the SALT II Agreement were presented to the Committee (CD/28 and CD/29). The hope was expressed that these agreements would speedily enter into force so that the negotiating process might be resumed soon with a view to bringing about further meaningful and substantial results.

While the exchanges of views on this item were most useful, they would need to be continued and intensified during the next session of the Committee in order that an agreed basis for progress might be found. The special responsibility of nuclear-weapon States was recognized as essential for attaining the goal of nuclear disarmament.

C. Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons

44. The item of the agenda entitled "Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons" was considered by the Committee, in accordance with its programme of work, from 25 to 29 June 1979.

45. In connexion with the item the following documents were before the Committee:

(a) Document CD/10, dated 27 March 1979, submitted by the delegation of Pakistan, concerning the conclusion of an International Convention to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.

(b) Document CD/23, dated 21 June 1979, submitted by the delegations of Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Mongolia, Poland, and the Union of Soviet Socialist Republics, containing a working paper on a draft international convention on the strengthening of guarantees of the security of non-nuclear States.

(c) Document CD/25, dated 26 June 1979, submitted by the delegation of Pakistan, containing a working paper on effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.

(d) Document CD/27, dated 2 July 1979, submitted by the delegation of the United States of America, containing a proposal for a CD recommendation to the United Nations General Assembly concerning the security of non-nuclear-weapon States against nuclear attack.

46. At its 39th plenary meeting on 5 July 1979, the Committee decided to establish, for the duration of its 1979 session, an ad hoc working group open to all Member States of the Committee to consider, and negotiate on, effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons. The Committee further decided that the ad hoc working group would present a report to the Committee before the conclusion of the 1979 session.

47. The Committee also decided, in accordance with rule 32 of the Rules of Procedure, that representatives of non-member States should have reserved seats in the conference room during the meetings of the ad hoc working group. After that decision was taken, the Chairman noted that, in adopting the decision under rule 32 of the Rules of Procedure, it was the understanding of the Committee that it would not constitute a precedent and that each case would be decided in the future on its merits.

48. At its 41st plenary meeting on 12 July 1979, the Committee also decided to nominate the representative of Egypt as Chairman of the Ad Hoc Working Group. The Ad Hoc Working Group held seven meetings between 13 July and 2 August and conducted also informal consultations during that period. As a result of its deliberations, the Ad Hoc Working Group submitted a report to the Committee (document CD/47).

49. The Committee noted that there was wide recognition of the urgent need to reach agreement on effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons. In that connexion the question of an international convention was widely discussed. There was no objection, in principle, to the idea of an international convention; however, the difficulties involved were also pointed out. There was also discussion on the question of a General Assembly resolution as well as reference to Security Council resolution and declarations to be deposited with the Secretary-General of the United Nations as an interim arrangement.

50. The Committee approved the recommendation of the Ad Hoc Working Group that at the beginning of its 1980 session the Committee on Disarmament should continue negotiations on effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.

51. At its 48th meeting on 7 August 1979 the Committee approved the report of the Ad Hoc Working Group which is an integral part of the Report of the Committee (Appendix II).

D. Chemical weapons

52. The item of the agenda entitled "Chemical weapons" was considered by the Committee, in accordance with its programme of work, from 24 to 27 April and from 16 to 27 July 1979.

53. In connexion with the item, the following documents were before the Committee:

(a) Document CD/5, dated 6 February 1979, submitted by the delegation of Italy, containing a working paper on chemical disarmament negotiations.

(b) Document CD/6, dated 6 February 1979, submitted by the delegation of the Netherlands, concerning some procedural suggestions with respect to the development of a ban on chemical weapons.

(c) Document CD/11, dated 9 April 1979, submitted by the Group of 21, containing a working paper on negotiations on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction.

(d) Document CD/14, dated 25 April 1979, submitted by Finland, containing a working document entitled "Chemical identification of chemical weapons agents; a Finnish Project".

(e) Document CD/15, dated 24 April 1979, submitted by the delegation of the United Kingdom, on a visit to Britain by chemical weapons experts (14-16 March 1979).

(f) Document CD/21, dated 20 June 1979, submitted by the delegation of Poland, containing a working paper on the prohibition of the development, production and stockpiling of all chemical weapons and their destruction.

(g) Document CD/26, dated 1 July 1979, submitted by the Secretariat in compliance with the decision of the Committee at its 31st plenary meeting, containing a compilation of material on chemical weapons from the Conference of the Committee on Disarmament and the Committee on Disarmament Working Papers and Statements, 1972-1979.

(h) Document CD/37, dated 12 July 1979, submitted by the delegation of the Federal Republic of Germany, entitled "Working Paper on some Aspects of International Verification of Non-Production of Chemical Weapons: Experience gained in the Federal Republic of Germany".

(i) Document CD/39, dated 16 July 1979, submitted by Finland, concerning the identification of potential organophosphorus warfare agents -- an approach for the standardization of techniques and reference data.

(j) Document CD/41, dated 25 July 1979, submitted by the delegation of the Netherlands, entitled "A working paper containing questions relevant to a Convention prohibiting chemical weapons".

(k) Document CD/44, dated 26 July 1979, submitted by the delegation of Poland, containing a working paper on an outline of a convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction.

(l) Document CD/48, dated 7 August 1979, submitted by the delegations of the Union of Soviet Socialist Republics and the United States of America, entitled "USSR-United States Joint Report on Progress in the Bilateral Negotiations on the Prohibition of Chemical Weapons".

(m) Document CD/49, dated 8 August 1979, submitted by the delegation of the Netherlands, entitled "Chemical Weapons -- Answers to Questionnaire contained in CD/41".

(n) Document CD/52, dated 13 August 1979, submitted by the delegations of France, Italy and the Netherlands, entitled "Chemical weapons -- Evaluation of the discussion in the Committee on Disarmament in 1979 with respect to a prohibition of chemical weapons".

54. The urgency and importance of negotiating an international convention prohibiting the development, production and stockpiling of chemical weapons and on their destruction was stressed by all members of the Committee. Several procedural suggestions were made to the Committee for making progress towards this objective in documents CD/5, CD/6, CD/11 and CD/21. It was, however, not possible to reach agreement on the methods and procedures for dealing with the question of chemical weapons, in particular the setting-up of an Ad Hoc Working Group for this purpose.

A useful exchange of views took place between delegations, with the participation of experts, and answers to specific questions, especially as regards the basic elements of a future convention, were provided. As a result, different aspects of the problem of the prohibition of chemical weapons have been further clarified.

The Committee noted with satisfaction the substantial joint statement that the delegations of the USSR and the United States of America made on 31 July 1979 on their bilateral negotiations with respect to an intended joint initiative on chemical weapons (document CD/48). The Committee also noted that the USSR and the United States of America would exert their best efforts to complete the negotiations and present a joint initiative to the Committee on this question as soon as possible.

The Committee, taking into account the fact that the prohibition of chemical weapons is one of the most urgent and vital problems in the area of disarmament, will proceed with negotiations at its 1980 session.

E. New types of weapons of mass destruction and new systems of such weapons; radiological weapons

55. The item on the agenda entitled "New types of weapons of mass destruction and new systems of such weapons; radiological weapons" was considered by the Committee, in accordance with its programme of work, from 10 to 13 July 1979.

56. In connexion with the item, the following documents were before the Committee:

(a) Documents CD/31 and CD/32, dated 9 July 1979, submitted respectively by the delegations of the Union of Soviet Socialist Republics and the United States of America, transmitting a document entitled "Agreed Joint USSR-United States Proposal on Major Elements of a Treaty Prohibiting the Development, Production, Stockpiling and Use of Radiological Weapons".

(b) Document CD/35, dated 10 July 1979, submitted by the delegation of the Union of Soviet Socialist Republics, on the negotiations on the question of the prohibition of new types of weapons of mass destruction and new systems of such weapons.

(c) Document CD/40, dated 23 July 1979, submitted by the delegation of Hungary, containing a working paper on the draft preambular part of the Treaty on the Prohibition of the Development, Manufacture, Stockpiling and Use of Radiological Weapons.

(d) Document CD/42, dated 25 July 1979, submitted by the delegation of the German Democratic Republic, containing a working paper on draft paragraph XI, subparagraph 3, and paragraph XII, subparagraph 3, of the Treaty on the Prohibition of the Development, Manufacture, Stockpiling and Use of Radiological Weapons.

57. The Committee noted with satisfaction the submission by the USSR and the United States of America of an agreed joint proposal on major elements of a Treaty prohibiting the development, production, stockpiling and use of radiological weapons (CD/31 and CD/32).

The sponsors of the proposal made a detailed presentation and provided additional clarifications and explanations, with the assistance of experts.

Draft formulations for the preambular part as well as for certain operative paragraphs were submitted to the Committee by some members (CD/40 and CD/42).

Following a preliminary discussion, the Committee concluded that it would, as soon as possible, continue consideration of the agreed joint proposal at its next annual session.

The Committee also considered the general question of new types of weapons of mass destruction and new systems of such weapons. Experts from some countries provided additional information. The Committee will give further examination to this problem next year.

F. Consideration of other areas dealing with the cessation of the arms race and disarmament and other relevant measures

58. During its 1979 session, the Committee had before it other documents which, although not considered under the items of the agenda, dealt with the cessation of the arms race and disarmament and other relevant measures in other areas. In accordance with the understanding announced by the Chairman of the Committee at the 26th plenary meeting, that heading IX of document CD/12 included, inter alia, questions dealing with further measures in the field of disarmament to prevent an arms race on the sea-bed and the ocean floor and in the sub-soil thereof, as well as further measures to prevent an arms race in outer space, the following documents were before the Committee:

(a) Document CD/9, dated 26 March 1979, submitted by the delegation of Italy, on an additional protocol 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" with a view to preventing an arms race in outer space.

(b) Document CD/13, dated 20 April 1979, submitted by the delegation of Poland, containing a working paper on further measures in the field of disarmament for the prevention of an arms race on the sea-bed and the ocean floor.

G. Consideration and adoption of the Annual Report and any other report as appropriate to the General Assembly of the United Nations

59. During the consideration and adoption of this report to the General Assembly of the United Nations, the following documents were tabled for including in the record:

(a) Document CD/50, dated 9 August 1979, submitted by the Group of 21, entitled, "Statement by the Group of 21 on the Conclusion of the annual session of the Committee on Disarmament in 1979".

(b) Document CD/51, dated 10 August 1979, submitted by a Group of Socialist States,**/ entitled, "Results of the 1979 Session of the Committee on Disarmament".

60. The present report is transmitted by the Chairman on behalf of the Committee on Disarmament.

**/ Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Mongolia, Poland, Union of Soviet Socialist Republics.

RULES OF PROCEDURE OF THE COMMITTEE ON DISARMAMENT
(Adopted at the 15th Plenary Meeting on 28 February 1979)

INTRODUCTION

These rules of procedure have been adopted taking into account the relevant provisions of the Final Document of the first special session of the General Assembly devoted to disarmament, including the agreement reached following appropriate consultations among the Member States during that Session which the General Assembly welcomed in the Final Document.

I. Functions and Membership

1. The Committee on Disarmament (hereinafter referred to as the Committee) is a disarmament negotiating forum open to the nuclear weapon States and thirty-five other States (Annex I).

2. The membership of the Committee will be reviewed at regular intervals.

3. All Member States of the Committee shall take part in its work in conditions of full equality as independent States, in accordance with the principle of sovereign equality enshrined in the Charter of the United Nations.

II. Representation and Accreditation

4. The delegation of a Member State of the Committee shall consist of a head of delegation and other representatives, advisers, and experts, as may be required.

5. Each delegation shall be accredited by a letter on the authority of the Minister of Foreign Affairs of the Member State, addressed to the Chairman of the Committee.

