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REPORT

OF THE COMMITTEE

ON THE PEACEFUL USES OF OUTER SPACE

UNITED NATIONS

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NOTE

Symbols of United Nations documents are composed of capital letters combined with figures. Mention of such a symbol indicates a reference to a United Nations document.

CONTENTS

REPORT OF THE COMMITTEE ON THE PEACEFUL USES OF OUTER SPACE

Rapporteur: Mr. Geraldo de VARVALHO SILOS (Brazil)

I. INTRODUCTION

1. The Committee on the Peaceful Uses of Outer Space met at United Nations Headquarters, New York from 15 to 18 October 1968 under the chairmanship of Mr. Kurt Waldheim (Austria). Mr. Gheorghe Diaconescu (Romania) served as Vice-Chairman and Mr. Gerlado de Carvalho Silos (Brazil) as Rapporteur. The verbatim records of the Committee's meetings were circulated as documents A/AC.105/PV.53-59.

Meetings of subsidiary bodies

2. The seventh session of the Legal Sub-Committee was held at the United Nations Office at Geneva from 4 to 28 June 1968 under the chairmanship of Mr. Eugeniusz Wyzner (Poland). The Sub-Committee's report on the work of its session (A/AC.105/45) is reproduced as annex III.

3. The Scientific and Technical Sub-Committee did not meet in 1968, in view of the holding of the United Nations Conference on the Exploration and Peaceful Uses of Outer Space.

Eleventh session of the Committee

4. At its 53rd meeting, on 15 October 1968, the Committee adopted the following agenda:

1. Opening statement by the Chairman.

2. Report of the Committee to the General Assembly on the preparations for, the organization and proceedings of the United Nations Conference on the Exploration and Peaceful Uses of Outer Space (General Assembly resolutions 2221 (XXI) and 2250 (S-V)).

   Documentation on the United Nations Conference on the Exploration and Peaceful Uses of Outer Space (A/AC.105/L.44).

3. Report of the Committee to the General Assembly (General Assembly resolution 2260 (XXII)).

4. Report of the Legal Sub-Committee (A/AC.105/45).

5. The opening statement by the Chairman is reproduced in annex I.

6. In the course of the discussions, statemments were made by the representatives of Argentina, Australia, Austria, Belgium, Brazil, Canada, Czechoslovakia, France, Hungary, India, Italy, Japan, Poland, Romania, Sierra Leone, Sweden, the Union of Soviet Socialist Republics, the United Arab Republic, the United Kingdom of Great Britain and Northern Ireland and the United States of America. The statements are reproduced in the verbatim records of the 53rd to 59th meetings.

7. Statements were also made by the representatives of the International Communication Union (ITU), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Health Organization (WHO), the World Meteorological Organization (WMO) and the Committee on Space Research of the International Council of Scientific Unions (COSPAR) who attended the session as observers. The statements are reproduced in the verbatim records of the 56th and 58th meetings.

8. At the 59th meeting of the Committee, the Chairman of the Committee, Mr. Kurt Waldheim (Austria), announced that in view of his duties as Foreign Minister of Austria, he was relinquishing his duties as Chairman of the United Nations Committee on the Peaceful Uses of Outer Space. The delegations of Australia, Belgium, Brazil, Bulgaria, Canada, Czechoslovakia, France, India, Iran, Italy, Japan, Lebanon, Mexico, Morocco, Romania, Sierra Leone, Sweden, the Union of Soviet Socialist Republics, the United Arab Republic, the United Kingdom of Great Britain and Northern Ireland and the United States of America expressed their deep appreciation of the work of Mr. Waldheim as Chairman of the Committee and extended their best wishes to him.

9. The Committee adopted its report to the General Assembly at its 59th meeting, on 18 October 1968.

10. The Committee's recommendations and decisions are set out below.

II. RECOMMENDATIONS AND DECISIONS

United Nations Conference on the Exploration and Peaceful Uess of Outer Space

11. The Committee considered the documentation compiled by the Secretariat on the preparation for, the organization and proceedings of the United Nations Conference on the Exploration and Peaceful Uses of Outer Space, held in Vienna from 14 to 27 August 1968. That documentation (A/AC.105/L.44) is reproduced in annex II.

12. In connexion with document A/AC.105/L.44, the Committee wishes to point out to the General Assembly that, since there was so short a time between the end of the Conference and the meeting of this Committee, sections of this document are of an interpretative nature and are not to be taken as an official record of the papers presented and the discussions held at the Conference.

13. In his opening statement (see anrex I), the Chairman of the Committee, who also served as the President of the Conference, pointed out the significance of the Conference and expressed the belief that it was able to fulfil its mandate by identifying the importance of practical applications of space exploration and the opportunities available for international co-operation in this field.

14. The Committee noted with satisfaction that the Conference was well attended. Seventy-eight countries participated, as well as nine specialized agencies, three intergovernmental organizations and one non-governmental organization. It has also been noted that most of the participants were represented by qualified persons in the field of space research and technology, and concerned with the problems of economic and social development which could be tackled by the introduction and promotion of space applications in their national programmes.

15. The Committee also noted that a well attended exhibition on the peaceful uses of outer space was arranged in conjunction with the Conference. Exhibits of six countries - Australia, Austria, Finland, India, Switzerland and the United States of America - were accommodated at the site of the Conference in the Kongress Zentrum. Large exhibitions of the Union of Soviet Socialist Republics and INTELSAT were housed in the Messepalast in the vicinity of the Kongress Zentrum.

16. The Committee expressed its appreciation to the Government of Austria for acting as host of the Conference as well as for its contribution to the organization and success of the Conference.

17. The Committee recommends that the Secretary-General should, as soon as possible, distribute very widely an annotated list of the papers presented at the Conference to Governments, educational institutions, learned societies and other appropriate recipients decided upon by the Secretary-General in order to permit and encourage requests for individual papers of interest. In response to these requests, the Secretary-General should furnish such copies of papers to persons making such requests. In addition, the Secretary-General should, where he feels it to be appropriate, make available copies of papers to other sources.

The Committee considers that this procedure will achieve the best possible dissemination of the results of the Conference and that a publication of the papers in one or more volumes would not be necessary or desirable since it would be too delayed and too costly to the United Nations and to purchasers.

18. The Committee also recommends, for the purpose of large-scale popularization of the results of the Conference, to publish and disseminate the materials relating to the Conference through the media of the United Nations in the form of a concentrated presentation of the basic questions that have been raised and discussed at the Conference.

Future work of the Scientific and Technical Sub-Committee

19. The Committee noted that although the Scientific and Technical Sub-Committee did not hold its annual meeting in 1968, the Conference provided the opportunity to take up the questions usually dealt with in the Sub-Committees, in particular, those related to the exchange of information, the encouragement of international programmes, and education and training in the field of outer space.

20. It also realized that the valuable information and viewpoints included in the papers presented to the Conference will assist the Sub-Committee to continue dealing with the questions under its mandate in a more useful and practical way.

21. Many delegations made reference to operative paragraph 11 of General Assembly resolution 2260 (XXII), and the Committee renewed its request to the Scientific and Technical Sub-Committee to take up at its forthcoming session in 1969 "the serious consideration of the suggestions and views regarding education and training in the field of the exploration and peaceful uses of outer space expressed in the General Assembly and in the Committee".

22. The representative of India proposed at the 53rd meeting of the Committee "that a small advisory group should be constituted and that action should be taken to arrange panel meetings, fellowships, surveys and technical assistance". These proposals were discussed in the Committee. While many delegations welcomed these proposals, there was no agreement on them and it was decided that the Scientific and Technical Sub-Committee should consider in detail all aspects of these proposals as expeditiously as possible.

23. The representative of Sierra Leone proposed at the 58th meeting of the Committee that arrangements should be made for the use of expert services through a United Nations Centre of Information and consultation in the field of practical applications of space technology. The Committee requests the Scientific and Technical Sub-Committee to examine this proposal in detail at its next session.

Report of the Legal Sub-Committee

24. The Committee took note of the report of the Legal Sub-Committee on the work of its seventh session (see annex III) and noted, in particular, the resolutions contained therein.

25. Many members expressed disappointment at the lack of adequate progress in the finalization of the convention on the liability for damage caused by the

launching of objects into outer space. The Committee expresses the hope that the Sub-Committee will be able to make more progress. The Committee recommends that the Legal Sub-Committee should meet early in 1969 to complete its work in drafting a convention on liability for damage caused by objects launched into outer space and, as proposed by the Legal Sub-Committee, to continue to study questions relative to the definition of outer space and the utilization of outer space and celestial bodies, including the various implications of space communications, as well as those comments which may be brought to the attention of the Committee by the specialized agencies in pursuance to paragraph 36 of this report.

Working Group on Direct Broadcast Satellites

26. In operative paragraph 13 of resolution 2260 (XXII), the General Assembly requested the Committee on the Peaceful Uses of Outer Space "to study the technical feasibility of communications by direct broadcasts from satellites and the current and foreseeable developments in this field, as well as the implications of such developments". Subsequently, the Legal Sub-Committee, at its last meeting in June 1968, adopted a resolution which recommended to the Committee "that it request the Scientific and Technical Sub-Committee to consider the question of direct broadcasting satellites, with a view to preparing a study of the technical problems involved, enlisting whenever appropriate the assistance of the competent specialized agencies of the United Nations". Widespread interest was aroused in the potential of direct broadcasting satellites at the recent United Nations Conference on the Peaceful Uses of Outer Space because of the expected technical feasibility of such satellite systems.

27. The Committee, in the light of these developments, considers that a working group should be set up to study and to report to the Committee on the technical feasibility of communications by direct broadcast from satellites and the current and foreseeable developments in this field as well as the implications of such developments, including comparative users costs and other economic considerations, as well as social, cultural, legal and other questions.

28. The first task of the working group would be to formulate a work schedule for its fields of study and establish a time-table. It shall, early in 1969, address itself to a study of the technical feasibility and technical characteristics of direct broadcasting from satellites, including questions relating to user costs, informing itself of and fully utilizing the work in this field done by the ITU and other specialized agencies, and prepare a report. On the basis of this report, the working group shall then proceed to consider additional economic as well as social, cultural, legal and other implications of direct broadcasting, again preparing a report on these implications. Both reports of the working group shall be transmitted to the Committee to enable it to report on the matter to the General Assembly, at its twenty-fourth session.

29. The working group shall be composed of interested members of the Committee, represented in so far as possible by specialists. Representatives of the specialized agencies of the United Nations shall be invited to participate in the work of the group.

30. The reports of the working group shall also be submitted to the Scientific and Technical Sub-Committee and the Legal Sub-Committee for their consideration if their respective time-tables permit.

31. The Secretary-General is requested to provide the working group with whatever information is currently available to him on the subject of direct broadcasting from satellites.

32. The Committee expresses the hope that interested States Members of the United Nations, and the specialized agencies will contribute comments and working papers to the working group for its information and guidance in the performance of its task.

International sounding rocket facilities

33. The Committee noted the progress of the Thumba International Equatorial Sounding Rocket Launching Station (TERLS) in India, and recommends that the United Nations continue to sponsor it.

34. The Committee took note of the work already accomplished by the Government of Argentina utilizing sounding rocket facilities for international co-operation and training in the peaceful scientific exploration of outer space as reported by Argentina to the Committee.

35. The Committee recommends that when the Government of Argentina has notified the United Nations that the Mar Chiquita station near Mar del Plata is in an operative condition the Secretary-General in consultation with the Chairman of the Committee appoint a small group of scientists, drawn from States Members of the Committee and familiar with space research and facilities, to visit the station in Argentina and report to the Committee of its eligibility for United Nations sponsorship in accordance with basic principles approved by the Committee in 1962 1/

Specialized agencies and other competent international bodies

36. The Committee noted with appreciation the participation and the contribution of the ILO, FAO, UNESCO, WHO, ICAO, ITU, WMO, IMCO, IAEA and COSPAR in the work of the United Nations Conference on the Exploration and Peaceful Uses of Outer Space. The Committee requests the specialized agencies and the International Atomic Energy Agency to consider the work of the Conference and to take the necessary follow-up steps to ensure the future progress of the work in their respective areas of competence.

37. The Committee took note of the resolution of the Legal Sub-Committee contained in its report (annex III, p. 12, para. 3 (a)) and recommends to the General Assembly to request the specialized agencies and the International Atomic Energy Agency to examine and report to the Committee on the Peaceful Uses of Outer Space on the particular problems that have arisen or may arise from the use of outer space in the fields within their competence and that they consider should be brought to the attention of the Committee.

38. The Committee further recommends to the General Assembly to request the specialized agencies concerned to continue to submit progress reports on their work in the field of the peaceful uses of outer space.

1/ See Official Records of the General Assembly, Seventeenth Session, Annexes, agenda item 27, document A/5181.

III. REGISTRATION

39. In conformity with the provisions of paragraphs 1 and 2 of General Assembly resolution 1721 (XVI), the Committee has continued to receive information from launching States concerning objects launched into orbit. Australia, France, Italy, the Union of Soviet Socialist Republics and the United States of America have furnished information. The information received since the Committee's last report has been placed in the public registry maintained by the Secretary-General and has been circulated in documents A/AC.105/INF.172-195.

ANNEXES

ANNEX I

Opening statement by the Chairman at the 53rd meeting of the Committee, on 15 October 1968

The Committee on the Peaceful Uses of Outer Space reconvenes today against the background of another year marked by continued progress in the exploration and peaceful uses of outer space. The programmes of the two leading space Powers have moved further ahead. The United States of America during the past year launched three new moon probes, Surveyor V, VI and VII, which succeeded in making soft landings on the moon with scientific equipment to test and analyse the composition of the lunar surface. Several thousand pictures and other scientific information have been transmitted back to the ground stations.

The Soviet Union in April launched its space vehicle Lunar XIV, which became the fourth Soviet moon satellite. Only a few weeks ago the Soviet Union succeeded in sending the Soviet spacecraft Zond V around the moon, returned it to earth, and then recovered it in the Indian Ocean. And as the Committee convenes this morning, three American astronauts are circling the earth in the latest space project. Our best wishes for a successful completion of their mission go to them. Their flight, planned to last for several more days, is certain to bring us significant new scientific and technical data and will help prepare the ground for still more ambitious ventures into outer space.

Indeed, it appears that we are approaching the threshold of man's first landing on the moon.

I wish to take this opportunity to congratulate both the Soviet Union and the United States of America once again for the outstanding achievements which their scientists and astronauts are accomplishing in the exploration of outer space.

The exploration of outer space, however, is by no means confined to the activities of the two leading space Powers. On the contrary, the number of countries actively engaged in programmes of space exploration is constantly growing. We know that some time ago France established an independent space programme. Today, we take note with pleasure that in November of last year Australia launched its WRESAT I satellite, and thus became the fourth nation to place a satellite in orbit. A steadily growing number of countries are participating in joint space programmes and scientists in almost every country of the world are now actively engaged in work connected with outer space science and technology and its repercussions in such fields as medicine, biology and various applications of space technology.

The past year has also seen notable activities within the framework of the United Nations. In this connexion, I should mention, above all, the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space,

which took place in Vienna in August of this year. The documents which the Committee now has before it bear evidence of the work which the Conference was able to accomplish. I believe that our Committee, in which the initiative for convening this Conference originated and which was one of the important organs in the planning stages of the Conference, can be truly proud of the results of this initiative.

We had set as the objective of the Conference the examination of the practical benefits to be derived from space research and exploration and the extent to which non-space Powers, and in particular the developing countries, could enjoy these benefits. It was possible, at the Conference, to show the truly promising possibilities in this respect. In the field of communications, the Conference called attention to new concepts and solutions to intercontinental telecommunication traffic through the use of communication satellites. It also pointed to the fact that, in the particular situation of many developing countries, the use of communication satellites could facilitate the establishment of modern communication systems and thus make an important contribution towards rapid progress in the educational, economic and social development of these countries.

Evidence presented at the Vienna Conference showed equally promising prospects in the field of weather observation and forecasting, through the use of meteorological satellites, and in the field of navigation and international sea and air traffic, through the use of navigational satellites. The Conference thus demonstrated the potentialities of the practical application of outer space research and technology, and indicated the possibilities for further action.

In recalling the results of the Conference, I wish to take this opportunity to express our gratitude to all those who have contributed to making the Conference a success. I wish, in the first place, to convey our sincere appreciation to the Secretary-General who, from the very beginning, lent his personal interest and support to the preparation of the Conference. Our gratitude also goes to Dr. Vikram A. Sarabhai, who served as Chairman of the Panel of Experts entrusted with much of the scientific preparation of the Conference, and later as Vice-President and Scientific Chairman of the Conference.

Much as we can be pleased with the achievements of the Vienna Conference, we must now bear in mind, however, that the Conference was not a final, but, on the contrary, a first step in our efforts to bring the practical benefits of space exploration to all nations, regardless of their degree of technical and economic development, in order to alleviate some of the economic and social problems which they face today.

It seems important that these efforts should now continue with increased emphasis, making use of the momentum created by the Vienna Conference. It is my sincere hope that our Committee will be able to play an active and prominent role in this respect.

In the legal field, our Legal Sub-Committee continued its efforts during the past year to elaborate an international agreement on liability for damage caused by the launching of objects into outer space and pursued its work on questions relating to the definition of outer space and the utilization of outer space and celestial bodies.

The report of the Legal Sub-Committee, which the Committee has received, outlines the progress which the Sub-Committee was able to make on these two questions.

The agenda for our present session comprises two main items. First, the report which the Committee has to submit to the General Assembly on the preparation for and the organization and proceedings of the United Nations Conference on the Exploration and Peaceful Uses of Outer Space, in accordance with General Assembly resolutions 2221 (XXI) and 2250 (S-V). In this connexion, I have the pleasure to draw your attention to the documents submitted by the Secretary-General. The second main item on our agenda is the report on the work of our Committee and its Sub-Committees, which will be submitted to the General Assembly, in accordance with General Assembly resolution 2260 (XXII). In this connexion, I wish to draw your attention to the report of the Legal Sub-Committee (see annex III). The Scientific and Technical Sub-Committee, as you will recall, did not meet in 1968, in view of the Conference held in Vienna.

I would suggest that we consider both items together and that delegations be free to deal with them either in one statement or, if they wish, by making separate statements on the two items. If I hear no objection, I take it that it is so decided.

ANNEX II

DOCUMENTATION ON THE UNITED NATIONS CONFERENCE ON THE EXPLORATION AND PEACEFUL USES OF OUTER SPACE*

CONTENTS

APPENDICES

* Previously issued under the symbol A/AC.105/L.44. In connexion with this document, the Committee wishes to point out to the General Assembly that, since there was so short a time between the end of the Vienna Conference and the meeting of this Committee, sections of this document are of an interpretative nature and are not to be taken as an official record of the papers presented or of the discussions held at the Conference.

I. NOTE BY THE SECRETARY-GENERAL

The United Nations convened the Conference on the Exploration and Peaceful Uses of Outer Space to assess practical benefits to be derived from space exploration and to find practical means for the sharing in these benefits by all Member States.

The Conference has clearly demonstrated that important and practical applications of space research for the direct benefit of mankind have already been developed and proven during this first decade of the space age. Discussions in the Conference have indicated that these practical applications could assist materially in alleviating some of the economic and social problems created by the explosive growth of population, the serious shortage of food, the spread of disease, problems of great concern to a vast majority of mankind. At the same time, the Conference has lighlighted the fact that, because of their complex, expensive and specialized nature, these tools of outer space are known only to a few nations. The developments in space science and technology have thus far benefited most those countries which are already far ahead in the economic and social time-table of the world. The space age is increasing the gap between the developed and developing areas of the world at an alarming rate.

It is most encouraging that there have been, and continue to be, programmes of co-operation, at all levels, in outer space research and its practical applications. If there were any doubts on the part of anyone on this point, these doubts were certainly dispelled by the reports, submitted to this Conference from country after country, citing co-operative programmes. The success of these efforts encourages us to believe that we can now press forward to greater levels of co-operation to harness the practical benefits that can accrue to man from the vast technological and scientific advances made through space exploration.

The United Nations and its family of agencies stand ready to play their part in this effort. Reports from specialized agencies to this Conference have shown what they are doing and what they plan to do. The World Weather Watch programme of the World Meteorological Organization (WMO), studies of the United Nations Educational, Scientific and Cultural Organization (UNESCO) on the use of satellite communication for mass education, project of the International Telecommunication Union (ITU) and the United Nations Development Programme (UNDP) for training of specialists in space communications - these indicate the level of effort in this direction. But more must be done. Special emphasis was laid in discussions at the Conference on the need to provide to developing countries meaningful information on space applications as well as the need to give them facilities for training and education in space science, technology and applications.

It has been noted that many participants in the Conference have taken this opportunity to review and explore the role of the United Nations in the peaceful exploration of outer space. That this topic has engaged the attention of Member States at this time is both opportune and significant. We can now look back over a decade of experience in this area of activity. The suggestions and ideas raised at the Conference in regard to the future role of the United Nations cover a wide range. It behoves all of us who are concerned, and in particular the Committee on the Peaceful Uses of Outer Space, seriously to consider the trend and scope of

these new ideas, to sift the suggestions made, and to make concrete recommendations concerning the role of the United Nations in the future. These recommendations must ensure that the resources and capacity of the United Nations will be utilized most effectively in this most important effort to realize, as soon as possible, practical benefits for all people from the exploration of outer space.

I am sure that every consideration will be given to the views and suggestions expressed during the Conference on the functions which could be performed by the United Nations.

II. INTRODUCTORY NOTE ON THE HISTORY AND ORGANIZATION OF THE CONFERENCE

The proposal for the holding of a United Nations Conference on the Exploration and Peaceful Uses of Outer Space had its origin in the Scientific and Technical Sub-Committee of the Committee on the Peaceful Uses of Outer Space at its third session in 1964.

In making the proposal, the Austrian representative recalled the decision taken by the General Assembly at its fourteenth session in resolution 1472 (XIV) to convene under United Nations auspices an international conference for the exchange of experience in the peaceful uses of outer space. For the Governments or countries other than the major industrial Powers, the information exchanged at the first United Nations Conference on the Peaceful Uses of Atomic Energy had been of vital importance in the formulation of national policies in the nuclear energy field, and he thought that similar benefits would be derived from a governmental conference on space research and technology. A conference on that subject would encourage space research in smaller countries whose authorities were not yet fully informed of the importance of technological by-products of space activities, and suggested that the Sub-Committee might consider whether it would not be useful to convene such a conference in the near future. Specifically, the Sub-Committee recommended that the Committee on the Peaceful Uses of Outer Space, in view of General Assembly resolution 1472 (XIV), should consider, after consultation with competent international organizations, the usefulness of organizing an International Conference on the Exploration and Peaceful Uses of Outer Space under United Nations auspices.

The Committee considered the Sub-Committee's recommendation at its sixth session in 1964 and decided to set up a working group composed of its entire membership to examine the desirability of holding an international conference on the peaceful uses of outer space in 1967 and also to make suggestions regarding its organization and possible objectives.

Owing to certain difficulties, the working group did not meet in 1965, and the Committee, at its seventh session, decided that it should meet in January 1966.

Meanwhile, the General Assembly, in resolution 2130 (XX), endorsed the Committee's decision to convene the working group.

The working group, which met in January and September 1966, recommended that an international conference of about two weeks' duration should be held in the latter half of 1967. It also recommended that the objectives of the conference should be:

(a) An examination of the practical benefits to be derived from space research and exploration on the basis of technical and scientific achievements and the extent to which non-space Powers, especially the developing countries, may enjoy these benefits, particularly in terms of education and development;

(b) An examination of the opportunities available to non-space Powers for international co-operation in space activities, taking into account the extent to which the United Nations may play a role.

The working group also outlined an agenda for the conference, including a review of results of space research during the ten years of the space age, and recommended that a panel of experts should be set up to function in co-operation with the Chairman of the Committee on the Peaceful Uses of Outer Space in order to make the organizational arrangements.

As regards the venue of the proposed conference, the working group noted with appreciation the generous offers of the Governments of France and Austria to invite the Conference to meet in Paris or Vienna, and referred the question to the Committee..

Finally, the working group recommended that every reasonable effort should be made to minimize the cost of the Conference to the United Nations.

The Committee at its eighth session in September 1966, endorsed the working group's recommendations and, after the Government of France had withdrawn its offer to convene the Conference in Paris, decided to convene the Conference in Vienna, and set up a panel of experts for the organization of the Conference, which was composed of the following thirteen countries: Australia, Brazil, Bulgaria, Czechoslovakia, France, India, Italy, Japan, Romania, Sweden, Union of Soviet Socialist Republics, United Arab Republic and United States of America. As regards the cost, it decided that a ceiling of between $300,000 and $350,000 should be established, the exact amount to be determined after consultations with members and with the Advisory Committee on Administrative and Budgetary Questions. The ceiling was later established at $350,000, with a provision of $145,000 for publishing the Conference proceedings.

The General Assembly at its twenty-first session in 1966 endorsed the recommendation of the Committee.

It was recalled that the Conference of the Heads of State or Government of Non-Aligned Countries held in Cairo in 1964 requested the space Powers to exchange and disseminate information on research in order that scientific progress in this field might benefit all and also proposed an international conference on this subject. It was agreed that the exploration and use of outer space should be carried on for the benefit of all; there was need for a wider dissemination of the knowledge and achievements of space science and technology, and the promotion of its practical application. Regarding the question of participation in the Conference, the General Assembly decided that States Members of the United Nations, States members of the specialized agencies, States Parties to the Statute of the International Court of Justice and States that the General Assembly decides specially to invite, should be invited to participate in the Conference and that the specialized agencies, the International Atomic Energy Agency, the Committee on Space Research of the International Council of Scientific Unions and inter-governmental space organizations should be invited as observers.

In resolution 2221 (XXI), the General Assembly decided to convene the United Nations Conference on the Exploration and Peaceful Uses of Outer Space in Vienna in September 1967. It endorsed the working group's recommendations contained in the report of the Committee on the Peaceful Uses of Outer Space, concerning the terms of reference, objectives, agenda and organization of the Conference, and called upon the Committee to submit a report on the Conference to the General Assembly.

When the Committee met in February 1967, it was suggested that the Conference might be postponed in order to allow time for better preparation. The Committee then unanimously agreed to recommend to the General Assembly that the Conference should be postponed for a period of approximately one year.

The General Assembly, at its fifth special session, accepted the Committee's recommendation and decided to hold the Conference from 14 to 27 August 1968. It also expressed the hope that the postponement of the Conference would provide an opportunity for better preparation and thus enhance the results for the benefit of all participants.

At its twenty-second session, the General Assembly, in resolution 2261 (XXII), expressed the hope that all those invited to the Conference would accept the invitation and called upon all participating States to devote their utmost efforts to ensure the success of the Conference. The General Assembly further requested the Secretary-General, with the assistance of the Committee on the Peaceful Uses of Outer Space and the Panel of Experts, and in co-operation with the interested specialized agencies, to continue to make the necessary organizational and administrative arrangements for the Conference, and to take appropriate steps to secure the widest publicity for it.

The work of the Panel of Experts

The Panel of Experts was charged with the following tasks: the establishment of deadlines for, and suitable lengths of, abstracts and papers to be submitted through States; the receipt, selection and scheduling of papers for the Conference; and the nomination of technical chairmen and other technical officers.

The Panel, under the chairmanship of Dr. Vikram A. Sarabhai (India), decided on the programme of the Conference, which included an introductory session, nine thematic sessions, and evening lecture sessions. It accepted about 200 papers to be read at the Conference.

The Panel also discussed the question of evening lectures to be given during the Conference and decided that suggestions for such lectures should be submitted by 31 May 1968. Sixteen such lectures were tentatively scheduled.

It agreed to recommend Dr. Kurt Waldheim (Austria), Chairman of the Committee on the Peaceful Uses of Outer Space, as President of the Conference and Dr. Vikram A. Sarabhai (India), the President of the Panel, as Vice-Chairman/Scientific Chairman of the Conference.

It further agreed that these two chief officers should make recommendations on the names of Chairmen and Vice-Chairmen for the thematic sessions and the evening lecture sessions, on the basis of lists to be supplied by participating Governments, after appropriate consultation with the Panel. It also considered the draft rules of procedure submitted by the Secretariat and decided that the Secretariat should finalize the rules of procedure.

The officers of the Conference

On 1 May 1968, the Secretary-General, on the recommendation of the Panel of Experts, appointed Dr. Kurt Waldheim, Foreign Minister of Austria, as President of

the Conference and Dr. Vikram A. Sarabhai, Chairman of the Indian National Committee and Space Research, as Vice-President and Scientific Chairman.

On the nomination of the Panel of Experts, the Secretary-General appointed nine chairmen and vice-chairmen for the nine thematic sessions of the Conference (A/CONF.34/INF.7). He also appointed Mr. A.H. Abdel-Ghani, Chief of the Outer Space Affairs Division in the Department of Political and Security Council Affairs of the United Nations Secretariat, as Executive Secretary of the Conference.

The programme of the Conference

The Conference secretariat, functioning under the guidance of, and in consultation with the President and Vice-President/Scientific Chairman, made necessary administrative arrangements for the Conference. The provisional rules of procedure and the programme of the Conference, prepared in accordance with the relevant decisions and taking into account similar conferences, were circulated to the participating countries and organizations one month before the opening of the Conference.

The Conference itself was organized on the basis of an initial series of introductory sessions which reviewed the results of space research during the ten years of the space age, with particular emphasis on their practical meaning, followed by nine thematic sessions on the following subjects: communications; meteorology; navigation; other space techniques of practical benefit; biology and medicine; non-space applications of space technology; education and training; international co-operation and opportunities for participation in space research and application; economic, legal and social problems of the exploration and use of outer space relevant to international co-operation and practical benefits.

Provision was made for the discussions in the thematic sessions of the Conference to be supplemented by group discussions and eighteen evening lectures. All sessions of the Conference were open to the public.

The exhibition

Following a suggestion made by the Panel of Experts, an exhibition on the peaceful uses of outer space was arranged in conjunction with the Conference. The exhibitions of Australia, Austria, Finland, India, Switzerland and the United States of America were accommodated in the Kongress Zentrum, where space was available for small exhibits, while the exhibitions of the USSR and INTELSAT were housed in the Messepalast in the vicinity of the Kongress Zentrum.

Publication programme

It is anticipated that the printed proceedings of the Conference would be similar in character to those of the International Conferences on the Peaceful Uses of Atomic Energy. In addition to introductory and explanatory material, the proceedings would reproduce the papers and evening lectures presented, in the language of submission, with the summaries in the other three working languages. Summaries would also be provided of the discussions in thematic sessions and of the group discussions.

Public information programme

The General Assembly in its resolution 2221 (XXI) requested the Secretary-General to make the organizational arrangements for the Conference, and to take appropriate steps to secure the widest publicity for it. The following steps were taken: the resolution of the Assembly calling for wide participation of countries in the Conference was conveyed to all Member States with a covering letter from the Chairman of the Committee on the Peaceful Uses of Outer Space; the Secretariat circulated a document containing all the necessary information regarding the Conference, including agenda, objectives, and relevant United Nations debates which indicated the importance of the Conference; a booklet on these lines was prepared and published in four languages in co-operation with the Office of Public Information and widely circulated; the Office of Public Information prepared a news feature on the Conference, which was made available to the news media; an article by the President of the Committee was published in the UN Monthly Chronicle and was issued to Member States; all such information was also made available to space publications and other news media. The Office of Public Information carried out publicity for the Conference under its normal programme with the aid of United Nations information centres.

Participation in the Conference

Seventy-eight Member States attended the Conference. Nine specialized agencies and four other international organizations also attended. The Conference, which was held in the Hofburg Palace, was addressed by the President of Austria at its opening session.

III. STATEMENT BY DR. FRANZ JONAS, PRESIDENT OF THE FEDERAL REPUBLIC OF AUSTRIA, AT THE OPENING SESSION OF THE CONFERENCE

[Original: German]

Austria is firmly resolved to fulfil the task of mediation which flows from its geopolitical position. We are happy that the world has recognized this preparedness and that ever larger and more important conferences and congresses are organized in Vienna. The United Nations also have recognized in a gratifying way the international function of Vienna. Thus we were able to welcome as hosts in 1961 the great Conference on Diplomatic Intercourse and Immunities, in 1963 the Conference on Consular Relations, and in May this year the first part of the Conference on the Codification of the Law of Treaties. We highly prize the confidence shown by the United Nations to our country. The fact that now the first conference of the United Nations on outer space is being held in the Austrian federal capital fills us with especial pride.

Austrian science does not come to this conference empty-handed. In the past and in the present, it has made a considerable contribution to the exploration of outer space. At a time when the problems of outer space were considered to be pure utopia, Austrian scientists laid the first foundations for the exploration of outer space. The participants in this Conference well know the names of the Austrian pioneers of outer space Valier, Oberth, Sänger and Pirquet, to name but a few. In the present also Austrian scientists are successfully participating in the solution of the manifold problems of the utilization of outer space. In all modesty, we Austrians would also point to the fact that the Committee on the Peaceful Uses of Outer Space, since its establishment in 1959, has been under the chairmanship of an Austrian, first our then representative Dr. Matsch, and later his successor, the present Austrian Federal Minister, Dr. Waldheim, who has now the honour of being President of this Conference.

Ladies and gentlemen, this Conference, according to the words of the Secretary-General of the United Nations, shall be but a beginning. In the coming days, you are not only going to exchange information on the state of the exploration of outer space and on the practical advantages of the opening up of outer space, but you will also discuss the way to carry out common undertakings, so that all States could participate in their success. A co-ordination of this work is necessary alone because of the fact that the required financial resources can be raised only by the very large and economically powerful States. But no monopoly of these super Powers in outer space should thus be created. The United Nations is the institution in whose framework the way must be found to enable all other States also to participate in the exploration and peaceful uses of outer space.

Ladies and gentlemen, we are fully conscious of the historical importance of this day when the Member States of the United Nations convene in Vienna for this first conference on outer space. They want to show that the path of man into outer space is to be a common path, and that the peace of endless space shall not be disturbed by the penetration of man. Quarrels and distrust and war, which poison the life of peoples on this earth, shall not be continued in outer space. A decision for a common exploration and for a common peaceful use of outer space would be the best method to prevent new distrust and to reduce old distrust. The

exploration of outer space shall not bring new fear to mankind but hope of great progress through common peaceful work.

Scientists and technicians promise us much for the future. I am convinced that they are going to keep this promise, if they are to carry out their work not on behalf and in the name of one State alone, but on behalf of the United Nations and in the interest of peace and progress for all.

Ladies and Gentlemen, I know that you, who participate as representatives of many Member States of the United Nations in this Conference, are faced by a difficult but promising task, and that you are fully aware of the responsibility that you bear for the future. Your peoples follow your work in this Conference with the greatest hope. Austria would be very happy if this Vienna Conference were to be the first successful step towards a real collaboration of all Powers in the exploration and peaceful use of outer space.

I convey to you, ladies and gentlemen, the most heartfelt welcome of the Austrian people. We hope that you will feel happy in Austria and that you will gather nothing but pleasant and interesting impressions in Vienna. On behalf of the Republic of Austria, I wish the best success to the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space in Vienna.

IV. GREETINGS FROM HEADS OF STATES AND GOVERNMENTS TO THE CONFERENCE

A. Message from Pope Paul VI, 14 August 1968

/Original: French/

At this, the opening of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space which the world has ever known, we extend our cordial greetings to the eminent delegates from all the participating nations. We wish to express our hopes for the success of their work and to assure them that the Catholic Church will be following their deliberations with the greatest interest.

The exploration and use of space may fairly be said to represent a new dimension for mankind. The advent of artificial satellites, which may be expected to grow ever more numerous and more successful, opens up hitherto undreamt-of possibilities for men and peoples, enabling them to communicate knowledge and information in every sphere. The new path this opens up may speed up immeasurably the progress of education, cultural exchanges and international aid. God grant that it may be a signal that the obstacles which still stand in the way of peaceful relations between certain social and national groups are soon to disappear; that it may herald an era of sincere co-operation between all the nations of the earth and a turning-point - perhaps a decisive one - in mankind's anguished progress towards unity and peace.

While the Church is not competent to pronounce on the technical and scientific aspects of the exploration of space, it is none the less directly interested in the educational, cultural, ethical and social consequences which must follow this sudden expansion of the field of human activity. It is anxious that the immense progress in space technology which the world has been watching with admiration for some years shall be made to serve the peace and well-being of humanity. And it hopes that, by a timely reminder of the moral and spiritual principles which the Popes have proclaimed over and over again in recent years, it will be making a useful contribution to the true welfare of society.

It will indeed be obvious to any impartial observer that to break or to disregard moral laws in this area would have particularly grave consequences. If the benefits of the use of space were to be confined inequitably to certain nations to the exclusion of others; if the free flow of information brought with it the unchecked dissemination of false information; if the increased means of communication were ever to become an instrument for ideological propaganda and used to spread subversion, to kindle hatred, to maintain racial discrimination, to set peoples and social classes against one another instead of uniting them - who could fail to see that the wonderful recent discoveries of science would then turn against man bringing unhappiness instead of happiness in their wake?

It has often been observed that progress in the field of science and technology is not necessarily followed by comparable progress in the field of ethics, or of international law or co-operation. None the less, noteworthy attempts have been made to which we would wish to pay our tribute. A treaty was concluded last year to lay down principles to govern the activities of nations in regard to space exploration and utilization. That was a first step, supported by the Holy See and

welcomed by the Church. The Church believes, however, that it is doing no more than its duty if it draws the attention of those concerned to the urgent need to take the matter further. What is needed is the elaboration of a "space code" forthwith to co-ordinate and discipline work in this field; it is vital that whatever new conquests science may soon make - and science is advancing very rapidly - shall find a legal framework and institutional arrangements already in existence to ensure that they serve the good of society and are not abused.

The space era could then go forward in an orderly way instead of in confusion and strife. It would bring benefits to all peoples, and not merely to a privileged few. Our thoughts go in particular to those who, by reason of their slower rate of cultural and economic development, have been kept in a distressing and unjust state of inferiority, and who now see opening up before them possibilities of rapid educational and cultural progress. To use the resources offered by the exploration of outer space so as to help them will be to work at one and the same time for the good of man, for the advancement of justice and for peace.

These are the hopes and the recommendations which we wish to express at the opening of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space. Most fervently we pray for God's blessing on the organizers of this Conference and all who participate in its work.

B. Message from Mr. A. Kosygin, Chairman of the Council of Ministers of the USSR

/Original: Russian/

On behalf of the Soviet Government, I send greetings to the participants in the United Nations Conference on the Exploration and Peaceful Uses of Outer Space - the first world-wide forum where the representatives of various countries of the world will be able to sum up the achievements made by humanity in this important field of activity and will be able to exchange views on the further prospects of space conquest for the benefit of the world.