6. The Delegations shall be seated following the English alphabetical list of membership.

III. Sessions

7. The Committee shall have an annual session divided into two parts. The first part shall begin on the first Tuesday in February. The Committee shall decide, as soon as practically possible, the opening date of the second part and the closing dates of both parts of its annual session, taking into account the requirements of its work.

8. The Chairman of the Committee, in full consultation with and with the agreement of all its Members, may convene the Committee in special session.

IV. Chairmanship

9. When the Committee is in session, the Chairmanship of the Committee shall rotate among all its members on the first day of the calendar month, a rotation which began in January 1979 following the English alphabetical list of membership.

10. If the head of the delegation which performs the function of Chairman cannot be present, he may be replaced by a member of his delegation. If no member of the delegation holding the chair is able to perform the function of Chairman the delegation next in order of rotation shall temporarily assume this function.

11. Apart from exercising the normal functions of a presiding officer and in addition to the powers conferred upon him elsewhere by these rules, the Chairman shall, in full consultation with the Committee and under its authority, represent it in its relations with States, with the General Assembly and other organs of the United Nations and with other international organizations.

12. During the period when the Committee is not in session the functions of the Chairman shall be carried out by the representative of the Member State which chaired the last plenary meeting of the Committee.

V. Secretariat

13. At the request of the Committee the Secretary-General of the United Nations, following consultations with the Committee, will appoint the Secretary of the Committee, who shall also act as his personal representative, to assist the Committee and its Chairman in organizing the business and time-tables of the Committee.

14. Under the authority of the Committee and its Chairman, the Secretary shall, inter alia, assist in the preparation of both the provisional agenda of the Committee and the first draft of the reports of the Committee to the General Assembly of the United Nations.

15. At the request of the Committee the Secretary shall provide professional assistance to the Committee by preparing background papers and bibliographies on issues which are the subject of negotiations in the Committee as well as by compiling data and information relevant to the conduct of negotiations.

16. The Secretary shall also perform such other functions as are entrusted to him by these rules or by the Committee.

17. The Secretary-General of the United Nations will be requested to provide the staff as well as the necessary assistance and services needed by the Committee and any subsidiary bodies which it may establish.

VI. Conduct of Work and Adoption of Decisions

18. The Committee shall conduct its work and adopt its decisions by consensus.

VII. Organization of Work

19. The work of the Committee shall be conducted in plenary meetings, as well as under any additional arrangements agreed by the Committee, such as informal meetings with or without experts.

20. The Committee shall convene in plenary meetings in accordance with a schedule to be agreed upon. These meetings shall be held in public unless the Committee decides otherwise. In the event that it is decided to hold a private meeting, the Committee shall also decide whether to issue a communiqué of the meeting. The communiqué shall adequately reflect the substance of the proceedings and decisions taken by the Committee.

21. If the Committee is unable to take a decision on the substance of an item under negotiation, it will consider the subsequent examination of that item.

22. The Committee may hold informal meetings, with or without experts, to consider as appropriate substantive matters as well as questions concerning its organization of work. When requested by the Committee, the Secretariat shall provide unofficial summaries of those meetings in the working languages.

23. Whenever the Committee deems it advisable for the effective performance of its functions, including when it appears that there is a basis to negotiate a draft treaty or other draft texts, the Committee may establish subsidiary bodies, such as ad hoc sub-committees, working groups, technical groups or groups of governmental experts, open to all Member States of the Committee unless the Committee decides otherwise. The Committee shall define the mandate for each of such subsidiary bodies and provide appropriate support for their work.

24. The Committee shall decide if its own rules of procedure may be adapted to the specific requirements of its subsidiary bodies. The meetings of the subsidiary bodies shall be informal unless the Committee decides otherwise. The Secretariat shall provide assistance to the subsidiary bodies, as requested, including the preparation of unofficial summaries of the subsidiary bodies' proceedings in the working languages of the Committee.

25. The approval by consensus of reports shall not be interpreted as affecting in any manner the essential requirement that such reports must reflect faithfully the positions of all the members of the respective organs.

26. The Committee and its subsidiary bodies shall normally meet at the Office of the United Nations at Geneva.

VIII. Agenda and Programme of Work

27. At the beginning of each annual session, the Committee shall adopt its agenda for the year. In doing so, the Committee shall take into account the recommendations made to it by the General Assembly, the proposals presented by Member States of the Committee and the decisions of the Committee.

28. On the basis of its agenda, the Committee, at the beginning of each part of its annual session, shall establish its programme of work, which will include a schedule of its activities for that part of the session, taking also into account the recommendations, proposals and decisions referred to in rule 27.

29. The provisional agenda and the programme of work shall be drawn up by the Chairman of the Committee with the assistance of the Secretary and presented to the Committee for consideration and adoption.

30. The subject of statements made in plenary meetings will normally correspond to the topic then under discussion in accordance with the agreed programme of work. However, it is the right of any Member State of the Committee to raise any subject relevant to the work of the Committee at a plenary meeting and to have full opportunity of presenting its views on any subject which it may consider to merit attention.

31. While the work of the Committee is in progress Member States may request the inclusion of an urgent item in the agenda. The Committee shall decide whether and when it should be considered.

IX. Participation by States not members of the Committee

32. Representatives of non-member States shall have reserved seats in the conference room during plenary meetings and, if the Committee so decides, at other meetings.

33. Interested States not members of the Committee may submit to the Committee written proposals or working documents on measures of disarmament that are the subject of negotiation in the Committee and may participate in the discussion of the subject-matter of such proposals or working documents.

34. The Committee will invite States not members of the Committee, upon their request, to express views in the Committee when the particular concerns of those States are under discussion. Having considered such a request, the Committee will, through its Chairman, transmit an invitation to that effect to the State or States concerned.

35. The Committee may also decide to invite the States referred to in rules 33 and 34 to participate in informal meetings and in meetings of its subsidiary bodies, in which case the procedure of rule 34 is applicable.

36. The provisions of rules 4 and 5 shall also apply to delegations of non-member States participating in the work of the Committee.

X. Languages, Records and Documents

37. Simultaneous interpretation, verbatim records of public plenary meetings and documents shall be provided in the languages used within the United Nations system by Member States of the Committee participating in its work.[1/] Any representative may speak in his own language provided he makes available simultaneous interpretation into a working language.

38. Numbers shall be given in the order in which documents are received by the Secretariat. Check lists of all documents reproduced by the Secretariat shall be available from time to time.

39. Documents of the Eighteen Nations Disarmament Committee (ENDC) and Conference of the Committee on Disarmament (CCD) series may be referred to without their re-submission.

40. Verbatim records and formal and other relevant documents of the Committee shall be distributed to States Members of the United Nations normally within two weeks. Official documents of the Committee will be made available for public use.

XI. Invitations to organs of the United Nations System

41. The Committee may decide to invite specialized agencies, the IAEA and other organs of the United Nations system to provide information as appropriate if the Committee decides that doing so would advance its work.

XII. Non-Governmental Organizations

42. All communications from non-governmental organizations to the Committee, to the Chairman or to the Secretariat, shall be retained by the Secretariat and be made available to delegations upon request. A list of all such communications shall be circulated to the Committee.

XIII. Reports to the United Nations General Assembly

43. The Committee shall submit, through the Chairman, reports to the United Nations General Assembly annually or more frequently as appropriate.

44. The drafts of such reports shall be prepared by the Chairman of the Committee with the assistance of the Secretary and shall be made available to all Member States of the Committee for consideration at least two weeks before the scheduled date for their adoption.

1/ In accordance with this provision the Committee reached an understanding to use, for the time being, Arabic, English, French, Russian and Spanish.

45. The reports of the Committee shall be factual and reflect the negotiations and work of the Committee. Unless the Committee decides otherwise, the drafts shall contain:

(a) The agenda;

(b) A summary of specific requests addressed to the Committee by the United Nations General Assembly at its preceding regular session;

(c) Sectional headings in accordance with items comprised in (a) and (b) above and other matters raised in the Committee during the year;

(d) Conclusions and decisions;

(e) A table of contents and an index of verbatim records, by country and subject, of the period covered by the reports;

(f) Working papers and proposals submitted during the year;

(g) Verbatim records of the meetings held during the year, distributed as a separate annex;

(h) Other relevant documents.

46. The Committee shall adopt the annual report at the end of its session. This report shall be made available to all Member States of the United Nations before the opening of the regular sessions of the United Nations General Assembly. All other reports shall be circulated without delay.

XIV. Amendments

47. These rules of procedure may be amended by decision of the Committee.

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* *

The following is the text of the Chairman's interpretative statement referred to in paragraph 15 of the report:

"it is the understanding of the Chairman, following consultations with members of the Committee, that the rules set forth in paragraph 18, chapter VI, entitled 'Conduct of Work and Adoption of Decisions' will also apply to any subsidiary organs the Committee may establish."

ANNEX I

(adopted at the 26th plenary meeting held on 10 April 1979)

Algeria
Argentina
Australia
Belgium
Brazil
Bulgaria
Burma
Canada
China[1/]
Cuba
Czechoslovakia
Egypt
Ethiopia
France
German Democratic Republic
Germany, Federal Republic of
Hungary
India
Indonesia
Iran
Italy
Japan
Kenya
Mexico
Mongolia
Morocco
Netherlands
Nigeria
Pakistan
Peru
Poland
Romania
Sri Lanka
Sweden
Union of Soviet Socialist Republics
United Kingdom of Great Britain and Northern Ireland
United States of America
Venezuela
Yugoslavia
Zaire

1/ At the time of the adoption of the Rules of Procedure China has not participated in the work of the Committee on Disarmament.

AD HOC WORKING GROUP TO CONSIDER, AND NEGOTIATE ON, EFFECTIVE INTERNATIONAL ARRANGEMENTS TO ASSURE NON-NUCLEAR-WEAPON STATES AGAINST THE USE OR THREAT OF USE OF NUCLEAR WEAPONS

Report to the Committee on Disarmament

1. In the course of consideration of item 3 of its 1979 agenda, entitled "Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons", the Committee, at its 39th meeting held on 5 July adopted the following decision

> "The Committee on Disarmament decides to establish, for the duration of its present session, an Ad Hoc Working Group open to all Member States of the Committee to consider, and negotiate on, effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons. The Ad Hoc Working Group will present a report to the Committee on Disarmament before the conclusion of the 1979 Session. The Committee further decides, in accordance with rule 32 of the Rules of Procedure, that representatives of non-member States shall have reserved seats in the conference room during the meetings of the Ad Hoc Working Group."

2. At the 41st meeting on 12 July the Committee elected the delegation of Egypt as Chairman of the Ad Hoc Working Group.

3. The Group held 7 meetings between 13 July and 2 August and conducted also informal consultations during that period.

4. In carrying out its mandate, the Ad Hoc Working Group took into account paragraph 59 of the Final Document of the Tenth Special Session of the General Assembly Devoted to Disarmament, where "the nuclear-weapon States are called upon to take steps to assure the non-nuclear-weapon States against the use or threat of use of nuclear weapons. The General Assembly notes the declarations made by the nuclear-weapon States and urges them to pursue efforts to conclude, as appropriate, effective arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.".

5. The Ad Hoc Working Group also took note of the Letter of the Secretary-General contained in document CD/1 transmitting resolutions adopted by the General Assembly at the thirty-third regular session and took note in particular of resolution 33/72 A and B.

Operative paragraphs 1 and 2 of resolution 33/72 A read as follows:

"1. Considers it necessary to take effective measures for the strengthening of the security of non-nuclear-weapon States through appropriate international arrangements;

2. Requests the Committee on Disarmament to consider, to that end, at the earliest possible date, the drafts of an international convention on the subject, submitted to the General Assembly at its thirty-third session, as well as all proposals and suggestions concerning effective political and legal measures at the international level to assure the non-nuclear-weapon States against the use of threat of use of nuclear weapons."

Operative paragraphs 1 and 2 of resolution 33/72 B read as follows:

"1. Urges that urgent efforts should be made to conclude effective arrangements, as appropriate, to assure the non-nuclear-weapon States against the use or threat of use of nuclear weapons, including consideration of an international convention and of alternative ways and means of achieving this objective;

2. Takes note of the proposals submitted and views expressed on this subject at its thirty-third session and recommends that the Committee on Disarmament should consider them and submit a progress report to the General Assembly at its thirty-fourth session."

6. In the conduct of its work it had before it the following four working papers which were introduced by their sponsors:

(a) a working paper by Pakistan, entitled "Conclusion of an international convention to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons" (CD/10)

(b) a working paper by Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Mongolia, Poland and the Union of Soviet Socialist Republics, entitled "Draft International Convention on the Strengthening of Guarantees of the Security of Non-Nuclear States" (CD/23)

(c) a working paper by Pakistan, entitled "Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons" (CD/25), and

(d) a working paper by the United States, entitled "Proposal for a CD Recommendation to the United Nations General Assembly Concerning the Security of Non-Nuclear-Weapon States Against Nuclear Attack" (CD/27).

7. Furthermore, the Secretariat, at the request of the Ad Hoc Working Group, prepared a compilation of material suggested by members of the Group. The Compilation was prepared on the understanding that it would be background material and that the material included therein would not prejudice the position of members of the Group on matters of substance.

8. From the outset there was an understanding that the work of the Group should be a step-by-step process, the first step being to identify the elements to be considered and negotiated on, the second the negotiation on these elements, and the third to reach agreement through consensus on effective international arrangements.

9. Extensive discussion took place on the elements to be considered and negotiated on. In this connexion, discussions were held on the relationship of the non-use of nuclear weapons, nuclear disarmament, the non-use of force in international relations, as well as the overall question of strengthening of international peace and security, to the mandate of the group. There was broad agreement that these elements can be divided into two general categories:

A. Scope and nature of the arrangements, and

B. Form of the arrangements, their number and binding character.

10. There was agreement that the arrangements had to be effective and international in character. The question of rationale, scope and nature of the arrangements was discussed at length. There was also discussion on the question of definition of nuclear and non-nuclear-weapon States, the criteria to be applied in such definition and the prerequisites for the extension of the arrangements. In that respect a number of ideas were submitted such as the extension of arrangements to all non-nuclear-weapon States without any condition or limitations; to all non-nuclear-weapon States which are not parties to the nuclear security arrangements of some nuclear powers; to non-nuclear weapon States parties to the NPT or any other comparable internationally binding commitment not to acquire nuclear explosive devices (such as the Treaty of Tlatelolco), except in the case of an attack by such a State allied to a nuclear-weapons State or associated with a nuclear-weapons State in carrying out or sustaining the attack; to non-nuclear-weapon States which renounced the production and acquisition of nuclear weapons and which have no nuclear weapons on their territories or under their jurisdiction or control. Different related questions were raised and comments were made on these issues.

Discussion also took place on the question of the arrangements in relation to the non-nuclear weapon States parties to military alliances.

Similarly the question of the nature of the arrangements in relation to nuclear disarmament, the non-use of nuclear weapons as well as the non-use of force in international relations was raised. In that context the idea was discussed that, pending nuclear disarmament, a general ban on the use or the threat of use of nuclear weapons and the non-use of force in international relations would be the most effective guarantee for the security of non-nuclear-weapon States. The point was also raised that a general ban on the use of nuclear weapons can only be considered in the context of nuclear disarmament.

11. As regards the form, number and binding character of the arrangements, there was recognition that search should continue for a common approach acceptable to all which could be included in an international instrument of a legally binding character. In that connexion the question of an international convention was widely discussed. There was no objection, in principle, to the idea of an international convention; however, the difficulties involved were also pointed out. There was also discussion on the question of a General Assembly resolution as well as reference to Security Council resolution and declarations to be deposited with the Secretary-General of the United Nations as an interim arrangement.

CONCLUSION

12. There was wide recognition of the urgent need to reach agreement on effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons. The Group was able, in the short time available to it, to begin meaningful consideration of, and negotiate on, some of the elements which fell within its mandate. Preliminary exploration of areas of agreement and disagreement clarified issues and at the same time underlined the complexity of the elements which have to be further considered and negotiated on.

13. The Ad Hoc Working Group recommends that at the beginning of its 1980 session the Committee on Disarmament should continue negotiations on effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.

CD/53/Corr.1
21 August 1979

ENGLISH/SPANISH ONLY

Report of the Committee on Disarmament

CORRIGENDUM

Correct paragraph 26 to read as follows:

"26. In accordance with its rules of procedure, and having received and considered requests from Finland, Switzerland, Socialist Republic of Viet Nam, Spain and Denmark the Committee invited:..."

GE.79-63684

CD/54
14 August 1979
Original: ENGLISH

STATEMENT BY MR. JAMSHEED MARKER, LEADER OF PAKISTAN DELEGATION TO THE COMMITTEE ON DISARMAMENT - 14.8.1979

Mr. Chairman,

At this last meeting of the 1979 session of the Committee on Disarmament, the Pakistan Delegation would wish to add a few supplementary remarks to the statement made on behalf of the Group of 21 -- a statement with which, needless to say, my delegation concurs fully.

Mr. Chairman,

It was the hope of the world community, following the special session on Disarmament, that the agreement reached on a specific Programme of Action and priorities for disarmament, together with establishment of new and more representative disarmament machinery, would lead to rapid progress towards the objectives of disarmament. The first session of the Committee on Disarmament is coming to an end and stock must be taken whether our hopes and expectations were real or illusory. I think no one will argue that the results of the 1979 session of the Committee on Disarmament are certainly less than the objective requirement of halting and reversing the global arms race. Our discussions and negotiations this year have not led to the dismantling of any weapons, or to reduction in military budgets, or de-escalation in the tensions and conflicts which plague many parts of the world. But, perhaps the harsh reality of this judgement is related less to the vigour of our efforts in this Committee, and more to the grave problems of security and insecurity which pre-occupy States today. If the Committee has been unable to achieve concrete results on the major items of its agenda, this is not due to the lack of negotiating machinery or because of technical difficulties; it is perhaps primarily due to the absence of sufficient political determination, on the part of most governments, and especially the major powers, to take the first bold steps towards the goal of disarmament.

As far as the work of the Committee is concerned, I believe that there were several positive developments during the current year. Among these, the Pakistan delegation considers the adoption of the rules of procedures and the agenda of this Committee as important pioneering work. Certainly, the record would show that the more representative character of the Committee has enriched its deliberations; and greater democracy in its procedures, as compared with

its predecessor body, has also contributed to more effective methods of work. I think it would be appropriate to reiterate, at this point of time, that if the CD is to fulfil its unique responsibilities as the single multilateral negotiating body, every State member must be enabled to participate in its work on a basis of equality, and its rules and practices must be applied equally to all States members.

Mr. Chairman,

The Committee has worked very actively during its first session. The pace of its meetings, the depth of its discussions and the interest and wide participation of members are encouraging signs of the great interest in disarmament negotiations and the priority attached to the functions of this body, by our respective Governments.

At the same time, Mr. Chairman, I do not think that we can claim that the CD has achieved any major breakthrough in disarmament negotiations. Two items were referred for this body for priority negotiations: the comprehensive test ban and a CW convention. On neither of these matters have substantive negotiations been initiated. The sequence of events on these items are outlined in the Group of 21 statement and I need not repeat it here. But, I think, it is clear that the Committee's work at this session will be judged largely by the progress, or lack of progress, on these priority issues. It is, therefore, unfortunate that we could not move further towards elaborating the conventions either on the nuclear test ban or on the prohibition of chemical weapons. It is not without significance, of course, that these two items are also subject to separate negotiations by two or three States outside this forum.

Mr. Chairman,

My delegation considers the progress made on the question of security assurances to non-nuclear States as the major substantive achievement of the first session of the Committee on Disarmament. The main conclusion of these deliberations is that an international convention to assure non-nuclear weapon States against the use or threat of use of nuclear weapons is necessary and feasible. The Committee has agreed that there is no objection in principle to such a convention. Of course a common formula for security assurances must be devised, and this can be done through further negotiations within the Committee. In approaching this task, the premise should not be that while the security of the major nuclear powers, and even their minor preoccupations,

should receive full reflection, the security concerns of non-nuclear States, particularly the countries of the third world, are of marginal importance. The need for security against the nuclear threat arises from the possession of nuclear weapons by the nuclear powers. Until these weapons are eliminated, the nuclear powers have an obligation to assure the non-nuclear States against the use or threat of use of nuclear weapons. Nor should this question be approached merely as another device for non-proliferation; rather, it should be conceived in the larger context of international peace and security and promotion of the goal of nuclear disarmament.

Mr. Chairman,

Our discussions on nuclear disarmament were of interest, and helped to clarify the different approaches to this question. It is unfortunate that we were unable to reach more concrete conclusions on this subject, especially as regards the primary role of this Committee in negotiations on nuclear disarmament, and on the various elements that will have to be covered in such negotiations. Pakistan continues to believe that nuclear disarmament will be a step by step process, and that in this process the contribution of each nuclear power will be determined by the level and sophistication of its nuclear arsenals. We also concur with the view that nuclear disarmament must be achieved in a balanced manner, without prejudicing the security of any State.

It is axiomatic that disarmament is the most serious and most complex form of negotiations that has ever been undertaken, and that the purpose upon which we are now engaged is of historic importance. We appreciate that the task of the super powers has been rendered immeasureably more difficult by the onerous responsibilities of national and international security with which they are obliged to concern themselves, and by the enormous complexity and sophistication of modern armaments. But, in turn, we hope that they too will appreciate that our concerns are not motivated by a mere desire to meddle in their bilateral or trilateral efforts, but by an acute and compelling realization of the brutal fact of our vulnerability. Bilateral failure in this field carries multilateral consequence of the most horrific proportions which is why we believe that meaningful progress in nuclear disarmament is unlikely so long as security is perceived in terms of narrow mathematical equations of defensive and offensive potential. The SALT II agreement, and the debate which it has evoked, demonstrates the difficulty of establishing an understanding of what constitutes

an equitable balance of power, or, as some would say, a balance of terror. We have been told that to expect more rapid progress in the complex task of nuclear disarmament is unreal or utopian; but can it be contested that with each day's delay this process becomes more and more complex as additional and more terrible systems of arms are developed to maintain a tenuous balance of power between major nuclear States. Let us not wait until this task becomes completely beyond the capacity of the international community to control. As Alexander Heren once said, "we are not the doctors, we are the disease". This is a sombre reflection which my delegation, at least, will keep in mind as we conduct our future negotiations on disarmament.

The work of the Committee on Disarmament for the current year will be considered by the forthcoming session of the United Nations General Assembly. The deliberations in the Assembly, which will take place in a different atmosphere and in a broader framework, will provide an opportunity to consolidate the achievements of the Committee and to renew efforts to overcome the difficulties which we have encountered. We hope, therefore, that the General Assembly will give indepth consideration to the work of this Committee and adopt considered and far-reaching recommendations for our future work.

As for the continuation of the negotiations in this body next year, we can but hope that we shall be able to devote greater time to substantive negotiations on various issues, particularly on those items which have been repeatedly accorded priority by the international community. If we are to be successful in achieving real and substantive progress on these major issues on our agenda, it is necessary that those powers which have special responsibilities in the field of disarmament, should repose increased confidence in the negotiations in this body. The Committee is not a clearing house for agreements worked out in more restricted forums; it is the principal multilateral body, and must be involved actively in the work on disarmament problems at each stage of their negotiation. Equally implicit, of course, is the need for all the other member States to display the requisite realism and appreciation of the difficulties. Unless this new approach, and greater pragmatism as well as democracy in our procedures guide our work, the CD may well regress into a forum for sterile debate and disputation. It is the responsibility of all member States to ensure against such a possibility. It is a responsibility

which is imposed because of our membership in this body, and by the interests of our peoples and of all the peoples of the world who desire to live in a climate of genuine peace and real security.