Humanity will remember for ever the scientific deeds and self-sacrifice of those who paved the difficult way into space in the interests of progress. The formulation of the theory of space flights by the great Tsiolkovsky at the beginning of the twentieth century, and the development of science and technology during the past decade, brought nearer the beginning of the space age - 4 October 1957, when the first artificial earth satellite was put into orbit in the Soviet Union. Several years later, the historic flight of Yuri Alexeevich Gagarin heralded the passage of humanity to the new frontiers of outer space conquest. This was followed by outstanding achievements in the exploration of the moon, Venus and the space around the sun and other celestial bodies.

Cosmic research not only extends the horizons of science, but opens up as well, at present, new opportunities for the solution of important practical tasks, such as ultra-long-range communications and television, weather forecasting and navigation. Wide prospects are being opened as well for the utilization of space technology in various other fields of human endeavour.

With the aim of better satisfying the needs of the developed and developing nations, the Soviet Union and other socialist countries are proposing the creation

of an international communications system through artificial earth satellites, based on democratic principles, with the complete equality of all its participants.

While conducting research on the utilization of outer space, it is essential not to allow space to become the arena of the arms race. Outer space should become the zone of peace and international co-operation. In our opinion, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, of 27 January 1967, signed by the majority of nations of the world, could represent a sound basis for the development of such international co-operation in this field, equal for all. The Treaty is an outstanding achievement of the peace-loving forces in the fight against those who would like to use outer space for aggression and war.

May I venture to express hope that the Conference will contribute to the progress of space research and to the further development of international co-operation and mutual understanding. On behalf of the Soviet Government, I wish to the United Nations Conference on the Exploration and Peaceful Uses of Outer Space every success in its work.

C. Message from Mrs. Indira Gandhi, Prime Minister of India

/Original: English/

The peaceful uses of outer space, particularly in the fields of telecommunications and meteorology, promise to confer great benefits to developing nations. It is appropriate, therefore, that the United Nations should convene a conference providing interaction of national policy-makers and scientists to review current developments and to explain these benefits. India looks forward to expanding areas of international collaboration and would take initiatives as she has at the United Nations-sponsored International Rocket Launching Station at Trivandrum and at the Experimental Satellite Communications Earth Station. I hope the Conference will succeed in laying the foundation for extended co-operation and I wish it success.

V. STATEMENT BY LEONID N. KUTAKOV, UNDER-SECRETARY-GENERAL FOR POLITICAL AND SECURITY COUNCIL AFFAIRS, TO THE OPENING SESSION OF THE CONFERENCE

/Original: English/

I have the honour to extend to you, at the outset, the greetings of the Secretary-General, U Thant, who plans to address you before the Conference concludes its work. I am very pleased and honoured to represent him at this Conference.

In a short decade since the launching of the first Sputnik by the Soviet Union in 1957, remarkable progress has been made in the conquest of outer space. Astronauts of both the Soviet Union and the United States have orbited the earth for days and walked in space. Man-made objects have landed on far-away planets and transmitted valuable information to earth.

Many of us have remained silent spectators of this astounding progress in space science and technology, and regrettably most people and countries have not been able to participate fully in, or even comprehend the deep meaning of these spectacular achievements.

We have already lost valuable time that can never be regained, and unless we act soon, the space age - like the atomic age - will witness waste and danger as a result of mankind's inability to exploit technical progress for its economic and social advancement.

It is everybody's hope, I am sure, that, as the first decade of space was devoted mainly to developments in space science and technology, the next decade will be known for the application of these developments for the benefit of mankind. It is in this spirit that this Conference is being held here in Vienna, namely, to examine the practical benefits to be derived from space research and exploration.

We are hopeful that discussions here will help to dispel the impression that outer space is unrelated to the earthly problems of nations. For the discussions here should clearly bring out that the exploration of outer space has far-reaching implications for many aspects of life on this planet. Developments in the area of space communications, meteorology, earth resource surveys, for example, will greatly advance the dissemination of information, mass education, weather modification and control, location and identification of food and mineral resources.

The discussions of these and other exciting possibilities will no doubt make it evident that the exploration of outer space is closely related to the problems facing developing nations. Indeed, they stand to gain much from the shared benefits of space science and technology. It is therefore my fervent hope that this Conference will identify ways and means of ensuring that these benefits are used for the economic and social betterment of all countries, particularly those in the developing areas.

The discussions here, therefore, should indicate to leaders of Governments, the academic communities, and all concerned with economic and social development, the true potentialities of the practical utilization of space. Let us hope that the Conference will broaden the vision of all participants and will challenge participating nations to seek the means to utilize fully these opportunities. In this sense, this Conference would only be a first step, to be followed in due time by joint practical ventures on a broad international level designed to bring the results of space explorations to all nations irrespective of the stage of their economic or social development.

In this regard, we have witnessed in the past close and fruitful collaborative efforts between space Powers, as well as between them and many other countries in the field of outer space. While we are gratified by such collaboration, it is to be hoped that this Conference will help to stimulate and strengthen such co-operation, both within the framework of the United Nations and the specialized agencies concerned, as well as bilaterally.

Finally, I wish to say how grateful we are to the Government of Austria for kindly offering the friendly atmosphere of the City of Vienna, well known for its warm hospitality, which will no doubt contribute to the success of the Conference. Let me recall with gratitude in this connexion that it was the Government of Austria which originally proposed the idea of this Conference at the third session of the Scientific and Technical Sub-Committee of the Committee on the Peaceful Uses of Outer Space held in 1964.

It is also my pleasant duty to pay tribute to those responsible for preparing and working out the arrangements for this Conference. In this regard, I wish to mention, in particular, the efforts of the President of the Conference, Dr. Kurt Waldheim; Vice-President and Scientific Chairman, Dr. Vikram Sarabhai; the eminent scientists who will chair the various sessions of this Conference; and the heads and representatives of the specialized agencies.

On behalf of the Secretary-General, I wish you all success in the work that lies before you. Thank you.

VI. OPENING STATEMENT BY DR. KURT WALDHEIM, PRESIDENT OF THE CONFERENCE

[Original: English]

There is perhaps no other field of human endeavour where science and technology have made such far-reaching progress in the past years as in the exploration and use of outer space. Only eleven years have passed since the launching of the first artificial satellite. Since then, man's entry into outer space has proceeded at an almost incredible pace. Scientific spacecraft travelled as far as the planets Mars and Venus; other spacecraft circled the moon and transmitted pictures of its hitherto unknown side. Spacecraft landed on the surface of the moon, gathering scientific information about the composition of the lunar surface. The first pioneers of space exploration have orbited the earth and, leaving their spaceships, have stepped out into outer space. At the same time, the practical applications of space research and technology are becoming, to an ever greater extent, part of our everyday life.

As we survey these tremendous scientific and technological achievements, I wish to extend to both the Soviet Union and the United States of America our sincere congratulations and our admiration for the outstanding success they have achieved in the exploration and use of outer space.

I should equally like to congratulate all other countries which are already active in this field and, like France, have established independent space programmes of their own, or, like so many others, are co-operating in joint international space projects. Moreover, it may be only fitting to acknowledge our indebtedness to the countless scientists of all nations who, through generations, have, by their patient and relentless work, laid the ground for today's spectacular evolution in science and technology, and for the practical benefits which we hope to win in the future. It is to them, to their vision and to their dedication that I should like to pay tribute at this moment.

Let me also pay special tribute to the memory of those pioneers of space exploration who have given their lives in this great venture of man to expand the frontiers of human knowledge and civilization. Their death has overshadowed our success, but at the same time their sacrifice has become a great challenge to us to continue our work, and a sacred obligation to ensure that the conquest of outer space will ultimately serve the needs and expectations of all mankind.

The first decade in the exploration and use of outer space has been marked by outstanding scientific and technological achievements. As in the great age of discoveries and explorations, when man, confident of his intuition and skill, dared to confront the dangers of the seas, man has once again started to search for new frontiers of knowledge and progress. He has penetrated deeply into the solar system and the universe; he has already asserted his place in outer space and proved his superiority over the most sophisticated machines and instruments.

These spectacular achievements in the scientific and technological field have quite naturally concentrated our interest on the exploration of outer space

and have perhaps overshadowed the practical benefits which space research and technology have yielded at the same time, and which could play an important role in the solution of many of the economic and social problems that our nations face today.

When these benefits are stated in concrete terms, however, their importance to all countries and, in particular, to the developing countries, becomes readily apparent. It is not unreasonable to assume, therefore, that the second decade of the exploration and use of outer space might now be marked by an increased emphasis on these practical applications, which will directly benefit all countries of the world, contribute to a solution of their economic and social problems and help to bridge the gap between the industrially advanced countries and the developing nations. The possibilities in this respect seem very promising, indeed.

In the field of communications, the steadily increasing national and international telecommunications traffic is calling for new concepts and solutions. The use of satellites has already inaugurated a new era in transatlantic and transpacific communications. But the real potentialities of a global satellite communications system are such that there is hardly any field of activity which would not directly or indirectly benefit. This applies in particular to the situation in the developing countries, where the use of communications satellites could greatly facilitate the establishment of modern communication systems and thus make an important contribution towards rapid progress in the educational, economic and social fields.

Equally promising, and particularly to the developing countries, appear the potential benefits resulting from the use of meteorological satellites in a system of weather observation and forecasting. Apart from the many lives which could be saved by adequate weather forecasts and storm warnings, a meteorological satellite system offers hitherto unknown possibilities in agriculture and water management. In fact, some experts have already calculated that the annual savings in the agricultural field alone might by far exceed the cost of the entire system.

Other encouraging prospects are offered through the use of satellites for navigation. Intercontinental and transoceanic traffic is growing so rapidly that the transport volume by sea and air will, as early as 1970, reach three times the present level. Parallel to the increase in traffic, the size of ships and planes is steadily growing. In a few years, we will be able to board giant jet planes and supersonic liners. It will therefore be necessary to improve the safety of the crowded sea routes and air channels through the use of better navigational methods, which could perhaps be best achieved through the use of satellites.

Whereas the use of satellites for communications, meteorology and navigation would most certainly exercise a tremendous impact on how man will live in the future, a recently developed survey-satellite, capable of observing and recording information about the natural resources of the earth, will prove to be of particular and direct advantage to the developing countries. This is a striking example of how quickly progress is achieved in modern science and technology, and reaffirms our hope that we will be able to put the potential of outer space research and technology to work for swift solutions to the urgent problems of all nations, irrespective of their degree of scientific, technical and economic development.

The prospects indeed are promising. To convert them into reality, however, will require a climate of genuine international co-operation.

The United Nations have not failed to recognize the important role they can play in this respect. In the first place, it appeared imperative to prevent an extension of the armaments race into outer space. Time and again the General Assembly of the United Nations has therefore reaffirmed that outer space should be used only for peaceful purposes. In the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, far-reaching provisions were established limiting military activities in outer space. The United Nations have thus made an important contribution towards removing the most likely causes of international political friction in outer space.

The United Nations have also concentrated their efforts on the establishment of legal rules for the exploration and use of outer space. As early as 1962, the General Assembly adopted a "declaration of legal principles governing activities in outer space". This work was then carried forward in long and extensive discussions in the Committee on Peaceful Uses of Outer Space and its legal Sub-Committee. The work of these committees led to concrete and important results.

In 1966, the General Assembly, in resolution 2222 (XXI) adopted the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, which reaffirmed the concepts embodied in the earlier Declaration and cast it into a more concrete and legally binding form. Last year, the General Assembly, again on a proposal elaborated by the Committee on the Peaceful Uses of Outer Space, adopted the International Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.

The United Nations have thus taken the first steps to bring the rule of law into outer space.

The United Nations are now taking the initiative to open up a fruitful dialogue between the space Powers and the non-space Powers in order to explore all possibilities of bringing the practical benefits of space exploration and space technology to all nations, and in particular to the developing countries. This is the main objective of the United Nations Conference on the Exploration and Peaceful Uses of Outer Space, which we are opening today here in Vienna.

It is, indeed, in the interest of all countries that knowledge and understanding should be more widely disseminated, and that the benefits of outer space research and technology should become the property of all countries.

In this respect, the International Exhibition of Space Science and Technology, which will be organized both in the conference building and in the Messepalast, will be of significant value for the objectives of this Conference. May I take this opportunity to express our sincere appreciation to all Governments and exhibitors for the special efforts they have taken to make their exhibits available to the delegations attending the Conference and to the interested public.

Outer space research and its practical applications are, by their very nature, of global concern and will require to an ever-increasing degree the co-operation of all nations.

Smaller countries which do not at this time have the resources for an independent space programme have made, and are still making, important contributions to space science and research. There is no doubt that these countries, if given adequate opportunities, could also greatly contribute, through their participation in joint space projects, to the technological conquest of outer space.

It is the firm wish of all of us that the exploration and use of outer space should be carried out in the interest and for the benefit of all mankind, and that the fruits of this great human endeavour should be shared by all nations irrespective of the degree of their economic and technical development.

It is my conviction that this Conference represents a significant step in this direction. The great number of outstanding scientists and experts who, on behalf of their Governments, will present papers to this Conference, will demonstrate the potentialities of the practical application of outer space research and technology. The studies and proposals elaborated by the specialized agencies in this field, such as ITU, WMO, UNESCO, ICAO and IMCO, will indicate the possibilities of joint actions and undertakings.

May I therefore express the hope that the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space will accomplish its goals. May it become a landmark in international co-operation in outer space and a symbol of the unity of all nations in this great venture of mankind.

VII. STATEMENT BY DR. VIKRAM A. SARABHAI, VICE-PRESIDENT AND SCIENTIFIC CHAIRMAN OF THE CONFERENCE

/Original: English/

This Conference, which marks the completion of a decade of the space age is appropriately held at the initiative of the Committee on the Peaceful Uses of Outer Space and through the directive of the General Assembly. The uses of outer space, peaceful as well as military, are already bringing about a qualitative change in our lives and can be expected to play an even more significant role in the future. The establishment of the Committee on the Peaceful Uses of Outer Space is indeed a recognition of this fact. Austria, our host country, has provided chairmen for this important Committee, who have guided its affairs with leadership, understanding and tact. The holding of this Conference in Vienna today is largely the result of the untiring efforts and initiative of its Chairman, who we are fortunate to have today as our President. May I, Sir, on behalf of all the participants, offer felicitations to you? I thank you for making this Conference possible and for bringing us to this lovely city.

I deem it a great privilege to have been nominated Vice-President and Scientific Chairman of this Conference. I trust that through my work I will be able to convey my appreciation of the honour you have accorded me.

India has established at Thumba with the active co-operation of the United States, the Soviet Union and France, an equatorial sounding rocket range. This international facility has received United Nations sponsorship and is a unique example of nations following different political paths joining resources for promoting the peaceful uses of outer space. Modest as that experiment is, I believe it provides a model of great significance for the future. So too is the Experimental Satellite Communications Earth Station at Ahmedabad, which has received support from the United Nations Development Fund and the International Telecommunication Union, and now runs an international training centre. United Nations assistance to the project, pledged several years ago, was a forward looking departure from established practice in such matters. For it involves a recognition of the proposition that advanced projects, even ones dealing with outer space, can be of relevance to the real problems of a developing nation. The trust displayed by the concerned international agencies in accepting our interest as a serious one has, I believe, been fully borne out by subsequent events. India is now putting up a commercial earth terminal for satellite communications with system's responsibility and project execution undertaken by its own nationals, who have acquired competence and self-confidence through participation in the earlier project. A ninety-eight-foot fully steerable antenna is also being fabricated in India. Moreover, equal benefits from the project flow to the nationals of the many countries, forming more than half of the trainees in the courses given at Ahmedabad.

I believe that several uses of outer space can be of immense benefit to developing nations wishing to advance economically and socially. Indeed, without them, it is difficult to see how they can hold their own in a shrinking world. I shall try to outline today some of the objectives of space research and some

implications of the practical uses of outer space. Drawing on experience gained through professional involvement and management responsibility for atomic energy and space research and their applications to tasks of national development in India, I will share with you some of my thinking on the problems encountered in realizing practical benefits from advanced technologies. Finally, I will examine the type of international collaboration that I believe is required before large numbers of nations in the world, developing countries as well as small advanced countries, can partake of the benefits of outer space.

The sun provides the driving force for almost everything that happens on earth: weather, rivers, vegetation, fossil fuels and, of course, life itself. But in contrast to the apparent constancy of the sun and the complete dependability of sunrise and sunset, we experience a capriciously variable environment, the fury of hurricanes and lashing ocean waves, droughts and floods, starvation one year and bumper crops another, and uncertain radio communications. The natural scientist looking for the subtle links through which the sun affects the earth and our lives has at last acquired in the exploration of space a dramatic new capability for study. He has discovered that in the solar system, the space separating the sun and the planets is filled with extremely rarified matter constantly flowing outwards from the sun with a velocity of about 300 to 500 kilometres per second. The solar wind, as it is called, carries with it the sun's magnetic field, and the régime around planets is broadly analogous to what happens when a big boulder sticks out in the middle of a swiftly-flowing stream of water. The sun itself is not placid and the surface is not uniform. Apart from beauty spots showing up every now and then, it throbs like a boiling cauldron and it experiences storms of great violence.

There is another major interest in exploring space. The earth's crust and the lower atmosphere have temperatures and densities such that electromagnetic and hydrodynamic phenomenon function largely independently of each other. But this state is rather special and does not commonly occur in the universe. Even on earth or if we go upwards beyond eighty or 100 kilometres, it does not occur in the molten core. In the sun and the stars, as well as in interstellar and interplanetary space, electromagnetic and hydrodynamic behaviour are intimately linked. In consequence, fluids behave in a manner unfamiliar to us and there are many open questions for which laboratory experiments are of limited use, since they do not simulate what happens on a cosmical scale. Space research has at last made direct experimentation possible in the magnetosphere of the earth and in interplanetary space.

A third important scientific objective has been to view the universe, the galaxy and the solar system through a wide window. The blanket of the atmosphere under which we live eliminates all but a tiny fraction of the broad spectrum of electromagnetic radiations and particles which impinge on the earth, carrying with them information about the sources where they originated and the properties of the media through which they have traversed. Depending merely on observations made with earthbound instruments to picture the universe and understand cosmology is like the attempt of a blindfolded man to describe an elephant by touching the trunk and the legs of the animal. Through space research, we have now become aware of X-rays not only from the sun, but from strange distant objects in the galaxy. The intensity often changes in a most interesting manner within a short period of a few days. Planetary research is helping us understand the origin of the solar system and the crucial question of the existence of

extraterrestrial life. We shall hear more about these exciting discoveries during the Conference. But I wish here to pay tribute to the scientists and engineers who have pioneered in this field. Particular mention is appropriately made of the outstanding contributions of the Soviet Union and the United States of America.

Technological advances which have provided weightlessness and permitted man to free himself from the solid earth have opened a vast field of human knowledge where, as yet, we are only scratching on the surface. They have also produced major qualitative changes of social and political significance. I suggest that the practical benefits are not realized in full measure unless the applications are undertaken side by side with the serious pursuit of activities which go beyond installing black boxes. They need the investment and commitment of nationals of the country in related fundamental and applied sciences and innovative tasks. Moreover, in realizing these benefits, the most difficult problems are neither technological nor economic, but related to human and social factors.

We should note that the peaceful uses of outer space, as for example in the field of telecommunications or meteorology, involve developments along advancing frontiers of science and technology. They produce rapid obsolescence not only of hardware, but established systems of organization, of administrators and technicians responsible for providing national services. The full benefits of outer space can be realized only when nationally and internationally an appropriate culture can be created. I recall our own experience in establishing a modest programme for studying equatorial aeronomy with sounding rockets from Thumba. It became quite obvious that we could succeed in executing such a programme only when the necessary social change occurred to permit an interdisciplinary group of specialists and innovators to work competently for a well-defined common objective.

We shall lose perspective in interpreting the social implications of space science and technology if we fail to recognize that those developments form an important part of a wider set of diverging human functions. A characteristic property of such functions is best illustrated by understanding the meaning of a number expressed as a power, for instance, three raised to the power of eighteen, which is about 390 million. In dynamic terms, it illustrates a very interesting feature of divergent functions. If a man were to spread a gossip to three other persons and each of these three would convey it to three others and so on, it would take just eighteen steps for all the people in a nation as large as India to know the spicy story. Note that if each step takes one hour, 90 per cent of the people get to learn the story only during the last two hours, the seventeenth and the eighteenth hours. Indeed during 80 per cent of the time, the process affects only 10 per cent of the population. All things which involve the human element, for example, population, knowledge and innovation, have this characteristic property. Like biological infection, which propagates almost unnoticed through many steps, but makes its onslaught felt all of a sudden, so too the social impact of innovative man has hit society like an avalanche. Scientific advances and technological innovations, along with their social and political implications, have suddenly overtaken the pace of the human life cycle and produced a crisis of obsolescence.

Many political implications arise from the military uses of outer space and surveillance by satellites. National security and sovereignty have been eroded, while privacy has been encroached upon. When security is threatened not by a hostile neighbour but by the actions of distant Powers, what is the relevance of traditional concepts in international relations, such as spheres of influence and

power politics, of bases and alliances? Obsolescence of thinking and patterns of behaviour in international affairs pose today a most serious threat to our survival.

The greatest cost-effectiveness of the uses of outer space occur through large-scale applications rather than those of limited scope. A communication satellite can most effectively serve communities dispersed over large areas. Meteorological applications of satellites are likewise most relevant for a global system like the World Weather Watch. This creates two types of problems, both of which are particularly acute to developing nations and to small advanced nations. In the first place, there is the difficulty of providing on an exclusively national basis either the effective utilization or the resources for deploying the new system. Generally in developing countries, the telecommunications traffic is not large enough to permit effective utilization of a satellite; the national meteorological organization is not equipped to make use of world-wide data for improved forecasting or to contemplate projects for weather modification. Under these circumstances, the benefits of the uses of outer space truly accrue only through international co-operation based on interdependence. Indeed, the situation here brings out dramatically a feature which is not peculiar to outer space but to many other fields of technological development; of monolithic technological systems created to serve social groups with diverse cultures, history and political objectives.

Space research shares with the growth of electronics and of atomic energy the characteristic that its progress has depended very crucially on the interplay of fundamental sciences with technology. Just as solid state physics has contributed to electronics and nuclear physics to reactor technology, several fundamental sciences have contributed to space research. This has the important consequence of providing to the practical applications an in-built culture of international science - propagating beyond national frontiers, permitting two-way communications not constricted by commercial considerations or even subject to effective containment on national considerations.

This Conference is to lay special emphasis on the benefits which can be derived by developing countries from participation in the peaceful uses of outer space. The primary concern of such nations must presumably be social and economic development, and indeed during the last twenty years, we have seen an increasing realization, at least intellectually, of the grave threat that exists to the security of the world through wide disparities in the standards of living in different regions. But a relevant question to ask in this context is why, in spite of much that has been attempted bilaterally, regionally and through international agencies, the gap between the advanced and the developing nations has widened rather than decreased? In examining the question from a different angle, I have asked myself why India is one of the most expensive poor countries? I could observe two important factors. First, that since developing nations by definition start from a low economic base, their incremental growth, large as it might be when expressed in percentages, is intrinsically small compared to the incremental annual growth even of much smaller economically advanced nations. Thus, a developing nation following a step-by-step approach towards progress is landed with units of small size which do not permit the economic deployment of new technologies. Through undertaking ventures uneconomical in size with obsolete technologies, the race with advanced nations is lost before it is started. Indeed, if one continues to operate on this philosophy, financial and technical assistance from the advanced nations to the developing nations can only result in the frustration of the former and the increasing economic dependence of the latter.

A positive approach out of this predicament seems to lie in finding solutions where the particular disadvantage of developing nations, that they have little to build on, is made an asset rather than a liability. I suggest that it is necessary for them to develop competence in advanced technologies and to deploy them for the solution of their own particular problems, not for prestige, but based on sound technical and economic evaluation involving commitment of real resources. They would most likely discover that the traditional approach of planning to provide things like electric power or telecommunication services for a national infra-structure, based on projections of growth from past experience, leads to a dead end. They will also discover that an alternative approach lies in creating consumption centres alongside facilities for supply; that, as in the case of large nuclear power stations serving agro-industrial complexes, synchronous satellites could be planned in the context of a programme to be simultaneously undertaken for direct broadcast television to the entire countryside. Indeed, they would discover that there is a totality about the process of development which involves not only advanced technology and hardware, but imaginative planning of supply and consumption centres, of social organization and management, to leap-frog from a state of backwardness and poverty.

Developing nations which have a large area and big population, such as India, have the possibility of effectively utilizing space communications systems for national needs. Compared to advanced nations, such as the United States of America, Canada and the USSR, they have indeed an advantage through not having an existing major investment in older technologies. For them the principal problem is of mobilizing resources and of developing them adequately. The most important input I regard in this exercise is, of course, the human element of trained engineers, scientists and managers, of people who understand not only the technological, but the social implications of the system which they wish to deploy. Developing nations differ widely in regard to existing human resources of the requisite type needed to partake in the peaceful uses of outer space. In India, for instance, when independence was achieved, there were in the country tens of thousands of engineers and scientists and several thousands abroad. The capability of such a country where scientific investigations dealing with meteorology, geomagnetism and astronomy have been conducted for more than 100 years and a sophisticated culture and tradition for learning exist, is quite different from that of developing countries with a much weaker professional base. True, the number of professional scientists and engineers in countries such as India, expressed as a percentage of population, is small; but in absolute terms, they compare well with the numbers that are found in nations such as the Federal Republic of Germany, Italy or Japan. Moreover, since advanced technologies require skilled personnel in large measure, the situation is not different for advanced and developing countries. Under these circumstances, surely, the developing countries with a professional base have an economic edge in a straight competitive situation.

At the moment, in India we are deeply interested and involved in an evaluation of the benefits that a synchronous satellite can provide for national needs of point-to-point communications, for mass communications through direct broadcast television to promote national integration as well as the economic development of isolated communities, for meteorological observations covering the vast Indian ocean and for assisting navigation. Just for one application, namely, the provision of broad-band communications for reaching, through television, half a million villages of India, it can be shown that, using satellites, the investment would be only about a third of what would be required with conventional technologies. Where capital

funds and foreign exchange are crucial bottlenecks, the deployment of a satellite communication system based on a largely indigenous effort in electronics can make all the difference in a national decision for adopting the most effective and persuasive means as yet available for mass communications. Indeed, it is estimated that, with an annual investment equivalent to about 40 million dollars, one can provide community television to all the 560,000 villages in India over a five-year period. This would, incidentally, generate a strong industrial base in electronics providing employment for about 120,000 qualified scientists, engineers, technicians, managers and other administrative personnel. But before such programmes can be undertaken, there are formidable problems, which perhaps many developing countries would encounter.

First, we often meet with lack of self-confidence to pursue major tasks involving complex and unfamiliar technologies. There is also an in-built culture within which a major departure from existing well proven systems and anything which is innovative in character is automatically regarded with suspicion. The administrative structure of Governments in many nations is dominated at the top not by technocrats, but by professional administrators, lawyers or soldiers, who are hardly likely to provide the insight, experience and the first-hand knowledge of science and technology, which are necessary at the decision-making level. Moreover, advanced nations often play a negative role in their interaction with the developing countries. There is seduction by their political and commercial salesmen who dangle new gimmicks which they suggest should be imported. Instead, indigenous capability should be developed and supported. There are those who preach as guardians of the economic well-being of the developing nations that they must proceed step-by-step following the same process by which the nations themselves progressed. One is often told that something is too sophisticated to be applied. This approach disregards what should perhaps be obvious, that when a problem is great, one requires the most effective means available to deal with it.

One of the hardest questions to be faced in adopting a synchronous satellite for national needs arises from the fact that many interested countries would not expect in the near future to have an independent capability for placing such a satellite in orbit. The nations advanced in space research have done much to extend the benefits of the peaceful uses of outer space to all countries, and one can reasonably count on their continued support. But the political implications of a national system dependent on foreign agencies for launching a satellite are complex. They are not negative in the present-day world only in the context of the coming together of the national interest of the launcher and the user nations. As long as there is no effective mutuality or interdependence between the two, many nations left only with the ground segment would probably feel the need for some measure of redundant capability under complete national jurisdiction. There is great scope today for the exploration of this structure of possible international systems which could provide credibility in increasing measure that the space segment could be relied upon even in the context of political and ideological differences among nations.

Perhaps collaborative participation of nations in the construction and operation of a launching system for the peaceful uses of outer space would be realized in the long run. The military overtones of a launcher development programme of course complicate the free transmittal of "know-how" of technology involved in these applications. But it is important to note a fundamental aspect of human development, that knowledge cannot for long be contained within artificial

boundaries and one has to learn to share and to control this knowledge rather than to control harmful effects through withholding the transfer of technology or knowledge. After all, the biggest secret regarding the atom bomb was let out when, through the demonstration of the explosion over Hiroshima, it became known to everybody that the device worked. Similarly, the biggest secret in space research became public property when the successful orbiting of the first Soviet satellite proved that this feat was possible. Thereafter, it is merely a question of time. Restrictions on the transfer of technologies which are involved in the peaceful uses of outer space merely jeopardize the security of the world through retarding the progress of nations.

A physicist is trained to accept that what is not possible in theory is not realizable in practice. This elementary experience can well be applied in planning international systems for promoting the peaceful uses of outer space, as indeed also for peaceful nuclear explosions. Those systems that do not provide full participation by all nations in all aspects of technology in which they are competent to partake, are, in my humble opinion, not salable, much less sustainable in the long run. Attempts to promote them merely poison international relations and the climate of co-operation. I hope that fresh thinking on this subject will be generated at this Conference. Unlike atomic energy, for which there is a specialized agency of the United Nations whose headquarters are in this city, there is for outer space in New York a separate division in the United Nations Secretariat and there is also the Committee on the Peaceful Uses of Outer Space. The resources at the disposal of the Outer Space Affairs Division are totally inadequate for it to perform an active role. I would earnestly urge that serious consideration be given to redefining its responsibilities and role providing appropriate back-up to stimulate on a continuing basis the understanding and the utilization by all nations of the uses of outer space. There is much scope for opening the doors to permit access to all of the advances in space technology. If this Conference is to the peaceful uses of outer space what the first Atoms for Peace Conference was to atomic energy, the high expectations with which we are assembled here today would be fully realized.

VIII. REPORTS ON THE INTRODUCTORY AND THEMATIC SESSIONS OF THE CONFERENCE

A. Report on papers presented at the introductory session

"Review of the results of space research during the ten years of the space age. Basic scientific results in the physical exploration of the upper atmosphere and outer space, manned space flight, lunar and planetary research, with particular emphasis on their practical meaning".

Submitted by Dr. Vikram Sarabhai, Vice-President
and Scientific Chairman of the Conference

The papers presented at the introductory session covered a broad spectrum of topics; they paved the way most effectively for the thematic sessions which were to follow, during which specific subjects were to be dealt with in greater depth and detail.

Three broad aspects of space research programmes were discussed:

(a) Advances in scientific knowledge resulting from the past decade of space exploration;

(b) Practical terrestrial benefits accruing from such exploration;

(c) National space programmes.

On the subject of scientific advances, a number of papers provided an interesting and welcome reassessment of the value of the work achieved in this field and the unique opportunities provided by space tools in helping man to increase his knowledge of his environment on the planetary and interplanetary scale, including such important questions as solar-terrestrial relationships, the origin of the solar system and the crucial question of the existence of extra-terrestrial life.

The importance of the basic research conducted in the course of space programmes often tends to be overshadowed by the more tangible practical benefits. It was most appropriate therefore that a number of speakers should stress the extent to which these benefits themselves rested on scientific knowledge and supporting technology developed in the course of scientific space research programmes. They highlighted one of the outstanding features of such research, namely, the opportunities it provides for interdisciplinary effort in which all branches of science are brought together and intimately involved with the engineering sciences.

As regards the practical applications resulting from the conquest of space, the benefits already available in the fields of meteorology and long-range communications were graphically described and future prospects clearly presented.

Reference was made to programmes of space application currently under development and to some of the exciting possibilities which are being opened up in such fields as satellite communications (development of small terminal multiple access systems, direct reception of broadcast transmissions from a satellite...), earth surveys (detection of crop disease, discovery of natural resources...), weather modification, navigation, cartography, gecdesy, collection of data from remote and/or mobile sensors etc.

As these programmes develop, it will clearly be of the utmost importance to give serious and timely consideration to the international implications and to the setting up of suitable organizational arrangements, possibly through the United Nations or specialized agencies, to ensure that the interests of all nations are safeguarded and that they can obtain maximum benefits from such programmes irrespective of political, ideological or economic differences.

Interesting reviews of the manned space flight programmes undertaken by the Soviet Union and the United States were presented. The speed with which the major hurdles, thought at one time to be insuperable, have been successfully passed is truly amazing and makes one realize the tremendous rate of progress achieved in the space field where, in the short space of ten years, we have passed from the putting into orbit of the first satellite to the manned flights involving up to three astronauts, with successful demonstration of extra-vehicular activity.

In this field too, immediate practical benefits have accrued in the fields of medicine and bio-technology through the application of sensors and techniques developed in connexion with these missions.

The reviews of national space programmes, which were presented at the third meeting of this session, were most timely, since the programmes which were described have now been operating for a sufficient number of years to permit certain lessons to be learnt from their achievements. The reports clearly brought out the necessity and value of soundly based international co-operation, whether bilateral or multilateral, and the need to ensure that such projects duly catered to the legitimate aspirations of the partners involved.

Another aspect of international co-operation in the field of space research was described by the President of Committee on Space Research of the International Council of Scientific Unions in the concluding paper of the session, in which he reviewed the work accomplished by this interdisciplinary scientific organization in fostering co-operative scientific space research projects and making available manuals which, by providing authoritative information on certain specific fields of space research, could prove useful to developing countries.

To sum up, the papers presented at this session provided ample evidence of the challenge and opportunities offered by the peaceful exploration of space and of the manner in which imaginative, timely and economically sound application of existing and future technologies and organizational arrangements, developed through space programmes, could profoundly influence the social and economic advancement of mankind.

B. Report on the papers presented at thematic session I (communications)

"Scientific, technical and economic aspects of radio and telephone communications and television using space satellites. Historical review. Possibilities and advantages of using space communications, including mass communications, for development, education and cultural purpose, taking into account the interest of the developing countries".

Submitted by Mr. T.A. Housley, Vice-Chairman of the session

In the unavoidable absence of the Chairman of thematic session I, Mr. Eric Esping, I present this summary of the work of the session. This has been discussed and agreed with Mr. Esping.

Thematic session I (communications) was characterized by the high standard of the papers presented and the interest they generated. The work done in the selection of authors and papers was amply justified.

In arranging the programme for the sessions, those papers dealing with direct or classical telecommunications aspects of the use of space were grouped and covered in the first session. This was followed by papers with more emphasis on the application issue - television, radio and the important feature of television via space for educational purposes. This was followed by a group of papers with emphasis on technical and operational detail.

Finally, in the thematic area were specialized papers of high erudition in the learned society category, but all on the forward side of design and thought. The formal thematic sessions were "built out", as it were, by four evening lectures and two group discussion sessions.

It became clear that - to use a pun - satellite communications were off the ground. This was exemplified, but not by any means exhausted, by the practical workaday systems already in use, such as INTELSAT and ORBITA.

It was also seen that research and development were in vigorous, almost virulent growth. We see that larger, better and cheaper per unit systems were progressively in the building, planning and research stages. This demonstrated that the cost/product relation was coming down encouragingly and service was quickly becoming practical in places and in service types not now available.

The veil was lifted on the further future, which is quite close by normal standards, of even more exciting things, such as the nuclear power thermionic reactor and electric propulsion satellites, which promise greatly increased powers of radio emissions and simplicity of service at acceptable cost.

We also saw some of the problems before us. One that stands out is in the area of education television. Here we saw, quite suddenly, that we have almost the technology to make moves in areas of television and radio coverage which were only dreamt of previously. But we also saw warnings that, with good intent, but with perhaps more enthusiasm than justification, we may be tempted to move in ways and in places that may be predisposed for failure.

It was seen clearly that a beginning should be made with need and not technology. But we should not be mesmerized by the new found tools of the use of space. The social and pedagogic issues in the area of education and the spread of information should be studied closely. We cannot but be encouraged by what is opening up, but we must recognize there is more to be done in the application area.

Another warning that came clearly was that space communications represented another consumer of a scarce and irreplaceable natural asset - the frequency spectrum. It was encouraging to hear the Secretary-General of ITU, which is the responsible United Nations organ in this area, assure us that this was fully appreciated and ITU has initiated action to hold a world-wide conference to consider and adapt the current radio regulations to meet radio communication needs including those of space. Encouragingly, also, it was clear in the presentations of the speakers that there was generally a responsible appreciation of the frequency field.

In conclusion, Mr. President, the thematic session on communications was fruitful in its area. It can be said in sincerity that the Conference was timely and its outcome worth-while. We are wiser now in our professional disciplines and, I believe, in our appreciation of the views, needs and hopes of others.

C. Report on papers presented at thematic session II (meteorology)

"Meteorological satellites and sounding rockets. Historical review. Development of experimental and operational systems and services including weather forecasting and weather research. Current and future research. Economic and social advantages of global and regional systems, taking into account the special geographical situation of developing countries".

Submitted by Mr. J.S. Sawyer, Chairman of the session

The papers presented to this conference have described systems for observing the atmosphere from satellites and rockets. Some of these systems are already in regular daily use serving the needs of meteorologists throughout the world; others are experimental and some are as yet only proposals in course of development.

Discussion has largely concerned the practical use of the systems, both operational and proposed, and the benefits which can arise from them, both at the present time and in the future.

The meteorological satellites now operating on a regular and continuing basis are those which have been developed and placed in orbit by the scientists and technologists of the United States and the Soviet Union. They are a magnificent technological achievement.

It has been shown convincingly that the pictures of cloud distribution provided by them are of immediate value in forecasting short-period weather changes, in locating strong air currents (jet streams) and in providing warnings of approaching storms, such as hurricanes and typhoons.

The automatic picture transmission facility provides direct transmission of pictures of cloud distribution from the satellite to relatively simple ground stations. This facility has been provided on the more recent satellites launched by the United States. The availability of APT has been received with enthusiasm by the representatives of nations participating in the conference and particularly by the representatives of smaller nations which have been able to install receiving equipment at a modest cost, and thereby have regular access to data of immediate value for weather forecasting. The direct benefit to forecasting was demonstrated by papers from nations in such diverse areas as the Middle East, Europe and Australia. The value of APT pictures in stimulating interest in meteorology and its application in developing countries was also stressed.

Of the experimental systems considered at the conference, the benefits of a continuous series of frequent cloud pictures from geostationary satellites was apparent, and also the potentialities of the French experiment, EOLE, for measuring winds by a system of a satellite and balloons operating together.