Finally, Mr. Chairman, I would like to express the sincere thanks of my delegation to yourself and your distinguished predecessors for the very skilful manner in which you have guided the deliberations of our Committee, and to the distinguished Secretary and the Secretariat of the Committee, as well as our superb interpreters for the able manner in which they have carried out their demanding task.

CD/L.1
28 February 1979

Original: ENGLISH

Draft Rules of Procedure of the Committee on Disarmament

INTRODUCTION

These rules of procedure have been adopted taking into account the relevant provisions of the Final Document of the first special session of the General Assembly devoted to disarmament, including the agreement reached following appropriate consultations among the Member States during that Session which the General Assembly welcomed in the Final Document.

I. Functions and Membership

1. The Committee on Disarmament (hereinafter referred to as the Committee) is a disarmament negotiating forum open to the nuclear weapon States and thirty-five other States (Annex I).

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4. The delegation of a Member State of the Committee shall consist of a head of delegation and other representatives, advisers, and experts, as may be required.

5. Each delegation shall be accredited by a letter on the authority of the Minister of Foreign Affairs of the Member State, addressed to the Chairman of the Committee.

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7. The Committee shall have an annual session divided into two parts. The first part shall begin on the first Tuesday in February The Committee shall decide, as soon as practically possible, the opening date of the second part and the closing dates of both parts of its annual session, taking into account the requirements of its work.

8. The Chairman of the Committee, in full consultation with and agreement of all its Members, may convene the Committee in special session.

IV. Chairmanship

9. When the Committee is in session, the Chairmanship of the Committee shall rotate among all its members on the first day of the calendar month, a rotation which began in January 1979 following the English alphabetical list of membership. If the head of the delegation which performs the function of Chairman cannot be present, he may be replaced by a member of his delegation.

10. Apart from exercising the normal functions of a presiding officer and in addition to the powers conferred upon him elsewhere by these rules, the Chairman shall, in full consultations with the Committee and under its authority, represent it in its relations with States, with the General Assembly of the United Nations and its organs and with other international organizations.

11. During the period when the Committee is not in session the functions of the Chairman shall be carried out by the representative of the Member State which chaired the last formal meeting of the Committee.

V. Secretariat

12. At the request of the Committee the Secretary-General of the United Nations, following consultations with the Committee, will appoint the Secretary of the Committee, who shall also act as his personal representative, to assist the Committee and its Chairman in organizing the business and timetables of the Committee.

13. Under the authority of the Committee and its Chairman, the Secretary shall, inter alia, assist in the preparation of both the provisional agenda of the Committee and the first draft of the reports of the Committee to the General Assembly of the United Nations.

14. At the request of the Committee the Secretary shall provide professional assistance to the Committee by preparing background papers and bibliographies on issues which are the subject of negotiations in the Committee as well as by compiling data and information relevant to the conduct of negotiations.

15. The Secretary shall also perform such other functions as are entrusted to him by these rules or by the Committee.

16. The Secretary-General of the United Nations will be requested to provide the staff as well as the necessary assistance and services needed by the Committee and any subsidiary bodies which it may establish.

VI. Conduct of Work and Adoption of Decisions

17. The Committee shall conduct its work and adopt its decisions by consensus.

VII. Organization of Work

18. The work of the Committee shall be conducted in plenary meetings, as well as through any additional arrangements agreed by the Committee, such as informal meetings or informal meetings with experts.

19. The Committee shall convene in plenary meetings in accordance with a schedule to be agreed upon. These meetings shall be held in public unless the Committee decides otherwise. In the event that it is decided to hold a private meeting, the Committee shall also decide whether to issue a communiqué of the meeting. The communiqué should adequately reflect the substance of the proceedings and decisions taken by the Committee.

20. If the Committee is unable to take a decision on the substance of an item under negotiation, it will consider the subsequent examination of that item.

21. The Committee may hold informal meetings, with or without experts, to consider as appropriate substantive matters as well as questions concerning its organization of work. When requested by the Committee, the Secretariat shall provide unofficial summaries of those meetings in the working languages.

22. Whenever the Committee deems it advisable for the effective performance of its functions, including when it appears that there is a basis to negotiate a draft treaty or other draft texts, the Committee may establish subsidiary bodies, such as ad hoc sub-committees, working groups, technical groups or groups of governmental experts, open to all Member States of the Committee unless the Committee decides otherwise. The Committee shall define the mandate for each of such subsidiary bodies and provide appropriate support for their work.

23. The Committee shall decide if its own rules of procedure may be adapted to the specific requirements of its subsidiary bodies. The meetings of the subsidiary bodies shall be informal unless the Committee decides otherwise. The Secretariat shall provide assistance to the subsidiary bodies, as requested, including the preparation of unofficial summaries of the subsidiary bodies' proceedings in the working languages of the Committee.

24. The approval by consensus of the reports shall not be interpreted as affecting in any manner the essential requirement that such reports must reflect faithfully the positions of all the members of the respective organs.

25. The Committee and its subsidiary bodies shall normally meet at the Office of the United Nations at Geneva.

VIII. Agenda and Programme of Work

26. At the beginning of each annual session, the Committee shall adopt its agenda for the year. In doing so, the Committee shall take into account the recommendations made to it by the General Assembly, the proposals presented by the Members of the Committee and the decisions of the Committee.

27. On the basis of its agenda, the Committee, at the beginning of each part of its annual session, shall establish its programme of work, which will include a schedule of its activities for that part of the session, taking also into account the recommendations, proposals and decisions referred to in rule 26.

28. The provisional agenda and the programme of work shall be drawn up by the Chairman of the Committee with the assistance of the Secretary and presented to the Committee for consideration and adoption.

29. The subject of statements made in plenary meetings will normally correspond to the topic then under discussion in accordance with the agreed programme of work. However, it is the right of any Member State of the Committee to raise any subject relevant to the work of the Committee at a plenary meeting and to have full opportunity of presenting its views on any subject which it may consider to merit attention.

30. While the work of the Committee is in progress Member States may request the inclusion of an urgent item in the agenda. The Committee shall decide whether and when it should be considered.

IX. Participation by States not members of the Committee

31. Representatives of non-member States shall have reserved seats in the conference room during plenary meetings and, if the Committee so decides, at other meetings.

32. Interested States not members of the Committee may submit to the Committee written proposals or working documents on measures of disarmament that are the subject of negotiation in the Committee and may participate in the discussion of the subject matter of such proposals or working documents.

33. The Committee will invite States not members of the Committee, upon their request, to express views in the Committee when the particular concerns of those States are under discussion. Having considered such a request, the Committee will, through its Chairman, transmit an invitation to that effect to the State or States concerned.

34. The Committee may also decide to invite the States referred to in rules 32 and 33 to participate in informal meetings and in meetings of its subsidiary bodies, in which case the procedure of rule 33 is applicable.

35. The provisions of rules 4 and 5 shall also apply to delegations of non-Member States participating in the work of the Committee.

X. Languages, Records and Documents

36. Simultaneous interpretation, verbatim records of public plenary meetings and documents shall be provided in the languages used within the United nations system by Member States of the Committee participating in its work. 1/ Any representative may speak in his own language provided he makes available simultaneous interpretation into a working language.

37. Numbers shall be given in the order in which documents are received by the Secretariat. Check lists of all documents reproduced by the Secretariat shall be available from time to time.

38. Documents of the Eighteen Nations Disarmament Committee (ENDC) and Conference of the Committee on Disarmament (CCD) series may be referred to without their re-submission.

39. Verbatim records and formal and other relevant documents of the Committee shall be distributed to States Members of the United Nations normally within two weeks. Official documents of the Committee will be made available for public use.

XI. Invitations to organs of the United Nations System

40. The Committee may decide to invite specialized agencies, the IAEA and other organs of the United Nations system to provide information as appropriate if the Committee decides that doing so would advance its work.

XII. Non-Governmental Organizations

41. All communications from Non-Governmental Organizations to the Committee, to the Chairman or to the Secretariat, shall be retained by the Secretariat and be made available to delegations upon request. A list of all such communications shall be circulated to the Committee.

1/ In accordance with this provision the Committee reached an understanding to use, for the time being, Arabic, English, French, Russian and Spanish.

XIII. Reports to the United Nations General Assembly

42. The Committee shall submit, through the Chairman, reports to the United Nations General Assembly annually or more frequently as appropriate.

43. The drafts of such reports shall be prepared by the Chairman of the Committee with the assistance of the Secretary and shall be made available to all Member States of the Committee for consideration at least two weeks before the scheduled date for their adoption.

44. The reports of the Committee should be factual and reflect the negotiations and work of the Committee. Unless otherwise decided, the drafts shall contain

(a) The agenda;

(b) A summary of specific requests addressed to the Committee by the United Nations General Assembly at its preceding regular session;

(c) Sectional headings in accordance with items comprised in (a) and (b) above and other matters raised in the Committee during the year;

(d) Conclusions and decisions;

(e) A table of contents and an index of verbatim records, by country and subject, of the period covered by the reports;

(f) Working papers and proposals submitted during the year;

(g) Verbatim records of the meetings held during the year, distributed as a separate annex;

(h) Other relevant documents.

45. The Committee shall adopt the annual report at the end of its session. This report shall be made available to all Member States of the United Nations before the opening of the regular sessions of the United Nations General Assembly. All other reports shall be circulated without delay.

XIV. Amendments

46. These rules of procedure may be amended by decision of the Committee.

CD/L.2/Rev.1
10 April 1979
Original: ENGLISH

Revised Working Paper on the Provisional Agenda and the Programme of Work

The Committee on Disarmament, as the multilateral negotiating forum, shall promote the attainment of general and complete disarmament under effective international control.

The Committee, taking into account inter alia the relevant provisions of the Final Document of the first special session of the General Assembly devoted to disarmament, will deal with the cessation of the arms race and disarmament and other relevant measures in the following areas:

I. Nuclear weapons in all aspects;

II. Chemical weapons;

III. Other weapons of mass destruction;

IV. Conventional weapons;

V. Reduction of military budgets;

VI. Reduction of armed forces;

VII. Disarmament and Development;

VIII. Disarmament and international security;

IX. Collateral measures; confidence building measures; effective verification methods in relation to appropriate disarmament measures, acceptable to all parties concerned;

X. Comprehensive Programme of Disarmament leading to general and complete disarmament under effective international control.

Within the above framework, the Committee on Disarmament adopts the following agenda for 1979 which includes items that, in conformity with the provisions of Section VIII of its Rules of Procedure, would be considered by the Committee:

1. Nuclear Test Ban.
2. Cessation of the nuclear arms race and nuclear disarmament.
3. Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.
4. Chemical weapons.

5. New types of weapons of mass destruction and new systems of such weapons; radiological weapons.

6. Consideration and adoption of the annual report and any other report as appropriate to the General Assembly of the United Nations.

In compliance with rule 28 of its Rules of Procedure, the Committee also adopts the following Programme of Work for the first part of its 1979 session:

PROGRAMME OF WORK

.....

In adopting its agenda and programme of work, the Committee has kept in mind the provisions of rules 30 and 31 of its Rules of Procedure.

CD/L./Rev.1
2 August 1979

Original ENGLISH

AD HOC WORKING GROUP TO CONSIDER, AND NEGOTIATE IF, EFFECTIVE INTERNATIONAL ARRANGEMENTS TO ASSURE NON-NUCLEAR-WEAPON STATES AGAINST THE USE OR THREAT OF USE OF NUCLEAR WEAPONS

Revised Draft Report to the Committee on Disarmament

1. In the course of consideration of item 3 of its 1979 agenda, entitled "Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons", the Committee, at its 59th meeting held on 5 July adopted the following decision:

> "The Committee on Disarmament decides to establish, for the duration of its present session, an Ad Hoc Working Group open to all Member States of the Committee to consider, and negotiate on, effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons. The Ad Hoc Working Group will present a report to the Committee on Disarmament before the conclusion of the 1979 Session. The Committee further decides, in accordance with rule 32 of the Rules of Procedure, that representatives of non-member States shall have reserved seats in the conference room during the meetings of the Ad Hoc Working Group.

2. At the 61st meeting on 12 July the Committee elected the delegation of Egypt as Chairman of the Ad Hoc Working Group.

3. The Group held 7 meetings between 17 July and 2 August and conducted also informal consultations during that period.

4. In carrying out its mandate, the Ad Hoc Working Group took into account paragraph 59 of the Final Document of the Tenth Special Session of the General Assembly Devoted to Disarmament, where the nuclear-weapon States are called upon to take steps to assure the non-nuclear-weapon States against the use or threat of use of nuclear weapons. The General Assembly notes the declarations made by the nuclear-weapon States and urges them to pursue efforts to conclude, as appropriate, effective arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons. .

5. The Ad Hoc Working Group also took note of the Letter of the Secretary-General contained in document CD/1 transmitting resolutions adopted by the General Assembly at the thirty-third regular session and took note in particular of resolution 33/72 A and B.

GE.79-63427

Operative paragraphs 1 and 2 of resolution 33/72 A read as follows:

"1. Considers it necessary to take effective measures for the strengthening of the security of non-nuclear-weapon States through appropriate international arrangements;

2. Requests the Committee on Disarmament to consider, to that end, at the earliest possible date, the drafts of an international convention on the subject, submitted to the General Assembly at its thirty-third session, as well as all proposals and suggestions concerning effective political and legal measures at the international level to assure the non-nuclear-weapon States against the use or threat of use of nuclear weapons."

Operative paragraphs 1 and 2 of resolution 33/72 B read as follows:

"1. Urges that urgent efforts should be made to conclude effective arrangements, as appropriate, to assure the non-nuclear-weapon States against the use or threat of use of nuclear weapons, including consideration of an international convention and of alternative ways and means of achieving this objective;

2. Takes note of the proposals submitted and views expressed on this subject at its thirty-third session and recommends that the Committee on Disarmament should consider them and submit a progress report to the General Assembly at its thirty-fourth session."

6. In the conduct of its work it had before it the following four working papers which were introduced by their sponsors:

(a) a working paper by Pakistan, entitled "Conclusion of an international convention to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons" (CD/10)

(b) a working paper by Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Mongolia, Poland and the Union of Soviet Socialist Republics, entitled "Draft International Convention on the Strengthening of Guarantees of the Security of Non-Nuclear States" (CD/23),

(c) a working paper by Pakistan, entitled "Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons." (CD/25), and

(d) a working paper by the United States, entitled "Proposal for a CD Recommendation to the United Nations General Assembly Concerning the Security of Non-Nuclear-Weapon States Against Nuclear Attack" (CD/27).

7. Furthermore, the Secretariat, at the request of the Ad Hoc Working Group, prepared a compilation of material suggested by members of the Group. The Compilation was prepared on the understanding that it would be background material and that the material included therein would not prejudice the position of members of the Group on matters of substance.

8. From the outset there was an understanding that the work of the Group should be a step-by-step process, the first step being to identify the elements to be considered and negotiated on, the second the negotiation on these elements, and the third to reach agreement through consensus on effective international arrangements.

9. Extensive discussion took place on the elements to be considered and negotiated on. In this connection discussions were held on the relationship of the non-use of nuclear weapons, nuclear disarmament, the non-use of force in international relations, as well as the overall question of strengthening of international peace and security, to the mandate of the group. There was broad agreement that these elements can be divided into two general categories:

A. Scope and nature of the arrangements, and

B. Forms of the arrangements, their number and binding character.

10. There was agreement that the arrangements had to be effective and international in character. The question of rationale, scope and nature of the arrangements was discussed at length. There was also discussion on the question of definition of nuclear and non-nuclear-weapon States, the criteria to be applied in such definition and the pre-requisites for the extension of the arrangements. In that respect a number of ideas were submitted such as the extension of arrangements to all non-nuclear-weapon States without any condition or limitations; to all non-nuclear-weapon States which are not parties to the nuclear security arrangements of some nuclear powers; to non-nuclear weapon States parties to the NPT or any other comparable internationally binding commitment not to acquire nuclear explosive devices, such as the Treaty of Tlatelolco, except in the case of an attack by such a State allied to a nuclear-weapons State or associated with the a nuclear-weapons State in carrying out or sustaining the attack; to non-nuclear-weapon States which renounced the production and acquisition of nuclear weapons and which have no nuclear weapons on their territories or under their jurisdiction or control. Different related questions were raised and comments were made on these issues.

Discussion also took place on the question of the arrangements in relation to the non-nuclear-weapon States parties to military alliances.

Similarly the question of the nature of the arrangements in relation to nuclear disarmament, the non-use of nuclear weapons as well as the non-use of force in international relations was raised. In that context the idea was discussed that, pending nuclear disarmament, a ban on the use or the threat of use of nuclear weapons and the non-use of force in international relations would be the most effective guarantee for the security of non-nuclear-weapon States.

11. As regards the form, number and binding character of the arrangements, there was recognition that search should continue for a common approach acceptable to all which could be included in an international instrument of a legally binding character. In that connexion the question of an international convention was widely discussed. There was no objection, in principle, to the idea of an international convention; however, the difficulties involved were also pointed out. There was also discussion on the question of a General Assembly resolution as well as reference to Security Council resolution and declarations to be deposited with the Secretary General of the United Nations as an interim arrangement.

CONCLUSION

12. There was wide recognition of the urgent need to reach agreement on effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons. The Group was able, in the short time available to it, to begin meaningful consideration of, and negotiate on, some of the elements which fell within its mandate. Preliminary exploration of areas of agreement and disagreement clarified issues and at the same time underlined the complexity of the elements which have to be further considered and negotiated on.

13. The Ad Hoc Working Group recommends that at the beginning of its 1980 session the Committee on Disarmament should continue negotiations on effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.

CD/L.4
14 August 1979
Original: ENGLISH

DRAFT REPORT OF THE COMMITTEE ON DISARMAMENT

I. INTRODUCTION

1. Paragraph 120 of the Final Document[1/] of the first special session of the General Assembly devoted to disarmament stated the following:

"The General Assembly is conscious of the work that has been done by the international negotiating body that has been meeting since 14 March 1962 as well as the considerable and urgent work that remains to be accomplished in the field of disarmament. The Assembly is deeply aware of the continuing requirement for a single multilateral disarmament negotiating forum of limited size taking decisions on the basis of consensus. It attaches great importance to the participation of all the nuclear-weapon States in an appropriately constituted negotiating body, the Committee on Disarmament. The Assembly welcomes the agreement reached following appropriate consultations among the Member States during the special session of the General Assembly devoted to disarmament that the Committee on Disarmament will be open to the nuclear-weapon States, and thirty-two to thirty-five other States to be chosen in consultation with the President of the thirty-second session of the Assembly; that the membership of the Committee on Disarmament will be reviewed at regular intervals; that the Committee on Disarmament will be convened in Geneva not later than January 1979 by the country whose name appears first in the alphabetical list of membership; and that the Committee on Disarmament will:

(a) Conduct its work by consensus;

(b) Adopt its own rules of procedure;

(c) Request the Secretary-General of the United Nations, following consultations with the Committee on Disarmament, to appoint the Secretary of the Committee, who shall also act as his personal representative, to assist the Committee and its Chairman in organizing the business and time-tables of the Committee;

1/ Official Records of the General Assembly: Tenth Special Session, Supplement No. 4 (A/S-10/4).

(d) Rotate the chairmanship of the Committee among all its members on a monthly basis;

(e) Adopt its own agenda taking into account the recommendations made to it by the General Assembly and the proposals presented by the members of the Committee;

(f) Submit a report to the General Assembly annually, or more frequently as appropriate, and provide its formal and other relevant documents to the States Members of the United Nations on a regular basis;

(g) Make arrangements for interested States, not members of the Committee, to submit to the Committee written proposals or working documents on measures of disarmament that are the subject of negotiation in the Committee and to participate in the discussion of the subject-matter of such proposals or working documents;

(h) Invite States not members of the Committee, upon their request, to express views in the Committee when the particular concerns of those States are under discussion;

(i) Open its plenary meetings to the public unless otherwise decided."

2. The Committee on Disarmament is open to the nuclear-weapon States and to the following thirty-five States, whose names were announced, after exhaustive consultations with Member States, by the President of the 32nd session of the General Assembly:[2/] Algeria, Argentina, Australia, Belgium, Brazil, Bulgaria, Burma, Canada, Cuba, Czechoslovakia, Egypt, Ethiopia, German Democratic Republic, Germany, Federal Republic of, Hungary, India, Indonesia, Iran, Italy, Japan, Kenya, Mexico, Mongolia, Morocco, Netherlands, Nigeria, Pakistan, Peru, Poland, Romania, Sri Lanka, Sweden, Venezuela, Yugoslavia and Zaire.

3. The Committee on Disarmament submits to the United Nations General Assembly its annual report on its 1979 session, together with the pertinent documents and records. This report also includes an account of the organization of the Committee (part II) and of the Committee's work based on the agenda adopted for 1979 (part III).

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2/ A/S-10/24

4. The Committee on Disarmament was convened by the Government of Algeria, and Mr. Abdelaziz Bouteflika, the Algerian Minister for Foreign Affairs, presided over the opening plenary meeting of the session, which took place on 24 January 1979. After hearing the Chairman's address, the Committee took note of the message from the Secretary-General of the United Nations, which was read out by the Director-General of the United Nations Office at Geneva.

5. During the first days of the session, statements of a general character were made by the representatives of the following member States, listed in the order of speaking: Mexico, France, Sri Lanka, Australia, Sweden, Soviet Union, United Kingdom, Yugoslavia, Italy, Pakistan, Venezuela, Belgium, Cuba, Canada, United States of America, Japan, Romania, Nigeria, Poland, Egypt, Ethiopia, Argentina, Federal Republic of Germany, German Democratic Republic, the Netherlands, Zaire, Kenya, Iran, Indonesia, Morocco and Czechoslovakia. Of these representatives, the following held the rank of Minister or Deputy Minister for Foreign Affairs: Mr. Andrew Peacock, Minister of Foreign Affairs of Australia, Mr. Henri Simonet, Minister for Foreign Affairs of Belgium, Mr. G.A.H. Pearson, Adviser on Disarmament and Arms Control of Canada, Dr. Pelegrín Torras, Deputy Minister for Foreign Affairs of Cuba, Mr. Jean François-Poncet, Minister of Foreign Affairs of France, Mr. Gunther van Well, State Secretary of the Federal Foreign Office of the Federal Republic of Germany, Mr. Luciano Radi, Under-Secretary for Foreign Affairs of Italy, Mr. Kasim Mwamzandi, Assistant Minister for Foreign Affairs of Kenya, Mr. Ilie Radulescu, Minister and Secretary of State at the Ministry of Foreign Affairs of Romania, Mr. A.C.S. Hameed, Minister of Foreign Affairs of Sri Lanka, Mr. Hans Blix, Minister for Foreign Affairs of Sweden, Lord Goronwy-Roberts, Minister of State at the Foreign and Commonwealth Office of the United Kingdom of Great Britain and Northern Ireland and Mr. Milorad Pesić, Deputy Federal Secretary for Foreign Affairs of Yugoslavia.

6. At the beginning of the session, the Committee on Disarmament received a message from Mr. L.I. Brezhnev, General Secretary of the Central Committee of the Communist Party of the Soviet Union and President of the Presidium of the Supreme Soviet of the USSR (CD/3). The Committee also received messages from the Holy See, transmitted by its Secretary of State, as well as from Mr. Santiago Roel, Secretary for Foreign Affairs of Mexico and Mr. George M. Seignious II, Director of the Arms Control and Disarmament Agency of the United States of America.