Many nations are co-operating in the exploration of the atmosphere above thirty km by means of rockets and it was demonstrated that the structure of the atmosphere above thirty km is highly variable. Knowledge of this region is of much scientific interest, but is also of practical importance for the design of future aircraft, for the re-entry of space vehicles and for understanding some aspects of radio propagation, as well as mesosphere-stratosphere interactions.

There is a need for continued co-operative studies by a world-wide rocket network in order to improve the understanding of the high atmosphere, although it remains to be determined to what extent it will be necessary to maintain indefinitely a surveillance of these levels by rockets for the purpose of weather forecasting. However, the present world-wide co-operation in rocket sounding provides a valuable basis on which to build a more comprehensive network for further scientific studies of the high atmosphere.

It was demonstrated at the conference that the satellite measurements of out-going heat and light from the earth provide data which are fundamental to our understanding of the behaviour of the atmosphere and to the forecasting of its longer-term changes. Refinements of these and other satellite measuring systems promise to give the world-wide coverage of observations of the atmosphere which will be necessary for any soundly-based system of preparing weather forecasts for more than a few days ahead. Indeed, satellite observations are probably the only economic way of achieving the necessary world-wide observations.

Although the ultimate performance of such satellite observing systems cannot be foreseen, their practicability appears, from the papers presented, to be in little doubt. Nevertheless, their application to extended period weather forecasting has yet to be established. On the basis of recent advances in the understanding of atmospheric behaviour, there is undoubtedly much optimism among meteorologists that it will be possible to achieve weather forecasts of great economic value for periods of two weeks or more ahead. However, the evidence on this aspect was not presented to the conference, and the potential achievements in regard to long-range weather forecasting have yet to be demonstrated.

To ensure the maximum benefit to the world from meteorological satellite systems, extensive international collaboration and co-ordination will be required. The World Meteorological Organization is developing valuable plans for the early exploitation of satellite observations within its system of World Weather Watch. In support of this, the necessary scientific understanding to support future developments will be provided by the Global Atmospheric Research Programme (GARP) jointly organized by the International Council of Scientific Unions (ICSU) and WMO.

There was wide recognition among participants at the conference of the value of meteorological observations from space, and of the substantial economic benefits likely to be derived from them when they are applied to weather forecasting. This emphasizes the importance of the plans which are being developed by WMO (including the joint programme with ICSU), and also the desirability that these plans should be actively supported by the United Nations, its Members and agencies.

D. Report on papers presented at thematic session III (navigation)

"Use of satellites for navigation and related services. Scientific and technical problems in development of space navigation systems. Economic evaluation. Studies of possible types of navigation systems".

Submitted by Dr. K. Morita, Chairman of the session

We all travelled to Vienna to attend this Conference by way of some means of transportation, whether by air or surface transport. As we all know, these traffic facilities require certain kinds of navigation aids.

Thematic session III treated problems about the application of space technology to safe and economic navigation of aircraft and surface vessels.

Eleven papers were accepted for thematic sessions III and III A. In those papers we have dealt with the following three fields:

(a) The review of the development of applications of space technology to navigation;

(b) System requirements and economic analysis of satellite navigation and related proposals on appropriate systems; and

(c) Theoretical approaches to satellite navigation.

In the first field, Mr. Kershner's paper gave the account on the present state of the "transit" navigation satellite system, the only existing one, while the others are still at projection stage; he investigated theoretically by trials and by simulation. The "transit" system is useful for oceanographic and surveying works and gives high accuracy. It uses four satellites at a height of 1,000 Km, and it is good for maritime purposes. Originally it was developed for military purposes and is now free for civil use: three industrial companies are fabricating receivers and computers needed for that system.

In the second field, several papers were presented. Mr. Keats touched on some marine uses of navigation satellites and analysed some economic effects of the satellite system. Also he treated the problems of collision avoidance and the capability of marine traffic control. In the discussion, the representative of IMCO commented that, unlike air traffic control, marine traffic control would not be conceivable.

The paper, written by Mr. Ehrlich and presented by Mr. Jaffe, gave general considerations for air and marine navigation, regarding especially the comparison with other terrestrial radio aids. They also discussed some possibilities of combining satellites with other aids. They further treated the communication problem. Besides the possibility of fixing the position by means of satellites, the satellites offer communication facilities for regions where such facilities have not yet been in existence. They also pointed out the importance of the antenna problems for aircraft, which are now under active study by the Application Technology Satellites.

Mr. Villiers and Mr. Manuali of France discussed the problems of separation standards for air traffic control in the North Atlantic region, and they proposed a system which uses two geostationary satellites and is capable of locating aircraft positions by means of range-and-range measurement from these satellites.

Mr. Braybrook of the United Kingdom presented the paper on navigation aids for aircraft and SST using satellites and/or three ocean platforms in the North Atlantic region. He also mentioned the economic implications of his systems.

Mr. Juo-wen of the Republic of China proposed some interesting techniques for the use of satellites for navigation, using synchronization techniques of pulse generators.

Two Japanese papers, presented by Mr. Iizuka and Mr. Kimura, pointed out that, in the Pacific region, there exist extended areas where no radio navigation aids can be available. However, there are many vessels, and especially Japanese fishing boats, needing a sophisticated navigation system. The requirements for satellite navigation systems in this region may be fulfilled by different types of systems. Among various projects considered by them, systems using geostationary satellites were favourably commented on by the Japanese speakers.

The ICAO paper presented by Mr. Bellringer outlined the Organization's activity in applications of space techniques relating to aviation. According to this report, air navigation technology made steady progress, so that position fixing by satellites will become increasingly applicable for air navigation. One of the most urgent problems, however, is that of communication between ground and aircraft over oceans that is to be made possible by satellites.

The Inter-Governmental Maritime Consultative Organization (IMCO) did not present any paper, but offered a number of comments from the floor. Also it distributed the document entitled "A satellite system for maritime services".

In the third field, two specialized papers were presented by Mr. Makishima of Japan and Mrs. Kalitzin from Bulgaria. The Japanese paper reported on some mathematical investigations concerning the accuracy of altitude and azimuth

measuring of satellites for position fixing. The paper would be judged as a good complement for the methods of measuring range as well as range rate. The Bulgarian paper was a pure mathematical one. Celestial mechanics is the basis of all the uses of artificial satellites, so the contribution, namely, the paper dealing with a new method of solving the equations of celestial mechanics, was important too.

Through the presentations of these papers and discussions, I felt it essential that a number of countries, as well as international organizations concerned, should devote more effort to the development of satellite systems for the expanded application of space technology to air and sea navigation.

In conclusion, I wish to express my sincere gratitude to those speakers who so generously contributed to the fruitful discussion, as well as to those who offered interesting comments from the floor. And I also thank all the distinguished delegates and observers for their constant attention and co-operation.

E. Report on papers presented at thematic session IV (other space techniques of practical benefit)

"Data-collecting systems. Geodetic applications. Earth resources and surveys".

Submitted by Professor Vladimir Guth, Vice-Chairman of the session

Thematic session IV under the title "Other space techniques of practical benefit" covered satellite uses other than communication, meteorology, and navigation, which were the themes of other sessions. The two techniques that received the most attention in thematic session IV were associated with geodesy and remote sensing.

The first of the three meetings on theme IV was devoted to the highly specialized subject of geodetic satellites. Eight papers were presented describing geodetic investigations, both theoretical and experimental. A satellite can be seen from vantage points widely separated on the earth surface. If the orbit of the satellite were precisely known, the position of an observatory at one of the points could be determined by angular and linear measurements made with respect to the satellite. However, satellite orbits vary sufficiently owing to atmosphere drag and perturbations in the earth's gravitational field so that this procedure, although satisfactory for navigation, is not precise enought for geodesy.

A variety of methods were discussed for improving accuracy, including the use of passive and active satellites. Large satellites, such as Pageos, permit optical tracking, while active satellites, such as Geos I and II, permit both optical and electronic tracking. Future use of lasers should still further improve distance measurement to the satellite.

In addition to the necessity for processing measurements of satellite position against a stellar background from a network of earth stations, extensive data processing is required to establish a world datum for cartography and variations in the gravity field for the determination of the local vertical.

Broad participation by States Members of the United Nations can enhance the value of the total effort and will provide to each participant data important to regional map-making.

Eleven papers were presented in the remaining two meetings on theme IV. These papers were devoted primarily to remote sensing of earth resources in the field of cartography, geography, oceanography, hydrology, agriculture, forestry and geology.

Satellites for communication, meteorology, navigation and geodesy are in use today, but earth resources satellites are still in the planning stage. Some earth resources data have already been obtained from Tiros and Nimbus satellites, and coloured photographs taken by Gemini astronauts with hand-held cameras have stimulated considerable interest in all earth resource disciplines. However, much experimental work will be required to determine the spectral regions best suited to the various needs.

Satellites provide much greater coverage than aircraft and consequently supply enormous amounts of data. In order to minimize data processing, experiments are being conducted to determine spectral signature for individual resources. For example, early results indicate the possibility of automatically mapping wheat, but screening out other crops, such as oats and barley. Present research involves the use of aircraft carrying sensors operating in the ultra-violet, visual, infra-red and microwave regions.

It is recognized that future operational systems will probably use both aircraft and satellites, but decisions regarding their respective use cannot be made until further experimental results are obtained and technical requirements are better defined.

The critical nature of the earth resources, particularly food and water, is of course generally recognized and was stressed in several papers in this session. Although some countries are faced with serious shortage today, the projected increase in population everywhere will lead to world-wide shortage unless action is taken immediately.

It is felt that measurements from space will permit better understanding and hence control of the world's ecology. This is a matter of such consequence affecting so many people that it must involve the attention of all States Members of the United Nations.

F. Report on papers presented at thematic session V (biology and medicine)

"Medical and biological problems in the study of outer space and the application of their solutions on earth. Use of the attainments of space biology and medicine in the interests of public health, industry and agriculture".

Submitted by Dr. O.G. Gazenko (on behalf of Academician V.V. Parin, Chairman of the session)

At the session on biology and medicine ten reports submitted by five countries were read and discussed, while full texts of reports submitted by UNESCO and WHO were distributed.

The over-all results of the session are summarized in the following paragraphs:

The data submitted to the session and its discussion confirmed that biology and medicine play a leading role in cosmic research, particularly in connexion with manned cosmic flights.

It was also pointed out that the results of cosmic research and of the general development of cosmic science produced a considerable influence on the progress of biology and medicine as disciplinary sciences as well as on their general practical aspects. This general conclusion stems from several reports but was outlined more specifically in the reports of WHO (Professor V. Violete), Academician V. Parin, Dr. H. Brown and Dr. G. Pichler.

Examples were cited of concrete utilization of the achievements of cosmic biology and medicine in various fields of clinical medicine, more particularly in the evaluation of the cardiac activity rate, originally developed for the purposes of cosmonaut health control (Dr. D. Denison, Academician V. Parin, Prof. O. Gazenko and others). The possibility of using the achievements of space biology and medicine for various needs on earth was stressed in a number of other reports devoted to the problems of creating closed ecological systems (Dr. B. Adamovich), to cosmic microbiology (UNESCO), to radio-biology (Dr. P. Velinov) and others.

Further progress on numerous current problems in the field of cosmic biology is possible in laboratories located on the earth and is consequently available to all countries of the world. The results of such research are not only important for future cosmic flights, but will assist over-all scientific progress, an improvement in technical qualifications and, further, could be used in everyday health practice.

Such work could well include the further improvement in methods of medical control of human health and in various types of medical measuring and research equipment, further work on certain biotechnological problems, research in the domain of limitation of activity, and physiology of the vestibular apparatus.

It would appear desirable for WHO and UNESCO to prepare a list of subjects that could be recommended for further study in earth-based laboratories so that the results become available not only for cosmic flights, but also for various needs on earth.

The reports submitted to the session would not exhaust all the possible fields of application of research in cosmic biology and medicine from the point of view of the interests of the developing countries and the world in general. The need has become clear for a special organization to distribute a flow of information in order to strengthen the links between those who have worked out a new method and those who may be called upon to use it. Mr. J. Hartwig's report stressed the acute need for training specialists capable of implementing wide interdisciplinary contacts within the over-all process of application in practice of all the achievements of cosmic biology and medicine.

Cosmonaut A. Leonov (USSR) participated in the work of the session and submitted a report on "Spatial perception in outer space". He also read a report by Yuri Gagarin entitled "Professional activity of the cosmonaut". Col. Gagarin's report was submitted to the general session as an expression of respect for the author and his achievements as the first man to carry out a cosmic flight.

G. Report on papers presented at thematic session VI (Non-space applications of space technology)

"Spin-off to industrial technology of know-how acquired in space research activities. Current progress and prospects."

Submitted by Mr. V. Gencic, Chairman of the session

In thematic session VI, "Non-space applications of space technology", sixteen papers were presented by scientists from Canada, France, the Federal Republic of Germany, India, Italy, Japan, the United States of America, the Union of Soviet Socialist Republics and Yugoslavia.

It is regrettable that the participants have not had the opportunity to hear two more papers announced previously, but withdrawn later.

The topics discussed in the presented papers can be thematically classified in three general groups.

The first one includes the specific non-space applications of space technology:

(a) The industrial application of new types of materials developed from research of cosmic devices,

(b) The stimulating effect of hypersonic experimental techniques on technical and scientific developments especially on degasing of steel, welding, electroforming and geological applications;

(c) The solution of dynamic problems in shipbuilding, civil and industrial engineering; and

(d) The construction of blurred images by space frequencies filtering which could be used in ordinary photography.

The second group deals with the papers referring to non-space applications of space technology in general: The problem of technology transfer as exemplified by NASA's Utilization Programmes is dealt with from three different aspects: (a) the government role, (b) the university role, and (c) the industrial role, explaining to what extent technology developed in space programmes has been communicated to industry.

Another paper contributed a review of direct, indirect, short-term and long-term benefits of space activities.

The other papers examined the contributions of the space research to economic and social progress with particular reference to countries of average economic

stature and the number of factors on which technological advance depends and the benefits to industry through participation in space activities.

Finally there was a discussion of the benefits that European industrial firms have derived from involvement in space programmes.

The third group suggested in three papers the possibilities for the application of industrial technology in space research to the developing countries stating:

(a) That valid advancement of the social-economic-political environment of developing countries can only be achieved through imaginative application of modern management techniques evolved for complex space programmes;

(b) The management techniques, materials research and quality control developed for the space programme may have direct application in helping to achieve the industrialization of the developing countries as efficiently and economically as possible, and that there is a real need for the United Nations body to promote the transfer of technology to the developing countries;

(c) As an indication of what a developing country might gain from a specific space project, India outlined the technological, managerial and industrial stimulus his country expects to derive by undertaking a satellite TV system, at present in the pilot project stage.

It can be concluded from the papers presented and the discussion during this session that:

(a) Space research has had and has a strong influence on methods and techniques used by modern industry;

(b) Space research has great relevance for industrial development in developing countries;

(c) We need to develop methods to transfer technology to developing countries in international co-operation.

H. Report on papers presented at thematic session VII (Education and training)

"Use of the results of space research and applications in general and specialized education. Programmes and opportunities for education and training. Role of international organizations in this field."

Submitted by Professor M. Bernard, Chairman of the session

Fourteen papers were presented at the seventh session; two by international agencies, and the others by the following countries: Bulgaria, Canada, France, India, Pakistan, Poland, the USSR and the United States of America.

The main ideas set out in these papers can be summed up as follows:

Vocational training of the required personnel

Universities in the countries engaged in space research have been closely associated with national activity, both by carrying out some of the research themselves and by organizing training for space research workers and technicians engaged in the construction of spacecraft. In some cases such instruction is included in a conventional curriculum, but some universities have even organized a "department of space science" to show the importance of the work they are undertaking.

Research and teaching at the higher levels are closely associated; they are organized simultaneously and require the existence of a corps of trained men.

This means that it should be possible for countries which have not yet begun space activity to send some of their citizens to acquire training in the universities of countries which are already engaged in this great adventure of modern times. For this preliminary operation, the following conditions must be met:

(a) The required instruction must exist (which is generally the case);

(b) The fact that instruction exists must be known. Several participants have expressed the view that providing information regarding the existence of such instruction should be one of the functions of an international agency;

(c) It must be possible for trainees to avail themselves of the instruction. This means that the country organizing the instruction must agree to accept foreign students (and this appears to be generally the case), but it also means that the financial problems have to be solved; hence, another function of an international agency will no doubt be to make appropriate financial arrangements to provide funds for periods of training in countries actively engaged in space activity;

(d) Full use must be made of the capacities of the trained students on their return to their countries which will require rational planning with regard to the number of specialists trained and the funds made available for research work in this field in which they can engage.

Educational programmes are affected by the development of space exploration

The development of space sciences and technology inevitably entails a major change in teaching programmes and methods, both at the secondary and university levels, the basic nature of which is reflected in the term "portmanteau discipline", in which a programme of education can be entirely reorganized around the general idea of space and most of the sciences, previously taught as separate subjects, can be integrated in a coherent whole.

Steps have been taken in a number of countries to set up new integrated programmes of scientific instruction organized around the idea of space. These revolutionary programmes attract young people, who in some countries have tended to abandon these sciences for the social sciences.

It would seem that, in this field, every nation, whether engaged in space exploration or not, could itself consider what changes it wishes to make in its educational system to take account of the upheaval resulting from space exploration. But here, too, time and money can be saved by an adequate exchange of information to develop ideas and avoid duplication. This function, which is performed in a certain measure by this Conference, where interesting papers have described some of the work accomplished with regard to teaching material, could be developed by an international agency, which could:

(a) Inform the member States of the projects carried out by any of the member States;

(b) Organize a system of exchange or at least loan of equipment, and, in that connexion, resolve some of the innumerable administrative and financial problems still involved in the removal of equipment from country to country.

Space techniques in the service of education

Education is a complex process, which consists partly of transmitting knowledge from master to pupil and partly in transmitting the "demand for knowledge" from pupil to master. It would be a gross mistake to reduce education to the first component, for the feedback from pupil to master is indispensable. It would be a further mistake to reduce education to these two components, for education is in fact a continuing adaptation of master to pupil and pupil to master and they must be able to communicate with each other.

Continuing education, in all countries, and mass education in the developing countries emerge as systems in which master and pupil are necessarily remote from one another because the class is scattered. It is therefore perfectly justifiable to think that modern methods of telecommunication by stationary satellites may be effective for meeting this part of the educator's requirements - the "transmission of information".

Session VII was devoted partly to this problem, which had been referred to repeatedly in session I, in a group discussion and an evening lecture. The problem was taken up again during the group discussion on the socio-pedagogic problems raised by the use of satellites in education.

It will clearly be some years before technical progress permits the practical realization of direct television from satellites. The numerous problems raised by such a system will obviously mean bringing in the international organizations. However, we shall lose time if we wait for this to happen before examining the problem of satellites in education.

Countries could even now make progress by attempting to solve the problem from their particular point of view, and they should consider the problem of the education of a scattered mass of people in which the transfer of knowledge is effected by television. Few experiments have as yet been made and have been on such a small scale that no conclusion can be reached. If nothing is done, the technology involved will run the risk of establishing a partly useless, or, even worse, harmful system, if it is used too hastily without previous study.

All nations must be aware of the revolutionary changes which the development of space technology is liable to bring about in educational techniques. They must be prepared to face up to them, and here, too, an international body might well assume the task of disseminating information and facilitating the exchange of documents and experts.

I. Report on papers presented at thematic session VIII

"International co-operation and opportunities for participation in space research and application: Programmes, results and opportunities. The role of international organizations concerned with the problems of outer space."

Submitted by Dr. R.S. Rettie, Chairman of the session

Since thematic session VIII finished only yesterday, this report is my own responsibility as there has been no time for collaboration with my distinguished Vice-Chairman, Ing. Teofile Tabanera of Argentina. Nevertheless, long association with Señor Tabanera and many recent discussions between us have resulted in his ideas strongly influencing mine, and perhaps he will be satisfied to be presented in that way.

I should like to give my impressions of session VIII, to discuss the feelings aroused by those things which I considered are most important. I trust the authors concerned will forgive me for oversights.

We listened to a total of seven papers on the role of international organizations, two of these regional in nature. A study and an understanding of this subject is necessary and valuable, but no positive general conclusion was apparent to me. None of the organizations described, not even the United Nations itself, is a panacea or solution for all problems. I found instead that it is important to design the organization to meet the specific problem and above all to maintain flexibility in organization and rapidity of responsible executive action. Hence, a wide variation in the forms of international organizations will probably continue.

Two papers on the availability of scientific and technical information showed that there is an abundance of material readily accessible thanks to NASA and its 29% interchange agreements in forty-eight countries and its special arrangements with the European Space Research Organization (ESRO). One hears the occasional complaint of lack of information, but my personal experience, and this Conference has confirmed it, is that there is just too much information available. Some predigestion is necessary, particularly for the benefit of the developing countries, which can be so easily swamped by the very amount available. We must think about this problem and seek methods of solving it.

I believe that we were considerably enlightened yesterday on the matter of international scientific co-operation. A representative of a small country told us of their expertise in the analysis of extra-terrestrial material, an expertise

sufficient, I am confident, to ensure that it will have an opportunity to analyse some of the extremely precious moon rocks hopefully to be brought to earth in the not very distant future. Although the Committee which organized the International Year of the Quiet Sun (IQSY) has been disbanded because its job was finished, and its lineal successor, the Inter-Union Committee on Solar Terrestrial Physics is springing phoenix-like from the ashes, the distinguished Chairman of the IQSY Committee told us how the scientists of seventy countries worked together for mutual benefit. A distinguished Russian scientist told us that, in a continuing programme covering only one aspect of the IQSY programme, nineteen nations are still freely and systematically sending optical tracking data on artificial satellites to the Soviet Union for analysis. There is no doubt that international co-operation in basic scientific matters is a very real and worth-while thing and is far easier to arrange than political co-operation.

The major space Powers necessarily conduct operations on a global scale involving international co-operation and we listened to three papers on this subject. From these and other papers we learned that NASA has tracking and telemetry stations in fourteen other countries or territories, all of whom actively participate in the tasks of the various networks, that at least thirteen other countries have taken part in experiments with NASA's Communications Satellites, that the USSR has been co-operating with France and India in sounding rocket experiments for meteorological purposes and is starting co-operative programmes with seven others, that France has tracking stations in three other countries and that ESRO has one in a non-member State. This exhaustive listing is not complete and I have personal knowledge of other similar cases not presented to this Conference in detail.

It was when we turned to co-operative activities in a general sense, restricted only to activities involving space technique, that a truly remarkable picture emerged of opportunities taken and others still to be taken. NASA has had collaborating scientific workers in at least eighty-four countries or territories of other countries, no exact number being available because NASA approval is not needed to receive APT transmissions from NASA satellites or to receive direct transmissions intended for ionospheric measurements. This number of eighty-four is larger than the number of States participating in this Conference. It includes nineteen whose experiments have been carried in NASA sounding rockets, launched in fourteen countries, four whose experiments have been carried in satellites, and four plus ESRO for whom nine satellites have been launched by NASA at no cost. I have given these figures Mr. President, in order that we may be clear about the extent of participation in space research by so many nations of the world.

From other papers, we learned of further significant but numerically less impressive forms of co-operation. Canada has carried experiments in sounding rockets and balloons for five other countries and has enjoyed great assistance from others, notably, the United States of America. ESRO is a co-operative endeavour of ten European nations. Several papers described the parts played and the benefits obtained by individual countries through co-operative projects. The Secretary-General of the United Nations provided a paper on the Thumba Range in India which has been assisted by France, the United States of America and the Union of Soviet Socialist Republics and has been used by these and other countries.

In the face of these wonderful achievements, we also had two papers on the needs of developing countries, this small number reflecting, I think, a high degree of uncertainty and perhaps of reticence on the part of many others. On balance,

it appears that opportunities in space research and in certain applications are indeed readily available to all, but there is a residual problem area. This appears to be one where relatively large investments are needed in order to take advantage of the new technologies and where reliable advice is needed by developing countries. If these deductions from the material provided during session VIII are confirmed by other studies, it is my belief that this is an area in which the United Nations can play an important and constructive role. The question deserves further consideration within the United Nations in the near future.

I have not commented directly on related discussion groups, three in number, because of the length of this report. The length is, I believe, justified in view of the importance of the subject.

J. Report on papers presented at thematic session IX

"Economic, legal and social problems of the exploration and use of outer space relevant to international co-operation and practical benefits"

Submitted by Professor A. Ambrosini, Chairman of the session

Thematic session IX was held the morning of 27 August, immediately preceding the closing session of the Conference.

Owing to lack of time, it was possible to read only the papers whose fundamental points were subsequently underlined by the Chairman, who also thanked the author of each paper. The time available did not permit further detailed discussion or clarification of the individual subjects, which at times were controversial.

Only seven papers were chosen for presentation at session IX (not counting an eighth paper submitted by the Republic of San Marino, which, however, was not read because of the absence of a delegate from that country). In fact, notwithstanding the ambitious programme of the session (social economic and juridical problems), none of the seven papers dealt exclusively with the social and economic implications of space activities.

In order to proceed in an orderly manner, the seven papers were divided into three categories. The first, concerning space application problems and the need of disciplining the possible exploitation of outer space, comprised two papers; three papers comprised the second category, which dealt with incipient international legislation and the future prospects of space legislation; the third category comprised two papers on specific juridical problems.

All the papers were important and their authors were well qualified.

It is opportune to state that practically all the papers pointed out the necessity of providing for two particular requirements:

(a) The requirement that order be established, in the increasing space activities of the various countries, by means of a specialized international organization with the power to control and to regulate, as well as the authority

to concede, to deny or to limit some particular use or the exploitation of outer space, which the 1967 Treaty declares to be the common property of mankind. The papers of Prof. Meyer from the Federal Republic of Germany and of Mr. Ventacassin from France especially insisted on this requirement (the former spoke of the establishment of an International Administrative Authority for the Regulation of Space Activities and the latter spoke of preferring a public international service in outer space). Prof. Suhkov of the USSR referred to the possibility of an outer space rescue service on a national or international basis. The announcement at the Conference that a draft agreement had been formulated by the socialist countries to institute a global telecommunication and television service by means of satellites underscored the above-mentioned requirement.

(b) The importance of establishing a demarcation line between air space, subject to the sovereignty of States, and a demilitarized outer space open to all. The paper of Prof. Meyer with noteworthy reasoning dwelled on this requirement. In this connexion, attention was drawn to the fact that the United Nations General Assembly has assigned to the Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space the task of studying the establishment of such a demarcation line.

While session IX was basically in accord regarding the two requirements, it seemed to be divided regarding the urgency of fulfilling these requirements.

The two subjects mentioned above were discussed before the meeting of session IX in a "group discussion" with inconclusive results.

It seems advisable in order to bring about useful co-operation that, in future conferences, an opportunity be offered for a more detailed discussion of these important legal problems.

IX. HIGHLIGHTS OF PAPERS PRESENTED AT THE CONFERENCE

The following is a summary of the salient features of the papers presented at the thematic sessions of the Conference:

I. Communications

The very nature of the new technique of satellites communication presupposes international co-operation in one form or another. The views expressed by a considerable number of organizations and experts would seem to indicate that the broad objectives of such co-operation might include the following:

(a) To ensure the use of satellite communication in the public interest for peaceful purposes and for better understanding between nations;

(b) To ensure the availability of satellite communication to all States, irrespective of the stage of their social, economic and technical development, on a global and non-discriminatory basis;

(c) To promote organizational and administrative forms providing equitable access to communication satellite systems, with special regard to smaller countries and developing areas;

(d) To provide proper access to global and regional communication satellite systems by the United Nations and the specialized agencies;

(e) To ensure equitable use of the radio frequency spectrum;

(f) To promote harmonious integration of satellite communication facilities into present and planned telecommunication networks;

(g) To promote favourable conditions for institutional or professional agreements enabling mass media to increase the exchange of news, programmes and programme materials;

(h) To encourage the use of satellite communication by different users, with special regard to the development of broadcasting and the flow of educational, scientific and informational materials;

These subjects are of broad concern to many organizations.

The International Telecommunication Union (ITU) in particular has the authority and competence to play its part in the orderly development of international standards and associated regulatory needs, including:

(a) Effective allocation of the frequency spectrum to accommodate the satellite communication systems of the future;

(b) Registration of radio frequency assignments to avoid harmful interference between services;

(c) Establishing conditions providing safeguards in the use of orbits, particularly the equatorial orbit.

Its area of competence could, in fact, be extended to the co-ordination of all technical and operational aspects of space communication systems in order to avoid undue proliferation of separate systems and the built-in duplications of operating effort, management and costs that this would entail.

In co-operation with other bodies, such as the United Nations Development Programme, ITU should also be in a position to give technical and possibly financial assistance to Member States, particularly the developing countries, for the survey of their communication needs and for the development of their domestic and/or regional communication facilities so they may make effective use of space communication. United Nations sponsorship could help to ensure that the launch of TV satellites by advanced nations for developing countries is not predicated to the state of the political equation between the countries involved.

With respect to UNESCO, it could, in co-operation with regional broadcasting unions, play an important role in aspects connected with the use of space communications for promoting the free flow of information, the rapid spread of education and greater cultural exchange.

No single development can perhaps alter the face of the developing countries as television via satellites can. The social, political and legal implications arising out of the dependent roles caused by this development are matters for serious and urgent consideration by the international community, as are the major problems presented by the potential use of such a powerful medium as television for reception via satellite in individual homes, specifically in countries outside the one in which the programme originated. The potential of this service warrants the technical and administrative effort which will be required to effect an internationally acceptable solution.

II. Meteorology

Weather is by its very nature world-wide. Long-range weather forecasting necessitates accurate three dimensional observations of the whole hemisphere. Now, with the advent of the space age, meteorologists can obtain the tools they need.

It is pertinent to recall that the United Nations appreciated the potential value of the new techniques, when, in 1961, the General Assembly adopted resolution 1721 (XVI) directing WMO to study, in the light of developments of outer space, ways of advancing our knowledge of the atmosphere and of developing weather forecasting capabilities. The result was the adoption of the World Weather Watch (WWW) in 1967, and, in response to General Assembly resolution 1802 (XVII), WMO and ICSU are jointly planning the Global Atmospheric Research Programme (GARP).

The WWW and GARP would set the stage for unravelling the various linking actions in the large-scale processes. The present-day prospect is that a rapidly emerging science and a developing technology can be brought into harmony in an international endeavour to understand those features of our atmospheric environment that so intimately influence our daily lives.

When the basic principal forces in the atmosphere and their interactions in making the weather are finally understood - a prerequisite for any programme of weather control - can measures be undertaken to modify weather for man's benefit?

Thus, international co-operation for the exploration of the atmosphere, essential for the success of these programmes, continues with the trend recognized long ago, when the International Meteorological Organization, predecessor of WMO, was created in 1873.

But still, there are two subjects which require the full support of scientific agencies and international space organizations:

(i) The possibility of a global meteorological rocket network devoted to a regular programme of synoptic observations and to the study of special problems. Such a programme will require the participation of developing countries, though the cost of such a sustained programme is not inconsiderable. Through careful consideration of scientific needs, it is possible to obtain substantial knowledge from limited programmes of rocket launchings.

(ii) The study of the political, legal, economic and sociological consequences of deliberate large-scale weather modification. It is becoming increasingly clear that the problem of weather modification is passing from an era of intellectually undisciplined speculation and more or less opportunistic field experimentation into an era of rational organized inquiry that will permit the exploration of an almost unlimited array of deliberate interventions in natural atmospheric processes.

When the form of international co-operation uniquely established with the WWW and GARP fully operates on a continuing basis, the world will experience an example of what can be achieved from the application of space science and technology for the benefit of all mankind.

III. Navigation

Modern means of transportation are rapidly shrinking distances in terms of travel on earth. The number of passengers travelling and cargo handled has increased steadily and it is estimated that this number will increase threefold.

To cope with this situation, transportation continues to improve, stressing features such as increased speed, larger size, etc. Traffic density is increasing and will continue to increase considerably both in the air and on the sea. Congestion on already saturated routes (like air passage over the North Atlantic), requires special attention.

The increase in traffic and in speed places heavy demands on navigational techniques. A considerable amount of research is being conducted to use space techniques for navigational purposes in attempts to achieve increased safety, efficiency and regularity more economically, both in air and sea transport operations. The term "navigation" encompasses many functions other than position determination alone. These include:

(a) Position determination service for:

(i) On-board self-determination by mobile vehicles;

(ii) Independent or remote determination of all mobile vehicles of a given type (ships, aircraft, etc.) for traffic control purposes (assurance of safe separation);

(iii) Independent or remote determination of all mobile vehicles that can assist in search and rescue operations.

(b) Communication service for:

(i) Traffic control and operational control;

(ii) Relay of independently determined position information to mobile vehicles or other ground-based traffic control centres;

(iii) Relay of search and rescue instructions;

(iv) Relay of environmental data and their forecast to and from mobile vehicles, i.e. weather (including clear air turbulence), ice, sea state, solar radiation, obstructions (free floating balloons or buoys, etc.).

(c) Telemetry service for:

(i) Monitoring of certain mobile vehicle sub-systems to provide automatically data for independent warning and ground recording of performance for vehicle maintenance and/or accident analysis;

(ii) Automatic monitoring and reporting of the environment encountered by mobile vehicles en route to provide information automatically to an environment survey and forecasting system.

Various systems involving satellite space techniques combined with existing techniques are under study in different parts of the world and their technical feasibility is being assessed. But the unresolved questions in the field of navigation satellites are of a geopolitical nature. Little progress can be made until such matters are settled. This includes questions such as:

(i) How to select the sites of ground stations and how to distribute them. This in great part must be answered from the viewpoint of interrational co-operation, and not purely from a technical assessment.

(ii) What kind of radio frequencies should be used? The allocated frequency bands by ITU for satellite navigation, according to preliminary investigations, will not be adequate for implementation of a satellite navigation system for civil use.

(iii) Who will bear the system costs? The characteristics of the over-all navigation satellite system should be determined by appropriate trade-offs between the technical and geopolitical factors involved.

For many other similar questions, co-operation and co-ordination between many organizations and bodies interested in various aspects of space affairs is particularly important. For example, there might have to be an international agreement to create a marine traffic control agency and to empower it to perform this function on the principal routes across the oceans and along the coasts, and the sea areas outside the principal harbours.

IV. Earth-resources surveys and other space techniques of practical benefit

Advances made in research during the last year have shown the tremendous potential of earth resources surveys from aerospace vehicles. It has been demonstrated in papers presented to the Conference that the developing countries have in this area the best opportunity to derive practical benefits for their national development.

The applications of satellites to the existing and potential problems of mankind here on the surface of earth are many and real. They must be explored and put to use, as appropriate, for the problems that they may help to solve, such as food production, water conservation etc. are critical.

But when expensive data-gathering aircraft and instruments are involved, interested countries must find means of sharing equipment and programmes, and, therefore, joint programmes for specific regions, as a minimum, should be considered to this effect.

In some cases, this international co-operation could easily be achieved through international associations already established or within the framework of programmes and projects in development. For instance, international co-operation in the field of hydrology through UNESCO and the International Hydrological Decade will be useful in establishing resource development, and in geography and cartography by the Geographical Union and the Pan American Institute of Geography and History, or in geodesy through the International Union of Geodesy and Geophysics and COSPAR.

It is considered that international co-operation could supplement bilateral agreements in four broad areas:

(i) Legal aspects concerning the security of data obtained;

(ii) The best ways to transfer the technology from countries with know-how to less developed countries;

(iii) To create the awareness of developing countries to these new techniques and to their need to use these technological inputs in their programmes;

(iv) To help with financial arrangements, especially in cost sharing.

Further, it was suggested that the first steps would be:

(i) The establishment of international test sites having physical and cultural surface patterns which differ markedly from country to country, and that will be available to all Members of the United Nations.

(ii) To meet training objectives, regional or international centres could be set up in conjunction with

(iii) Ground receiving stations serving groups of countries.

The implementation of this world-wide effort would offer developing countries a chance to leap years in the technological cycle, it being difficult to overstate the importance of this technology in its sociological impact.

V. Biology and medicine

The outstanding scientific and technological progress made over the past decade, especially in the field of astronautics, has given rise to new branches of science, such as space-biology, astro-botany and bio-instrumentation.

In this area, the efforts have been concerned chiefly with enhancing our fundamental understanding of biological phenomena, which include a component aptly termed bio-engineering.

Space biology and medicine are confronted with a wide range of tasks. Progress achieved in this field will promote not only future development of astronautics, but also of health service, industry and agriculture.

Rich experience accumulated in the fields of automatic processing of physiological information, computer diagnostics and prediction of diseases is already being used in public health. On-board medical apparatus with necessary modifications can be widely used in clinical medicine, since it is of a small size, less weight and of high efficiency.

Applied microbiology has attracted increasing attention owing to its potential impact on society, which obviously now faces a number of rapidly growing dangers, most of which have microbiological aspects.

First, there is the deterioration of man's physical environment, particularly in urbanized areas. Secondly, there is the food shortage in developing countries, which appears particularly acute if one considers the protein supply. Finally, the population growth as such increases the difficulty of guiding human ecology.

In all three sectors, microbiological studies initiated by space research are likely to provide a powerful stimulus and a source of relevant innovations.

VI. Non-space applications of space technology

It has become clear that the availability of new technology is today as important to national and regional economic growth as are the availability of raw materials, skilled personnel or a communications and transportation structure.

Countries actively engaged in space research develop their industries by introducing technological processes and new material required by the special conditions of space missions. This entails (a) scientific research, and (b) the training of highly educated experts. But space technology is not an end in itself. Its effective use constitutes a major and expanding national resource, which can broaden the national technical base, increase the rate of economic growth and help to raise the standard of living and capital income of a country.

But many keen students of the subject believe that the most important "fall out" has been a growing understanding of the techniques of systems engineering and of all the intricate processes and procedures that bridge the gap from the first conception of a complex system to its final functioning.

The developing countries with restricted means, not having the material resources to take an active part in space research, are only "onlookers", with a limited capacity to absorb and use the new technologies and capabilities.

Although some excellent efforts have been made by the space Powers to distribute the knowledge nationally and internationally, it is necessary to help the developing countries to introduce the new technology, and the way that has been suggested is:

(i) To encourage and support through United Nations bodies the access to the new technologies by developing countries;

(ii) To form a United Nations fund to award annual grants to scientists and experts excelling in the application of space technology.

That can be extended to develop the managerial capability and the leadership necessary for the co-ordination of programmes directed to the solution in food, transportation, housing and communications and other social needs which are areas of great concern to all of us.

VII. Education and training

The prerequisite of any space programme is the availability of trained specialists. The provision of adequate and well-adapted training facilities is thus

one of the major outside inputs which developing countries will require if they are to participate in space programmes and reap practical benefits from the results of space exploration.

The training of scientists and other specialists in the field of space research cannot be conceived outside institutions and agencies actively participating in space exploration. Reliance has so far been placed mainly on bilateral and multilateral arrangements with countries leading in this field of research and substantial progress has been achieved in this way. However, it may happen as a natural consequence of this state of affairs that the training schemes will be influenced to a considerable degree not only by the needs of the less advanced nation, but also by the current research and development trends within the leading country. This makes it difficult for scientists from developing regions to adjust to the work assignments they are given when they return to their home country and so encourages "brain-draining".

One might presume therefore that for many small and medium-sized countries it would be much easier to embark upon a joint space undertaking, be it only training or a more advanced project, were that co-operation not only bilateral and multilateral, but truly international.

Within the framework of existing international agencies, the facilities available for education and training in the space field are those provided at the United Nations sponsored range at Thumba - The Thumba Equatorial Sounding Rocket Launching Facility (TERLS) - and by the specialized agencies concerned, principally ITU and WMO, who organize, inter alia, periodic workshops on communication satellite technology and on meteorological satellites respectively. UNESCO and IAEA also provide training in fields of relevance to space research.

At the regional level, facilities available include those offered by India at the Experimental Satellite Communication Earth Station it has established at Ahmedabad with the assistance of UNDP and ITU. Courses are offered there to Indian and foreign engineers and technicians in all phases of the design, construction, operation and maintenance of a communication satellite earth station and in the technology of communication satellite systems. The Inter-American Committee for Space Research and the Argentine Space Commission have, for their part, organized a Latin American School on Space Physics in Bariloche, Argentina, while the European Space Research Organization arranges scientific round-table conferences and also periodic summer schools and colloquia on space science and technology.

While the value of these facilities is recognized, it is felt the time has come for undertaking a fair and impartial assessment of the needs and opportunities facing the less developed nations in the field of space education and training. The task which should be undertaken under the aegis of the United Nations would consist primarily in:

(i) Co-ordinating the training facilities offered by the States leading the space effort and by the relevant United Nations agencies and regional organizations;

(ii) Examining the present training needs and providing the necessary expertise in this domain, if requested;

(iii) Supervising the training programmes and suggesting new directions of training should the need arise;

(iv) Organizing United Nations-sponsored conferences, symposia, training courses and regional seminars;

(v) Publishing or organizing the publication of directories, bibliographies, abstracts and reviews related particularly to space training (fellowships, courses, congresses, conferences);

(vi) Providing fellowships and travel grants.

It was suggested that consideration be given to creating within the United Nations a committee, commission or agency working along these lines.

VIII. International co-operation and opportunities for participation in space research and applications

The exploration of space and particularly space applications would appear to demand international co-operation on a wide scale, and one of the objectives of the Conference was to examine the opportunities available to non-space Powers for international co-operation in space activities, taking into account the extent to which the United Nations may play a role.

In terms of resolutions unanimously accepted by the General Assembly of the United Nations, nations already engaged in space activities have an obligation towards non-space Powers to help them get involved in space programmes (whether in the field of space science or applications, or even in the broader field of technology), so that these "latecomers" can successfully undertake national or multilateral programmes compatible with their national objectives. Such programmes must be related to funds which nations can devote for actual implementation without having to duplicate the research and development already carried out by the space Powers.

The first decade of outer space research has witnessed a wide variety of international co-operation. Many ongoing programmes of a substantial character make it clear that opportunities for space co-operation can be found with a number of nations, with regional organizations like ESRO, ELDO, with the INTELSAT consortium, and in a more general sense, with the specialized agencies of the United Nations like ITU and WMO and non-governmental agencies like COSPAR and IAF.

The two space Powers, the United States of America and the Union of Soviet Socialist Republics, are co operating with a large number of countries in various aspects of space research.

(i) The United States of America, besides collaborating with a large number of countries in sounding rocket programmes, has, either on a bilateral or multilateral basis, also launched, free of cost, satellites designed and fabricated by other countries. The meteorological satellite system with the APT ground system launched by the United States of America permits any country in the world to receive its weather data on a routine basis at negligible cost.

Many American universities co-operating with the National Aeronautics and Space Administration of the United States of America, provide a variety of opportunities for training and participation in various space disciplines and projects.

(ii) A co-operative effect of great interest to developing nations with serious internal communication and educational problems is a future project, wherein the United States of America intends to place at the disposal of a specific developing country a United States satellite which would broadcast television programmes directly into small inexpensive village receivers.

(iii) The United States of America communications satellite programme has, from its inception, placed heavy emphasis on international co-operation. The United States has a new programme for the launching of a series of five Application Technology Satellites (ATS) and welcomes the participation of all interested nations in this programme.

The Soviet Union also co-operates with a number of countries in systematic observations of artificial earth satellites and the study of results obtained. A programme with France envisions the launching of a French satellite by a Soviet rocket. The Soviet Union is an active participant in the planning and implementation of the World Weather Watch. Along with seven countries, the Soviet Union has announced the establishment of "Intersputnik", an international communication satellite system open to all countries who wish to participate.

From the experience gained so far of widespread co-operative efforts in the field of space activities, certain broad conclusions are obvious;

(a) A vast amount of scientific and technical literature is already available and can be obtained by any developing country at a very nominal cost;

(b) Some facilities for the practical training of personnel in various space programmes are also available. Specialized training in space programmes can be put to best use only if countries have definite programmes. To train personnel without an adequate national programme may result in the emigration of trained personnel to countries where such training can be applied;

(c) The implications of domestic space activities should be carefully examined before committing resources and personnel.

With the limited resources - both financial and in trained manpower - available for space activities, many of the developing nations more often than not are faced with the difficult problem of making a choice of the right space programme which should be implemented in the national interest. To assist the developing countries to make the right decision, it would be very helpful if they were provided with balanced and competent advice by an independent organization on the merits or drawbacks of the different projects suited to the country's needs, their financial implications, manpower requirements etc., and suggestions for co-operative arrangements, if any, considered desirable. On the basis of such advice, the policy-makers of developing nations could consider the various projects in all their

aspects, keeping in view the available resources, and decide upon the projects to be taken up for execution. A Centre for Information and Consultation under the auspices of the United Nations is suggested for this purpose.

Co-operative programmes of mutual benefit between countries having different levels of technological development is difficult to achieve, since each partner expects different benefits from such co-operative arrangements.

Participation in space application programmes will be for some a means of commercial development, for others it will provide an opportunity for technological, scientific or industrial progress; and for still others, it will be the tool necessary for solving a large-scale social problem.

For co-operation in the space field to be successful it must be organized in a sufficiently flexible manner to satisfy these diverse yet legitimate motivations. Otherwise, there is a great risk that in the space field, as in many other fields, the mechanism of co-operation will result in making less developed nations pay what to them is a high price, in exchange for a service usually too sophisticated to meet their needs or to be truly cost-effective.

Many of the potential uses of space technology, such as the use of satellites for direct broadcasts, air navigation control, weather prediction control and earth resources, will require international consensus for identifying common interests without detriment to the national interests. There is little doubt that the evolution of space technology will inevitably lead to an ever increasing gap in technology between the developed and the developing nations. One of the prime tasks of agencies responsible for international co-operation should be to devise means to bridge the gap. They should, of course, as hitherto, continue to provide encouragement and leadership in taking co-operative advantage of the new practical applications of space technology, which is bound to be made possible in the near future through developing technology, and play an important role in developing international operating arrangements. For their effective and useful functioning, international organizations should be structured in such a manner that:

(a) They look particularly to the broad needs of the international community. They must not be so fragmented or so limited in their competence or jurisdiction so as to fail to meet these needs;

(b) They must remain close to the scientific and technological aspects of space activities, so as to match international arrangements to operating realities;

(c) They must encourage the initiative of individual nations or groups of nations with the capacity to devise and conduct operating space programmes;

(d) They must retain flexibility to adjust to unforeseen developments in technology and applications.

The functioning of multilateral organizations like ELDO and ESRO shows that it is possible for a number of countries with different levels of technology and economic status successfully to participate in a common programme and derive

benefit from such joint participation. An outstanding feature of the European space programme is that it is being planned on a very broad basis so that all participating countries have an opportunity to partake in a segment of their own choice and suited to their requirements within the over-all programme.

The INTELSAT has attempted to construct an organization which provides a model of joint financing, pooling resources, sharing the benefits of research and development, avoiding wasteful duplication and potentially harmful interferences, providing a voice for all participants in policy-making and ensuring co-operation for the mutual benefit of all participants. The progress made by this organization in the period of four years in the utilization of a new technology demonstrates that such organizations can usefully contribute to the search for effective and meaningful co-operation.

The Committee on the Peaceful Uses of Outer Space of the United Nations is at present the "focal point for co-operation in the peaceful exploration and use of outer space". The Committee is assisted in its work by two specialized Sub-Committees, a Legal Sub-Committee and a Scientific and Technical Sub-Committee. With the increase in the extent and scope of space activities undertaken by the member countries, the work of the Committee is bound to increase considerably in the near future.

For a large variety of reasons, international co-operation in space is a complicated problem and how it should be met will vary with the type of co-operation required. There is, however, little doubt that applications satellite programmes, in particular, provide both a challenge and an opportunity to bring the nations of the world closer together, and utilize this new technology to assist the quest of all mankind for a better life on earth.

IX Economic, legal and social problems of the exploration and use of outer space relevant to international co-operation and practical benefits

The development of space law was traced and the positive achievement in establishing a legal order in outer space was emphasized. This achievement included the conclusion of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies, and the 1968 Agreement on the Rescue of Agreements, the Return of Astronauts and the Return of Objects Launched into Outer Space. The provisions of these two instruments were examined and appraised. While they represented progressive development of space law, it was found that many of them required further elaboration. It was also pointed out that some of the existing provisions were subject to interpretation by individual States and that uniformity in their interpretation and implementation called for international co-operation. In this connexion, consideration was given to the interrelationship of economic, legal, cultural and social aspects of space activities.

Attention was also drawn to many questions relating to liability for damage caused by objects launched into outer space, such as the environments in which injury occurred, absolute liability, joint and several liability, limitation of liability in amount, and the procedures for determining liability and for payment of compensation.

Other subjects dealt with included the question of defining outer space, the sharing of benefits derived from the application of space technology to such fields as communications, meteorology, navigation, hydrology, forestry, agriculture and geography and geodesy. Reference has also been made to the co-operation between international organizations, particularly between the United Nations and the specialized agencies, in the regulation of space activities.

Above all, it was stressed that space application must be for the benefit of all mankind and that any legal regulation in the space field must be geared to this end.

X. HIGHLIGHTS OF THE ISSUES RAISED IN THE GROUP DISCUSSIONS

The primary objectives of the Conference, in brief, were to examine:

(a) The extent to which it may be possible for the developing nations to enjoy the practical benefits of space research and exploration;

(b) The opportunities available to developing nations for fruitful international co-operation in space activities.

Owing to limitations of time, it was felt that the thematic sessions would not be able to provide adequate opportunity to the participants to discuss issues outside the scope of the papers presented during the sessions. Keeping the objectives of the Conference in view, it was considered that the participants should have an opportunity for discussing the various live issues relating to peaceful uses of outer space, particularly relevant to developing nations and those involving international relations and co-operative efforts. Such discussion would serve to focus the attention of all concerned on the complexity of problems involved and help to crystallize the various possible solutions. With the objective in view, a series of nine group discussions were arranged during the Conference.

The panel for each group discussion comprised a Chairman and three to five members. The list of topics discussed and the composition of the panels are given in the annex to this chapter.

All the group discussions were very well attended and the participants contributed in a very large measure to the lively discussions. A number of issues, which were not discussed at the thematic sessions, were brought up and discussed at these group discussions. It could perhaps be said that the group discussions made a positive contribution to the achievements of the objectives of the Conference.

The highlights of the issues raised in the group discussions are summarized below:

1. Topic Relevance to developing nations of space programmes.

Points for discussion

(a) The peaceful uses of outer space most relevant to the developing countries.

(b) The circumstances under which they can be applied most profitably.

(c) The extent of the investments which the developing countries could make.

(d) The outside inputs.

Participants

Chairman	Dr. V.A. Sarabhai
Panel members	Mr. V. Gencic
	Dr. F. Seitz
	Dr. S. Gnanalingam
	Mr. T.M. Tabanera
	Mr. B.V. Lipatov

The topic of this discussion provided a good start to the series and the interest it aroused was evident from the attendance and the participation from the floor.

There was general agreement on the fact that the peaceful uses of outer space most relevant to the developing countries lie at the present time in the fields of meteorology and communications. Reference was made to the stimulus which space research can provide to industrial development thereby providing a means of achieving the industrialization of developing countries more speedily and effectively and mention was also made of possible applications of geodetic surveys and of earth resource surveys, including hydrological surveys.

The chief importance of space meteorology lies in the fact that long-range weather forecasting could prove vital to countries whose economies are critically dependent upon agriculture, a characteristic feature of many developing countries.

The advantages of space communications are vital in themselves, since the benefits of other space applications cannot be obtained without good communication facilities. In addition, space communications could prove decisive as a medium of mass communication in the areas such as agricultural methods, population control and spread of literacy.

As regards the circumstances under which the peaceful uses of outer space could most profitably be applied and the extent of the investments which the developing countries could make, it was recognized that it was unrealistic to consider developing countries en bloc. A distinction had to be made between

(a) Those countries which at present had a low per capita income, but one which was growing faster than the population increase. These could be called the positive gradient countries; and

(b) Those countries where the growth rate of population was greater than the economic growth rate. These could be called the negative gradient countries.

However, the resources in terms of qualified scientists and industrial capability, which could provide the nucleus of a space programme, varied widely within each category. It was thus difficult to be dogmatic about the way in which such programmes could be started.

Generally speaking, in the first case, space programmes could be started either through bilateral agreements or with international sponsorship. But even in these cases, more attention should be given to stimulating practical applications.

In the case of the second category of countries, it was generally unrealistic to expect investments on their part for such programmes, and it was perhaps only through external action via international agencies that progress could be made in creating an awareness of their own needs and of the potential benefits of space programmes. In such cases, international sponsorship might possibly make Governments more willing to allocate funds for such programmes.

Nevertheless, it was considered important that developing countries should as far as possible be associated as full-fledged partners in appropriate fields of space research. It was also necessary to make them aware of their obligations in certain aspects of such research as, for instance, their participation in geophysical studies, for which the training of specialists would be easily forthcoming. Training was in fact one of the important outside inputs which developed countries could provide. In addition, a number of developing countries were uniquely situated as regards the observation of certain phenomena and their association in relevant projects could be fostered through the international scientific unions.

A specific example which was quoted showed that, while small scale participation in an international space programme could be achieved through individual enthusiasm and skill, obtaining government funding to enable such participation to be extended and to become really meaningful on a national basis was quite a different matter, because there was not that vital feeling of commitment on the part of the national leaders.

It was thus essential to expose political leaders and policy makers to the benefits of space research and the present conference could be an excellent way of doing this, provided a good feed-back was ensured through the work of each delegation.

2. Topic Role of international agencies in promoting peaceful uses of outer space.

Points for discussion

(a) The role of international agencies in surveying and identifying peaceful applications of economic and social significance to developing nations.

(b) The role that international agencies can play in facilitating nationals of developing countries for undertaking managerial and technical responsibilities for space projects.

(c) The role that international agencies can play in:
(i) facilitating the sharing of "know-how";
(ii) provision of experts;
(iii) provision of hardware;
(iv) provision of finances.

Participants

Chairman	Mr. A. Frutkin
Panel Members	Mr. F. de Mendonca
	Mr. M. Mili
	Prof. Blamont
	Dr. N. Takagi
	Mme. Masevitch

There already exist a number of international organizations like ITU and WMO, which have some experience in implementing projects in certain aspects of the practical applications of peaceful uses of outer space. Developing countries could with advantage draw upon the experience of such organizations for implementing their space projects. The ITU, for example, assisted India in the establishment of a research and training centre for satellite communication technology at Ahmedabad, and has undertaken in other countries projects in the fields of radio and telecommunications. The international organizations could provide the developing countries not only with competent technical advice for space projects which they wish to undertake, but could also help them to secure necessary financial assistance, if required, by putting them in touch with international financing institutions like the World Bank.

The existing international agencies can play an active role in exposing the developing countries to the practical benefits which will accrue to them by undertaking space programmes most suited to their needs, by dissemination of information regarding the practical applications of space research and thus provide suitable stimulus for them to embark on space research programmes. They could help the developing countries to:

(a) Draw up programmes for specific projects and long-term plans and advise them of the inputs required for implementing them, keeping in view the economic and technological status of the countries concerned;

(b) Advise them of the most effective and economical way to implement the project programme;

(c) Draw up detailed programmes of co-operation, either bilateral or regional.

The main difficulty encountered by the developing countries in undertaking space programmes was the lack of trained personnel. International agencies could play a very important role in solving the problem by:

(a) Arranging training courses for persons from developing countries relevant to specific projects to be undertaken by them;

(b) Aiding the universities in developing countries to conduct courses in various disciplines relevant to space research, thereby enabling them not only to develop an interest in space research, but also simultaneously help them to build a nucleus of trained people for undertaking space programmes on their own;

(c) Conducting seminars, conferences, summer schools etc. The persons so trained could, on return to their countries, form the nucleus group for implementing their own national projects.

A view was expressed that developing countries should draw up suitable national programmes of their own and establish suitable national organizations to implement them. These national organizations could seek the assistance of the appropriate international organizations for training facilities, exchange of technical information etc. International agencies would be able to render assistance more effectively in this manner.

A suggestion was also made that international agencies should establish "consulting centres" in developing countries which wish to undertake or participate in space programmes. Those centres would train nationals for space projects. It was also suggested that a committee should be established which would serve as a clearing centre for information and advice and also process the requests for assistance from developing countries and advise them on all matters vital to the promotion of space programmes.

Another view on the role of international agencies in promoting space research effort in developing countries was that they should act as "catalytic" agents in promoting the efforts of the developing countries. The agencies themselves need not have experts of their own, but should serve as an umbrella under which countries - both developed and developing - could collaborate in the most effective manner, beneficial to both. They should make full use of the national organizations to assist the conclusion of bilateral or small multilateral agreements. A suggestion was also made that developing countries should also help each other by offering facilities for training etc., to the extent available and feasible, so that the "brain drain" risk, inherent if persons from developing countries are sent to developed countries for training, is eliminated. The international agencies should also respond to requests for assistance from developing nations quickly and in a flexible manner.

On the question of the best form of international co-operation, the consensus of opinion was that bilateral agreements provided the best basis, because in multilateral agreements the goals and responsibilities were not clearly defined, and it was difficult to ensure that the interests of all the participants were served in a manner satisfactory to all of them.

A view was expressed that while for the present the existing international organizations could serve the needs of the developing countries, a separate international organization would be necessary in the course of time when the pace of space activity in developing countries gathers momentum. This could serve as the forum for all countries to discuss and negotiate co-operative agreements. It was suggested that it would be preferable to have a two-tier organization: one tier could handle the political and legal aspects, and the second tier a new specialized agency of the INTELSAT type, where technical and operational problems could be discussed and solved.

3. Topic Synchronous communication satellites for national, regional and international telecommunications. Organizational considerations, scope and role vis-à-vis conventional technology.

Points for discussion

(a) The cost effectiveness of synchronous communication satellites vis-à-vis conventional methods for providing narrow-band and broad-band telecommunications.

(b) The reliability and mean useful life of communication satellite.

(c) The cost-effectiveness of leasing the channels from INTELSAT versus having an exclusive national satellite.

(d) The problems associated with a national system depending on an international/foreign organization.

Participants

Chairman	Mr. T.A. Housley
Panel members	Mr. W. Bolay
	Mr. C.H. Laigle
	Dr. F.G. Nixon
	Mr. M. Vladimir
	Mr. N.V. Shenoy

It was felt that satellites can do no more than microwave links can, and the latter sometimes do the job in a better way.

Are satellite systems competitive with microwave systems? How is one system superior to another? Why is the cost of one less than the cost of the other? The answers to such questions lie in the state of art and technology. It was agreed that the low cost of ground receiving stations is of great importance. The synchronous satellite systems will have low cost, longer life and high reliability. It was emphasized that cost could be reduced further if efforts were pooled.

Satellites are, and will be, the only universal answer to telecommunication problems, but it was felt that both conventional and new techniques of communication will have to continue side by side at least for awhile

Having an exclusive national satellite might cost more than leasing channels from a system, but for a particular country it might be worth it since this would help to develop its own industry and would gain in technological know-how. In this case, it is the difference between the cost of leasing and the cost of the technical know-how gained this way.

It was suggested that domestic satellites should be used for broadcasting, as India plans using them. The system was considered very appropriate for countries with practically no regular television network for educational programmes, which should cover thousands of square miles. It was also felt that domestic satellites could be used as well for communication purposes, which is an essential aspect of a developing economy.

Remarkable similarities are found between the INTELSAT and INTERSPUTNIK systems. The difference lies in the constitution of this governing body and voting procedure.

A global system is preferable, but coexistence of several systems is possible. For matters like frequency allocation, placements of satellites, even the harmonization of tariffs, can probably be achieved through the creation of a

co-ordinating agency. All countries should be members of this organization, which should work within the United Nations or should have United Nations patronage.

It was felt that ITU should continue to play its regulatory role, as it has done in the past, but that it should expand its role, scope and functions. At the same time, however, it was also felt that regulatory bodies cannot be expected to change their ways and take care of the new matters, and it was therefore suggested that the Secretary-General of the United Nations should have a task force for synchronous satellites for point-to-point communications and all other conjoint uses and that such a group could work within the United Nations for a number of agencies and organizations. This task force should have a "think tank".

The obsolescence of existing satellites should not stand in the way of new systems. A static attitude must not be assumed in the field that is constantly evolving, and stress was laid on intensive study of frequency spectrum.

4. Topic State of art for direct broadcast television from synchronous satellites.

Points for discussion

(a) Assessment of when direct broadcast television will become operationally feasible.

(b) The optimal specifications relating to the frequency Effective Radiated Power (ERP), pointing accuracy, area of coverage and satellite weight for minimizing over-all system costs.

(c) The cost of a front-end converter for direct reception and copatibility of a new system with the existing networks.

(d) Political problems involved in direct broadcast television.

Participants

Chairman	Mr. M. Mercier
Panel members	Mr. R.P. Haviland Mr. Borodich Mr. J.N. Blonstein

While it was suggested that satellites with very powerful transmitters could be produced within the next few years and direct broadcast from satellites would be available in about five years from now, it was remarked that such techniques are already in existence and it is the military security reason which prevents the sharing of such an existing system. Nations holding such systems should not share their inventions or development out of charity, but, in their own interest, should do so for the common benefit of all nations. On the other hand, it was felt that it is not military security that interferes with the sharing of it with the world, but it is a matter of cost, since this has been a very expensive programme.

On frequencies, views vary throughout the world. The frequency allocation is a very important problem for direct television broadcasting from satellites.

In Europe, there is a particular problem because of close communication networks and highly developed instruments and installations. The United Kingdom, Spain and Italy use the same frequency band. A view was expressed that satellites over Europe might raise interference problems.

Frequency allocation for the United States of America and Europe could be difficult, but for India it might be easy. It was suggested that frequency problems should be handed over to ITU for the purpose of economization and allocation. Frequency bands used should be such as to exclude interference between satellite and ground broadcast. ITU is already studying a number of programmes relating to this effect. It was felt that all technical problems fall within the sphere of activity of ITU, and it should be called upon to resolve technical problems pertaining to international co-operation in satellite broadcasting. ITU plans to hold a conference in this connexion in 1970-1971. The importance of this conference cannot be over-emphasized.

It was mentioned that there is potential interest in Europe by banks, companies using computers and large commercial organizations to broadcast at once to their branches all over Europe the status of particular information, through the use of a direct broadcast to syndicate antennae.

Satellites are likely to cover enormous areas at present. It was suggested that problems of large countries should be considered on one hand, and those of small countries on the other. Large ones were defined as those with areas of about one million square kilometres or greater, such as the Union of Soviet Socialist Republics, India and Brazil. The policy problems in large countries could be handled within the country itself. For smaller countries, since the satellite does not lend itself at the present state of development, it was opined that a solution based on the regional system will have to be considered.

If ground receivers are equipped with converters, the price of the equipment would increase considerably.

In any large system, the receiver investment would dominate the cost of the entire system. Generally the public wants maximum comfort and minimum expense. It was therefore suggested that the aim should be to produce reasonably good receivers at a low cost.

It was felt that sensitivity regarding political aspects should not be "played up" too much. Nations must get used to this type of duality. It is hoped that political problems arising from direct television broadcasts will be resolved by the United Nations and its different bodies.

Policies developed in the United Nations, ITU and other such agencies relating to international efforts should take into account the enormous differences of economical and technical developments between various countries and should leave sufficient flexibility and find solutions for various areas and types of problems. For example, problems of Western and Eastern Europe need two different solutions.

Satellites should be considered as completely new tools, the structure of which is not an extension of previous inventions. The approach of the United Nations and its Committee on the Peaceful Uses of Outer Space is to benefit all mankind, which should be the basis for the structure of direct satellite broadcast in future, with due considerations for the legal aspects.

A view was expressed that education and instruction through direct television broadcast from only one satellite for the entire school population seems impractical, especially when one considers different levels of intellect and many languages involved. One cannot achieve over-all national educatien with a single channel and a few teachers.

A domestic satellite used for educational purposes would require intense programming work. A centrally broadcast programme and locally monitored by teachers would substantially aid the pace of education.

5. Topic — Scale of national participation for practical benefits from the World Weather Watch

Points of discussion

(a) Use of APT data to amplify forecasts issued by WMC.

(b) Participation in the balloon programme of the EOLE and GHOST type.

(c) Computation of vertical motion fields with a dense grid using data from an open grid.

(d) Analysis of ocean temperatures.

Participants

Chairman	Prof. P.R. Pisharoty
Panel members	Dr. D.S. Johnson
	Prof. V.A. Bugaev
	Dr. J.S. Sawyer
	Dr. M. Ramatullah
	Dr. Hiroshi Tsuchiya
	Dr. I.D. Berycskin

Scientific weather forecasting was organized during the middle of the last century, but the science and practice of meteorology have undergone a remarkable revolution in the past ten years; more dramatic changes can confidently be expected to occur in the next ten years. This revolution is primarily the result of the introduction of the meteorological satellite as an observational platform.

World Weather Watch (WWW) is a comprehensive global co-operation, objective of which is to "enable the unprecedented opportunities which now present themselves for progress in the atmospheric sciences to be seized and to enable all member nations to derive the full benefits of the improved meteorological services which such a progress will make possible".

To attain this objective, WWW will establish a world-wide system for collecting and transmitting measurements of the atmospheric parameters on a global scale and processing them with high speed electronic computers both for research as well as operational purposes.

The essential elements of WWW are:

(a) A global observing network;

(b) Global data processing;

(c) A global telecommunication system;

(d) A research programme;

(e) A programme for education and training of atmospheric physicists.

This system is organized with three World Meteorological Centres (WMC-s) and twenty-eight Regional Meteorological Centres (RMC-s). The WMC-s will collect and process the information for over-all global forecasts and the Regional Centres will solve the specific regional problems.

Participation of small nations or developing countries was discussed under the following guidelines:

(a) Use of APT data to amplify forecasts issued by WMC;

(b) Participation in the balloon programme of the EOLE and GHOST types;

(c) Computation of vertical motion fields with a dense grid using data from an open grid;

(d) Analysis of ocean temperatures.

The Panel discussions revealed the following information:

(a) The WWW would help the national services through enabling them to receive a large amount of observational and processed data which they would have never received but for the organization of WWW.

(b) There was ample scope for co-operation in WWW by small nations and developing nations. For example, such a co-operation can be effected through theoretical and other investigational studies with data which would be available, perhaps for the first time. Small nations having adequate technical abilities can also help through the sharing of the responsibilities in their respective territories through the collection and dissemination of sophisticated meteorological data.

(c) The use of APT was of great importance to countries and regions where the observing and reporting network is incomplete or sparse. The information would become sometimes useful for modifying WMC forecasts. This would also help in the issue of local forecasts of heavy rain or snow produced by lakes, mountains and coast lines. Thus, APT, can be used effectively in any area or region. Often APT equipment can prove more useful than a weather radar, which is so widely used.

(d) Satellites can be used not only for collection and transmission of meteorological data, but also for dissemination of meteorological forecasts and warnings to farmers, mariners and other consumers. There is also ample scope for a

greater liaison between meteorologists, space scientists and space technologists regarding the replacement of conventional techniques by new techniques.

(e) The EOLE and GHOST programmes are opening new possibilities to obtain data for

(a) The establishment of a new kind of dynamic climatology;

(b) The refinement of atmospheric models, especially those pertaining to tropical zones.

(f) Developing countries can make substantial contributions, through joint efforts, in the solution of problems in the design and fabrication of equipment to be used, and in theoretical meteorology. A satellite by itself does not solve any problem, but helps in the solution of specific problems.

The Panel reached the following conclusions:

(a) Since weather and climate affect almost every aspect of human life, it is essential that they should be taken into consideration in making policy-decisions of national importance. National meteorological services which provide the information needed for making sound policy-decisions, large and small, play a vital role, and the improvements expected from WWW will improve the service now rendered by national meteorological services. It has to be realized that great improvements may not be available in the immediate future; however, we are well on the way to obtaining a significant increase in the knowledge of the atmospheric processes which would lead to a substantial improvement in weather prediction.

(b) Small nations also have an important role to play in WWW, particularly in the field of atmospheric research.

(c) Developing nations can participate in satellite programmes, because there are still many challenging problems associated with the measurements of the atmospheric structure. Some of the sensing devices can be developed and provided by nations not necessarily involved in building spacecraft systems. There are formidable problems inherent in ground-based technology which must be solved, such as surface pressure sensors, buoys and balloons, which provide opportunities for all interested persons working in the field. There is also ample scope for improving the theoretical and operational methods for obtaining reliable long-term forecasts from the observed parameters.

6. Topic Earth resources survey by remote sensing.

Points of discussion

(a) Utility and state of the art of remote sensing by aeroplane and study of the problem areas.

(b) Training of people in remote sensing.

(c) Cost effectiveness of remote sensing compared with conventional methods.

Participants

Chairman	Mr. Leonard Jaffe
Panel members	Dr. A.B. Park Dr. W. Sibert Dr. de Mendonca

1. Aeroplanes have been used for conventional photography and, experimentally, colour photography. The development of methods has been made as follows:

(a) Research in laboratories;

(b) Experimental results from towers 60-90 feet high;

(c) Use from aircraft.

These have reduced the time and expenditure required in more than twenty operational and more possible experimental applications.

The view was expressed that planes now in operational stages will always have certain advantages compared to remote sensing from satellites (in the research and development stage), namely:

(a) There are less-stringent limitations in the weight and space needed, so aeroplanes will be advantageous in the first stages of development and testing;

(b) Aircraft are not fixed in orbit, and they can fly at any time over required areas, which is very important in case of natural disasters.

It is considered that the right solution will be without doubt the combination of ground survey, aeroplanes and space vehicles.

2. Training is a very important subject and the work really begins after data have been collected. Many trained interpreters will be required for the evaluation of the enormous quantity of data recorded daily. These trained people vary from research workers who hold Ph.D.degrees to technicians.

It was suggested that the best way, after a national programme has been carefully designed, is to use bilateral agreements for training personnel in centres devoted to this research; later on, once this initial group has been formed, training can be conducted in special places locally or in regional centres.

3. With reference to cost effectiveness, panelists considered that there were two advantages to be considered for the use of remote sensors vis-à-vis conventional methods:

(a) The reduced cost to obtain data, through extended coverage and by the use of new methods based on the orthographic quality of photographs;

(b) The economic advantage of reducing the time needed to produce maps (in some cases from five years to three months). The early availability of basic maps and their subsequent easy up-dating has been estimated in one country to result in an annual benefit of $US500 million, which is far more than the cost of a remote sensing system.

These initial considerations led, during the discussion, to two very important questions:

(a) The type of programme that a developing country can develop; and

(b) Priorities in development according to the users.

For the first, it was considered that the experience, once the programme areas have been defined, shows that a national programme would be divided into two steps with training not considered as a separate part:

(a) The setting up of minimum instrumentation for conventional photographs and infra-red, including test sites, and data bank. This stage will cost about $US2 million over a time of one-and-a-half to two years.

(b) The extension of the possibilities of using side-looking radar, infra-red radiometry, other sensors and a computer will be more expensive ($US3 million) and will take about the same time.

It can be deduced that the programme could be expensive in the light of the actual budgets and resources of many countries, but the results are so promising that economic returns will justify the effort and the investment required.

With reference to priorities, opinions vary, but can perhaps be summarized as follows:

(a) Agriculture;

(b) Oceanography;

(c) Geology;

(d) Hydrology.

This list was, of course, not considered exhaustive and many countries will establish, in accordance with their state of development and their needs, perhaps different objectives and priorities, but, in any case, agriculture and cartography applications are indispensable.

The panel considered that:

(a) Earth Resources Survey is a subject of the maximum interest to the world, because of the requirements of a world with a population explosion. But it has to be clearly established that we still have to be very cautious in the assessment of its value to solve all the problems and it has also to be stated that remote sensing cannot replace man on the ground, but can direct man's efforts to be more efficient.

(b) Earth Resources Survey will have to be a national programme in each country, where all the interested agencies will have to co-ordinate their interests and objectives so as to obtain the best results with maximum efficiency.

(c) International arrangements for the best use of the techniques, whether bilateral or multilateral, will have to be settled very fast. The first task will be the organization of training centres, second, the solving of the legal problems that will be created. For the first, use can be made of existing institutions if they could be reshaped to respond to new needs.

(d) The efficient use of any system will create a tremendous requirement for systems analysis to decide the inputs required for the decision-making process.

(e) It is the consensus that aircraft can be used immediately for a number of programmes, but we must begin to understand some of the interpretation problems which are not often recognized by space scientists.

7. Topic International co-operation for peaceful uses of outer space

Points for discussion

(a) What type of bilateral and multilateral co-operative activities are needed in situations where there is potential scope for an application but (i) the perception of it or (ii) an adequate professional base are non-existing?

(b) What is the scope for bilateral and regional co-operation for (i) small industrially advanced countries, (ii) developing countries with a professional base and those without it?

(c) What lessons have we learnt from the problems of (i) ESRO/ELDO, (ii) TERLS, and (iii) EXOMETNET?

Participants

Chairman	Dr. A. Dattner
Panel members:	Dr. A.R. Ratsimamanga
	Ing. F. Fiorio
	Acad. G.I. Petrov
	Mr. H.E. Newell
	Acad. L. Krastanov
	Prof. E.V. Chitnis

International co-operation in the field of the peaceful uses of outer space is essential if small and/or developing countries are not to be mere onlookers, but are to participate meaningfully in space exploration and reap its practical benefits.

It was pointed out that the form which this co-operation should take in order to achieve maximum effectiveness would vary according to the specific needs of the individual countries. Some cases would best be dealt with by a broad framework; others would require a small and focused framework.

The objectives of international co-operation can be considered under two main headings:

(a) Technical (including training, basic/technological research, development and operations);

(b) Political (including standardization, regulation, control and economic/social applications),

It can be said that the former is more suited to direct co-operation (bilateral and multilateral/regional), while the latter calls for action through global inter-governmental agencies of the type of ITU, WMO, IMCO and ICAO. As space applications become increasingly important, it will be necessary for such agencies to gear themselves to exert timely action in meeting new and growing needs.

International co-operation presupposes an effort at the national level. It is essential, therefore, that before looking to international agencies for assistance, developing countries should develop the necessary base and initiate action to identify and foster indigenous talent, interest and enthusiasm. This would be the first necessary step in giving countries the feeling of involvement, which is so vital if they are to participate in international co-operative projects as full-fledged partners.

The prerequisites of any space programme are technical facilities, funds and trained specialists. It is the existence of the latter which is decisive in the first phase. A nucleus of competent persons interested in one or several fields relating to space research could serve to focus national efforts and to channel assistance from other nations, possibly with the leverage of international organizations. The Thumba range in India provided an outstanding example of how much could be achieved in this manner. In order to create this nucleus it is important that adequate training facilities should be available and accessible to qualified nationals of any country interested in undertaking space research. Here is a field in which much has already been achieved by bilateral or small multilateral co-operation, but where inter-governmental agencies such as UNESCO can also play a role. The United Nations Outer Space Affairs Group provides background information on existing facilities for training in the space field, but it might be appropriate to examine whether it could not play a more active role in this regard.

Once the nucleus of a space group existed in a country, which expressed the desire to establish co-operative projects with one or more other countries, there are some important guidelines to be followed.

(a) The co-operation should unreservedly aim to benefit all parties concerned. Its objectives and common interests should be clearly defined.

(b) A programme corresponding to these objectives should be prepared by experienced people and provision should be made for unbiased supervision of its progress.

(c) A clear plan of funding should be drawn up, so that projects could be pursued till their completion.

It was, however, suggested that in the case of joint projects involving countries having less technology, know-how, and experienced personnel than their partners, it might be useful to have a source of unbiased advice, particularly for the elaboration of the programmes, so that the less-experienced partner could take decisions in full knowledge of the facts. Existing specialized agencies by their very nature might not be in a position to provide this advice and it is difficult for States to be unbiased. One solution which was proposed was that the United Nations Outer Space Affairs Group should be strengthened so as to serve as a rallying point for this type of action. It could play this role by organizing more conferences like the present one or by other means to be defined.

8. Topic Legal aspects of the peaceful uses of outer space

Points for discussion

(a) Peaceful uses of outer space

(b) Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies

(c) Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space

(d) Draft agreement on liability for damage caused by space objects launched into outer space

Participants

Chairman	Prof. K. Rao
Panel members	Prof. Ambrosini Mr. Dembling

The group discussion on the legal aspects of the peaceful uses of outer space stressed the need to ensure that space activities be directed more for the benefit of non-space countries and that outer space be reserved for peaceful uses. It was suggested that the latter could probably be effected through an amendment 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. The group also considered the question of defining outer space. While the establishment of a demarcation line between air space and outer space was considered necessary, it was pointed out that the adoption of a definition of outer space at this stage would be premature. It was hoped, however, that the time would come when it would be possible to formulate an acceptable scientific definition. Other points discussed included the early conclusion of a convention on liability for damage caused by space objects launched into outer space and the need to expand the role of the United Nations in the obligatory registration of the launching of objects into outer space.

9. Topic Social and pedagogical problems connected with the use of satellite for education

Points for discussion

(a) For whom is a programme of education and training required?

(b) Who can be educated and trained by this means alone?

(c) What can be taught by this method?

(d) How can this method be used for teaching purposes (i) using pictures only, (ii) using voice and pictures (language problem), (iii) problem of feed-back from pupil to teacher.