7. Later during the session, statements were also made in the Committee by the Deputy Minister for Foreign Affairs of Czechoslovakia, Mr. Milos Vejvoda; the Minister of State of External Affairs of India, Mr. Samarendra Kundu; the Minister of State for Foreign and Commonwealth Affairs of the United Kingdom of Great Britain and Northern Ireland, Mr. Douglas Hurd; and the Director of the Arms Control and Disarmament Agency of the United States of America, Mr. George M. Seignious II.

II. ORGANIZATION OF THE COMMITTEE

A. 1979 Session of the Committee

8. The Committee was in session from 24 January to 27 April and from 14 June to ... 1979. During this period, the Committee held ... formal plenary meetings at which members set forth their Governments' views and recommendations on the questions before the Committee.

9. The Committee also held ... informal meetings on various subjects, including its schedule of work, organization and procedures, as well as all items of the agenda considered by the Committee.

B. Participants in the Work of the Committee

10. Representatives of the following member States participated in the work of the Committee: Algeria, Argentina, Australia, Belgium, Brazil, Bulgaria, Burma, Canada, Cuba, Czechoslovakia, Egypt, Ethiopia, France, German Democratic Republic, Germany, Federal Republic of, Hungary, India, Indonesia, Iran, Italy, Japan, Kenya, Mexico, Mongolia, Morocco, Netherlands, Nigeria, Pakistan, Peru, Poland, Romania, Sri Lanka, Sweden, Union of Soviet Socialist Republics, United Kingdom of Great Britain and Northern Ireland, United States of America, Venezuela, Yugoslavia, Zaire.

C. Organizational Questions and Adoption of the Rules of Procedure

11. The Committee decided that its chairmanship should be rotated among all its members on a monthly basis, i.e. by the calendar month. The following member States assumed the Chairmanship of the Committee: Algeria for January, Argentina for February, Australia for March, Belgium for April and the recess between the first and second part of the 1979 session of the Committee, Brazil for the remainder of June, Bulgaria for July, and Burma for August and the recess until the 1980 session of the Committee.

12. The Secretary-General of the United Nations, after appropriate consultations, appointed, on 14 June 1979, Ambassador Rikhi Jaipal, former Permanent Representative of India to the United Nations, as Secretary of the Committee who shall act also as his personal representative.

13. The Committee also decided to admit representatives of non-member countries to plenary meetings in the Council Chamber where they might occupy the seats marked "government representatives" which would be reserved for them.

14. The Committee further decided to establish an ad hoc working group, open to the participation of any member State, to prepare draft rules of procedure for the Committee. The Committee also decided for that purpose that the ad hoc working group should take into account the various drafts circulated informally, as well as the views of delegations.

15. The ad hoc working group, under the Chairmanship of the representative of Argentina, who was also the Chairman of the Committee, held 17 meetings. At the 15th plenary meeting of the Committee the Chairman submitted the draft rules of procedure. The draft rules of procedure, as recommended by the ad hoc working group, were adopted by the Committee. In reference to these rules and before their adoption, the Chairman, as a result of consultations with the Committee, made an interpretative statement (Annex I). Interpretative statements were also made by a number of delegations in connexion with the text adopted.

16. At its 26th plenary meeting the Committee also adopted annex I to its Rules of Procedure. The text of the Rules of Procedure and its annex I (document CD/8) appears in annex I to this report.

17. At the 11th meeting after informal consultations, the Chairman stated that the arrangements made by the Conference of the Committee on Disarmament, in connexion with the Ad Hoc Group of Scientific Experts to Consider International Co-operative measures to Detect and Identify Seismic Events, should be maintained. The Chairman also found general agreement that the Group, which is open to all members of the Committee on Disarmament, should remain open to States not members of the Committee. The Committee took note of the arrangements made by the Conference of the Committee on Disarmament and of the general agreement that wider participation in the Ad Hoc Group would be desirable.

D. Agenda for the 1979 Session and Programme of Work for the First and Second Parts of the Session

18. At its 18th plenary meeting the Committee decided to establish an ad hoc working group, open to the participation of all member States of the Committee, to consider questions relating to the preparation of the agenda and programme of work of the Committee, in order to enable the Chairman to draw up the provisional agenda and programme of work in conformity with rule 29 of the Rules of Procedure.

19. The ad hoc working group, under the Chairmanship of the representative of Australia, who was also the Chairman of the Committee, held 11 meetings.

20. During the 26th plenary meeting, some delegations made statements in connexion with the provisional agenda. At the 27th plenary meeting the Chairman introduced a proposal of the ad hoc working group indicating specific dates and items in the programme of work. The Committee then adopted the Agenda and Programme of Work which are reproduced below (CD/12):

"Agenda and Programme of Work of the Committee on Disarmament

(adopted at the 26th and 27th plenary meetings held on 10 and 11 April 1979)

The Committee on Disarmament, as the multilateral negotiating forum, shall promote the attainment of general and complete disarmament under effective international control.

The Committee, taking into account inter alia the relevant provisions of the Final Document of the first special session of the General Assembly devoted to disarmament, will deal with the cessation of the arms race and disarmament and other relevant measures in the following areas:

I. Nuclear weapons in all aspects;

II. Chemical weapons;

III. Other weapons of mass destruction;

IV. Conventional weapons;

V. Reduction of military budgets;

VI. Reduction of armed forces;

VII. Disarmament and Development;

VIII. Disarmament and international security;

IX. Collateral measures; confidence-building measures; effective verification methods in relation to appropriate disarmament measures, acceptable to all parties concerned;

X. Comprehensive Programme of Disarmament leading to general and complete disarmament under effective international control.

Within the above framework, the Committee on Disarmament adopts the following agenda for 1979 which includes items that, in conformity with the provisions of Section VIII of its Rules of Procedure, would be considered by the Committee:

1. Nuclear Test Ban.

2. Cessation of the nuclear arms race and nuclear disarmament.

3. Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.

4. Chemical weapons.

5. New types of weapons of mass destruction and new systems of such weapons; radiological weapons.

6. Consideration and adoption of the annual report and any other report as appropriate to the General Assembly of the United Nations.

In compliance with rule 28 of its Rules of Procedure, the Committee also adopts the following Programme of Work for the first part of its 1979 session:

PROGRAMME OF WORK

19 - 23 April: Cessation of the nuclear arms race and nuclear disarmament.

24 - 27 April: Chemical weapons.

In adopting its agenda and programme of work, the Committee has kept in mind the provisions of rules 30 and 31 of its Rules of Procedure."

21. At the 26th plenary meeting of the Committee the Chairman introduced document CD/L.2/Rev.1 on the provisional agenda and programme of work and announced the following understanding:

"In submitting the provisional agenda of the Committee on Disarmament, it is the understanding of all members of the Committee that heading IX, dealing inter alia with 'collateral measures', includes the following questions, to be considered by the Committee at the appropriate stages of its work:

1. Further prohibition of military or any other hostile use of environmental modification techniques;

2. Further measures in the field of disarmament to prevent an arms race on the sea-bed and the ocean floor and in the subsoil thereof;

3. Further measures to prevent an arms race in outer space."

22. During the second part of the 1979 session of the Committee, the question of the programme of work was considered, in accordance with rule 28 of the Rules of Procedure. The Chairman submitted at the 33rd plenary meeting a proposal on the programme of work for the second part of the session, which was adopted by the Committee. It read as follows:

"21-22 June:	Nuclear test ban.
25-29 June:	Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.
2-6 July:	Cessation of the nuclear arms race and nuclear disarmament.
10-13 July:	New types of weapons of mass destruction and new systems of such weapons; radiological weapons.
16-27 July:	Chemical weapons.
30 July - 3 August:	Nuclear test ban.
...	Consideration and adoption of the annual report to the General Assembly of the United Nations. */

In adopting its Programme of Work, the Committee has kept in mind the provisions of rules 30 and 31 of its Rules of Procedure.

*/ In accordance with rule 44 of the Rules of Procedure, the draft reports to the United Nations General Assembly shall be made available to all Member States of the Committee for consideration at least two weeks before the scheduled date for their adoption."

23. The Committee devoted the period 6-14 August 1979 to the consideration and adoption of its annual report to the General Assembly of the United Nations.

E. Participation by States not members of the Committee

24. The following States not members of the Committee communicated their intention to attend the plenary meetings of the Committee: Austria, Burundi, Chile, Denmark, Finland, Gabon, Greece, Guatemala, Honduras, Iraq, Ireland, Israel, Ivory Coast, Jordan, Kuwait, Malta, New Zealand, Norway, Portugal, Qatar, Senegal, Spain, Sudan, Switzerland, Turkey and Viet Nam.

25. The Committee on Disarmament received requests to participate in its work (CD/14, 16, 26, 30, 34 and 38) from the following States not members of the Committee: Finland, Switzerland, Viet Nam, Spain and Denmark.

26. In accordance with its rules of procedure, and having received requests from Finland, Switzerland, Socialist Republic of Viet Nam, Spain and Denmark the Committee invited:

(a) the representative of Finland to participate in the work of the Committee during its 1979 session on chemical weapons, at both formal and informal meetings, in accordance with rules 33 and 35;

(b) the representative of Switzerland to make a statement in the Committee on the question of chemical weapons, in accordance with rule 34;

(c) the representative of the Socialist Republic of Viet Nam to participate in the work of the Committee during its 1979 session in the consideration of the question of effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons, both at its formal and at its informal meetings, in accordance with rules 33 to 35;

(d) an expert from Spain to participate in the Ad Hoc Group of Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events, pursuant to the decision adopted by the Committee on 15 February 1979;

(e) the representative of Spain to make a statement in the Committee when it took up the question of chemical weapons, in accordance with rule 34; and

(f) the representative of Denmark to participate in the work of the Committee during its 1979 session on chemical weapons, both at its formal and at its informal meetings, as well as in any subsidiary body that the Committee might establish on that question, in accordance with rules 33 to 35.

27. At its 43rd plenary meeting the Committee also decided, in accordance with rule 32 of the Rules of Procedure, that representatives of non-member States shall have reserved seats during informal meetings on chemical weapons.

F. Communications from Non-Governmental Organizations

28. In accordance with Article 42 of the Rules of Procedure, a list of all communications from non-governmental organizations was circulated to the Committee (CD/NGC.1).

III. WORK OF THE COMMITTEE DURING ITS 1979 SESSION

29. The work of the Committee during its 1979 session was based on its agenda and programme of work adopted for the year. The rules of procedure are in annex I and the list of documents issued by the Committee, as well as the texts of those documents, are included as annex II to the report. An index of the verbatim records by country and subject, listing the statements made by delegations during 1979, and the verbatim records of the meetings of the Committee are attached as annex III to the report.

30. The Committee also had before it a letter dated 17 January 1979 from the Secretary-General of the United Nations (CD/1), transmitting all the resolutions on disarmament adopted by the General Assembly at its thirty-third session in 1978, in particular those entrusting specific responsibilities to the Committee on

Disarmament, namely: resolution 33/59A, "Chemical and bacteriological (biological) weapons"; 33/60, "Implementation of General Assembly resolution 32/78"; 33/66A and B, "Prohibition of the development and manufacture of new types of weapons of mass destruction and new systems of such weapons"; 33/71F, H and L, "Review of the implementation of the recommendations and decisions adopted by the General Assembly at its tenth special session"; 33/72A and B, "Conclusion of an international convention on the strengthening of guarantees of the security of non-nuclear States"; and 33/91G and H, "General and Complete disarmament".