(e) What is the cost effectiveness of this method?

Participants

Chairman	Mr. W.F. Libby
Panel members	Mr. M. Bernard
	Mr. P.L. Vepa
	Prof. Dr. S. Piotrowski
	Prof. Dr. O.M. Belozerkowskij

While educational television and radio using conventional methods is already operational on a national basis in a number of countries (speakers referred to programmes currently existing in Colombia, France, Ghana, India, Japan, the USSR and elsewhere), the possibility of using a satellite for this purpose opens up exciting and challenging opportunities together with a number of important problems.

On the hardware side, the required technology is already or will very shortly be developed and the availability of operational systems will be mainly determined by programme and funding priorities.

It is all the more important, therefore, that close and timely consideration should be given to the socio-pedagogical problems associated with the use of satellites for education, so that when the time comes, nations should be fully prepared to put this new tool to the best possible use.

The panel considered exclusively the television aspect of educational broadcasting, which can be used basically to provide two categories of teaching:

(a) For children at elementary and secondary school levels;

(b) For adults:

(i) Further education in the developed countries;

(ii) Basic social, agricultural, civic education in the developing countries.

In the first case, when used in a classroom environment, television is merely another teaching aid which, by its impact, can be most useful, particularly in remote and isolated villages or communities, for such subjects as science, literature and geography.

When attempting to provide education outside a classroom environment, whether for children or for adults, satellite television could only provide one part of the teaching process, that is to say, the transmission of information from the teacher to the student. The other aspect, that of communication from student to teacher, which is so vital to education as opposed to mere imparting of information, had to be achieved by other means. This was the problem known as "feed-back".

The more obvious methods of obtaining feed-back by mail, telephone, meetings of monitors etc., involve delays and are not always adapted to educational requirements. Attempts have therefore been made to resolve this problem in a number of ways in the case of existing educational television programmes using conventional methods. Examples quoted included the following:

(a) Community viewing in the presence of a monitor who could answer the questions which the programme might evoke. Here it was important to choose and train the monitors with care. This was no easy matter, since the fact of using television courses presupposed that the monitors were not sufficiently competent to give the course themselves, and yet they had to be competent enough to answer questions.

(b) The second approach was to start from the premise that the number of questions which could be asked relating to a given course was not infinite and to assume that if the production were arranged so that the teacher gave his class or lecture in front of a sample cross-section of ten to twenty students, the latter would ask all or almost all the questions which the viewer himself would be likely to raise.

These methods were so far only an attempt to solve the problem and were not yet regarded as either perfect or final. This was a field which called for intensive research and experimentation, if the instability resulting from feed-back delay were to be avoided.

As regards programme production, two approaches were mentioned, that using image alone and that which associated sound and image and was therefore appropriate for eradicating illiteracy.

The possibility of using image alone could be useful in overcoming language difficulties and could, either with or without a monitor, be used to teach basic hygiene, agricultural methods, family planning etc. In a country such as India, which had fourteen major languages and several hundred dialects, this could provide an attractive alternative to the more sophisticated and expensive solution of having one video channel and several audio channels.

The problem of coping with various cultural, agricultural and traditional backgrounds by means of a single programme still remained, even if there were no language barrier, as, for example, in the Spanish-speaking countries of South America.

While these difficulties should not be underestimated, they could also be regarded, constructively, as a challenge in producing a more uniform language, system of education and way of life.

The actual production of the programme was important since it was essential to involve the student actively and hold his attention, and in extreme cases teach him despite himself.

It was felt that there would be a definite need for specially trained educational television producers who would have a sense of values appropriate to their task. Close co-operation between producers and educators was essential and in some cases it might be preferable for the educators themselves to produce their programmes, even if the latter were technically less perfect than those produced by professionals.

Experiments could be conducted into the manner in which the "lesson" could best be put across: by direct transmission from a classroom, by means of cartoons, in between television commercials, etc. Here again was a field in which there was room for a great deal of research.

In conclusion, the discussion brought out clearly the two chief problems to which early attention should be given, if the best possible use is to be made of satellite television when it becomes available:

(a) Feed-back problems;

(b) Programme production.

If timely attention is not given to these "software" aspects of education via satellite, a most valuable new tool for the speedy eradication of illiteracy and the education of large populations could be misused with the gravest consequences.

XI. CLOSING STATEMENT OF THE VICE-PRESIDENT AND SCIENTIFIC CHAIRMAN

When I started preparing for this summing-up session, I felt rather overwhelmed, because we have covered a vast canvas and heard so much of deep significance that it seemed difficult without an adequate passage of time really to do justice to it. But I believe that the ideas which have been presented here, and the many suggestions - those related to hard reality and some others which still appear to be in the realm of fantasy - have together enriched our experience at this Conference. The question has often been asked: "Can one afford to undertake space research?" But I am sure there are many here like myself, who will ask: "Can anyone afford to ignore the applications of space research?" One departs from the Conference with the conviction that applications of space research touch every facet of life and, in adopting them imaginatively and with understanding, nations have an opportunity to dedicate themselves to a meaningful task of direct relevance to their development. Indeed, the total impact on national life can be dramatic.

I suggest that many delegates, when they return to their own countries, would find it worth-while to look once again through some of the key papers presented here. It is not possible to name each one of them, but at the introductory session significant applications were admirably summarized.

The Chairman of the thematic sessions have lightened my task by summarizing what happened at the sessions. I will devote my remarks to certain aspects not covered in their reports, particularly the group discussions, which I believe are an innovation for a United Nations conference. These have provided a welcome opportunity for an exchange of ideas, so much so that while at the start we envisaged six group discussions, we ended up with nine. The last, on legal affairs, unhappily did not quite come off, because it was set up without adequate preparation and I offer my regrets to the Chairman of the thematic sessions concerned for the confusion created.

I would now like to touch upon what I consider to be some noteworthy aspects of the Conference. If I cannot do adequate justice to all points, it is because the time for reflection has been short and the material vast.

There was a great deal of discussion at the Conference on the regulatory functions which would be required if satellite communications are extensively used for all manner of national needs in telecommunications, including mass communications involving direct broadcast television. It was felt that regulatory problems would be different in various regions depending upon the existing level and sophistication of telecommunications and that the regulatory specifications established by ITU should permit variations in different areas of the world to maximize the cost-effectiveness of the telecommunications systems. It was also recognized that progress in the field is so rapid that regulatory bodies have to move much faster than is customary in considering new developments of great economic significance

to nations. Suggestions have been made about a two-level international system for providing services related to satellite telecommunications. The need for reform of the existing set-up of INTELSAT was generally recognized, and indeed formal consultations are already proceeding for this purpose. Moreover, a new international system has been proposed. This has too many dimensions for me to deal with adequately at this time, but the subject has been keenly discussed, and interesting ideas will be found in the reports of the group discussions for concrete action in the future.

It was established that the technique for direct broadcast of television, which involves high power in the transponder and a restricted radiated beam from the satellite, is almost here. There is great over-all saving in the cost of the system when use is made of satellites with high effective radiated power. The question of obsolescence of existing satellites also came out, because during their effective life of perhaps five to ten years they are overtaken by developments in technology. In consequence, an important question arises as to their replacement prior to the completion of their useful time of operation to make possible the deployment of newer techniques. It is a hard decision to make, but will have to be faced, taking into consideration a reduction of over-all systems cost, particularly of ground terminals. It would be appropriate if an international body such as INTELSAT sponsors research and development on a significant scale to make possible systems cost reduction at the earliest possible opportunity. There was great interest in trying out the implications of transmission frequencies from satellites in the 1 and the 10 G/c regions for direct broadcast.

In the discussion on meteorology, it was noted that, in most countries, the practical use of meteorology is currently made most effectively by aviation. It was emphasized that, to derive wider benefits, nations would need to devote much greater effort than hitherto on meteorology applied to medium-range and long-range weather forecasting and weather modification schemes. It was urged that nations would be well advised to invest in such programmes of benefit to their economies.

Automatic Picture Transmission (APT) came out as a programme of great importance and interest to a large number of countries and individuals. It has occurred to me that, if modest units are widely installed, they could perhaps also be used to receive charts of global meteorological conditions prepared at the World Weather Watch Centres. I am intrigued by the possibility of the dual use of the system to improve the quality of local forecasting.

When we came to Vienna, we thought that the areas of most immediate practical applications would be communications, meteorology and navigation, in that order. But one of the most striking things to emerge has been appreciation of the great potentiality of remote sensing devices, capable of providing large-scale practical benefits. One of the group discussions considered the cost-effectiveness of these techniques, and it was pointed out that there is a high cost/benefit ratio, which, for example, in cartography, can be as much as 18 : 1. The time has come to interest meteorologists, hydrologists, surveyors, agricultural specialists and other groups in such programmes. The Chairman of the thematic session summarized the consensus that aircraft could initially be used because of their comparatively low cost. There is need, to begin with, to understand problems of interpretation. Remote sensing cannot replace man on ground, but can direct man's efforts on ground to be more efficient.

We had an interesting group discussion on education. The benefits of television for education are well recognized, but it was noted that television is not a substitute for the teacher, but a powerful means of making him more effective. The main problems are not technical, but pedagogical. They are principally the identification of people who could be benefited by education through television, the motivation of people to be receptive to the benefits of education, the creation of suitable programmes to maintain continuous interest, the selection of monitors to conduct the programmes, the special problems when a country is multilingual, and the question of feed-back from subjects on effectiveness of the programmes and its evaluation. There is great need to develop "software" for educational and instructional television.

The role of the United Nations, its international agencies, and international co-operation were discussed at three most interesting group discussions. The thematic sessions on biology and medicine, on non-space applications, and education recognized that there was need for United Nations programmes that would provide training in these three areas. It has been stated that the Ivory Coast, Madagascar, Kenya and Ghana are ready to co-operate in a United Nations training project. The need to increase the cost effectiveness of United Nations agencies and programmes was repeatedly voiced. It was noted that the success of multinational programmes depended on credibility in the stated purpose. The Thumba Equatorial Rocket Launching Station in India is a good example of international co-operation where bilateral collaborative effort under the umbrella of United Nations sponsorship had worked very effectively.

Bilateral co-operation often offers the most advantageous way for getting on with work. It was recognized that international co-operation works best when concerned with specific projects, and also that there are a number of ways in which projects are initiated and sustained and a rigid approach is inappropriate.

The activities of the United Nations were discussed at a number of sessions. At present, we have the Committee on the Peaceful Uses of Outer Space, its two Sub-Committees and the Outer Space Affairs Division of the Department of Political and Security Council Affairs of the United Nations Secretariat. It was recognized that more would have to be done, and while the question of an independent agency was raised, there was much emphasis on strengthening activities within the framework of the Outer Space Affairs Division with scope to take initiative. On the professional side, the Division could be augmented by specialists seconded for a limited duration of time by member States.

I would like to invite attention of the Conference to experience in the International Council of Scientific Unions (ICSU). When space research became possible, there was a need to bring together scientists interested in various disciplines and COSPAR was formed by ICSU, involving various bodies, such as the Union of Geophysics and Geodesy, of Astronomy, of Radio and so on. We have in the United Nations various bodies such as ITU, WMO, UNESCO and FAO, charged with responsibilities in specific areas of applications. It has occurred to me forcefully at this meeting that there is no group or body which can take initiative on a continuing basis for promoting the applications of space, particularly in developing countries. There is a need at the United Nations level to look at the present and the forward-looking problems of applications of the uses of outer space in a variety of fields. I have suggested that an applications resource group of ten or twelve specialists, with an advisory role and meeting perhaps once a year, might be quite effective to generate new ideas that might lead to the tying-in of

the efforts done by various agencies. Moreover, there is a good scope for some projects to be supported jointly by two or more specialized agencies, as is being done by the International Atomic Energy Agency and the Food and Agriculture Organization of the United Nations. The Outer Space Affairs Division could generate a great deal of interest and understanding by arranging specialist panel meetings on specific topics on lines IAEA has followed so effectively. These panel meetings, perhaps no more than four per year, of fifteen or twenty people, could produce documentation and new ideas on specific applications, which could then be distributed widely. These meetings could be held in different parts of the world in order to generate local interest. And then there is the need for a number of scholarships for nationals of developing countries. I feel that one would need perhaps a hundred per year for training related to specific applications which a nation wants to undertake. There should be funds available for Governments committed to certain projects to be able to send their people to institutions run by nations advanced in the subjects concerned. The funds should support travel expenses and maintenance during a period of six months to a year.

Another programme of some importance which the United Nations could consider would be to undertake survey missions, on request, from countries or groups of countries to explore the potential of certain specific techniques within the context of local situations. There is need for a modest programme of technical assistance for developing countries to set up facilities like APT. If a country wants to construct an APT unit itself, there should be some funds available for taking a scientist or engineer to a place where he could make the first unit. For example, we will be very happy to provide at our Space Science and Technology Centre in India facilities and assistance to those wishing to build such units themselves and then taking the units back with them. This type of technical assistance should be geared to specific programmes of immediate benefit where the country itself is interested in making a commitment. United Nations sponsorship, like at Thumba, to multinational co-operative projects for space applications might be very helpful in providing an umbrella for bilateral co-operation.

I have tried to estimate what all this adds up to in financial terms. It seems that an allocation within the United Nations of something like half a million dollars a year may be required at the start. This might grow to 1 or 2 million dollars in three years. Independently of the activities of the specialized agencies, this would be quite a significant added input by the United Nations, through its Outer Space Affairs Division, to promote the peaceful uses of outer space.

There is yet another need of particular relevance to developing countries to which I would like to refer. There are many countries like Brazil, Argentina, some States in Africa, Indonesia, Pakistan, India, Australia and Canada, which have territories vast enough or regions which require to be covered by telecommunications, which could use part or all of a synchronous satellite capability exclusively leased for their own national needs. There are also many smaller countries, in Europe, for instance, where need exists for regional telecommunications. Local control of fully-leased channels should not be inconsistent with international obligations and control of the global satellite telecommunication system. At least as far as developing countries are concerned, I feel much could be gained if national use of INTELSAT facilities, for instance, could be based on full-time leasing of channels, for which they can pay in local currency for the first twenty years or so, since one great difficulty for them

would be payment in foreign exchange for a national service. The financial impact of this would be quite small compared to the magnitude of world technical assistance today, which is probably in the region of $US3 to 5 billion a year, and expenditure on the peaceful uses of outer space, which is also of that order. If, internationally, something like a hundred million dollars a year are used to augment the facilities of international satellites, for example through INTELSAT, and channels could be hired full-time in local currency for the time being, providing low-cost utilization of a complete satellite, the expenditure by an agency such as UNDP would amount to something like 2 per cent per annum of the volume of all aid or expenditure on space research. It seems to me that with the promise that outer space is now presenting, this type of international support would be well worth-while. Most importantly, it would eliminate the investment today by developing countries in obsolete technologies and permit a drastic reduction of satellite communication tariffs through their full utilization which is not possible immediately in many regions on international traffic by itself.

It would be appropriate if the reports of this Conference are first considered by the Scientific and Technical Sub-Committee of the Committee on the Peaceful Uses of Outer Space. I would hope that this Sub-Committee could look at all aspects in a detailed manner and come up with concrete proposals which the Committee on the Peaceful Uses of Outer Space and the United Nations could hopefully adopt. I feel that one of the important objectives of this Conference would not be fulfilled if the presentations given here are not available to a wider audience of policy-makers through pamphlets and effective audio-visual media. It is important to be able to disseminate information in various regions to the many people who could not come to Vienna. I hope that the United Nations will allocate adequate resources to make this possible without delay.

Finally, Sir, I have the pleasant duty of thanking you and the host country. A most important ingredient of this Conference has been the relaxed atmosphere in which we have approached our task, and, to no small extent, this is due to the very generous hospitality afforded by Austria. I want to say on behalf of all of us how much we have appreciated this. Mr. President, I referred earlier to your personal contribution. But for your very active initiative through these last two or three years, this Conference would certainly not have taken place. Such a Conference cannot succeed without the inputs which the delegations of nations bring to it. Various delegations, and particularly nations which have developed space research effectively, have been most generous in sharing information and experiences. This sets a very good precedent for the future. I am sure that in this achievement the main objective of this Conference has been realized. I wish to thank the United Nations Secretariat - Mr. Abdel-Ghani and his associates, the scientific secretaries who have taken time off from their countries to come to work for the Conference, the Office of Public Information, the Conference officers and, of course, the interpreters, without whom this Conference could not have succeeded.

I wish to thank all delegates personally for the kindness, thought and courtesy that I have received in my job, which I hope has been to your satisfaction.

XII. CLOSING STATEMENT BY THE PRESIDENT OF THE CONFERENCE

/Original: English/

The first United Nations Conference on the Exploration and Peaceful Uses of Outer Space is thus approaching its conclusion.

Over the past fourteen days, scientists and officials from seventy-nine nations and representatives from numerous international and scientific organizations have gathered in this hall to explore the practical benefits to be derived from space research and exploration, on the basis of technical and scientific achievements, and to study how the non-space Powers and especially the developing countries may enjoy these benefits.

The reports which the Scientific Chairman and the Chairmen of the thematic sessions have just made to the Conference bear witness of the determination with which the Conference has approached its task, the wide interest which it aroused and the results which it was able to achieve.

I believe that the Conference was able to fulfil its mandate. We have indeed heard a number of statements which clearly demonstrated that our expectations were not too high. This is particularly true of the space applications involving the use of satellites.

Thus the use of communications satellites was the object of extensive discussion. The versatility, flexibility and low cost of satellite communications has already exercised a profound effect on international communications even at this stage of their development. Such satellites offer considerable advantages both to advanced and developing countries and it is therefore most likely that we will witness rapid progress in this field. In fact, there already exist provisional arrangements and concrete proposals concerning the establishment of a global communication satellite network, and it is to be hoped that reasonable solutions will be found. We expect this all the more as there was general agreement that communication satellites could effectively be used for information and training and thus help developing countries in their manifold and difficult task of economic and social development.

In this connexion, I should like to refer to the memorandum submitted by the Secretary-General of the United Nations, which indicated the difficulties faced by the United Nations in the field of broadcasting and stressed the importance of satellite communication links for that Organization.

All these questions deserve our continued attention and will, I am sure, be further studied in the competent organs of the United Nations, as well as by the specialized agencies.

In the field of meteorology, too, a start has already been made through the establishment of a World Weather Watch. The enormous savings which apparently could be achieved through improved weather forecasts, especially in agricultural and water management, will certainly act as an incentive for extensive co-operation

in this field. The use of satellites for navigation has also found a positive evaluation and it was pointed out that the so-called survey satellites could offer considerable advantages especially to developing countries.

Apart from these spectacular applications of outer space technology, it was clearly stated that space research and technology bring about indirect economic and other benefits, which are already being felt in such different fields as electronics, medicine, biology, metallurgy and even in organizational management. I am therefore convinced that the Conference has demonstrated that the interaction between science and technology, between scientific research and industrial applications can indeed provide the tools for swift technical, economic and social progress and thus influence directly the level of economic and technical development.

The Conference has also rightly devoted part of its sessions to the aspects of international co-operation in the application of space science and technology. It has examined how those countries which are not in a position to carry out an independent space programme could share the benefits resulting from space research and technology. It was said that bilateral co-operation is indicated in all those fields for which multilateral co-operation is either not practicable or not available. This type of co-operation may in particular enable countries to build up an infra-structure in the field of outer space, thus facilitating their participation in international projects.

Regional co-operation is likewise necessary and desirable. The needs and goals of the various geographical areas seem to be different. Whereas, for example, advanced countries might find it interesting to use satellites for the automatic transmission and exchange of data, developing countries might wish to give more weight to the use of satellites for agriculture, water management, education and training and the survey of earth resources. Regional co-operation is therefore of great importance and can lead - as in the case in Europe - to the establishment of regional organizations.

There can be no doubt, however, that some activities, such as the effective functioning of a World Weather Watch, or the equitable use and distribution of frequency bands, will demand, by the very nature of these activities, world-wide co-operation and co-ordination. The greatest benefits for all, economic and otherwise, could certainly best be achieved through large-scale applications of outer space research and technology, and consequently through international co-operation, on as wide a basis as possible. This explains why numerous speakers expressed themselves in favour of strengthening the role of the Committee on the Peaceful Uses of Outer Space, of the United Nations Secretariat and the specialized agencies.

Surely, it was not possible for the Conference, in fourteen short days, to find solutions to all the problems which we face at the beginning of the second decade of the space age. No one could have seriously expected that. But I am sure that, on this closing day of the Conference, we can say that we have advanced a first and perhaps not insignificant step on the long and difficult road towards our goal.

Scientists and technologists who attended the Conference are today perhaps more aware of the problems they face, of their true dimensions, of their different aspects and of their often complex implications. Through their discussions with scientists from other countries, they have, I am sure, increased their knowledge and

understanding, and, through their contacts with representatives from other nations and other societies, they will have gained greater insight into the complexities of the issues before them.

Government officials, particularly from the developing countries, will have acquired a deeper understanding of the possibilities which outer space research and technology could offer for the solution of many, or at least some of the technical, economic and social problems with which their nations are confronted today.

I am convinced that the Conference will thus prove to be an important event in the development of international co-operation in the exploration and uses of outer space, and that it will give momentum to our efforts to bring the benefits of space technology to all nations, irrespective of their degree of technical and economic development.

The Conference, however, was only a first step on a long and challenging path. The scientists and experts who have spoken at the Conference have demonstrated the potentialities of the practical applications of outer space technology and indicated the possibilities for progress and co-operation. The next step will now have to be taken by our Governments. May we, on this closing day of the Conference, express the hope that they will recognize their responsibilities, and that the probing mind of the scientist, the ingenuity of the engineer and the courage of the astronaut will be matched by the farsightedness and determination of the political leaders.

Before I now conclude the proceedings of the Conference, I wish to express my sincere appreciation to all those who have contributed so greatly to its success.

In the first place, I should like to convey my gratitude to the Secretary-General of the United Nations, U Thant, who, ever since the beginning of the preparatory stages, has lent his personal interest and assistance to the Conference. We regret that he was prevented from being with us at this closing session, as he had intended.

I should equally like to extend my appreciation to the distinguished Vice-President and Scientific Chairman of the Conference, Dr. Vikram Sarabhai. As Chairman of the Panel of Experts, he has supervised the scientific preparations for the Conference, as Vice-President of the Conference, he bore the responsibility for guiding its scientific work. Dr. Sarabhai has discharged his mandate with distinction, and has gained our admiration for his tireless and devoted efforts. I, who worked so closely with him during these past weeks, am the first to know how much the Conference owes to his work.

With the same gratitude, I should like to thank all the eminent scientists who were chosen by the Conference as chairmen and vice-chairmen of the thematic sessions and as chairmen of the evening sessions. The Conference was indeed fortunate to benefit from their wisdom, insight and experience, and, on behalf of all delegations, I wish to thank them for their efficient and devoted work.

I also wish to thank the Executive Secretary of the Conference, Mr. Abdel-Ghani, who has been entrusted with most of the administrative arrangements for the Conference. If the Conference, in spite of the many difficulties arising from the special nature of its work, was able to work so smoothly and efficiently, it was

to a large extent due to the work of the Executive Secretary and his able and devoted staff, many of whom bore more than the usual share of responsibility in the preparation of this Conference.

Finally, let me thank all the United Nations staff who worked with us during the Conference, all the many visible and invisible helpers who contributed so much to make the Conference a success.

Distinguished delegates, my very special gratitude, however, goes to you, to all delegations, to all representatives of international organizations attending the Conference. Your co-operation, your work, was the essence of this Conference. You have accomplished its success. On behalf of the officers of the Conference I wish to thank you for your collaboration.

Before concluding may I, with your permission, say a few words not as President of the Conference, but as head of the delegation of Austria. Many delegates in their interventions expressed their gratitude for the hospitality with which they were received in Austria and in the City of Vienna. I wish to thank you for your kind words. Austria and Vienna were indeed proud to have been host to the Conference and we are happy if your stay in Vienna was not only fruitful, but pleasant as well. We now wish you a happy return to your home countries, and we hope that you will soon come to Vienna again.

Distinguished delegates, we are concluding this Conference at a moment of political tension, filled with unrest and anxiety. We have demonstrated at this Conference the possibilities for a peaceful exploration of outer space and its use in the interest and for the progress of all mankind. May we also have the wisdom to find and to secure, here on earth, peace for all men.

I now declare closed the United Nations Conference on the Exploration and Peaceful Uses of Outer Space.

APPENDICES

APPENDIX I

LIST OF PARTICIPATING COUNTRIES IN THE CONFERENCE

Algeria
Argentina
Australia
Austria
Belgium
Bolivia
Brazil
Bulgaria
Burma
Byelorussian Soviet Socialist Republic
Canada
Ceylon
Chile
China
Colombia
Costa Rica
Czechoslovakia
Denmark
Dominican Republic
Ecuador
Federal Republic of Germany
Finland
France
Ghana
Greece
Guatemala
Holy See
Hungary
India
Indonesia
Iran
Iraq
Ireland
Israel
Italy
Ivory Coast
Japan
Kenya
Kuwait
Lebanon
Liberia
Libya
Madagascar
Mexico
Monaco
Mongolia
Morocco
Nepal
Netherlands
Nicaragua
Norway
Pakistan
Panama
Peru
Philippines
Poland
Portugal
Republic of Korea
Romania
Saudi Arabia
Senegal
South Africa
Spain
Sweden
Switzerland
Thailand
Tunisia
Turkey
Uganda
Ukrainian Soviet Socialist Republic
Union of Soviet Socialist Republics
United Arab Republic
United Kingdom of Great Britain
and Northern Ireland
United States of America
Upper Volta
Uruguay
Venezuela
Yugoslavia

APPENDIX II

LIST OF PARTICIPATING ORGANIZATIONS

Specialized agencies

Food and Agriculture Organization of the United Nations (FAO)
International Atomic Energy Agency (IAEA)
International Civil Aviation Organization (ICAO)
International Labour Organisation (ILO)
International Telecommunication Union (ITU)
Inter-Governmental Maritime Consultative Organization (IMCO)
United Nations Educational, Scientific and Cultural Organization (UNESCO)
World Health Organization (WHO)
World Meteorological Organization (WMO)

Other inter-governmental organizations

European Space Research Organization (ESRO)
European Launcher Development Organization (ELDO)
International Telecommunications Satellite Consortium (INTELSAT)

Non-governmental organizations

Committee on Space Research (COSPAR) of the International Council of Scientific Unions

APPENDIX III

LIST OF OFFICERS OF THE CONFERENCE

President: H.E. Dr. Kurt Waldheim
Vice-President/Scientific Chairman: Dr. Vikram Sarabhai
Executive Secretary: Mr. A.H. Abdel-Ghani

Introductory session	Chairman, Dr. V.A. Sarabhai (India) Secretaries, Miss Prat and Mr. Raghavan
Thematic sessions	
I. Communications	Chairman, Mr. Erik Esping (Sweden) Vice-Chairman, Mr. Trevor A. Housley, C.B.E. (Australia) Secretaries, Mr. Robinson and Miss Prat
II. Meteorology	Chairman, Mr. J.S. Sawyer, F.R.S. (United Kingdom) Vice-Chairman, Mr. Bert Bolin (Sweden) Secretaries, Mr. Ricciardi and Mr. Zaman
III. Navigation	Chairman, Dr. Kiyoshi Morita (Japan) Vice-Chairman, Dr. H.C. Freiesleben (Federal Republic of Germany) Secretaries, Dr. Beloded and Mr. Zaman
IV. Other space techniques of practical benefit	Chairman, Dr. Robert C. Seamans, Jr. (United States of America) Vice-Chairman, Prof. Vladimir Guth (Czechoslovakia) Secretaries, Mr. Ricciardi and Mr. Zaman
V. Biology and medicine	Chairman, Acad V.V. Parin (Union of Soviet Socialist Republics) Vice-Chairman, Prof. Dr. Heinz Graul (Federal Republic of Germany) Secretaries, Dr. Beloded and Mr. Zaman
VI. Non-space applications of space technology	Chairman, Mr. Vladimir Gencic (Yugoslavia) Vice-Chairman, Prof. Giuseppe Gabrielli (Italy) Secretaries, Mr. Ricciardi and Miss Prat
VII. Education and training	Chairman, Prof. M. Bernard (France) Vice-Chairman, Prof. Alexandru Spataru (Romania) Secretaries, Miss Prat and Mr. Zaman

Thematic session	
VIII. International co-operation and opportunities for participation in space research and application	Chairman, Dr. R.S. Rettie (Canada) Vice-Chairman, Mr. Teofilo Tabanera (Argentina) Secretaries, Mr. Robinson and Mr. Ogunbanwo
IX. Economic, legal and social problems of the exploration and use of outer space relevant to international co-operation and practical benefits	Chairman, Prof. Antonio Ambrosini (Italy) Secretaries, Miss Chen and Mr. Ogunbanwo
Evening lectures	
For the list of officers of evening lectures, see appendix VI.	
Credentials Committee	
	Chairman, Mr. Carlos Elizondo (Mexico)

APPENDIX IV

LIST OF PAPERS PRESENTED AT THE CONFERENCE

Introductory session

Document Series	Title	Author	Submitted by
INT.1	Practical terrestrial benefits derived from using outer space	Dr. Franz Matsch	Austria
INT.2	General review of Japan's space activities	Noboru Takagi and Akiyoshi Matsuura	Japan
INT.3	Contributions and results of space science programmes	Homer E. Newell	United States
INT.4	Man's role in space	Dr. George Mueller	United States
INT.5	Overview of space applications programmes	Leonard Jaffe	United States
INT.6	The aerospace stimulus to technological advance	John L. Sloop and Mac C. Adams	United States
INT.7	The French effort: a balance-sheet		France
INT.8	A decade of space and upper atmospheric research in Canada	Dr. D.C. Rose and Dr. R.S. Rettie	Canada
INT.9	The first artificial earth satellite - the beginning of space age and further development of the peaceful conquest of space	A.A. Blagonravov	USSR
V.B.5	Professional activities of cosmonauts	Yu.A. Gagarin	USSR
INT.11	Soviet explorations of moon, planets and interplanetary space	G.I. Petrov and G.A. Skuridin	USSR
INT.12	Scientific and practical aspects of research of structure and variations of upper atmosphere parameters	V.G. Istomin, M.Ya. Marov, V.V. Mikhnevich	USSR
INT.13	Lunar surface explorations with automatic stations "Luna-9" - "Luna-13"	A.P. Vinogradov, Yu.A. Surkov, K.P. Florensky, I.I. Cherkasov, V.V. Shvarev	USSR

Document Series	Title	Author	Submitted by
	Thematic session I. Communications		
	(i) General		
I.1	Satellite television: a system proposal for India	B.S. Rao, Prasad L. Vepa, M.S. Nagarajan, H. Sitaram, B.Y. Nerurkar	India
I.2	Possibility of, and profit to be gained by, using satellites for educational purposes	Toyashi Yoshida	Japan
I.4	Space broadcasting - how, when and why	R.P. Haviland	United States
I.5	Satellite system for educational television	Dr. Harold A. Rosen	United States
I.6	Satellites for education: lessons from a decade of experience with educational television	Wilbur Schramm	United States
I.7	Special contribution of Great Britain to the design of civil communication - satellite earth stations	H. Stanesby	United Kingdom
I.8	The role of small earth stations in future civil communication satellite systems	J.L. Blonstein	United Kingdom
I.10	Method of recognizing the source of a television programme and arrangement, realizing the method	D.N. Mishev and K.I. Konov	Bulgaria
I.11	Conceptual study of satellites for direct-TV-broadcast with incore-thermionic-reactor and electrical propulsion	W. Rasch, A. Quast, W. Oldekop, W. Scharf	Federal Republic of Germany
I.12	Project "Symphony"	J. Bouvet and Dr. A.H. Schendel	France/Federal Republic of Germany
I.13	Application of satellites to the telecommunications scene	T.A. Housley, C.B.E.	Australia
I.14	Advantages and disadvantages of satellite telecommunications	R. Sueur	France
I.15	The uses of the "Symphony" satellites		France

Document Series	Title	Author	Submitted by
I.16	Radiocommunications in the exploration and peaceful uses of outer space		ITU
I.17	The application of communication satellites for domestic telecommunications in Canada	F.G. Nixon	Canada
I.18	The development and present characteristics of the Fucino station	G. Salvatori	Italy
I.19	The educational satellite transmissions	M. Rodino	Italy
I.20	The potentialities of space communication for promoting the free flow of information, the spread of education and greater cultural exchange, and the related international arrangements needed		UNESCO
I.21	Progress in the field of space radiocommunication in the Republic of China	K.P. Liang	Republic of China
I.22	Monitoring of TV transmission quality over cosmic communication lines	M.I. Krivosheyev	USSR
I.23	"ORBITA" satellite communication system	L.J. Kantor and S.V. Borodich	USSR
I.24	The optimization of cosmic communication systems	G.R. Uspensky and G.S. Gusakov	USSR
I.25	"Molnia-I" communication satellite	M.R. Kaplanov	USSR
I.26	Television education via satellite	Teofilo M. Tabanera	Argentina
I.27	Use of communication satellites by the United Nations		United Nations

(ii) Specialized

I.A.1	The optimization of antenna electrical performance	G.H. Bryant	United Kingdom
I.A.2	Determination of the optimum modulation technique for single-voice channel operation under very severe noise conditions	P.N. Denbigh	United Kingdom

Document Series	Title	Author	Submitted by
I.A.3	Beam shaping for optimum illumination patterns	Sidney Cornbleet	United Kingdom
I.A.4	Influence of the ionosphere of the earth and other planets on the maximal frequency in space communications	K. Serafimov	Bulgaria
I.A.5	Properties and design of antennas of the cassegrain type for radio communications with space stations	M. Velkov, A. Peinerdjiev, K. Serafimov	Bulgaria

Thematic session II. Meteorology

(i) General

II.1	The role of meteorological satellites in World Weather Watch		WMO
II.2	Operational weather satellites and their implications	David S. Johnson	United States
II.3	Continuous observation of weather motion	Verner E. Suomi	United States
II.4	Atmospheric structure research for long-term forecasting	William Nordberg	United States
II.6	Space meteorology in France	M. Villevieille	France
II.7	The EOLE programme	J. Muller	France
II.8	The near future of use of data of meteorological satellites for quantitative weather forecast	M.I. Yudin	USSR
II.9	Light and heat of the planet: satellite actinometry	V.G. Boldyrev, V.L. Gayevsky, L.B. Krasil'shchikov, I.A. Chetverikov	USSR
II.10	Satellite meteorology today and tomorrow	V.A. Bugayev	USSR
II.11	Electronic computer recognizes clouds	D.M. Sonechkin	USSR
II.12	Satellites and planetary circulation of atmosphere	Sh. A. Musaelyan	USSR
II.13	The data from cosmos of sources and heat flows	Yu.V. Kurilova	USSR

Document Series	Title	Author	Submitted by
	(ii) Sounding rockets		
II.A.1	Meteorological rocket soundings on a global scale	Sidney Teweles	United States
II.A.2	The development and use of meteorological and sounding rockets in the United Kingdom	Dr. N. Simmons	United Kingdom
II.A.3	Destructible meteorological rocket sonde "DART"	B. Muller	Federal Republic of Germany
II.A.4	A recoverable and reusable sounding rocket	W. Pittelkow	Federal Republic of Germany
II.A.5	Infra-red measurements of the atmosphere	Francesco Pellegrini	Italy
II.A.6	Rocket engineering and development of upper atmosphere physics	E.G. Shwidkovsky	USSR
II.A.7	The experimental inter-American meteorological rocket network (EXAMETNET)	Conrado J. Estol	Argentina
	(iii) Automatic picture transmission (APT)		
II.B.1	Use of satellite cloud pictures in routine meteorological work	Y.L. Tokatly	Israel
II.B.2	The analysis and use of APT data	Vincent J. Oliver and Ralph K. Anderson	United States
II.B.3	Receiving APT-pictures with simple electronic instruments	H. Kindl and G. Schiffner	Austria
II.B.4	The design and benefits of an automatic picture transmission (APT) network	Dr. Joseph Clodman	Canada
	iv) Satellites		
II.C.2	Weather research satellites	Morris Tepper	United States
II.C.3	The selective chopper radiometer for atmospheric temperature sounding	S.D. Smith and J.T. Houghton	United Kingdom
II.C.4	Weather invisible from earth: high-resolution television pictures	N.F. Veltishchev	USSR

Document Series	Title	Author	Submitted by
II.C.5	"Meteor" experimental cosmic meteorological system	I.M. Andronov and N.N. Sheremetievsky	USSR
	(v) Regional		
II.D.1	Space science stimulates meteorological research in Pakistan	M. Rahmatullah	Pakistan
II.D.2	Space meteorological studies in India	Prof. P.R. Pisharoty and G.C. Asnani	India
II.D.3	The studies of winter monsoon clouds over the Western Pacific regions	Kiyoshi Tsuchiya	Japan
II.D.4	Typical weather developments in Europe as observed by meteorological satellites	Dr. Leopold Kletter	Austria
II.D.5	The value to the southern hemisphere of meteorological observations from satellites	J.C. Langford	Australia
II.D.6	Spiral cloud bands in low-pressure areas of medium latitudes observed on the photographs taken by meteorological satellites	Ales Gottwald	Czechoslovakia
II.D.7	An attempt at mathematical description of the spiral structure of cloudiness in the occluded cyclone on the basis of the solution of W - equation	Pavla Hlachova	Czechoslovakia
II.D.8	What meteorology may expect from the EOLE experiment	P. Morel	France
II.D.9	Meteorological satellites and safety of navigation	K.P. Vasil'yev	USSR
II.D.10	The weather of tropical zone in infra-red rays	P.N. Belov	USSR
II.D.11	The use of modern facilities in Polish meteorology	J. Michalczewski, J. Walczewski	Poland
	Thematic session III. Navigation		
	(i) General		
III.1	Study on navigation satellite system	Yasuo Iizuka	Japan

Serial No.	Title	Author	Submitted by
III.2	Considerations on requirements to capacities of the navigation satellite system around Japan	Kenjiro Azumi and Koichi Kimura	Japan
III.3	The general utility and character of prospective navigation services satellite systems	Eugene Ehrlich	United States
III.5	The United States Navy navigation satellite system	R.B. Kershner	United States
III.6	The DIOSCURI system of air control and navigation by satellite	J. Villiers and B. Manuali	France
III.7	Satellites and ocean platforms for civil aviation operations over the North Atlantic	J.H. Briggs and L.J. Braybrook	United Kingdom
III.8	The impact of space developments on civil aviation		ICAO
III.9	The use of satellites for navigation	Chu Juo-wen	Republic of China
III.10	Consideration of some marine uses of navigation satellites	Edgar S. Keats	United States

(ii) Specialized

III.A.1	Navigation using the altitude and azimuth of the artificial satellite	Tsutomu Makishima	Japan
III.A.2	A new method of solving the equations of celestial mechanics	Prof. Nikola St. Kalitzin	Bulgaria

Thematic session **IV.** Other Space Techniques of Practical Benefit

(i) General

IV.1	Aerospace applications in agriculture and forestry	Dr. A.B. Park	United States
IV.2	Space applications in water resource development	Charles J. Robinove	United States
IV.3	Space applications in support of artography and geography	Winston Sibert	United States
IV.4	Geologic applications of earth orbital satellites	W.T. Pecora	United States

Serial No.	Title	Author	Submitted by
IV.5	Space craft oceanography - its scientific and economic implications for the next decade	John W. Sherman and Capt. Leroy Cheney	United States
IV.6	The satellite geodesy programme	Dr. George P. Woollard	United States
IV.7	Some practical applications of space-age programmes for developing nations	Fernando de Mendonça	Brazil
IV.8	Secondary uses of EOLE satellites	Edouard Sachot	France
IV.9	The value of satellite techniques in the evaluation of natural resources of large areas	Y.O. Fortier J.M. Harrison S.G. Gamble L.W. Morley	Canada
IV.10	Automatic docking in space and its association with theory and practice of automatic control	B.V. Raushenbakh	USSR
IV.11	Satellites, hydrology and the International Hydrological Decade		UNESCO

(ii) Geodesy

IV.A.1	Present status of researches on satellite triangulation in Japan	H. Hirose Y. Harada A. Sinzi	Japan
IV.A.2	Applications of satellite geodesy	A.H. Cook	United Kingdom
IV.A.3	Geophysical research based on visual observations of satellites	D.G. King-Hele D.E. Smith	United Kingdom
IV.A.4	On the mass-functions of the earth, derived from orbital perturbations of artificial satellites	Karl Ledersteger	Austria
IV.A.5	Studies on geodetic networks with satellites	Dr. K. Rinner	Austria
IV.A.6	A determination of the steric rectangular co-ordinates of earth's points based on observations from artificial earth satellites	Vladimir K. Hristov	Bulgaria
IV.A.7	The French space geodesy programme	J.J. Levallois J. Kovalevsky	France

Serial No.	Title	Author	Submitted by
IV.A.8	French geodesic satellites	J.C. Husson	France
IV.A.9	Certain variants of the exploitation of artificial-satellite observations in the field of continental and global geodesy	L. Cichowicz	Poland

Thematic session V. Biology and Medicine

(i) Biology

V.A.1	Space research - source of biological knowledge	Allan H. Brown	United States
V.A.2	Biological and technical aspects of habitability of space ships and planetary stations	B.A. Adamovich Yu.G. Nefyodov	USSR
V.A.3	Space research and biological sciences	O.G. Gazenko	USSR
V.A.4	Benefits to be derived from space microbiology		UNESCO

(ii) Medicine

V.B.1	Contributions of space technology to solutions of medical problems	Quentin L. Hartwig	United States
V.B.2	A method for the estimation of the cardiac output during space flight	D.M. Denison and P. Howard	United Kingdom
V.B.3	Further findings of extraterrestrial vestibular research	Herbert J. Pichler	Austria
V.B.4	On protection from the cosmic rays and internal radiation belt in space flights	P. Velinov	Bulgaria
V.B.5	Results of Soviet research of charged particles and magnetic fields in cosmic space	S.N. Vernov K.I. Greengaus S.S. Dolginov Yu.I. Logachev	USSR
V.B.6	Spatial perception in outer space	A.A. Leonov	USSR
V.B.7	Accomplishments of human physiology and space exploration	V.V. Parin	USSR
V.B.8	Physical training as a means for specific elevation of the tolerance level to negative environmental influences	Dr. Zbigniew Jethon	Poland

Thematic session VI. Non-Space Applications of Space Technology

Serial No.	Title	Author	Submitted by
VI.1	The industrial and technological spin-off from a nationwide television system using satellites	Ashok Parthasarathi	India
VI.2	Reconstruction of blurred images by space frequency filtering	Jumpei Tsujiuchi	Japan
VI.3	The government role in technology utilization programmes	Richard L. Lesher	United States
VI.4	Economic benefits from non-space application of space technology	George J. Howick	United States
VI.5	The university role in technology utilization programmes	Arthur M. Weimer	United States
VI.6	The industrial role in technology utilization programmes	R.A. Gaiser	United States
VI.8	Management's opportunities for second-order technological contributions	William E. Zisch	United States
VI.9	Stimulating effects of space aerodynamics on technical and scientific developments	Dr. Walter Wuest	Federal Republic of Germany
VI.10	The technical and industrial "spin-off" from space activities	M. Claverie	France
VI.11	The benefits to Canadian industry through participation in space activities	W.M. Auld P.A. Lapp C.E. MacKimmie	Canada
VI.12	Space activity and its influence on industry	I. Capriolo and E. Vallerani	Italy
VI.13	Possible application of satellite technology in other fields	Mario de Leo	Italy
VI.14	Development of information systems for deep space exploration	Yu.K. Khodarev	USSR
VI.16	Studies methods of dynamics of carrier rockets and space vehicles and possibilities of these methods in other branches of engineering	G.N. Mikishev and B.I. Rabinovich	USSR

Serial No.	Title	Author	Submitted by
VI.17	Achievements in the field of space materials science and their use in industry	G.G. Konrady V.V. Kozelkin L.A. Novitsky V.V. Shvarev	USSR
VI.18	Some possibilities for the application of industrial technology in space research to the benefit of the developing countries	Vladimir Gencic	Yugoslavia

Thematic session VII. Education and Training

VII.1	Educational problems relating to space research in developing countries	M. Rahmatullah	Pakistan
VII.2	Opportunities available to developing nations through the use of communication satellites: the Delhi project	Prasad L. Vepa	India
VII.3	The NASA university programme	Francis B. Smith	United States
VII.4	University projects in space system engineering and their potential benefits for developing countries	William Bollay and Bruce B. Lusignan	United States
VII.5	Education and training	Robert Jastrow	United States
VII.6	Educational materials produced by the space programme	James V. Bernardo	United States
VII.7	The university-space programme interaction	Willard F. Libby	United States
VII.8	Instruction and training in space science and technology in France	Prof. M.Y. Bernard	France
VII.10	Space activities in Canadian universities	B.W. Currie	Canada
VII.12	Influence of space explorations on general and special education	C.M. Belotserkovsky	USSR
VII.13	Experience of the people's observatories in the People's Republic of Bulgaria in training secondary school pupils in disciplines connected with the mastering of outer space	Dr. Nikola S. Nikolov	Bulgaria

Serial No.	Title	Author	Submitted by
VII.14	Proposals concerning the training of scientists	Dr. S. Piotrowski	Poland
VII.15	Survey of existing programmes for education and training in the field of the peaceful uses of outer space		United Nations

Thematic session VIII. International Co-operation and Opportunities for Participation in Space Research and Applications

VIII.1	Little league space research	Uri Shafrir	Israel
VIII.2	International experimentation with communications satellites	Leonard Jaffe	United States
VIII.3	NASA programmes and opportunities for international co-operation in space	Arnold W. Frutkin	United States
VIII.4	Co-operation through the exchange of scientific and technical information	Melvin S. Day	United States
VIII.5	International organizations in space activities	Herman Pollack	United States
VIII.6	Can the INTELSAT experience serve as a precedent for international co-operation in other fields?	Frank E. Loy	United States
VIII.7	International benefits of co-operative tracking and data acquisition agreements	Gerald M. Truszynski	United States
VIII.8	Benefits of membership in COSPAR	Prof. Roy	COSPAR
VIII.9	Considerations on the sampling of extraterrestrial material	G. Dorfler, W. Kiesl, F. Hecht	Austria
VIII.10	The work of the European Launcher Development Organization		ELDO
VIII.11	The European Space Research Organization		ESRO
VIII.12	France and co-operation with the non-space powers	M. Bignier	France
VIII.13	The role of international organizations	G. de Beisgelin	France

Serial No.	Title	Author	Submitted by
VIII.14	Needs of the developing countries in the field of the practical benefits to be derived from space research and exploration		Sierra Leone
VIII.15	International co-operation in the peaceful uses of outer space	Dr. D.C. Rose and Dr. R.S. Rettie	Canada
VIII.17	The San Marco project: a programme of international collaboration	Luigi Broglio	Italy
VIII.18	Some results of international co-operation in the field of optical tracking of artificial satellites for ten years	A.G. Massevitch	USSR
VIII.20	Co-operation of the USSR with other countries in the study and peaceful uses of outer space	B.N. Petrov	USSR
VIII.21	Rockets in weather service	C.M. Poloskov	USSR
VIII.22	Organization and activities of the International Telecommunications Satellite Consortium	John A. Johnson	INTELSAT
VIII.23	International co-operation in solar terrestrial research		UNESCO
VIII.24	Australian sounding rocket experiments complementing satellite firings	B. Rofe and P.M. Twiss	Australia
VIII.25	The role of the United Nations in furthering international co-operation in the peaceful uses of outer space		United Nations
VIII.26	United Nations-sponsored international sounding rocket launching facilities		United Nations
VIII.27	Functions of the United Nations in disseminating information on the peaceful uses of outer space for Member States		United Nations
VIII.28	Applications of artificial satellites to the education and instruction of people in developing countries	Dr. Tatomir Andelić	Yugoslavia

Serial No.	Title	Author	Submitted by
VIII.29	The European Space Conference and its importance for the co-ordination of European space activities		Italy

Thematic session IX. Economic, Legal and Social Problems of the Exploration and Use of Outer Space Relevant to International Co-operation and Practical Benefits

IX.1	Social benefits to mankind from the "space approach" to international relations	Dr. Franco Fiorio	San Marino
IX.2	Summary of the National Academy's summer study of space applications	Dr. W. Deming Lewis	United States
IX.3	The first decade of law in space	Leonard C. Meeker	United States
IX.4	International liability for damages caused by the launching of objects into outer space - theory and applications	Paul G. Dembling	United States
IX.5	Economic, legal, and social problems resulting from the exploration and use of outer space	J.L. Vencatassin	France
IX.6	Tendencies and prospects in the development of space law	A.S. Piradov	USSR
IX.7	International co-operation in the rescue of astronauts	G.P. Zhukov	USSR
IX.8	Legal problems of outer space	Prof. Dr. Alex Meyer	Federal Republic of Germany

APPENDIX V

GROUP DISCUSSIONS

Date	Subject	Panel	Points for discussion
16 August 1968	Relevance to developing nations of space programmes.	Dr. V.A. Sarabhai, Chairman Mr. V. Gencic Dr. F. Seitz Dr. S. Gnanalingam Mr. T.M. Tabanera Mr. B.V. Lipatov	(a) The peaceful uses of outer space most relevant to the developing countries. (b) The circumstances under which they can be applied most profitably. (c) The extent of the investments which the developing countries could make. (d) The outside inputs.
17 August 1968	Role of international agencies in promoting peaceful uses of outer space	Mr. A. Frutkin, Chairman Mr. F. de Mendonça Mr. M. Mili Prof. Blamont Dr. N. Takagi Mme. Masevitch	(a) The role of international agencies in surveying and identifying peaceful applications of economic and social significance to developing nations. (b) The role that international agencies can play in facilitating nationals of developing countries for undertaking managerial and technical responsibilities for space projects.

Date	Subject	Panel	Points for discussion
			(c) The role that international agencies can play in facilitating the sharing of "know-how", and in the provision of experts, hardware and finances.
19 August 1968	Synchronous communication satellites for national, regional and international telecommunications - organizational considerations, scope and role vis-à-vis conventional technology	Mr. T.A. Housley, Chairman Mr. W. Bolay Mr. C.H, Laigle Dr. F.G. Nixon Mr. M. Vladimir Mr, N.V. Shenoy	(a) The cost-effectiveness of synchronous communication satellites vis-à-vis conventional methods for providing narrow-band and broad-band telecommunications. (b) The reliability and mean useful life of communication satellites. (c) The cost-effectiveness of leasing the channels from INTELSAT versus having an exclusive national satellite. (d) The problems associated with a national system depending on an international/ foreign organization.

Date	Subject	Panel	Points for discussion
20 August 1968	State of art for direct broadcast television from synchronous satellites	Mr. M. Mercier, Chairman Mr. R. Haviland Mr. Borodich Mr. J.N. Blonstein	(a) Assessment of when direct broadcast television will become operationally feasible. (b) The optimal specifications relating to the frequency, Effective Radiated Power (ERP), pointing accuracy, area of coverage and satellite weight for minimizing over-all system costs. (c) The cost of a front-end converter for direct reception and compatibility of a new system with the existing networks. (d) Political problems involved in direct broadcast television.

Date	Subject	Panel	Points for Discussion
21 August 1968	Scale of national participation for practical benefits from the World Weather Watch Programme	Prof. P.R. Pisharoty, Chairman Dr. D.S. Johnson Mr. V.A. Bugaev Mr. J.S. Sawyer Mr. M. Rahmatulla Mr. H. Tsuchiya Mr. I.D. Beryiskin	(a) Use of APT data to amplify forecasts issued by World Weather Centres. (b) Participation in balloon programmes of the EOLE and GHOST types. (c) Computation of vertical motion fields with a dense grid using data from an open grid. (d) Analysis of ocean temperatures.
22 August 1968	Earth resources survey by remote sensing	Mr. L. Jaffe, Chairman Mr. A.B. Park Mr. W. Sibert Dr. de Mendonça	(a) What is the utility and state of art of remote sensing by aeroplane and study of the problem areas. (b) How can you train people in remote sensing? (c) What is the cost-effectiveness of remote sensing as compared with orthodox methods?
23 August 1968	International co-operation for peaceful uses of outer space	Dr. A. Dattner, Chairman Dr. A.R. Ratsimamanga Ing. F. Fiorio Acad. G.I. Petrov Mr. H.E. Newell Acad. L. Krastanov Prof. E.V. Chitnis	(a) What type of bilateral and multilateral co-operative activities are needed in situations where there is potential scope for an application, but (i) the perception of it, or (ii) an adequate professional base are non-existent?

Date	Subject	Panel	Points for Discussion
			(b) What is the scope for bilateral and regional co-operation for (i) small industrially advanced countries, (ii) developing countries with a professional base and those without it?
			(c) What lessons have we learnt from the problems of (i) ESRO/ELDO, (ii) TERLS, and (iii) EXCMETNET
24 August 1968	Legal aspects of the peaceful uses of outer space	Prof. K. Rao, Chairman Prof. Ambrosini Mr. Dembling	(a) Peaceful uses of outer space
			(b) Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies
			(c) Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space
			(d) Draft agreement on liability for damage caused by space objects launched into outer space
24 August 1968	Social and pedagogical problems connected with the use of satellites for education	Mr. W.F. Libby, Chairman Mr. M. Bernard Mr. P.L. Vepa Prof. Dr. S. Piotrowski Prof. Dr. O.M. Belozerkowskij	(a) For whom is a programme of education and training required?

Date	Subject	Panel	Points for Discussion
			(b) Who can be educated and trained by this means alone?
			(c) What can be taught by this method?
			(d) How can this method be used for teaching purposes: (i) using pictures only, (ii) using voice and pictures (language problem), (iii) problem of feed-back from pupil to teacher?
			(e) What is the cost-effectiveness of this method?

APPENDIX VI

EVENING LECTURE SCHEDULE

Date		Title	Lecturer	Chairman
Thursday 15 August	1.	Space technology and the future of mankind	Dr. F. Seitz	Prof. M. Roy
"	2.	Ten years in space exploration in USSR	V. Raushenback	Sir R. Cockburn
Friday 16 August	3.	Commercial communication satellites	J.V. Charyk	A.G. Massevich
	4.	Space technology in the service of mass education and training	Prof. Blamont	Mr. Jaffe
Saturday 17 August	5.	Forty years on auroral research in northern Canada	Prof. B.W. Currie	Dr. R. Luest
	6.	Solar terrestrial relations as an object of space research	Dr. H.O. Ruppe	Dr. S. Gnanalingam
Monday 19 August	7.	Rocket propulsion and space research	Sir R. Cockburn	Dr. S. Dhawan
"	8.	Potentialities of space meteorology to agricultural production and weather modification	Prof. P.R. Pisharoty	Prof. V.A. Bugaev
Tuesday 20 August	9.	Management of a national space programme	Dr. R.C. Seamans, Jr.	Dr. V. Sarabhai
	10.	Meteorological satellite in USSR	V.A. Bugaev	Dr. V. Sarabhai

Date		Title	Lecturer	Chairman
Wednesday 21 August	11.	The role of upper winds over desert areas, cloud cover and abnormal weather conditions over the United Arab Republic in meteorological sounding rocketry	A.S. Abdalla Khalil	Dr. J. Podzimek
"	12.	Engineering promise of space	Dr. H.G. Stever	Dr. Newell
Thursday 22 August	13.	Role of achievements in space exploration for development of television broadcasting in the USSR	M.I. Krivosheyev	Prof. Bignier
"	14.	Problems of earth and cosmic biotelemetry, application of biotelemetry	V.V. Parin	Prof. Dr. H. Graul
Friday 23 August	15.	New dimensions in weather analysis and prediction	T.F. Malone	Dr. Khalil
"	16.	A model for estimating the expected benefit from space activities	Dr. Ing. H.H. Koelle	Prof. Broglio
Monday 26 August	17.	The effects of a space programme in stimulating science, engineering and education	Dr. R.L. Bishplinghoff	Mr. J. Marsicek
	18.	Finnish Stellar Triangulation	Prof. T. Honkasalo	Dr. N. Takagi

ANNEX III

REPORT OF THE LEGAL SUB-COMMITTEE ON THE WORK OF ITS SEVENTH SESSION*

4-28 June 1968

CONTENTS

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* Previously issued under the symbol A/AC.105/45.

ANNEX III

INTRODUCTION

1. The Legal Sub-Committee opened its seventh session at the United Nations Office at Geneva on 4 June 1968 under the Chairmanship of Mr. Eugeniusz Wyzner (Poland).

2. In his opening statement, the Chairman referred to the previous successful work of the Sub-Committee which had led to the formulation of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, and of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space. He said that the primary purpose of the session was to work out a draft agreement on liability for damage caused by objects launched into outer space which, under General Assembly resolution 2345 (XXII) of 19 December 1967, is to be submitted to the General Assembly at its twenty-third session. He noted that the resolution "Calls upon the Committee on the Peaceful Uses of Outer Space to complete urgently the preparation of the draft agreement on liability for damage caused by the launching of objects into outer space and, in any event, not later than the beginning of the twenty-third session of the General Assembly, and to submit it to the Assembly at that session".

Adoption of the agenda

3. At the suggestion of the Chairman, the Sub-Committee adopted the following provisional agenda for the session (A/AC.105/C.2/L.31):

1. Statement by the Chairman.

2. Draft agreement on liability for damage caused by objects launched into outer space.

3. Study of the questions relative to:

   (a) The definition of outer space;

   (b) The utilization of outer space and celestial bodies, including the various implications of space communications.

Organization of work

4. The Sub-Committee held a total of twenty-one meetings. The views expressed in the Sub-Committee are summarized in documents A/AC.105/C.2/SR.90-110. In accordance with its decision on the organization of work, the discussion in the Sub-Committee was for the most part devoted to the draft agreement on liability for damage caused by objects launched intc outer space, beginning with a general exchange of views and proceeding to drafting. The Sub-Committee also held a general debate on the third item of its agenda, namely, the study of questions relative to the definition and utilization of outer space. At its ninety-eighth meeting, the Sub-Committee decided to establish a Working Party of the Whole which would draft the provisions on which agreement was reached in principle in the plenary meetings of the Sub-Committee. The Working Party held a total of six meetings.

5. The Sub-Committee concluded its work on 28 June 1968 by unanimously adopting the present report. A list of the representatives of States members of the Sub-Committee attending the session, of the observers for specialized agencies and of the secretariat of the Sub-Committee is appended to the present report (appendix IV).

I. LIABILITY FOR DAMAGE CAUSED BY THE LAUNCHING OF OBJECTS INTO OUTER SPACE

6. The Sub-Committee had before it three draft conventions concerning liability for damage caused by the launching of objects into outer space: a revised draft convention submitted by the delegation of Belgium (A/AC.105/C.2/L.7/Rev.3); a draft convention submitted by the delegation of the United States of America (A/AC.105/C.2/L.19); and a draft convention submitted by the delegation of Hungary (A/AC.105/C.2/L.10/Rev.1), as amended at the present session (A/AC.105/C.2/L.10/Rev.1/Corr.1). In the course of the Sub-Committee's discussions, two draft conventions were submitted by the delegations of India (A/AC.105/C.2/L.32 and Add.1) and Italy (A/AC.105/C.2/L.40 and Corr.1 and 2).* At the request of the Sub-Committee the Secretariat prepared the following addenda to the comparative table (A/AC.105/C.2/W.2/Rev.4) setting forth: (a) the provisions of the draft convention submitted by India (A/AC.105/C.2/W.2/Rev.4/Add.1); (b) the provisions of the draft convention submitted by Italy (A/AC.105/C.2/W.2/Rev.4/Add.3); and (c) the text or points on which agreement or provisional agreement was reached at the sixth session of the Sub-Committee (A/AC.105/C.2/W.2/Rev.4/Add.2). At the 108th meeting of the Sub-Committee, the delegation of India submitted a revised draft Convention (A/AC.105/C.2/L.32/Rev.1 and Corr.1) for future consideration.

7. In addition, the following proposals were submitted by members of the Sub-Committee:

(a) A proposal was made by the delegation of Canada with respect to the definition of the term "damage" (A/AC.105/C.2/L.44), and by the delegation of Australia with respect to the term "launching authority" (A/AC.105/C.2/L.39).

(b) In regard to the question of the field of application and exemptions from the provisions of the Agreement, proposals were submitted respectively by the delegations of the United States (A/AC.105/C.2/L.34), the United Kingdom (A/AC.105/C.2/L.37/Rev.1), and Mexico (A/AC.105/C.2/L.43). A proposal was submitted by the delegation of France concerning the questions of State liable and joint and several liability (A/AC.105/C.2/L.36/Rev.2), to which an amendment was submitted by the United Kingdom (A/AC.105/C.2/L.38). The delegations of Austria, Belgium, France, Italy, Sweden and the United Kingdom jointly submitted a proposal on international organizations (A/AC.105/C.2/L.41, Add.1 and Corrs.1, 2 and 3). There was also a working paper submitted by Australia and Canada dealing with joint liability, liability for damage (i) on earth and to aircraft, (ii) to space objects, and (iii) to third parties, and damage in respect of which compensation is not payable (A/AC.105/C.2/L.42). The delegations of Australia and the United Kingdom submitted a working paper on applicable law for the determination of compensation (A/AC.105/C.2/L.47). Also submitted was a working paper by Australia on pursuit of remedies in respondent State or under other international agreements

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* The draft convention submitted by Italy incorporated provisions previously proposed by Italy in documents A/AC.105/C.2/L.33 and L.35.

(A/AC.105/C.2/L.48). At the 110th meeting of the Sub-Committee, a proposal was submitted by the United Kingdom and co-sponsored by Argentina, Australia, Austria, Belgium, Brazil, Canada, France, Japan, Mexico, Sweden and the United States (A/AC.105/C.2/L.51), drawing attention to certain matters which the Sub-Committee had discussed but on which it was unable to reach agreement.

8. In the course of the discussions in the Working Party, additional working papers were submitted by the delegations of the Union of Soviet Socialist Republics on the field of application (A/AC.105/C.2/WP/1) and on questions of joint liability, absolute liability and exoneration from liability (A/AC.105/C.2/WP/2), India on the question of absolute liability and exoneration from liability (A/AC.105/C.2/WP/3), the United States on general rule (A/AC.105/C.2/WP/4/Rev.1), and the Union of Soviet Socialist Republics on State liable and joint liability (A/AC.105/C.2/WP/5).

9. The aforementioned written proposals and working papers, together with the comparative table and the addenda thereto, are reproduced in appendix I to this report. Other proposals were made by various delegations orally, reference to which may be found in the summary records.

10. The Sub-Committee agreed on the following texts and principles to be embodied in the agreement on liability for damage caused by objects launched into outer space.

Definitions[1/]

1/ (a) Text provisionally agreed upon at the sixth session of the Sub-Committee:

"Damage" means loss of life, personal injury or other impairment of health, or damage to property of States or of their persons, natural or juridical, or of international organizations.

(No agreement was reached on the inclusion of indirect damage and delayed damage in the definition.)

(b) Points on which agreement was reached at the sixth session of the Sub-Committee

The term "launching" should include "attempted launching". In defining the term "Launching State", the following elements should be included:

1. the State which launches or attempts to launch the space object or the space device,

2. the State from whose territory the space object or the space device was launched,

3. the State from whose facility the space object or space device was launched.

(The question whether the State referred to in (2) and (3) above should be liable primarily, or only secondarily (if the State referred to in (1) cannot be identified) was left for further consideration.)

Field of application and exemption from provisions of agreement 2/

Text agreed:

"In the event of damage being caused to a space object of one State or to persons or property on board such a space object by the space object* of another State, the latter State shall be liable only if the damage is due to its fault or the fault of the persons for whom it is responsible."

(* On the understanding that the term "space object" includes its component parts.)

2/ Points on which agreement was reached at the sixth session of the Sub-Committee:

A. The provisions of this Convention shall not apply to damages sustained by:

(a) Nationals of the Launching State;

(b) Foreign nationals in the immediate vicinity of a planned launching or recovery area as the result of an invitation by the Launching State.

(No agreement was reached on whether the Convention should apply to damages sustained by:

(a) Persons who are permanent residents but not nationals of the Applicant (Presenting) State;

(b) A space craft and its personnel during launching, transit or descent.)

B. The Launching (Respondent) State should be absolutely liable to pay compensation for damage caused on the surface of the earth and to aircraft in flight.

(No agreement was reached on whether the Launching (Respondent) State should, on proof of fault, be liable to pay compensation for damage caused to space objects which have left the surface of the earth.)

State or international organization liable 3/

Question of joint liability

Texts agreed:

"If in the case referred to in paragraph 1,* damage is caused to a third State Party to this Convention or to its physical or juridical persons, the States mentioned in paragraph 1* shall be jointly and severally liable. The burden of compensation for such damage shall be apportioned between those States in accordance with the extent to which they were at fault; if the extent of the fault of each of those States cannot be established, the burden shall be apportioned equally between them.

"Whenever two or more States jointly launch a space object, they shall be jointly and severally liable for any damage caused."

(* See "Text agreed" under "Field of application and exemption from provisions of agreement" above.)

3/ Points on which provisional agreement was reached at the sixth session of the Sub-Committee

International organizations that launch objects into outer space should be liable under the Convention for damage caused by such activities.

(No agreement was reached on the question whether the liability of the States members of the international organization that are parties to the liability convention:

(a) should be residual and arise only in the event of default by the international organization, or

(b) should arise at the same time as the liability of the international organization.

Nor was agreement reached on the question of the rights of international organizations under the Convention. This problem requires further consideration.)

Question of absolute liability and exoneration from liability

Text agreed:

"Unless otherwise provided in the Convention, exoneration from absolute liability shall be granted to the extent that the respondent establishes that the damage has resulted either wholly or partially from gross negligence or from an act or omission done with intent to cause damage on the part of the claimant or of natural or juridical persons it represents. No exoneration whatever shall be granted in cases where the damage results from activities conducted by the respondent which are not in conformity with international law, in particular, the Charter of the United Nations and the Treaty on the Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies."

Measure of damages

Principle agreed:

The Sub-Committee left open the question of the law to be applied to the assessment of compensation for damage. It was agreed however that if there was agreement on the applicable law between the claimant and the respondent, then that law should be applied.

Presentation of claims by States or international organizations and in respect of natural or juridical persons

Text agreed:

"1. A Contracting Party which suffers damage, or whose natural or juridical persons suffer damage, may present a claim for compensation to a respondent.

"2. Subject to the provision of paragraph 1, a Contracting Party may also present to a respondent a claim in respect of damage sustained by any natural or juridical person in its territory.

"3. A Contracting Party may also present a claim for damage sustained by its permanent residents in respect of whom neither the State of nationality nor the State in which the damage was sustained has presented a claim or notified its intention of presenting a claim.

"4. No claim may be presented under this Convention in respect of the nationals of the respondent."

Presentation of claims for compensation through diplomatic channel 4/

4/ Points on which agreement was reached at the sixth session of the Sub-Committee:

1. A claim may be presented by the Applicant (Presenting) (claimant) State through the diplomatic channel.

2. Presentation of a claim under the Convention shall not require the prior exhaustion of any local remedies that may be available in the Launching (Respondent) State. In the event the Applicant (Presenting) (claimant) State does not have diplomatic relations with the Launching (Respondent) State, the former may request a third State to present its claim and otherwise represent its interest.

Time-limits for presentation of claims 5/

5/ Points on which agreement was reached at the sixth session of the Sub-Committee:

1. A claim may be presented not later than one year following the date of the occurrence of the accident or the identification of the party that is liable.

2. If the Applicant (Presenting) (claimant) State does not know of the facts giving rise to the claim within the aforementioned one-year period, it may present a claim within one year following the date on which it learned of the facts; however, this period shall in no event exceed one year following the date on which the Applicant (Presenting) (claimant) State could reasonably be expected to have learned of the facts through the exercise of due diligence.

3. The above-mentioned time-limits shall apply even if the full extent of the damage may not be known. In this event, however, the Applicant (Presenting) (claimant) State shall be entitled to revise its claim and submit additional documentation beyond the above-mentioned time-limits until one year after the full extent of such damage is known.

Pursuit of remedies available in respondent State or under other international agreements

Text agreed:

"Presentation of a claim under the Convention shall not require the prior exhaustion of any local remedies that may be available to the claimant or to those whom the claimant represents.

"Nothing in this Convention shall prevent a claimant or any natural or juridical person that it might represent from pursuing a claim in the courts or administrative tribunals or agencies of a respondent. A claimant shall not however be entitled to pursue claims under this Convention in respect of the same damage for which a claim is being pursued in the courts or administrative tribunals or agencies of a respondent, or under another international agreement which is binding on the claimant and the respondent."

Procedure for settlement of claims for compensation 6/

6/ Points on which agreement was reached at the sixth session of the Sub-Committee:

If a claim presented under the Convention is not settled within six months from the date on which the Applicant (Presenting) (claimant) State completes its documentation, the Applicant (Presenting) (claimant) State may refer the matter to an arbitral commission.

Recommendation of the Sub-Committee

11. The Sub-Committee noted that while some progress was made at the present session, there remained important elements on which rapprochement of views was necessary. The Sub-Committee recommends that the Committee on the Peaceful Uses of Outer Space give consideration to convening the Legal Sub-Committee as soon as it considers that substantial progress can be made on a Convention on liability for damage caused by objects launched into outer space.

II. STUDY OF QUESTIONS RELATIVE TO (a) THE DEFINITION OF OUTER SPACE, AND (b) THE UTILIZATION OF OUTER SPACE AND CELESTIAL BODIES, INCLUDING THE VARIOUS IMPLICATIONS OF SPACE COMMUNICATIONS (agenda item 3)

12. The Sub-Committee considered agenda item 3, namely, the study of questions relative to (a) the definition of outer space and (b) the utilization of outer space and celestial bodies, including the various implications of space communications, at its 102nd, 103rd, 104th and 107th meetings.

13. At the opening of the 102nd meeting, the Chairman informed the Sub-Committee that he had, in accordance with the decision taken by the Sub-Committee at its 84th meeting on 14 July 1967, transmitted through the Chairman of the Committee on the Peaceful Uses of Outer Space to its Scientific and Technical Sub-Committee the questionnaire adopted by the Legal Sub-Committee at its sixth session, with respect to the study of questions relative to the definition of outer space. He drew attention to the conclusions reached by the Scientific and Technical Sub-Committee at its 1967 session to the effect that it was not possible at the present time to identify scientific or technical criteria which would permit a precise and lasting definition of outer space; that a definition of outer space, on whatever basis, was likely to have important implications for the operational aspects of space research and exploration; and that it would continue its consideration of this matter at future sessions. 7/

14. In the course of the general discussion of item 3, which dealt with both the problem of defining outer space and that of the utilization of outer space, the following proposals were submitted:

Proposals by France

(a) Draft convention concerning the registration of objects launched into space for the exploration or use of outer space (A/AC.105/C.2/L.45);

(b) Recommendation to the Committee on the Peaceful Uses of Outer Space on the questions of defining outer space and of the utilization of outer space (A/AC.105/C.2/L.50/Rev.1).

Proposal by Czechoslovakia

Concerning the question of the utility of the elaboration of the legal principles on which the creation and functioning of space communications should be based.

Proposal by Sweden

Pertaining to the technical problems connected with direct broadcasting satellites.

These proposals are reproduced in appendix II of the present report.

7/ See Official Records of the General Assembly, Twenty-second Session, Annexes, agenda item 32, document A/6804, annex II, para. 36.

15. The representative of Czechoslovakia stated that he would not press for an immediate decision on his proposal. Subsequently, the Sub-Committee adopted the proposal of Sweden, as modified by the Union of Soviet Socialist Republics, as resolution I, which reads as follows:

"The Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space,

"Having in mind paragraph 13 of General Assembly resolution 2260 (XXII), entitled 'Report of the Committee on the Peaceful Uses of Outer Space',

"Conscious of the importance and urgency of the problem of the potentialities of the operation of direct broadcasting satellites,

"Recommends to the Committee on the Peaceful Uses of Outer Space that it request the Scientific and Technical Sub-Committee to consider the question of direct broadcasting satellites, with a view to preparing a study of the technical problems involved, enlisting whenever appropriate the assistance of the competent specialized agencies of the United Nations."

16. The Sub-Committee then considered the French revised proposal (A/AC.105/C.2/L.50/Rev.1), to which amendments were suggested by the United States of America, the United Kingdom, Canada, the Union of Soviet Socialist Republics and Australia. The proposal, as amended, was adopted by the Sub-Committee as resolution II, which reads as follows:

I

"The Legal Sub-Committee,

"Desiring to continue its studies on the definition of outer space,

"Noting that the Scientific and Technical Sub-Committee discussed the definition of outer space at its fifth session and decided to continue its consideration of the matter at future sessions,

"Recommends to the Committee on the Peaceful Uses of Outer Space to place consideration of the study of questions relative to the definition of outer space on the agenda of the next session of the Legal Sub-Committee.

II

"The Legal Sub-Committee,

"Desiring to obtain the technical and scientific documentary material necessary for consideration of the study of questions relative to the utilization of outer space,

"Considering the technical and scientific competence of the specialized agencies and the International Atomic Energy Agency in respect of the peaceful uses of outer space which come within their terms of reference,

"Considering the need to give effect to Article 58 of the United Nations Charter in order to promote co-ordination among the various specialized agencies concerned with certain aspects of the peaceful uses of outer space,

"Recommends to the Committee on the Peaceful Uses of Outer Space:

(a) to request the specialized agencies and the International Atomic Energy Agency to examine and report to it on the particular problems that have arisen or may arise from the use of outer space in the fields within their competence and that they consider should be brought to the attention of the Committee on the Peaceful Uses of Outer Space;

(b) to place on the agenda of the next session of the Legal Sub-Committee, under the item concerned with the study of questions relative to the utilization of outer space, consideration of the results of the investigations which the specialized agencies and the International Atomic Energy Agency will have communicated to it, in order that these may be examined and discussed by the Legal Sub-Committee."

17. No agreement was reached in the Sub-Committee on the inclusion in the resolution of the wording concerning a draft Convention on the registration of objects launched into space for the exploration or use of outer space.

18. It was agreed, however, that this subject could be considered at the next session of the Sub-Committee, under the item of the agenda entitled "Study of questions relative to the utilization of outer space and celestial bodies, including the various implications of space communications".

19. At the request of the delegation of Canada, the Sub-Committee decided to reproduce a paper presented by the International Telecommunication Union on possible harmful interference of a space object with telecommunications as an appendix to the present report (appendix III).

APPENDICES

APPENDIX I

PROPOSALS, AMENDMENTS AND OTHER DOCUMENTS RELATING TO LIABILITY FOR DAMAGE CAUSED BY THE LAUNCHING OF OBJECTS INTO OUTER SPACE

Belgium: proposal for a convention on the unification of certain rules governing liability for damage caused by space devices to third parties on the surface of the earth and to aircraft in flight (A/AC.105/C.2/L.7/Rev.3)

/See Official Records of the General Assembly, Twenty-second Session, Annexes, agenda item 32, document A/6804, annex III, appendix II, pp. 16-17./

United States of America: proposal (A/AC.105/C.2/L.19)

Convention concerning liability for damage caused by the launching of objects into outer space

/See ibid., pp. 18-20./

Hungary: revised draft Convention concerning Liability for Damage caused by the Launching of Objects into Outer Space (A/AC.105/C.2/L.10/Rev.1)

/See ibid., pp. 20-21./

Hungary: proposal (A/AC.105/C.2/L.24 and Add.1)

/See ibid., p. 21./

Hungary: proposal (A/AC.105/C.2/L.10/Rev.1/Corr.1)

In the revised draft Convention concerning liability for damage caused by the launching of objects into outer space (A/AC.105/C.2/L.10/Rev.1) submitted by Hungary:

Delete from article III of the Hungarian draft:

"... from natural disaster or...".

India: proposal (A/AC.105/C.2/L.32)

Convention concerning liability for damage caused by the launching of objects into outer space

The Contracting Parties,

Recognizing the common interest of mankind in the peaceful exploration and use of outer space,

Recalling the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, adopted by the United Nations General Assembly on 13 December 1963 as resolution 1962 (XVIII),

Believing that the exploration and use of outer space should be carried on for the betterment of mankind and for the benefit of States irrespective of their degree of economic or scientific development,

Desiring to contribute to broad international co-operation in the scientific as well as in the legal aspects of the exploration and use of outer space for peaceful purposes,

Believing that such co-operation will contribute to the development of mutual understanding and to the strengthening of friendly relations between States and peoples,

Recalling resolution 1884 (XVIII), calling upon States to refrain from placing in orbit around the earth any objects carrying nuclear weapons or any other kind of weapons of mass destruction or from installing such weapons on celestial bodies, which was adopted unanimously by the United Nations General Assembly on 17 October 1963,

Having regard to United Nations General Assembly resolutions 2260 (XXII) of 3 November 1967 and 2345 (XXII) of 19 December 1967, which inter alia called upon the Committee on the Peaceful Uses of Outer Space to complete urgently the preparation of the draft of an agreement on Liability for Damage Caused by the Launching of Objects into Outer Space,

Bearing in mind the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies, which came into force on 10 October 1967, and the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, which was opened for signature on 22 April 1968,

Recognizing that activities in the exploration and use of outer space may from time to time result in damage,

Seeking to establish uniform rules of liability and a simple and expeditious procedure governing financial compensation for damage,

Agree as follows:

Definitions

Article I

For the purpose of this Convention

(a) "Damage" means loss of life, personal injury or other impairment of health, or damage to property of States or their persons, natural or juridical, or of international organizations.