31. In the same letter the Secretary-General drew attention, in particular, to the following provisions of those resolutions:

(a) In resolution 35/59A, operative paragraph 3 requests the Committee on Disarmament, as a matter of high priority, to undertake, at the beginning of its 1979 session, negotiations with a view to elaborating an agreement on effective measures for the prohibition of the development, production and stockpiling of all chemical weapons and for their destruction, taking into account all existing proposals and future initiatives; and operative paragraph 6 requests the Committee on Disarmament to report on the results of its negotiations to the General Assembly at its thirty-fourth session.

(b) In resolution 33/60, operative paragraph 6 requests the Committee on Disarmament to take up immediately the agreed text resulting from the negotiations referred to in paragraph 5 of the same resolution with a view to the submission as soon as possible of a draft test-ban treaty, which will attract the widest possible adherence, to a resumed thirty-third session of the General Assembly.

(c) In resolution 33/66A, operative paragraph 2 requests the Committee on Disarmament, while taking account of its existing priorities, to pursue its examination of the subject, with any appropriate expert assistance, with a view to reaching agreement on the prevention of the emergence of new weapons of mass destruction based on new scientific principles and achievements and the speedy preparation of specific agreements on individual types of weapons which may be identified; and operative paragraph 4 requests the Committee on Disarmament to report on its examination of the subject to the General Assembly at its thirty-fourth session.

(d) In resolution 33/66B, operative paragraph 1 requests the Committee on Disarmament, in the light of its existing priorities, actively to continue negotiations with the assistance of qualified governmental experts, with a view to reaching an agreement on the prohibition of the development and manufacture of new types of weapons of mass destruction and new systems of such weapons, and expedite the preparation of specific agreements on particular types of such weapons and operative paragraph 2 requests the Committee on Disarmament to submit a report on the results achieved to the General Assembly for consideration at its thirty-fourth session.

(e) In resolution 33/71F, operative paragraph 1 takes note with satisfaction of the measures adopted, or about to be adopted, to revitalize the multilateral disarmament machinery available to the United Nations among which, in particular, the fact that the Disarmament Commission has just held its first session on organizational matters and that the Committee on Disarmament is already properly constituted in conformity with the relevant provisions of the Final Document embodied in its General Assembly resolution S-10/2; and operative paragraph 2 expresses the hope that all nuclear-weapon States will participate in the Committee on Disarmament, and is confident that the Committee will include in its rules of procedure provisions to ensure that it may function effectively as a multilateral negotiating disarmament body.

(f) In resolution 33/71H, operative paragraph 1 of its section IV invites the Committee on Disarmament to take into account, when determining its priorities and programme of work, the priorities established in paragraph 45 of the Final Document of the Tenth Special Session of the General Assembly and the resolution adopted at the thirty-third session of the General Assembly; operative paragraph 2 requests the Committee on Disarmament to undertake, at its first session in January 1979, on a priority basis, negotiations on: (a) a treaty on the complete prohibition of nuclear weapon tests: (b) a treaty or convention on the complete and effective prohibition of the development, production and stockpiling of all types of chemical weapons and on their destruction; and operative paragraph 3 requests the Committee on Disarmament to submit reports to the General Assembly annually or more frequently, as appropriate, and provide its formal and other relevant documents to Member States on a regular basis.

(g) In resolution 33/71L, operative paragraph 2 requests the Committee on Disarmament to report to the General Assembly at its thirty-fifth session on the state of the consideration of all the proposals and suggestions listed in paragraph 125 of the Final Document of the tenth special session (A/RES/S-10/2).

(h) In resolution 33/72A, operative paragraph 2 requests the Committee on Disarmament, with a view to taking effective measures for the strengthening of the security of non-nuclear-weapon States through appropriate international arrangements, to consider, at the earliest possible date, the drafts of an international convention on the subject submitted to the General Assembly at its thirty-third session, as well as all proposals and suggestions on effective political and legal measures at the international level to assure the non-nuclear-weapon States against the use or threat of use of nuclear weapons.

(i) In resolution 33/72B, operative paragraph 2 takes note of the proposals submitted and views expressed on the subject at the thirty-third session of the General Assembly and recommends that the Committee on Disarmament should consider them and submit a progress report to the General Assembly at its thirty-fourth session.

(j) In resolution 33/91G, operative paragraph 2 requests the Committee on Disarmament to consider modalities of the review of the membership of the Committee and to report on this subject to the General Assembly at its thirty-fifth session; and operative paragraph 3 requests the Committee on Disarmament to make arrangements for interested States, not members of the Committee, to submit to the Committee written proposals or working documents on measures of disarmament that are the subject of negotiation in the Committee and to participate in the discussion of the subject-matter of such proposals or working documents; and operative paragraph 4 reaffirms that States not members of the Committee, upon their request, should be invited by it to express views in the Committee when the particular concerns of those States are under discussion.

(k) Resolution 33/91H requests the Committee on Disarmament, at an appropriate stage of its pursuit of proposals contained in the Programme of Action adopted by the tenth special session (A/RES/S-10/2), to consider urgently the question of an adequately verified cessation and prohibition of production of fissionable materials for weapons purposes and other nuclear explosive devices and to keep the General Assembly informed of the progress of that consideration.

32. The Committee received a letter dated 16 January 1979 from the Secretary-General of the United Nations (CD/2) transmitting the proposals and suggestions listed in paragraph 125 of the Final Document of the Tenth Special Session in accordance with General Assembly resolution 33/71L of 14 December 1978.

33. The Committee also received a letter dated 28 March 1979 from the Under-Secretary-General of the United Nations for Political and Security Council Affairs CD/17, transmitting, on behalf of the Secretary-General, the report of the United Nations Seminar on Nuclear Collaboration with South Africa.

34. The Committee has received the following documents:

(a) Document CD/20 submitted by the delegation of Hungary, dated 20 June 1979, transmitting the text of a communiqué adopted at the meeting of the Committee of the Ministers for Foreign Affairs of the Warsaw Treaty Member States held in Budapest on 14 and 15 May 1979 concerning the items under the headings "A. Nuclear Test Ban", "B. Cessation of the Nuclear Arms Race and Nuclear Disarmament" and "C. Effective international arrangements to assure non-nuclear weapon States against the use or threat of use of nuclear weapons", as well as section F. of the report entitled "Consideration of Other Areas Dealing with the Cessation of the Arms Race and Disarmament and Other Relevant Measures".

(b) Document CD/22, dated 20 June 1979, submitted by the delegation of Mongolia, transmitting the declaration by the Government of the Mongolian Peoples Republic, published in Ulan-Bator on the occasion of the signature of the Soviet-United States Strategic Arms Limitation Treaty (SALT II).

(c) Document CD/28, dated 27 June 1979, submitted by the delegations of the USSR and United States of America transmitting the Treaty and the Protocol to the Treaty on the Limitation of the Strategic Offensive Arms between the United States of America and the Union of Soviet Socialist Republics, the Joint Statement of Principles and Basic Guidelines for subsequent negotiations on the Limitation of Strategic Arms and the Joint USSR-United States of America Communiqué, concerning the items under the headings "A. Nuclear Test Ban", "B. Cessation of the Nuclear Arms Race and Nuclear Disarmament", "D. Chemical weapons" and "E. New Types of Weapons of Mass Destruction and New Systems of Such Weapons; Radiological Weapons", as well as section F. of the report entitled "Consideration of Other Areas Dealing with the Cessation of the Arms Race and Disarmament and Other Relevant Measures."

(d) Document CD/29, dated 2 July 1979, submitted by the delegation of the United States of America, transmitting additional documents relating to the treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Strategic Offensive Arms.

(e) Document CD/33, dated 10 July 1979, submitted by the delegation of Italy, transmitting the text of a letter from the President of the Council of Ministers of the Italian Republic to the President of the United States of America and the Chairman of the Presidium of the Supreme Soviet of the Union of Soviet Socialist Republics on the occasion of the signature of the SALT II agreements.

A. Nuclear Test Ban

35. The item of the agenda entitled "Nuclear Test Ban" was considered by the Committee, in accordance with its programme of work, from 21 to 22 June and from 30 July to 3 August.

36. The Committee had before it a progress report on the Seventh Session of the Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events (CD/18) which met from 5-9 March. It also had before it the Second Report of the Ad Hoc Group on its meeting from 16-27 July (document CD/43 and Addendum 1).

37. In addition to the reports submitted by the Ad Hoc Group, the following documents were before the Committee in connexion with the item:

(a) Document CD/7 dated 1 March 1979, submitted by the Netherlands, on the use of short-period initial motion data for discrimination purposes.

(b) Document CD/45, dated 30 July 1979, submitted by the delegation of Sweden, containing a working paper on International Seismological Datacenter Demonstration Facilities in Sweden.

(c) Document CD/46, dated 31 July 1979, also submitted by the delegation of Sweden, on a draft decision for a continued mandate to the Ad Hoc Group of Seismic Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events.

38. At its 48th meeting held on 7 August 1979, the Committee approved the report of the Ad Hoc Group and decided to continue the mandate of the Ad Hoc Group, as well as to invite the World Meteorological Organization to continue to participate in the work of the Group.

39. At the 46th plenary meeting of the Committee on 31 July 1979, the representative of the United Kingdom made a statement, also on behalf of the Union of Soviet Socialist Republics and the United States of America, concerning the tripartite negotiations on a treaty prohibiting nuclear weapon tests in all environments and its protocol covering nuclear explosions for peaceful purposes.

40. Within the framework of the discussion of this agenda item the Committee examined the work of the Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events and approved the second report of the Ad Hoc Group. The Committee expressed its appreciation to the Ad Hoc Group for its valuable and important work, believing that the recommendations of the group should be taken into account when the exchange of seismic data is implemented in practice. The Committee decided to extend the mandate of the Ad Hoc Group.

The highest priority of the question of a nuclear test ban and the importance of the Committee's role in elaborating a treaty were generally stressed. To that end, the Committee will continue its work at its 1980 session.

The Committee urged the participants in the tripartite negotiations to make every effort to bring the negotiations to an early and successful conclusion and to transmit the results to the Committee on Disarmament for its consideration.

B. Cessation of the Nuclear Arms Race and Nuclear Disarmament

41. The item of the agenda entitled "Cessation of the Nuclear Arms Race and Nuclear Disarmament" was considered by the Committee, in accordance with its programme of work from 19-23 April and from 2-6 July. In addition to its plenary meetings, the Committee held .... informal meetings on the subject during and after the period allocated for the consideration of the item.

42. In connexion with the item, the following documents were before the Committee:

(a) Document CD/4, dated 1 February 1979, submitted by the delegations of Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Mongolia, Poland, and the Union of Soviet Socialist Republics, concerning negotiations on ending the production of all types of nuclear weapons and gradually reducing their stockpiles until they have been completely destroyed. Romania joined the co-sponsors of this document.

(b) Document CD/36/Rev.1, dated 12 July 1979, submitted by the Group of 21,*/ containing a working paper on Cessation of Nuclear Arms Race and Nuclear Disarmament.

43. The discussions on this item helped clarify the various approaches to the question of nuclear disarmament. Two documents containing proposals and suggestions were submitted to the Committee (CD/4 and CD/36/Rev.1). These documents contributed to an exploration of the possibility of effective negotiations in that respect. The co-sponsors of the submitted documents and other members of the Committee on Disarmament exchanged views on a number of specific questions in an effort to identify the prerequisites and elements for multilateral negotiations on nuclear disarmament and to delineate the course of action for the achievement of this objective.

The documents relating to the SALT II Agreement were presented to the Committee (CD/28 and CD/29). The hope was expressed that these agreements would speedily enter into force so that the negotiating process might be resumed soon with a view to bringing about further meaningful and substantial results.

While the exchanges of views on this item were most useful, they would need to be continued and intensified during the next session of the Committee in order that an agreed basis for progress might be found. The special responsibility of nuclear weapon States was recognized as essential for attaining the goal of nuclear disarmament.