(b) "Launching" includes "attempted launching" whether or not it fulfils the expectations of those responsible therefor.

(c) "Space Objects" mean space ships, satellites, orbital laboratories, containers and other devices designed for movement in outer space and sustained there by means other than reaction of air, as well as the means of delivery of such bodies and any part thereof.

(d) "Launching authority" means the State responsible for the launching, or where an international inter-governmental organization is responsible for launching, that organization, provided that that organization declares its acceptance of the rights and obligations provided for in this Agreement and a majority of the States members of that organization are Contracting Parties to this Agreement and to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies.

(e) "Claimant" means the State or other Contracting Party that presents a claim for compensation to a respondent.

(f) "Respondent" means a launching authority from which compensation is sought under this Convention.

Liability

Article II

1. The respondent shall be absolutely liable to pay compensation to the claimant in accordance with the provisions of this Convention, for damage caused in all environments except outer space by the launching, transit or descent of all or part of a space object.

2. The claimant shall only be required to furnish evidence relative to the connexion between the damage suffered by it and the space object in question.

Exemptions

Article III

1. Unless otherwise provided in the Convention, exemption from liability may be granted only in so far as the respondent produces evidence that the damage has resulted either wholly or partially from a wilful act on the part of the claimant or of natural or juridical persons it represents which has been committed in full knowledge that damage will probably result. Provided that no mitigation of the principle of absolute liability may be allowed in cases where the claimant or the natural or juridical persons which it represents have not committed acts which are in contravention of the rules of international law. No exemption from the principle of absolute liability will be granted in cases where the respondent has conducted activities which affect the rights of other States under general international law.

2. The provisions of this Convention shall not apply to damages sustained by:

(a) nationals of the launching authority;

(b) foreign nationals in the immediate vicinity of a planned launching or recovery area as result of an invitation by the launching authority.

Joint and Several Responsibility

Article IV

If damage is caused as a result of the launching of a space object under a joint programme, the parties concerned shall, jointly and severally, be liable. Provided that nothing in this article shall preclude the conclusion of agreements on the apportionment of liability between two or more Contracting Parties.

Presentation of Claims

Article V

1. A Contracting Party which suffers damage or whose natural or juridical persons suffer such damage may present a claim for compensation to a respondent.

2. A claimant may also present to a respondent a claim of any natural or juridical person, permanently residing in its territory, other than a person having the nationality of the respondent.

3. A claim shall be presented through diplomatic channels. A claimant may request another State to present its claim and otherwise represent its interests in the event that it does not maintain diplomatic relations with a respondent.

4. Presentation of a claim under the Convention shall not require the prior exhaustion of any local remedies that may be available in the Launching (Respondent) State. Provided that nothing in this Convention shall prevent the claimant or a natural or a juridical person from pursuing a claim in the administrative agencies or courts of a respondent. In such a case, the claimant shall not be entitled to simultaneously pursue claims under this Convention against the respondent.

Article VI

1. A claim must be presented within one year of the date of the concurrence of the damage, or of the identification of the launching authorities liable. If the claimant could not reasonably be expected to have known of the facts giving rise to the claim, the claim must be presented within one year of the date on which these facts officially become known.

2. In cases where an international organization is liable under this Convention claims may be presented through the Secretary-General of the United Nations.

Article VII

1. In case of disagreement between the claimant and the respondent, the two parties shall endeavour to arrive at a settlement through the recognized means of the peaceful settlement of disputes.

2. If no settlement is arrived at within one year of the presentation of the claim the claimant may refer the matter to a Claims Commission as provided for in the Protocol annexed to this Convention.

Currency

Article VIII

Sums due in compensation for damage shall be fixed and payable in the currency of the claimant or in a freely convertible currency unless the Parties agree otherwise.

Joinder of Claims

Article IX

There may be joinder of claims where there is more than one claimant in respect of damage due to the same event or where more than one State or international organization is liable.

Final Clauses

Article X

1. This Convention shall be open to all States for signature. Any State which does not sign this Convention before its entry into force in accordance with paragraph 4 of this article may accede to it at any time.

2. This Convention shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with Governments of the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America, which are hereby designated the Depositary Governments.

3. (Provision regarding mode of accession of international organizations to the Convention, their rights and duties and relationship with States Parties to the Convention to be inserted.)

4. This Convention shall enter into force upon the deposit of instruments of ratification by five Governments including the Governments designated as Depositary Governments under this Convention.

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

6. The Depositary Governments 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 to this Agreement, the date of its entry into force and other notices.

7. This Convention shall be registered by the Depositary Governments pursuant to Article 102 of the Charter of the United Nations.

Article XI

Any State Party to the Convention may propose amendments to this Convention. Amendments shall enter into force for each State Party to the Convention accepting the amendments upon their acceptance by a majority of the States Parties to the Convention and thereafter for each remaining State Party to the Convention on the date of acceptance by it.

Article XII

A Contracting Party may give notice of its withdrawal from the Convention one year after its entry into force by written notification to the Depositary Governments. Such withdrawal shall take effect one year from the date of receipt of this notification.

Article XIII

This Convention, of which the Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited in the archives of the Depositary Governments. Duly certified copies of this Convention shall be transmitted by the Depositary Governments to the Governments of the signatory and acceding States.

India: proposal (A/AC.105/C.2/L.32/Add.1)

Add to article IV the following as paragraphs 2 and 3:

2. In cases where the territory or facilities of a State were used for the launching of a space object by another State or States, both the former and the latter are jointly or severally liable for the damage caused.

3. If an international organization is responsible under the provisions of this Convention for damage caused by its space object, both the organization and its members are jointly and severally liable. Claims in respect of damage caused by the activities of an international organization shall first be presented to the organization. If the organization is unable to settle the claim then the claimant may proceed against any one or more of the members of the organization which are also parties to the Convention.

India: proposal (A/AC.105/C.2/L.32/Rev.1)

Convention concerning liability for damage caused by the launching of objects into outer space

The Contracting Parties,

Recognizing the common interest of mankind in the peaceful exploration and use of outer space,

Recalling the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, adopted by the United Nations General Assembly on 13 December 1963 as resolution 1962 (XVIII),

Believing that the exploration and use of outer space should be carried on for the betterment of mankind and for the benefit of States irrespective of their degree of economic or scientific development,

Desiring to contribute to broad international co-operation in the scientific as well as in the legal aspects of the exploration and use of outer space for peaceful purposes,

Believing that such co-operation will contribute to the development of mutual understanding and to the strengthening of friendly relations between States and peoples,

Recalling resolution 1884 (XVIII), calling upon States to refrain from placing in orbit around the earth any objects carrying nuclear weapons or any other kind of weapons of mass destruction or from installing such weapons on celestial bodies, which was adopted unanimously by the United Nations General Assembly on 17 October 1963,

Having regard to United Nations General Assembly resolutions 2260 (XXII) of 3 November 1967 and 2345 (XXII) of 19 December 1967 which inter alia called upon the Committee on the Peaceful Uses of Outer Space to complete urgently the preparation of the draft of an agreement on Liability for Damage Caused by the Launching of Objects into Outer Space,

Bearing in mind the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, and the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space,

Recognizing that activities in the exploration and use of outer space may from time to time result in damage,

Seeking to establish uniform rules of liability and a simple and expeditious procedure governing financial compensation for damage,

Agree as follows:

Article I

For the purpose of this Convention

(a) "Damage" means loss of life, personal injury or other impairment of health; or damage to property of States or their persons, natural or juridical, or to property of international organizations.

(b) "Launching" includes "attempted launching" whether or not it fulfils the expectations of those responsible therefor.

(c) "Space Objects" mean space ships, satellites, orbital laboratories, containers and other devices designed for movement in outer space and sustained there by means other than reaction of air, as well as the means of delivery of such bodies and any part thereof.

(d) "Launching State" means the State which launches a space object or procures the launching by another State of a space object.

(e) "Claimant" means the State that presents a claim for compensation to a respondent.

(f) "Respondent" means a Launching State from which compensation is sought under this Convention.

Article II

Unless otherwise provided in the Convention a Launching State shall be absolutely liable for damage caused by its space object whether during launching or thereafter.

Article III

1. Unless otherwise provided in the Convention exoneration from absolute liability shall be granted to the extent that the respondent establishes that the damage has resulted either wholly or partially from gross negligence or from an act or omission done with intent to cause damage on the part of the claimant or of a natural or juridical person it represents. No exoneration whatever shall be granted in cases where the damage results from activities conducted by the respondent which are not in conformity with international law, in particular, the Charter of the United Nations and the Treaty on the Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies.

2. The provisions of this Convention shall not apply to damage sustained by

(a) nationals of the Launching State

(b) foreign nationals in the immediate vicinity of a planned launching or recovery area as a result of an invitation by the Launching State.

Article IV

1. In the event of damage being caused to a space object of one State or to persons or property on board such a space object by the space object of another State, the latter State shall be liable **only if the damage is due to its fault or the** fault of the persons for whom it is responsible.

2. If in the case referred to in paragraph 1, damage is caused to a third State Party to this Convention or to its physical or juridical persons, the States mentioned in paragraph 1 shall be jointly and severally liable. The burden of compensation for such damage shall be apportioned between those States in accordance with the extent to which they were at fault; if the extent of the fault of each of those States cannot be established, the burden shall be apportioned equally between them.

Article V

1. If damage is caused as a result of the launching of a space object under a joint programme the parties concerned shall, jointly and severally, be liable.

2. In cases where the territory or facilities of a State were used for the launching of a space object by another State or States, both the former and the latter are jointly and severally liable for the damage caused.

Article VI

The amount of compensation payable under this Convention shall be determined in accordance with any national law which is agreed upon between the claimant and the respondent. If the claimant and respondent do not agree on a national law to be applied, the amount of compensation payable shall be determined in accordance with international law and taking account of the national law of the claimant State.

Article VII

1. A Contracting Party which suffers damage or whose natural or juridical persons suffer damage, may present a claim for compensation to a respondent.

2. A Contracting Party may also present a claim in respect of damage sustained by its nationals or by persons permanently resident in its territory who are not nationals of the respondent and in respect of whom the State of nationality has not presented a claim or notified its intention of presenting a claim.

3. A claim shall be presented through diplomatic channels. A claimant may request another State to present its claim and otherwise represent its interests in the event that it does not maintain diplomatic relations with a respondent.

4. Presentation of a claim under the Convention shall not require the prior exhaustion of any local remedies that may be available to the claimant or to those whom the claimant represents.

5. Nothing in this Convention shall prevent a claimant or any natural or juridical person that it might represent from pursuing a claim in the courts or administrative tribunals or agencies of a respondent. A claimant shall not however be entitled to pursue claims under this Convention in respect of the same damage for which a claim is being pursued in the courts or administrative tribunals or agencies of a respondent, or under another international agreement which is binding on the claimant and the respondent.

Article VIII

1. A claim may be presented not later than one year following the date of the occurrence of the accident or the identification of the party that is liable.

2. If the claimant does not know of the facts giving rise to the claim within the aforementioned one-year period, it may present a claim within one year following the date on which it learned of the facts; however, this period shall in no event exceed one year following the date on which the claimant could reasonably be expected to have learned of the facts through the exercise of due diligence.

3. The above-mentioned time-limits shall apply even if the full extent of the damage may not be known. In this event, however, the claimant shall be entitled to revise its claim and submit additional documentation beyond the above-mentioned time-limits until one year after the full extent of such damage is known.

Article IX

Sums due in compensation for damage shall be fixed and payable in the currency of the claimant or in a freely convertible currency unless the Parties agree otherwise.

Article X

There may be joinder of claims where there is more than one claimant in respect of damage due to the same event or where more than one State is liable in respect of damage.

Article XI

1. In case of disagreement between the claimant and respondent, the two parties shall endeavour to arrive at a settlement through diplomatic negotiations.

2. If no settlement is arrived at within one year of the presentation of the claim, either party may invoke the provisions of the compulsory Protocol on the Settlement of Disputes, annexed to this Convention.

Article XII

1. This Convention which includes the Compulsory Protocols on International Organizations and Settlement of Disputes as integral parts shall be open to all States for signature. Any State which does not sign this Convention before its entry into force in accordance with paragraph 3 of this article may accede to it at any time.

2. This Convention shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with the Governments of the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America, which are hereby designated the Depositary Governments.

3. This Convention shall enter into force upon the deposit of instruments of ratification by five Governments including the Governments designated as Depositary Governments under this Convention.

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

5. The Depositary Governments 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 to this Agreement, the date of its entry into force and other notices.

6. This Convention shall be registered by the Depositary Governments pursuant to Article 102 of the Charter of the United Nations.

Annex I

Compulsory Protocol on International Organizations

The Contracting Parties,

Bearing in mind article XIII of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies,

Taking note of the possibility that practical difficulties might arise, relating to the subject-matter of the present Convention, in so far as international organizations are concerned,

Desiring to establish an expeditious procedure for the solution of any such difficulties in the light of the relevant provisions of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies,

Agree as follows:

Article I

The provisions of this Convention shall apply, with the exception of articles XI to XIV, to each international inter-governmental organization which conducts space activities, provided that that organization declares its acceptance of the rights and obligations provided for in the Convention and a majority of the States members of that organization are Contracting Parties to this Convention and to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies.

Article II

General Rule

If an international organization to which article I of this Protocol applies is responsible in terms of the provisions of the Convention for damage caused by its space object, both the organization and its members are jointly and severally liable.

Article III

Procedure

1. Claims in respect of damage due to the space activities of such an international organization shall be first presented to the organization. If the organization is unable to settle the claim within six months, the claimant may proceed against any one or more of the members of the organization which are also parties to the Convention.

2. The claim of an international organization to which article I of this Protocol applies may be presented directly to the respondent. If the latter so desires, the claim shall be resubmitted by one or more States members of the organization to be chosen by the organization itself.

Annex II

Compulsory Protocol on Settlement of Disputes

The Contracting Parties to the Convention on Liability for Damage Caused by Objects Launched into Outer Space,

Bearing in mind the provisions of article XI of the Convention, pertaining to the settlement of disputes,

Seeking to establish a procedure for the definitive settlement of disputes which may arise between claimants and respondents with regard to claims to compensation for damage,

Agree as follows:

Article I

Enquiry Commission

1. If a claim remains unsettled for more than six months after its presentation, the claimant and respondent shall establish an Enquiry Commission, on the basis of parity, within one month of a request by either claimant or respondent for its establishment.

2. The Enquiry Commission shall, taking into account the positions of the respective parties, make recommendations with regard to the settlement of the claim, within six months of its establishment.

3. The Enquiry Commission shall determine its procedure.

Article II

Claims Commission

1. A Claims Commission shall be established upon request of either party if:

(i) the Enquiry Commission is not established as provided for in article I (1);

(ii) the Enquiry Commission is unable to arrive at any recommendations within the period specified in article II (2).

Article III

1. The Claims Commission shall be composed of one nominee each of the claimant and respondent and a third member, the Chairman, to be chosen by the claimant and respondent jointly. The nominees of the claimant and the respondent shall respectively be designated within two months of the request for the establishment of the Claims Commission. If no agreement is reached on the choice of the Chairman within four months of the request for the establishment of the Claims Commission, the Secretary-General of the United Nations may be requested by either party to nominate the Chairman. The nomination made by the United Nations Secretary-General shall be binding.

2. If one of the parties fails to designate its nominee within the stipulated period, the person appointed by the United Nations Secretary-General at the request of the other party shall constitute a single member Claims Commission.

3. Any vacancy which may arise in the Claims Commission by way of death, ill-health or resignation of one or more members shall be filled by the same procedure adopted for their original nomination.

4. The Claims Commission shall determine its procedure.

5. The Claims Commission shall determine the place or places where it shall sit and all administrative matters connected therewith.

6. All decisions of the Claims Commission shall be by majority vote, except in cases where a single member Commission is established.

Article IV

No increase in the membership of the Claims Commission shall take place where two or more claimants or respondents are joined in any one proceeding before the Commission. The claimants so joined shall collectively nominate one member of the Commission in the same manner and subject to the same conditions as would be the case for a single claimant. When two or more respondents are so joined, they shall collectively nominate one member of the Commission in the same way. If the

claimants or respondents fail to nominate their member within the stipulated period, the nominee of the Secretary-General of the United Nations shall constitute a single-member Commission.

Article V

1. The Claims Commission shall have competence only with regard to the specific claim before it. The Commission's sole function shall be, in the light of the respective contentions of the claimant and respondent and of the facts of the case as made available to it, to decide on the merits of the claim for compensation and to determine the amount of compensation payable, if any.

2. The Commission shall not have the competence to render an authoritative interpretation of the Convention.

Article VI

1. The Commission shall be guided by the provisions of article VI of the Convention in so far as the law to be applied by it is concerned.

2. The Commission shall state the reasons for its decision, which shall be final and binding.

Article VII

The expenses in regard to the Claims Commission shall be borne equally by the parties.

India: proposal (A/AC.105/C.2/L.32/Rev.1/Corr.1)

1. Insert after article XII the following articles:

Article XIII

Any State Party to the Convention may propose amendments to this Convention. Amendments will enter into force for each State Party to the Convention accepting the amendments upon their acceptance by a majority of the States Parties to the Convention and thereafter for each remaining State Party to the Convention on the date of acceptance by it.

Article XIV

A Contracting Party may give notice of its withdrawal from the Convention one year after its entry into force by written notification to the Depositary Governments. Such withdrawal shall take effect one year from the date of receipt of this notification.

Article XV

This Convention, of which the Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited in the archives of the Depositary Governments. Duly certified copies of this Convention shall be transmitted by the Depositary Governments to the Governments of the signatory and acceding States.

2. In annex I, article I, replace the words "articles XI to XIV" by "articles XII to XV".

3. In annex II, article II, delete the number "1." and in sub-paragraph (ii) replace "article II (2)" by "article I (2)".

Working Paper submitted by the Italian delegation (A/AC.105/C.2/L.40)

Draft convention concerning liability for damage caused by the launching of objects into outer space

Preamble

The Contracting Parties,

Recognizing that activities in the peaceful exploration and use of outer space may on occasion result in damage,

Recalling the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies signed on 27 January 1967,

Seeking to establish a uniform rule of liability and a simple and expeditious procedure governing compensation for damage,

Believing that the establishment of such a procedure will contribute to the growth of friendly relations and co-operation among nations,

Agree as follows:

Purpose of the Convention

Article 1

The purpose of this Convention is to govern the international liability of States for damage caused in the exercise of their space activities to another member State and the natural or juridical persons that it represents, in accordance with the Washington Treaty of 27 January 1967.

Definitions (Launching State - Space Object - Damage)

Article 2

1. Launching State shall be understood to mean the State which launches or procures the launching of a space object, entered in its own registers or registered with the United Nations Secretariat (which must in any case be notified beforehand of the launching and be provided with all the information necessary to identify the object in question);

2. The State whose territory or facility is used for the launching shall be deemed to be the Launching State, if it does not state that it is the actual Launching State or if the latter is not a party to the Convention, even if the State whose territory or facility is used does not participate actively and substantially in the launching, transit control and descent of the space object;

3. The international organizations referred to in article 6 below shall be treated for the purpose in the same way as States;

4. Space object means any man-made object designed to reach outer space and to move there (either) naturally or by means of radio-electric signals or the control exercised by pilots on board;

5. For the purposes of this Convention, the component parts of space objects that become detached or are made to detach during transit, and objects thrown or launched from space objects, shall be deemed to be space objects;

6. Damage means loss of life, personal injury or impairment of health and destruction or damage to property caused by space objects.

Field of application of the Convention

Article 3

1. This Convention shall apply to all damage caused by space objects; (a) on the earth; (b) in the earth's atmosphere; (c) in outer space, including other celestial bodies;

2. However, the present Convention shall not cover damage caused in the territory of the Launching State and in particular damage sustained at the time and in the area of launching and return of space objects by persons playing a part in the operations related thereto, or damage sustained from endogenous causes by space objects and their personnel during launching, transit or descent. For this purpose, social labour legislation and agreements between the parties concerned shall be paramount in the assessment of compensation.

Nature of and grounds for liability in the various cases of damage on the earth, in the earth's atmosphere and in outer space

Article 4

1. Damage caused on the earth, even in the case of circumstances beyond control shall constitute grounds for compensation by the very fact that the damage has occurred and was caused by a space object;

2. Damage caused in the earth's atmosphere to aircraft shall be presumed to be due to the fault of the space object; if, however, the damage is caused by one space object to another space object, it shall be presumed to be attributable to common fault.

Both cases shall be open to proof of the contrary;

3. In the case of damage caused by a space object in outer space, liability shall rest with the Launching State if a fault on its part is proved;

4. When two or more space objects have collided or interferred with each other in transit and damage to third parties on the ground has resulted, the damage shall be presumed to be attributable to the common fault of the said objects and the Launching States shall be jointly liable;

5. The Launching State which has had to pay the entire compensation shall have the right to appeal against the other jointly liable States.

Liability for damage (States)

Article 5

1. The Launching State shall be liable for the damage caused by a space object.

2. When the space object is jointly launched by several States or by States and international organizations (referred to in article 6), they shall be jointly and severally liable for the damage caused by the space object.

The sums paid to the victim of the damage shall be shared equally by the parties liable in accordance with previous agreements, and if no such agreements exist it shall also be apportioned equally.

Liability (International Organizations)

Article 6

1. If an international organization which conducts space activities has transmitted to the Secretary-General of the United Nations a declaration that it accepts and undertakes to comply with the present Convention, all the provisions

of the Convention, except articles 13, 16, 17 and 18, shall apply to the organization as to a State which is a Contracting Party.

2. Consequently, if the organization launches, or procures the launching of a space object, and that object causes damage, the organization, like any Launching State, shall be directly liable for the damage vis-à-vis the victims.

3. Should the organization fail to pay the amount of the compensation already agreed to or fixed, the States members of the organization can be called upon as guarantors within the period and under the conditions referred to in article 11 below.

Extinction or reduction of liability

Article 7

If the damage has been caused, either wholly or partially, by an act or omission on the part of the victim, the liability of the Launching State may be extinguished or reduced according to the gravity (fraud or fault) of the act or omission.

Assessment of liability

Article 8

The compensation which a State shall be liable to pay under this Convention for the damage it has caused shall be determined in accordance with applicable principles of international law, justice and in view of the singular nature of the matter, equity.

Rules of procedure; claims for compensation

Article 9

1. The State which has sustained damage (Applicant, (Presenting) (Claimant) State) can present a claim for compensation to the State that is liable, hereinafter called the Respondent State.

The same claim can be presented by the State for damage caused anywhere to its own nationals and to natural or juridical persons permanently domiciled in its territory;

2. The presentation of a claim under this Convention shall not require exhaustion of any remedies which might otherwise exist in the Respondent State;

3. A claim shall be presented through the diplomatic channel within one year of the date when the damage and the State liable for it became known.*

4. The same procedure shall apply when the claim is presented by or against an international organization. The representation of the international organization, for the purposes of this diplomatic procedure, may then be assumed by one of the States members of the organization.

* NOTE: If it is desired to introduce a time-limit or an expiry date, the following formula can be adopted:

"In any case, three years after the date of the occurrence that caused the damage, the claim shall cease to be maintainable."

Arbitration Commission for the settlement of claims for compensation

Article 10

1. If a claim presented under this Convention is not settled amicably within one year from the date on which documentation is completed, the Applicant (Presenting) (Claimant) State may request the establishment of an arbitration commission to decide the claim.

The competence of such commission shall extend to any dispute arising from the interpretation or application of this Convention. The Respondent State and the Applicant (Presenting) (Claimant) State shall each promptly appoint one person to serve on the commission, and a third person, who shall act as chairman, shall be appointed by the President of the International Court of Justice.

If the Respondent State fails to appoint its member within three months, the person appointed by the President of the International Court of Justice shall be the sole arbitrator.

2. No increase in the membership of the commission shall take place where two or more Applicant (Presenting) (Claimant) States or Respondent States are joined in any one proceeding before the commission. The Applicant (Presenting) (Claimant) States so joined shall collectively appoint one person to serve on the commission in the same manner and subject to the same conditions as would be the case for a single Applicant (Presenting) (Claimant) State. Similarly, where two or more Respondent States are so joined, they shall collectively appoint one person to serve on the commission in the same way.

If the Applicant (Presenting) (Claimant) State or the Respondent State fails to appoint its member within three months, the person appointed by the President of the International Court of Justice shall be the sole arbitrator.

3. The Commission shall take its decisions according to law in conformity with article 8 above. It shall determine its own procedure and arrive at its decision by majority vote. Such decision shall state the views of the members of the commission.

4. The decision of the commission shall be rendered expeditiously. It shall be final and binding upon the parties.

5. The expenses incurred in connexion with any proceeding before the commission shall be divided equally between the Applicant (Presenting) (Claimant) and Respondent States.

As an alternative to 2 above

If in the same dispute there are two or more Applicant (Presenting) (Claimant) States and (or) two or more Respondent States, they shall agree to appoint one person to represent them on the commission, which shall thus always comprise three members.

Procedure relating to International Organizations which do not pay compensation for damages

Article 11

1. If, within one year of the date on which compensation has been agreed upon or otherwise established pursuant to article 10, an international organization has failed to pay the amount of such compensation, the States members of the organization shall, upon service of notice of such default by the Applicant (Presenting) (Claimant) State within three months of such default, be obligated to pay the amount of compensation, each in proportion to its contribution to the budget of the organization: and if this contribution is not known, the member States shall be jointly liable for the entire compensation.

2. In no circumstances may the member States question the justification for or the amount of compensation due by the organization.

Procedure under ordinary law

Article 12

This Convention shall not prejudice the rights of victims to institute proceedings before the ordinary courts of the Applicant (Presenting) (Claimant) State or the Respondent State, or to choose any other international procedure, with a view to obtaining compensation for damage.

However, in such a case, the Applicant (Presenting) (Claimant) State may no longer have recourse to the procedures referred to in articles 9, 10 and 11 above; but the normal diplomatic intervention with a view to bringing about an amicable settlement between the parties to the dispute shall not be excluded.

Settlement of disputes

Article 13

Any question arising from the interpretation or application of this Convention, which is not previously settled by other peaceful means of their choice, may be referred by any Contracting Party thereto to the International Court of Justice for decision.

Amendments

Article 14

A Contracting Party may propose amendments to this Convention. An amendment shall come into force for each Contracting Party accepting the amendment on acceptance by a majority of the Contracting Parties, and thereafter for each remaining Contracting Party on acceptance by it.

Withdrawal

Article 15

A Contracting Party may give notice of withdrawal from this Convention five years after its entry into force by written notification to the Secretary-General of the United Nations. Such withdrawal shall take effect one year from the date of receipt of the notification by the Secretary-General. A State withdrawing from this Convention shall not thereby be relieved of any obligation or liability with respect to damages arising before withdrawal becomes effective.

Signature and accession

Article 16

This Convention shall be open for signature by all States. Any State which does not sign this Convention before its entry into force pursuant to article 18 below may accede to it at any time.

Ratification: Depositary

Article 17

This Convention shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with the Secretary-General of the United Nations.

Entry into force

Article 18

This Convention shall enter into force thirty days following the deposit of the fifth instrument of ratification or accession. It shall enter into force as to a State ratifying or acceding thereto upon deposit of its instrument of ratification or accession.

Obligation of depositary

Article 19

The Secretary-General of the United Nations shall inform all signatory and acceding States and all organizations which have made declarations under article 6, paragraph 1, of signatures, deposits of instruments of ratification or accession, declarations of acceptance referred to in article 6, paragraph 1, the date of entry into force of this Convention, proposals for amendments, notifications of acceptances of amendments, the date of entry into force of each amendment, and notices of withdrawal, and shall transmit to those States and organizations certified copies of each amendment proposed.

Article 20

This Convention, of which the Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Secretary-General of the United Nations, who shall send certified copies of each to the Governments of all the signatory and acceding States.

Annex to the Draft Convention concerning the liability of States for damage caused by space devices

submitted by the delegation of Italy

In preparing this draft, we took into consideration the four draft conventions on this subject known to us, namely, the three drafts (those of the United States, Belgium and Hungary) submitted at earlier sessions of the Legal Sub-Committee of the United Nations Committee on the Peaceful Uses of Outer Space, and the preliminary draft submitted by France to a working party established by the European Conference on Outer Space.

We selected the best ideas and formulations from these four drafts, most of them having been taken from the United States and French drafts, which in our opinion are fuller and more coherent.

The method chosen for formulating the articles of this draft is the one best suited to the legal tradition of Latin countries, namely, the adoption of general, comprehensive texts providing for the largest possible number of cases likely to arise in practice, while taking into account general legal principles.

We have also tried to "depersonalize" the draft as much as possible by including concepts and formulas put forward by delegations of other countries in various international forums, so as to meet as far as possible universal aspirations and desires and make the draft more generally acceptable.

To clarify these points further we have set out below some comments on the various provisions of the draft convention.

Preamble

The whole of the preamble has been taken from the United States draft, which has the merit of codifying "uniform rules of liability and a simple procedure".

Article 1 - Purpose of the Convention

None of the drafts at present being considered by international bodies contains such an article. However, this article seems necessary as the discussions held at the international level have given the impression of a lack of uniformity in the interpretation of the limits and character of international liability.

Article 2 - Definitions

1. Launching State. The purpose of this paragraph was to emphasize the now urgent need for precise individual identification of space devices (registration) and for codifying the procedure for notifying the United Nations Secretariat of the launching and of its characteristics.

2. This paragraph reproduces the principle embodied in the French draft (article 1 (3)) and is designed to permit in all cases the identification of the State responsible for the launching, on the basis of objective data.

Article 3 - Field of application of the Convention

2. This has been based on the corresponding articles of the United States draft, with some minor additions or changes.

Article 4 - Nature and basis of liability

This article involves the complete rejection of the system advocated in the United States draft, whereby the principle of objective liability is applied in all cases. This system is not only unfair, but can sometimes result in anomalies, as in the case of damage caused by collision or impact.

The French draft also rejects the principle of objective liability in all cases, but the system adopted in the present draft seems more comprehensive.

1. This paragraph reproduces the wording adopted in the conventions on air navigation.

3. The wording adopted is similar to that of the French draft.

Article 6 - Liability (international organizations)

1. The wording of the United States draft was adopted as it seemed to be the best.

Article 8 - Assessment of liability

This article reproduces the substance of article IV of the United States draft. However, the words "in view of the singular nature of the matter" have been added to justify the reference to equity.

Article 9 - Rules of procedure: Claims for compensation

4. These rules were considered necessary, since it might be desirable for a member State to represent an international organization which has no headquarters or diplomatic representation stricto sensu.

Article 10 - Arbitration commission for the settlement of claims for compensation

This article reproduces, with some variations, article X of the United States draft, which is very long and perhaps unnecessarily detailed.

The possibility of simplifying it along the lines of the corresponding article in the French draft, or of the draft proposed by India might be worth considering.

Article 12 - Procedure under ordinary law

This article is based on the general principle of electa una via non datur recursus ad alteras.

Articles 13 to 20 - Final and formal clauses

The final and formal clauses of the United States draft have been adopted, with some modifications notably in articles XII and XV of that draft.

In article 13 (XII in the United States draft) the opening phrase "subject to prior recourse to proceedings under article X" has been omitted for the following reasons:

(a) Even where no dispute exists, it would seem advisable at the request of a member State to obtain an authoritative interpretation of one or other of the articles of the Convention, which has given rise to dispute or has been interpreted in different ways.

(b) A final arbitral award may conflict with the different (authoritative) interpretation subsequently adopted on the basis of a new protocol.

Article 16 (XV in the United States draft) reproduces the wording of the corresponding article of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies (better known as the Space Treaty or Washington Treaty) of 27 January 1967. With this wording the present Convention would be open for signature or accession by all States.

Working Paper submitted by the Italian delegation
(A/AC.105/C.2/L.40/Corr.1)

Corrigendum*

1. In article 1, line 3: delete the word "Washington".

2. (Affects French text only).

3. (Affects French text only).

4. In article 5, paragraph 2, line 4: delete the word "equally,".

5. In article 9, paragraph 1, line 1: delete "(Applicant, (Presenting) (Claimant) State)".

6. (Affects French text only).

Working Paper submitted by the Italian delegation
(A/AC.105/C.2/L.40/Corr.2)

In article 17 of the draft convention submitted by the Italian delegation (A/AC.105/C.2/L.40), replace the sentence "Instruments of ratification and instruments of accession shall be deposited with the Secretary-General of the United Nations" by the following:

> "Instruments of ratification and instruments of accession shall be deposited with the Governments of the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America, which are designated in this Convention as the Depositary Governments."

The other articles of the Italian draft referring to the Secretary-General of the United Nations should be amended accordingly. The purpose of this amendment is to bring the Italian draft into line with the corresponding provisions of the treaty of 27 December 1967 (article XIV (2)).

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* This corrigendum applies also to the text reproduced in A/AC.105/C.2/W.2/Rev.4/Add.3.

United States of America: proposal (A/AC.105/C.2/L.34)

Field of application and exemptions from provisions of agreement

The Launching State shall not be liable under this Convention for damage caused to space objects of other Launching States, and their personnel, during launching, transit or descent, unless such damage is caused by the fault of the Launching State.

If the collision of space objects causes damage to third parties, the Launching States shall be individually and jointly liable for such damage. As between themselves, the Launching States shall share equally the burden of such compensation unless there is a showing of comparative fault, in which event the burden of compensation shall be apportioned between them accordingly.

France: revised proposal concerning the State liable and joint and several liability (A/AC.105/C.2/L.36/Rev.2)

1. A State which launches a space object or procures the launching by another State of a space object shall be liable for damage caused to persons or property during the launching, transit or descent of such space object, irrespective of the place in which the damage occurs.

2. Whenever several States launch or procure the launching of a space object as a joint project, they shall, jointly and severally, be liable for the damage caused.

3. The State whose territory or facilities were used for the launching of a space object shall be liable in the same manner as the Launching State if for any reason it does not identify the latter or if the latter is not a Party to this Convention.

United Kingdom of Great Britain and Northern Ireland: revised proposal (A/AC.105/C.2/L.37/Rev.1)

Field of application

An Applicant State may present claims in respect of damage sustained by its nationals or by persons permanently resident in its territory who are not nationals of the Respondent State and in respect of whom the State of nationality has not presented a claim or notified its intention of presenting a claim.

United Kingdom: proposal (A/AC.105/C.2/L.38)

Amend paragraphs 1 and 3 of the proposal of France (A/AC.105/C.2/L.36) to read as follows:

1. A State which launches a space object or which actively and substantially participates in the launching of a space object by another State shall be liable under the present Convention for damage caused to persons or property by the launching, transit or descent of such space object, irrespective of the place in which the damage occurs.

3. The State whose territory or facilities were used for the launching of a space object, but which has not actively and substantially participated in the launching, is liable in the same manner as the Launching State only if it does not for any reason identify the latter, or if the latter is not a party to the Convention.

Australia: proposal (A/AC.105/C.2/L.39)

"Launching Authority" means a Contracting Party that launches or actively and substantially participates in the launching of a space object, or an international organization that has transmitted a declaration to the Secretary-General of the United Nations under article... of this Convention and that launches or actively and substantially participates in the launching of a space object. It includes a Contracting Party from whose territory or facility a space object is launched,

(a) if that Contracting Party does not disclose the identity of the Contracting Party or international organization responsible for launching a space object from its territory; or

(b) if none of the States or international organizations responsible for the launching is a Party to this Convention.

Austria, Belgium, France, Sweden and United Kingdom of Great Britain and Northern Ireland proposal (A/AC.105/C.2/L.41)

International Organizations

Article ...

1. This Agreement shall apply, with the exception of articles ... and ..., in the same manner as it applies to a State, to each international intergovernmental organization which conducts space activities if the organization declares its acceptance of the rights and obligations provided for in this Agreement, and if the majority of States members of the organization are Parties to this Agreement and to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Celestial Bodies, or notify their acceptance of the rights and obligations provided for in this Agreement in respect of the activities of the organization.

2. An international inter-governmental organization to which paragraph 1 of this article applies and which has launched or procured the launching of a space object shall be liable for damage caused by that object. Any claim in respect of such damage shall be presented to the organization.

3. If within six months of the date of presentation of the claim the organization has not carried out its obligations, the States members of the organization who are referred to in paragraph 1 of this article shall be held individually and jointly liable for the obligations of the organization under this Agreement.

4. An international inter-governmental organization to which paragraph 1 of this article applies may present a claim, pursuant to the provisions of this Agreement, for damage caused to the organization by a space object.

Austria, Belgium, France, Sweden and United Kingdom of Great Britain and Northern Ireland: proposal (A/AC.105/C.2/L.41/Add.1)

International Organizations

Article ...

Add Italy as co-sponsor of the proposal.

Australia and Canada: Working Paper (A/AC.105/C.2/L.42)

1. The General Rule

2. Joint Liability

If during its launching, transit or descent, damage is caused by a space object that has been launched by several Launching Authorities, those Launching Authorities shall be jointly and severally liable.

3. Liability for damage on earth and to aircraft

The Launching Authority shall be absolutely liable to pay compensation for damage caused on the earth or to an aircraft in flight and its occupants, during the launching, transit or descent of a space object.

4. Liability for damage to space objects

A Launching Authority shall not be liable under this Convention for damage caused to space objects of other Launching Authorities and to the occupants of such space objects during launching, transit or descent unless the damage is caused by the fault of the first-mentioned Launching Authority.

5. Liability for damage to third parties

If space objects cause damage to third parties, the Launching Authorities shall be jointly and severally liable for such damage. As between themselves, the Launching Authorities shall share equally the burden of compensation unless there is comparative fault, in which event the burden of compensation shall be apportioned between them accordingly.

6. Damage in respect of which compensation is not payable

Compensation shall not be payable under this Convention in respect of damage caused by a space object to:

(a) nationals of the Launching Authority; or

(b) foreign nationals in the immediate vicinity of a planned launching or recovery area as the result of an invitation by the Launching Authority.

Mexico: proposal (A/AC.105/C.2/L.43)

Field of application

An Applicant State may present claims in respect of damage sustained by its nationals and by persons permanently resident in its territory. If the Applicant State does not present a claim in respect of damage sustained by persons permanently resident in its territory, or notifies its intention not to do so, the State of nationality shall be entitled to present the corresponding claim, so long as such persons are not nationals of the Respondent State.

Canada: proposal (A/AC.105/C.2/L.44)

"Damage" means loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of their persons, natural or juridical, or to property of international organizations.