C. Effective international arrangements to assure non-nuclear weapon states against the use or threat of use of nuclear weapons

44. The item of the agenda entitled "Effective international arrangements to assure non-nuclear weapon states against the use or threat of use of nuclear weapons" was considered by the Committee, in accordance with its programme of work, from 25-29 June.

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*/ Algeria, Argentina, Brazil, Burma, Cuba, Egypt, Ethiopia, India, Indonesia, Iran, Kenya, Mexico, Morocco, Nigeria, Pakistan, Peru, Sri Lanka, Sweden, Venezuela, Yugoslavia, Zaire.

45. In connexion with the item the following documents were before the Committee:

(a) Document CD/10, dated 27 March 1979, submitted by the delegation of Pakistan, concerning the conclusion of an International Convention to assure non-nuclear weapon States against the use or threat of use of nuclear weapons.

(b) Document CD/23, dated 21 June 1979, submitted by the delegations of Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Mongolia, Poland, and the Union of Soviet Socialist Republics, containing a working paper on a draft international convention on the strengthening of guarantees of the security of non-nuclear States.

(c) Document CD/25, dated 26 June 1979, submitted by the delegation of Pakistan, containing a working paper on effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.

(d) Document CD/27, dated 2 July 1979, submitted by the delegation of the United States of America, containing a proposal for a CD recommendation to the United Nations General Assembly concerning the security of non-nuclear-weapon States against nuclear attack.

46. At its 39th plenary meeting on 5 July 1979, the Committee decided to establish, for the duration of its 1979 session, an ad hoc working group open to all Member States of the Committee to consider, and negotiate on, effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons. The Committee further decided that the ad hoc working group would present a report to the Committee before the conclusion of the 1979 session.

47. The Committee also decided, in accordance with rule 32 of the Rules of Procedure, that representatives of non-member States should have reserved seats in the conference room during the meetings of the ad hoc working group. After that decision was taken, the Chairman noted that, in adopting the decision under rule 32 of the Rules of Procedure, it was the understanding of the Committee that it would not constitute a precedent and that each case would be decided in the future on its merits.

48. At its 41st plenary meeting on 12 July 1979, the Committee also decided to nominate the representative of Egypt as Chairman of the Ad Hoc Working Group. The Ad Hoc Working Group held seven meetings between 13 July and 2 August and conducted also informal consultations during that period. As a result of its deliberations, the Ad Hoc Working Group submitted a report to the Committee (document CD/47) containing the following conclusion:

"12. There was wide recognition of the urgent need to reach agreement on effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons. The Group was able, in the short time available to it, to begin meaningful consideration of, and negotiate on, some of the elements which fell within its mandate. Preliminary exploration of areas of agreement and disagreement clarified issues and at the same time underlined the complexity of the elements which have to be further considered and negotiated on.

13. The Ad Hoc Working Group recommends that at the beginning of its 1980 session the Committee on Disarmament should continue negotiations on effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons."

49. At its 48th meeting, the Committee adopted the report of the Ad Hoc Group.

D. Chemical Weapons

50. The item of the agenda entitled "Chemical Weapons" was considered by the Committee, in accordance with its programme of work, from 24-27 April and 16-27 July 1979.

51. In connexion with the item, the following documents were before the Committee:

(a) Document CD/5, dated 6 February 1979, submitted by the delegation of Italy, containing a working paper on chemical disarmament negotiations.

(b) Document CD/6, dated 6 February 1979, submitted by the delegation of the Netherlands, concerning some procedural suggestions with respect to the development of a ban on chemical weapons.

(c) Document CD/11, dated 9 April 1979, submitted by the Group of 21, containing a working paper on negotiations on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction.

(d) Document CD/14, dated 25 April 1979, submitted by Finland, containing a working document entitled "Chemical identification of chemical weapons agents; a Finnish Project".

(e) Document CD/15, dated 24 April 1979, submitted by the delegation of the United Kingdom, on a visit to Britain by chemical weapons experts (14-16 March 1979).

(f) Document CD/21, dated 20 June 1979, submitted by the delegation of Poland, containing a working paper on the prohibition of the development, production and stockpiling of all chemical weapons and their destruction.

(g) Document CD/26, dated 1 July 1979, submitted by the Secretariat in compliance with the decision of the Committee at its 51st plenary meeting, containing a compilation of material on chemical weapons from the Conference of the Committee on Disarmament and the Committee on Disarmament Working Papers and Statements, 1972 - 1979.

(h) Document CD/37, dated 12 July 1979, submitted by the delegation of the Federal Republic of Germany, entitled "Working Paper on some Aspects of International Verification of Non-Production of Chemical Weapons: Experience gained in the Federal Republic of Germany".

(i) Document CD/39, dated 16 July 1979, submitted by Finland, concerning the identification of potential organophosphorus warfare agents — an approach for the standardization of techniques and reference data.

(j) Document CD/41, dated 25 July 1979, submitted by the delegation of the Netherlands, entitled "A working paper containing questions relevant to a Convention prohibiting chemical weapons".

(k) Document CD/44, dated 26 July 1979, submitted by the delegation of Poland, containing a working paper on an outline of a convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction.

(l) Document CD/48, dated 7 August 1979, submitted by the delegations of the Union of Soviet Socialist Republics and the United States of America, entitled "USSR-United States Joint Report on Progress in the Bilateral Negotiations on the Prohibition of Chemical Weapons".

(m) Document CD/49, dated 8 August 1979, submitted by the delegation of the Netherlands, entitled "Chemical Weapons -- Answers to Questionnaire contained in CD/41".

(n) Document CD/52, dated 13 August 1979, submitted by the delegations of France, Italy and the Netherlands, entitled "Chemical weapons -- Evaluation of the discussion in the Committee on Disarmament in 1979 with respect to a prohibition of chemical weapons".

52. The urgency and importance of negotiating an international convention prohibiting the development, production and stockpiling of chemical weapons and on their destruction was stressed by all members of the Committee. Several procedural suggestions were made to the Committee for making progress towards this objective in documents CD/5, CD/6, CD/11 and CD/21. It was, however, not possible to reach agreement on the methods and procedures for dealing with the question of chemical weapons, in particular the setting-up of an Ad Hoc Working Group for this purpose.

A useful exchange of views took place between delegations, with the participation of experts, and answers to specific questions, especially as regards the basic elements of a future convention, were provided. As a result, different aspects of the problem of the prohibition of chemical weapons have been further clarified.

The Committee noted with satisfaction the substantial joint statement that the delegations of the USSR and the United States of America made on 31 July on their bilateral negotiations with respect to an intended joint initiative on chemical weapons (document CD/48). The Committee also noted that the USSR and the United States of America would exert their best efforts to complete the negotiations and present a joint initiative to the Committee on this question as soon as possible.

The Committee, taking into account the fact that the prohibition of chemical weapons is one of the most urgent and vital problems in the area of disarmament, will proceed with negotiations at its 1980 session.

E. New Types of Weapons of Mass Destruction and New Systems of Such Weapons; Radiological Weapons

53. The item on the agenda entitled "New Types of Weapons of Mass Destruction and New Systems of Such Weapons; Radiological Weapons" was considered by the Committee, in accordance with its programme of work, from 10 to 13 July 1979.

54. In connexion with the item, the following documents were before the Committee:

(a) Documents CD/31 and CD/32, dated 9 July 1979, submitted respectively by the delegations of the Union of Soviet Socialist Republics and the United States of America, transmitting a document entitled "Agreed Joint USSR-United States Proposal on Major Elements of a Treaty Prohibiting the Development, Production, Stockpiling and Use of Radiological Weapons".

(b) Document CD/35, dated 10 July 1979, submitted by the delegation of the Union of Soviet Socialist Republics, on the negotiations on the question of the prohibition of new types of weapons of mass destruction and new systems of such weapons.

(c) Document CD/40, dated 23 July 1979, submitted by the delegation of Hungary, containing a working paper on the draft preambular part of the Treaty on the Prohibition of the Development, Manufacture, Stockpiling and Use of Radiological Weapons.

(d) Document CD/42, dated 25 July 1979, submitted by the delegation of the German Democratic Republic, containing a working paper on draft paragraph XI, subparagraph 3, and paragraph XII, subparagraph 3, of the Treaty on the Prohibition of the Development, Manufacture, Stockpiling and Use of Radiological Weapons.

55. The Committee noted with satisfaction the submission by the USSR and United States of America of an agreed joint proposal on major elements of a Treaty prohibiting the development, production, stockpiling and use of radiological weapons (CD/31 and CD/32).

The sponsors of the proposal made a detailed presentation and provided additional clarifications and explanations, with the assistance of experts.

Draft formulations for the preambular part as well as for certain operative paragraphs were submitted to the Committee by some members (CD/40 and CD/42).

Following a preliminary discussion, the Committee concluded that it would, as soon as possible, continue consideration of the agreed joint proposal at its next annual session.

The Committee also considered the general question of new types of weapons of mass destruction and new systems of such weapons. Experts from some countries provided additional information. The Committee will give further examination to this problem next year.

F. Consideration of Other Areas Dealing with the Cessation of the Arms Race and Disarmament and Other Relevant Measures

56. During its 1979 session, the Committee had before it other documents which, although not considered under the items of the agenda, dealt with the cessation of the arms race and disarmament and other relevant measures in other areas. In accordance with the understanding announced by the Chairman of the Committee at the 26th Plenary Meeting, that heading IX of document CD/12 included, inter alia, questions dealing with further measures in the field of disarmament to prevent an arms race on the sea-bed and the ocean floor and in the sub-soil thereof, as well as further measures to prevent an arms race in outer space, the following documents were before the Committee:

(a) Document CD/9, dated 26 March 1979, submitted by the delegation of Italy, on an additional protocol to the 1967 "Treaty on Principles Governing the Activities

of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestrial Bodies" with a view to preventing an arms race in outer space.

(b) Document CD/13, dated 20 April 1979, submitted by the delegation of Poland, containing a working paper on further measures in the field of disarmament for the prevention of an arms race on the sea-bed and the ocean floor.

57. During the consideration and adoption of this report to the General Assembly of the United Nations, the following documents were tabled for including in the record:

(a) Document CD/50, dated 9 August 1979, submitted by the Group of 21, entitled, "Statement by the Group of 21 on the Conclusion of the annual session of the Committee on Disarmament in 1979."

(b) Document CD/51, dated 10 August 1979, submitted by a Group of Socialist States, **/ entitled, "Results of the 1979 Session of the Committee on Disarmament."

58. The present report is transmitted by the Chairman on behalf of the Committee on Disarmament.

**/ Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Mongolia, Poland, Union of Soviet Socialist Republics.

CD/NGO.1
6 August 1979

Original: ENGLISH

List of Communications from Non-Governmental Organizations

No.	Date	Author and geographical origin
1	18 December 1978	Women for Peace, Basle (Switzerland)
2	22 January 1979	Quaker United Nations Office, Geneva (Switzerland)
3	22 January 1979	The Japan Council Against Atomic and Hydrogen Bombs, Gensuikyo, 6-19-23 Shimbashi, Minatoku, Tokyo 105 (Japan)
4	24 January 1979	World Federation of United Nations Associations, Geneva (Switzerland)
5	25 January 1979	World Federation of Democratic Youth, Budapest (Hungary)
6	27 January 1979	Association to Make a Brighter Society, Yakkoji, Tawaramoto-cho, Shiki-gun, Nara-Ken (Japan)
7	30 January 1979	World Association for the School as an Instrument of Peace, Geneva (Switzerland)
8	14 February 1979	Association to Make a Brighter Society, Yakkoji, Tawaramoto-cho, Shiki-gun, Nara-Ken (Japan)
9	21 February 1979	World Association for the School as an Instrument of Peace, Geneva (Switzerland)
10	20 July 1979	World Peace Council, Helsinki (Finland)
11	30 July 1979	The Church of Scientology in Switzerland, Geneva (Switzerland)

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