Australia/United Kingdom of Great Britain and Northern Ireland

Working Paper (A/AC.105/C.2/L.47)

Applicable Law for Determination of Compensation

The amount of compensation payable in accordance with this Convention shall be determined in accordance with any national law which is agreed upon between the claimant and the respondent. If the claimant and respondent do not agree on a national law to be applied, the amount of compensation payable shall be determined in accordance with applicable principles of international law, justice and equity, and taking account of the national law of the State in whose territory the damage occurred.

Australia

Working Paper (A/AC.105/C.2/L.48)

Pursuit of Remedies in Respondent State or under other international agreements

The following text is an amendment to article V (4) of the Indian draft A/AC.105/C.2/L.32:

"Presentation of a claim under the Convention shall not require the prior exhaustion of any local remedies that may be available to the claimant or to those whose interests the claimant represents. Nothing in this Convention shall prevent a claimant or any natural or juridical person from pursuing a claim in the administrative agencies or courts of a respondent. But a claimant shall not be entitled to pursue claims under this Convention in respect of damage for which a claim is being pursued in the administrative agencies or courts of a respondent."

Argentina, Australia, Austria, Belgium, Brazil, Canada, France, Japan, Sweden, United Kingdom of Great Britain and Northern Ireland and United States of America: proposal (A/AC.105/C.2/L.51)

The foregoing delegations consider that Governments should, as a matter of urgency, concentrate their attention on the following important issues that have been discussed but not yet resolved by the Legal Sub-Committee:

(i) whether the Convention should exclude nuclear damage;

(ii) whether there should be any limitation of liability in amount;

(iii) whether the Convention should provide compulsory third party settlement of disputes;

(iv) the relationship between international organizations and the Convention;

(v) the law applicable to measure of damages;

(vi) unresolved aspects of joint liability.

Union of Soviet Socialist Republics: Revised Working Paper (A/AC.105/C.2/WP/1/Rev.2)

Damage caused by a space object from the time of its launching till landing shall be compensated for in accordance with the provisions of this Convention, irrespective of the place where such damage is caused.

Unless otherwise provided in this Convention, liability for damage caused by a space object shall be absolute.

Union of Soviet Socialist Republics: Working Paper (A/AC.105/C.2/WP/2)

1. In the event of damage being caused to a space object or to persons or property on board a space object by the space object of another State, that State shall be held liable only if it was at fault or if persons for whom it is responsible were at fault.

2. If in the case referred to in paragraph 1, a claim is made by a third State, the States mentioned in paragraph 1 shall be held jointly liable. The amount of compensation shall be apportioned between those States in accordance with the extent to which they were at fault; if the extent of the fault of each of the parties cannot be established, the amount shall be apportioned equally between them.

India: Working Paper (A/AC.105/C.2/WP/3)

Revised text of article III of the Indian proposal contained in document A/AC.105/C.2/L.32

Article III

1. Unless otherwise provided in the Convention, exemption from liability may be granted only in so far as the respondent produces evidence that the damage has resulted either wholly or partially from gross negligence on the part of the claimant or of natural or juridical persons it represents, or from an act or omission of such claimant done with intent to cause damage. No exemption from the principle of absolute liability will be granted in cases where the respondent has conducted activities which are not in conformity with the Charter of the United

Nations and with the Treaty on the principles governing the activities of States in the exploration and use of outer space, including the moon and other celestial bodies /and other relevant international agreements/.

2. The provisions of this Convention shall not apply to damages sustained by:

(a) nationals of the launching Authority;

(b) foreign nationals in the immediate vicinity of a planned launching or recovery area as a result of an invitation by the launching Authority.

United States of America: proposal (A/AC.105/C.2/WP/4/Rev.1)

General Rule

A launching (authority) (State) shall be absolutely liable for damage caused by its space object whether during launching or thereafter, except as otherwise provided in this Convention.

Union of Soviet Socialist Republics: Working Paper
(A/AC.105/C.2/WP/5)

Where a space object launched from the territory or facility of one State has been entered in the register of another State, the latter shall compensate any damage caused by such object. If the State of registry cannot be determined or if the State of registry is not a Party to this Convention, the damage shall be compensated by the State from whose territory or facility the object was launched. The State which has compensated the damage shall be entitled to claim reimbursement from the other participants in a joint launching who are Parties to this Convention.

Comparative table (A/AC.105/C.2/W.2/Rev.4) of provisions contained in the proposals submitted by Belgium (A/AC.105/C.2/L.7/Rev.3), the United States of America (A/AC.105/C.2/L.19) and Hungary (A/AC.105/C.2/L.10/Rev.1 and A/AC.105/C.2/L.24)

/See Official Records of the General Assembly, Twenty-second Session, Annexes, agenda item 32, document A/6804, annex III, appendix II, pp. 23-31./

Addendum to comparative table (A/AC.105/C.2/W.2/Rev.4/Add.1)

India: proposal
(A/AC.105/C.2/L.32)

CONVENTION CONCERNING LIABILITY FOR DAMAGE CAUSED BY THE LAUNCHING OF OBJECTS INTO OUTER SPACE

India: proposal
(A/AC.105/C.2/L.32)

CONVENTION CONCERNING LIABILITY FOR DAMAGE CAUSED BY THE LAUNCHING OF OBJECTS INTO OUTER SPACE

Preamble

The Contracting Parties

Recognizing the common interest of mankind in the peaceful exploration and use of outer space,

Recalling the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, adopted by the United Nations General Assembly on 13 December 1963 as resolution 1962 (XVIII),

Believing that the exploration and use of outer space should be carried on for the betterment of mankind and for the benefit of States irrespective of their degree of economic or scientific development,

Desiring to contribute to broad international co-operation in the scientific as well as in the legal aspects of the exploration and use of outer space for peaceful purposes,

Believing that such co-operation will contribute to the development of mutual understanding and to the strengthening of friendly relations between States and peoples,

Recalling resolution 1884 (XVIII), calling upon States to refrain from placing in orbit around the earth any objects carrying nuclear weapons or any other kind of weapons of mass destruction or from installing such weapons on celestial bodies, which was adopted unanimously by the United Nations General Assembly on 17 October 1963,

Having regard to United Nations General Assembly resolutions 2260 (XXII) of 3 November 1967 and 2345 (XXII) of 19 December 1967 which inter alia called upon the Committee on the Peaceful Uses of Outer Space to complete urgently the preparation of the draft of an agreement on Liability for Damage Caused by the Launching of Objects into Outer Space,

Bearing in mind the Treaty on Principles Governing the Activities of States in Exploration and Use of Outer Space, including the Moon and other Celestial Bodies, which came into force on 10 October 1967, and the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, which was opened for signature on 22 April 1968,

Preamble (continued)

Recognizing that activities in the exploration and use of outer space may from time to time result in damage,

Seeking to establish uniform rules of liability and a simple and expeditious procedure governing financial compensation for damage,

Agree as follows:

Definitions

DEFINITIONS

Article I

For the purpose of this Convention

(a) "Damage" means loss of life, personal injury or other impairment of health, or damage to property of States or their persons, natural or juridical, or of international organizations.

(b) "Launching" includes "attempted launching" whether or not it fulfils the expectations of those responsible therefor.

(c) "Space Objects" mean space ships, satellites, orbital laboratories, containers and other devices designed for movement in outer space and sustained there by means other than reaction of air, as well as the means of delivery of such bodies and any part thereof.

(d) "Launching authority" means the State responsible for the launching, or where an international inter-governmental organization is responsible for launching, that organization, provided that that organization declares its acceptance of the rights and obligations provided for in this Convention and a majority of the States members of that organization are Contracting Parties to this Convention and to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies.

(e) "Claimant" means the State or other Contracting Party that presents a claim for compensation to a respondent.

(f) "Respondent" means a launching authority from which compensation is sought under this Convention.

Field of application and exemptions from provisions of agreement

Article II

1. The respondent shall be absolutely liable to pay compensation to the claimant in accordance with the provisions of this Convention, for damage caused in all environments except outer space by the launching, transit or descent of all or part of a space object.

Field of application and exemptions from provisions of agreement (continued)

Article III

2. The provisions of this Convention shall not apply to damages sustained by:

(a) nationals of the launching Authority;

(b) foreign nationals in the immediate vicinity of a planned launching or recovery area as result of an invitation by the launching Authority.

State or international organization liable

Article II

1. The respondent shall be absolutely liable to pay compensation to the claimant in accordance with the provisions of this Convention, for damage caused in all environments except outer space by the launching, transit or descent of all or part of a space object.

Article I

(f) "Respondent" means a launching authority from which compensation is sought under this Convention.

(d) "Launching authority" means the State responsible for the launching, or where an international inter-governmental organization is responsible for launching, that organization, provided that that organization declares its acceptance of the rights and obligations provided for in this Convention and a majority of the States members of that organization are Contracting Parties to this Convention and to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies.

Question of joint liability

Article IV

If damage is caused as a result of the launching of a space object under a joint programme, the parties concerned shall, jointly and severally, be liable. Provided that nothing in this article shall preclude the conclusion of agreements on the apportionment of liability between two or more Contracting Parties.

International organizations and the Agreement

Article I

(a) "Damage" means loss of life, personal injury or other impairment of health, or damage to property of States or their persons, natural or juridical, or of international organizations.

(d) "Launching authority" means the State responsible for the launching, or where an international inter-governmental organization is responsible for launching, that organization, provided that that organization declares its acceptance of the rights and obligations provided for in this Convention and a majority of the States members of that organization are Contracting Parties to this Convention and to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies.

Article VI

2. In cases where an international organization is liable under this Convention claims may be presented through the Secretary-General of the United Nations.

Article X

3. (Provision regarding mode of accession of international organizations to the Convention, their rights and duties and relationship with States parties to the Convention to be inserted).

Question of absolute liability and exoneration from liability

Article II

1. The Respondent shall be absolutely liable to pay compensation to the claimant in accordance with the provisions of this Convention, for damage caused in all environments except outer space by the launching, transit or descent of all or part of a space object.

2. The claimant shall only be required to furnish evidence relative to the connexion between the damage suffered by it and the space object in question.

Article III

1. Unless otherwise provided in the Convention, exemption from liability may be granted only in so far as the respondent produces evidence that the damage has resulted either wholly or partially from a wilful act on the part of the claimant or of natural or juridical persons it represents which has been committed in full

Question of absolute liability and exoneration from liability (continued)

knowledge that damage will probably result. Provided that no mitigation of the principle of absolute liability may be allowed in cases where the claimant or the natural or juridical persons which it represents, have not committed acts which are in contravention of the rules of international law. No exemption from the principle of absolute liability will be granted in cases where the respondent has conducted activities which affect the rights of other States under general international law.

2. The provisions of this Convention shall not apply to damages sustained by:

(a) nationals of the launching Authority;

(b) foreign nationals in the immediate vicinity of a planned launching or recovery area as a result of an invitation by the launching Authority.

Measure of damages

Article I

(a) "Damage" means loss of life, personal injury or other impairment of health, or damage to property of States or their persons, natural or juridical, or of international organizations.

Limitation of liability in amount

Payment of compensation in convertible currency

Article VIII

Sums due in compensation for damage shall be fixed and payable in the currency of the claimant or in a freely convertible currency unless the Parties agree otherwise.

Presentation of claims by States or international organizations and on behalf of natural or juridical persons

Article V

1. A Contracting Party which suffers damage or whose natural or juridical persons suffer such damage, may present a claim for compensation to a respondent.

2. A claimant may also present to a respondent a claim of any natural or juridical person, permanently residing in its territory, other than a person having the nationality of the respondent.

Article I

(e) "Claimant" means the State or other Contracting Party that presents a claim for compensation to a respondent.

Joinder of claims

Article IX

There may be joinder of claims where there is more than one claimant in respect of damage due to the same event or where more than one State or international organization is liable.

Presentation of claims for compensation through diplomatic channel

Article V

(3) A claim shall be presented through diplomatic channels. A claimant may request another State to present its claim and otherwise represent its interests in the event that it does not maintain diplomatic relations with a respondent.

Time-limits for presentation of claims

Article VI

(1) A claim must be presented within one year of the date of the occurrence of the damage, or of the identification of the launching authority liable. If the claimant could not reasonably be expected to have known of the facts giving rise to the claim, the claim must be presented within one year of the date on which these facts officially become known.

Pursuit of remedies available in Respondent State or under other international agreements.

Article V

(4) Presentation of a claim under the Convention shall not require the prior exhaustion of any local remedies that may be available in the Launching (Respondent) State. Provided that nothing in this Convention shall prevent the claimant or a natural or a juridical person from pursuing a claim in the administrative agencies or courts of a respondent. In such a case, the claimant shall not be entitled to simultaneously pursue claims under this Convention against the respondent.

Procedures for settlement of claims for compensation

Article VII

(1) In case of disagreement between the claimant and the respondent, the two parties shall endeavour to arrive at a settlement through the recognized means of the peaceful settlement of disputes.

(2) If no settlement is arrived at within one year of the presentation of the claim the claimant may refer the matter to a Claims Commission as provided for in the Protocol annexed to this Convention.

Space object not to be subject to sequestration or enforcement measures

Jurisdiction of International Court of Justice

Parties to agreements, signature, accession and ratification

Entry into force

Article X

(1) This Convention shall be open to all States for signature. Any State which does not sign this Convention before its entry into force in accordance with paragraph 4 of this article may accede to it at any time.

(2) This Convention shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with Governments of the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America, which are hereby designated the Depositary Governments.

Article X

(4) This Convention shall enter into force upon the deposit of instruments of ratification by five Governments including the Governments designated as Depositary Governments under this Convention.

(5) For States whose instruments of ratification or accession are deposited subsequent to the entry into force of this Convention, it shall enter into force on the date of the deposit of their instruments of ratification or accession.

Amendments

Article XI

Any State Party to the Convention may propose amendments to this Convention. Amendments shall enter into force for each State Party to the Convention accepting the amendments upon their acceptance by a majority of the States Parties to the Convention and thereafter for each remaining State Party to the Convention on the date of acceptance by it.

Withdrawal from and denunciation of agreement

Article XII

A Contracting Party may give notice of its withdrawal from the Convention one year after its entry into force by written notification to the Depositary Governments. Such withdrawal shall take effect one year from the date of receipt of this notification.

Notification by Depositary

Article X

(6) The Depositary Governments 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 to this Agreement, the date of its entry into force and other notices.

Authentic text and deposit of agreement

Article XIII

This Convention, of which the Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited in the archives of the Depositary Governments. Duly certified copies of this Convention shall be transmitted by the Depositary Governments to the Governments of the signatory and acceding States.

Article X

(2) This Convention shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with Governments of the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America, which are hereby designated the Depositary Governments.

Registration of Agreement with United Nations

Article X

(7) This Convention shall be registered by the Depositary Governments pursuant to Article 102 of the Charter of the United Nations.

Addendum to comparative table (A/AC.105/C.2/W.2/Rev.4/Add.2)

TEXT OR POINTS ON WHICH AGREEMENT OR PROVISIONAL AGREEMENT WAS REACHED AT THE SIXTH SESSION OF THE LEGAL SUB-COMMITTEE

Definitions

(1) Text provisionally agreed upon

"Damage" means loss of life, personal injury or other impairment of health, or damage to property of States or of their persons, natural or juridical, or of international organizations.*

* No agreement was reached on the inclusion of indirect damage and delayed damage in the definition.

(2) Points on which agreement was reached

The term "launching" should include "attempted launching".

In defining the term "Launching State" the following elements should be included:*

1. the State which launches or attempts to launch the space object or the space device,

2. the State from whose territory the space object or the space device was launched,

3. the State from whose facility the space object or space device was launched.

* The question whether the State referred to in (2) and (3) above should be liable primarily, or only secondarily (if the State referred to in (1) above cannot be identified) was left for further consideration.

Field of application and exemptions from provisions of agreement

Field of application:

Points on which agreement was reached

A. The provisions of this Convention shall not apply to damages sustained by:*

(a) Nationals of the Launching State;

(b) Foreign nationals in the immediate vicinity of a planned launching or recovery area as the result of an invitation by the Launching State.

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* No agreement was reached on whether the Convention should apply to damages sustained by:

(a) Persons who are permanent residents but not nationals of the Applicant (Presenting) State;

(b) A spacecraft and its personnel during launching, transit or descent.

B. The Launching (Respondent) State should be absolutely liable to pay compensation for damage caused on the surface of the Earth and to aircraft in flight.*

---

* No agreement was reached whether the Launching (Respondent) State should on proof of fault, be liable to pay compensation for damage caused to space objects which have left the surface of the Earth.

International organizations and the Agreement

Liability of International Organizations

Points on which provisional agreement was reached

International organizations that launch objects into outer space should be liable under the Convention for damage caused by such activities.*

---

* No agreement was reached on the question whether the liability of the States members of the international organization that are parties to the liability convention:

(a) should be residual and arise only in the event of default by the international organization, or

(b) should arise at the same time as the liability of the international organization.

Nor was agreement reached on the question of the rights of international organizations under the Convention. This problem requires further consideration.

Question of absolute liability and exoneration from liability

Field of application

Points on which agreement was reached

A. .....

B. The Launching (Respondent) State should be absolutely liable to pay compensation for damage caused on the surface of the Earth and to aircraft in flight.*

---

* No agreement was reached whether the Launching (Respondent) State should, on proof of fault, be liable to pay compensation for damage caused to space objects which have left the surface of the Earth.

Presentation of claims for compensation through diplomatic channel

Presentation of claims

Points on which agreement was reached

1. A claim may be presented by the Applicant (Presenting) (claimant) State through the diplomatic channel.

Presentation of a claim under the Convention shall not require the prior exhaustion of any local remedies that may be available in the Launching (Respondent) State.

2. In the event the Applicant (Presenting) (claimant) State does not have diplomatic relations with the Launching (Respondent) State, the former may request a third State to present its claim and otherwise represent its interests.

Time-limits for presentation of claims

Time-limits for presentation of claims

Points on which agreement was reached

1. A claim may be presented not later than one year following the date of the occurrence of the accident or the identification of the party that is liable.

2. If the Applicant (Presenting) (claimant) State does not know of the facts giving rise to the claim within the aforementioned one-year period, it may present a claim within one year following the date on which it learned of the facts; however, this period shall in no event exceed one year following the date on which the Applicant (Presenting) (claimant) State could reasonably be expected to have learned of the facts through the exercise of due diligence.

3. The above-mentioned time-limits shall apply even if the full extent of the damage may not be known. In this event, however, the Applicant (Presenting) (claimant) State shall be entitled to revise its claim and submit additional documentation beyond the above-mentioned time-limits until one year after the full extent of such damage is known.

Procedures for settlement of claims for compensation

Arbitration in the event of dispute

Points on which agreement was reached

If a claim presented under the Convention is not settled within six months from the date on which the Applicant (Presenting) (claimant) State completes its documentation, the Applicant (Presenting) (claimant) State may refer the matter to an arbitral commission.

Addendum to comparative table (A/AC.105/C.2/W.2/Rev.4/Add.3)

Italy: Proposal
(A/AC.105/C.2/L.40)

DRAFT CONVENTION CONCERNING LIABILITY FOR DAMAGE CAUSED BY THE LAUNCHING OF OBJECTS INTO OUTER SPACE

Working Paper submitted by the Italian delegation
(A/AC.105/C.2/L.40)

DRAFT CONVENTION CONCERNING LIABILITY FOR DAMAGE CAUSED BY THE LAUNCHING OF OBJECTS INTO OUTER SPACE

Preamble

The Contracting Parties,

Recognizing that activities in the peaceful exploration and use of outer space may on occasion result in damage,

Recalling the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies signed on 27 January 1967,

Seeking to establish a uniform rule of liability and a simple and expeditious procedure governing compensation for damage,

Believing that the establishment of such a procedure will contribute to the growth of friendly relations and co-operation among nations,

Agree as follows:

Purpose of the Convention

Article 1

The purpose of this Convention is to govern the international liability of States for damage caused in the exercise of their space activities to another member State and the natural or juridical persons that it represents, in accordance with the Washington Treaty of 27 January 1967.

Definitions

Article 2

1. Launching State shall be understood to mean the State which launches or procures the launching of a space object, entered in its own registers or registered with the United Nations Secretariat (which must in any case be notified beforehand of the launching and be provided with all the information necessary to identify the object in question);

2. The State whose territory or facility is used for the launching shall be deemed to be the Launching State, if it does not state that it is the actual launching State or if the latter is not a Party to the Convention, even if the State whose territory or facility is used does not participate actively and substantially in the launching, transit control and descent of the space object;

3. The international organizations referred to in Article 6 below shall be treated for the purpose in the same way as States;

4. Space object means any man-made object designed to reach outer space and to move their (either) naturally or by means of radio-electric signals or the control exercised by pilots on board;

5. For the purposes of this Convention, the component parts of space objects that become detached or are made to detach during transit, and objects thrown or launched from space objects, shall be deemed to be space objects;

6. Damage means loss of life, personal injury or impairment of health and destruction or damage to property caused by space objects.

Field of application and exemptions from provisions of agreement

Article 3

1. This Convention shall apply to all damage caused by space objects; (a) on the earth; (b) in the earth's atmosphere; (c) in outer space, including other celestial bodies;

2. However, the present Convention shall not cover damage caused in the territory of the Launching State and in particular damage sustained at the time and in the area of launching and return of space objects by persons playing a part in the operations related thereto, or damage sustained from endogenous causes by space objects and their personnel during launching, transit or descent. For this purpose, social labour legislation and agreements between the parties concerned shall be paramount in the assessment of compensation.

Article 4

1. Damage caused on the earth, even in the case of circumstances beyond control shall constitute grounds for compensation by the very fact that the damage has occurred and was caused by a space object;

2. Damage caused in the earth's atmosphere to aircraft shall be presumed to be due to the fault of the space object; if, however, the damage is caused by one space object to another space object, it shall be presumed to be attributable to common fault.

Both cases shall be open to proof of the contrary;

Field of application and exemptions from provisions of agreement (continued)

3. In the case of damage caused by a space object in outer space, liability shall rest with the Launching State if a fault on its part is proved;

4. When two or more space objects have collided or interfered with each other in transit and damage to third parties on the ground has resulted, the damage shall be presumed to be attributable to the common fault of the said objects and the Launching States shall be jointly liable;

Art. 9 - (1) ...

The same claim can be presented by the State for damage caused anywhere to its own nationals and to natural or juridical persons permanently domiciled in its territory;

State or international organization liable

1. The Launching State shall be liable for the damage caused by a space object.

2. When the space object is jointly launched by several States or by States and international organizations (referred to in Art. 6), they shall be jointly and severally liable for the damage caused by the space object.

The sums paid to the victim of the damage shall be shared equally by the parties liable in accordance with previous agreements, and if no such agreements exist, it shall also be apportioned equally.

Article 6

1. If an international organization which conducts space activities has transmitted to the Secretary-General of the United Nations a declaration that it accepts and undertakes to comply with the present Convention, all the provisions of the Convention, except articles 13, 16, 17 and 18, shall apply to the organization as to a State which is a Contracting Party;

2. Consequently, if the organization launches, or procures the launching of a space object, and that object causes damage, the organization, like any Launching State, shall be directly liable for the damage vis-à-vis the victims.

3. Should the organization fail to pay the amount of the compensation already agreed to or fixed, the States members of the organization can be called upon as guarantors within the period and under the conditions referred to in Article 11 below.

State or international organization liable (continued)

Article 2

1. Launching State shall be understood to mean the State which launches or procures the launching of a space object, entered in its own registers or registered with the United Nations Secretariat (which must in any case be notified beforehand of the launching and be provided with all the information necessary to identify the object in question);

2. The State whose territory or facility is used for the launching shall be deemed to be the Launching State, if it does not state that it is the actual launching State or if the latter is not a party to the Convention, even if the State whose territory or facility is used does not participate actively and substantially in the launching, transit control and descent of the space object;

3. The international organizations referred to in Article 6 below shall be treated for the purpose in the same way as States;

Question of joint liability

Article 5 ...

2. When the space object is jointly launched by several States or by States and international organizations (referred to in Art.6), they shall be jointly and severally liable for the damage caused by the space object.

The sums paid to the victim of the damage shall be shared equally by the parties liable in accordance with previous agreements, and if no such agreements exist, it shall also be apportioned equally.

Article 4 ...

4. When two or more space objects have collided or interfered with each other in transit and damage to third parties on the ground has resulted, the damage shall be presumed to be attributable to the common fault of the said objects and the Launching States shall be jointly liable;

5. The Launching State which has had to pay the entire compensation shall have the right to appeal against the other jointly liable States.

International organizations and the Agreement

Article 11

1. If, within one year of the date on which compensation has been agreed upon or otherwise established pursuant to Article 10, an international organization has failed to pay the amount of such compensation, the States members of the organization shall, upon service of notice of such default by the Applicant (Presenting)

(Claimant) State within three months of such default, be obligated to pay the amount of compensation, each in proportion to its contribution to the budget of the organization: and if this contribution is not known, the member States shall be jointly liable for the entire compensation;

2. In no circumstances may the member States question the justification for or the amount of compensation due by the organization.

Article 6

1. If an international organization which conducts space activities has transmitted to the Secretary-General of the United Nations a declaration that it accepts and undertakes to comply with the present Convention, all the provisions of the Convention, except articles 13, 16, 17 and 18, shall apply to the organization as to a State which is a Contracting Party;

2. Consequently, if the organization launches, or procures the launching of a space object, and that object causes damage, the organization, like any Launching State, shall be directly liable for the damage vis-à-vis the victims.

3. Should the organization fail to pay the amount of the compensation already agreed to or fixed, the States members of the organization can be called upon as guarantors within the period and under the conditions referred to in Article 11 below.

Question of absolute liability and exoneration from liability

Article 4

1. Damage caused on the earth, even in the case of circumstances beyond control shall constitute grounds for compensation by the very fact that the damage has occurred and was caused by a space object;

2. Damage caused in the earth's atmosphere to aircraft shall be presumed to be due to the fault of the space object; if, however, the damage is caused by one space object to another space object, it shall be presumed to be attributable to common fault.

Both cases shall be open to proof of the contrary.

3. In the case of damage caused by a space object in outer space, liability shall rest with the Launching State if a fault on its part is proved;

4. When two or more space objects have collided or interfered with each other in transit and damage to third parties on the ground has resulted, the damage shall be presumed to be attributable to the common fault of the said objects and the Launching States shall be jointly liable;

Article 7

If the damage has been caused, either wholly or partially, by an act or omission on the part of the victim, the liability of the Launching State may be extinguished or reduced according to the gravity (fraud or fault) of the act or omission.

Measure of damages

Article 8

The compensation which a State shall be liable to pay under this Convention for the damage it has caused shall be determined in accordance with applicable principles of international law, justice and in view of the singular nature of the matter, equity.

Article 10 ...

3. The Commission shall take its decisions according to law in conformity with Article 8 above. It shall determine its own procedure and arrive at its decision by majority vote. Such decision shall state the views of the members of the commission.

Limitation of liability in amount

Payment of compensation in convertible currency

Presentation of claims by States or international organizations and on behalf of natural or juridical persons

Article 9

1. The State which has sustained damage (Applicant, (Presenting) (Claimant) State) can present a claim for compensation to the State that is liable, hereinafter called the Respondent State.

The same claim can be presented by the State for damage caused anywhere to its own nationals and to natural or juridical persons permanently domiciled in its territory;

Joinder of claims

Article 10 ...

2. No increase in the membership of the commission shall take place where two or more Applicant (Presenting) (Claimant) States or Respondent States are joined in any one proceeding before the commission. The Applicant (Presenting) (Claimant) States so joined shall collectively appoint one person to serve on the commission in the same manner and subject to the same conditions as would be the case for a single Applicant (Presenting) (Claimant) State. Similarly, where two or more Respondent States are so joined, they shall collectively appoint one person to serve on the commission in the same way.

If the Applicant (Presenting) (Claimant) State or the Respondent State fails to appoint its member within three months, the person appointed by the President of the International Court of Justice shall be the sole arbitrator.

As an alternative to 2 above

If in the same dispute there are two or more Applicant (Presenting) (Claimant) States and (or) two or more Respondent States, they shall agree to appoint one person to represent them on the commission, which shall thus always comprise three members.

Presentation of claims for compensation through diplomatic channel

Article 9 ...

3. A claim shall be presented through the diplomatic channel within one year of the date when the damage and the State liable for it became known.

4. The same procedure shall apply when the claim is presented by or against an international organization. The representation of the international organization, for the purposes of this diplomatic procedure, may then be assumed by one of the States members of the organization.

Article 12

This Convention shall not prejudice the rights of victims to institute proceedings before the ordinary courts of the Applicant (Presenting) (Claimant) State or the Respondent State, or to choose any other international procedure, with a view to obtaining compensation for damage.

However, in such a case, the Applicant (Presenting) (Claimant) State may no longer have recourse to the procedures referred to in Articles 9, 10 and 11 above; but the normal

diplomatic intervention with a view to bringing about an amicable settlement between the parties to the dispute shall not be excluded.

Time limits for presentation of claims

Article 9 ...

3. A claim shall be presented through the diplomatic channel within one year of the date when the damage and the State liable for it became known.*

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*NOTE: If it is desired to introduce a time limit or an expiry date, the following formula can be adopted:

"In any case, three years after the date of the occurrence that caused the damage, the claim shall cease to be maintainable."

Pursuit of remedies available in Respondent State or under other international agreements

Article 9 ...

2. The presentation of a claim under this Convention shall not require exhaustion of any remedies which might otherwise exist in the Respondent State;

Article 12

This Convention shall not prejudice the rights of victims to institute proceedings before the ordinary courts of the Applicant (Presenting) (Claimant) State or the Respondent State, or to choose any other international procedure, with a view to obtaining compensation for damage.

However, in such a case, the Applicant (Presenting) (Claimant) State may no longer have recourse to the procedures referred to in Articles 9, 10 and 11 above; but the normal diplomatic intervention with a view to bringing about an amicable settlement between the parties to the dispute shall not be excluded.

Procedures for settlement of claims for compensation

Article 10

1. If a claim presented under this Convention is not settled amicably within one year from the date on which documentation is completed, the Applicant (Presenting) (Claimant) State may request the establishment of an arbitration commission to decide the claim.

The competence of such commission shall extend to any dispute arising from the interpretation or application of this Convention. The Respondent State and the Applicant (Presenting) (Claimant) State shall each promptly appoint one person to serve on the commission, and a third person, who shall act as chairman, shall be appointed by the President of the International Court of Justice.

If the Respondent State fails to appoint its member within three months, the person appointed by the President of the International Court of Justice shall be the sole arbitrator.

2. No increase in the membership of the commission shall take place where two or more Applicant (Presenting) (Claimant) States or Respondent States are joined in any one proceeding before the commission. The Applicant (Presenting) (Claimant) States so joined shall collectively appoint one person to serve on the commission in the same manner and subject to the same conditions as would be the case for a single Applicant (Presenting) (Claimant) State. Similarly, where two or more Respondent States are so joined, they shall collectively appoint one person to serve on the commission in the same way.

If the Applicant (Presenting) (Claimant) State or the Respondent State fails to appoint its member within three months, the person appointed by the President of the International Court of Justice shall be the sole arbitrator.

As an alternative to 2 above

If in the same dispute there are two or more Applicant (Presenting) (Claimant) States and (or) two or more Respondent States, they shall agree to appoint one person to represent them on the commission, which shall thus always comprise three members.

Procedures for settlement of claims for compensation (continued)

3. The Commission shall take its decisions according to law in conformity with Article 8 above. It shall determine its own procedure and arrive at its decision by majority vote. Such decision shall state the views of the members of the commission.

4. The decision of the commission shall be rendered expeditiously. It shall be final and binding upon the parties.

5. The expenses incurred in connexion with any proceeding before the commission shall be divided equally between the Applicant (Presenting) (Claimant) and Respondent States.

Space object not to be subject to sequestration or enforcement measures

Jurisdiction of International Court of Justice

Article 13

Any question arising from the interpretation or application of this Convention, which is not previously settled by other peaceful means of their choice, may be referred by any Contracting Party thereto to the International Court of Justice for decision.

Parties to agreements, signature, accession and ratification

Article 16

This Convention shall be open for signature by all States. Any State which does not sign this Convention before its entry into force pursuant to Article 18 below may accede to it at any time.

Article 17

This Convention shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with the Secretary-General of the United Nations.

Entry into force

Article 18

This Convention shall enter into force thirty days following the deposit of the fifth instrument of ratification or accession. It shall enter into force as to a State ratifying or acceding thereto upon deposit of its instrument of ratification or accession.

Amendments

Article 14

A Contracting Party may propose amendments to this Convention. An amendment shall come into force for each Contracting Party accepting the amendment on acceptance by a majority of the Contracting Parties, and thereafter for each remaining Contracting Party on acceptance by it.

Withdrawal from and denunciation of agreement

Article 15

A Contracting Party may give notice of withdrawal from this Convention five years after its entry into force by written notification to the Secretary-General of the United Nations. Such withdrawal shall take effect one year from the date of receipt of the notification by the Secretary-General. A State withdrawing from this Convention shall not thereby be relieved of any obligation or liability with respect to damages arising before withdrawal becomes effective.

Notifications

Article 19

The Secretary-General of the United Nations shall inform all signatory and acceding States and all organizations which have made declarations under Article 6, paragraph 1, of signatures, deposits of instruments of ratification or accession, declarations of acceptance referred to in Article 6, paragraph 1, the date of entry into force of this Convention, proposals for amendments, notifications of acceptances of amendments, the date of entry into force of each amendment, and notices of withdrawal, and shall transmit to those States and organizations certified copies of each amendment proposed.

Authentic text and deposit of agreement

Article 20

This Convention, of which the Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Secretary-General of the United Nations, who shall send certified copies of each to the Governments of all the signatory and acceding States.

APPENDIX II

PROPOSALS CONCERNING QUESTIONS RELATIVE TO THE DEFINITION OF OUTER SPACE AND THE UTILIZATION OF OUTER SPACE AND CELESTIAL BODIES, INCLUDING THE VARIOUS IMPLICATIONS OF SPACE COMMUNICATIONS

France: proposal (A/AC.105/C.2/L.45)

Draft convention concerning the registration of objects launched into space for the exploration or use of outer space

The Governments signatories of this Convention,

Considering that the registration or entry in a register of objects launched into outer space is mentioned in several provisions of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies,

Considering the advantages, at the international level, of the establishment of common rules governing the registration of objects launched into space for the exploration or use of outer space,

Have agreed on the following provisions:

Article 1

Any object launched into space for the exploration or use of outer space shall be registered by entry in a register kept by a service under the supervision of one or more Governments Parties to this Convention. Each Government shall inform the Depositary Government of the establishment or termination of the services under its supervision.

There shall be only one registration of each object, but the registration may be transferred from one service to another.

Article 2

Each Contracting Party, acting separately or, in the case of a joint service, together with the other Contracting Parties exercising supervision over that service, shall determine the rules of law applicable to registration.

However, the entry in the register concerning each object shall include at least:

(a) the registration number;

(b) where applicable, the name of the object;

(c) the name and address of the governmental or inter-governmental agency or non-governmental entity procuring the launching;

(d) the external specifications of the object, such as total weight, shape, dimensions and external component parts;

(e) the law applicable to the object and to the persons carried in it when an inter-governmental agency or a group of natural or juridical persons, referred to in sub-paragraph (c) hereof, procures the launching.

Each Contracting Party undertakes to provide any other Contracting Party with any information requested by the latter regarding the particulars referred to in sub-paragraphs (a) and (c) of the preceding paragraph concerning any object registered by a service under its supervision, whether such supervision is exclusive or shared with other Governments.

The registers of services functioning in the territory of any State whose Government is a party to this Convention shall /, so far as possible,/ be accessible to the public.

Article 3

The registration number shall be composed of:

(a) the letter C, followed by a dash;

(b) the mark of the registration service, chosen from among the symbols assigned by international telecommunications regulations as identifying radio call signals to the State or States exercising supervision over the service which keeps the register. This mark shall be followed by a dash;

(c) the registration mark, consisting of Roman capital letters, Arabic numerals or a combination of such letters and numerals. This mark must be clearly distinguishable from those reserved for aircraft or for distress or emergency signals.

This number shall be displayed in at least two places on the object and on opposite sides thereof, if the size of the object permits. It shall be repeated as frequently as possible in order to permit identification, in case of accident, of portions or component parts of the object. The height of the characters shall be determined by technical considerations. The number shall be shown on at least one identification plate inside the object. The processes and materials used for reproduction of the registration number and manufacture of the identification plate shall be such, having regard to the conditions in which the object will be used, as to provide the best possible guarantee that the registration number will be identifiable as speedily as possible if the object or its component parts are found.

Article 4

At /two-year/ intervals, on the proposal of the Government Depositary of this Convention, a Conference shall be convened in order to consider in the light, inter alia, of scientific and technical advances, measures which could be adopted with regard to the questions dealt with in articles 2 and 3 of this Convention.

At such a conference, it may be decided by unanimous vote of the Contracting Parties represented and voting that the said common rules may at subsequent Conferences be adopted by a /two-thirds/ majority of the Contracting Parties represented and voting and be binding upon all the Contracting Parties.

The first conference shall take place in the third year after the date of entry into force of this Convention.

Article 5

Any Contracting Party may propose amendments to this Convention.

For this purpose, it shall transmit the text of the amendment to the Depositary Government, which shall communicate it to all the other Governments Parties. If at least one third of the latter state that they consider it necessary to discuss the proposal, a review conference shall be convened as soon as possible on the proposal of the Depositary Government.

Amendments adopted by the majority of the Contracting Parties represented and voting shall enter into force for the Governments /ratifying,/ approving /or accepting/ them /one/ month/s/ after one half of the Contracting Parties, at the date of adoption of the amendment by the conference, have deposited /the instrument of ratification or/ the notification of approval /or acceptance/ concerning them with the Government Depositary of this Convention. They shall enter into force for any other Government /one/ month/s/ after that Government has deposited the relevant instrument or notification.

If, after the Depositary Government has informed the other Governments Parties to this Convention of the text of a proposed amendment, at least two-thirds of the Contracting Parties intimate that the amendment can be adopted without the convening of a review conference, the said amendment shall enter into force, for those Contracting Parties, /one/ month/s/ after the last reply from one of them has reached the Depositary Government. The amendment shall enter into force for any other Contracting Party /one/ month/s/ after its reply has reached the Depositary Government.

Article 6

No reservation may be made in respect of this Convention.

*
* *

(followed by the formal provisions)

Czechoslovakia: proposal (A/AC.105/C.2/L.46)

The Legal Sub-Committee,

Having in mind the increasing significance of space communications and the technical development in this field;

Taking into account the useful activity of the International Telecommunication Union in the field of space communications;

Recalling the resolution of the General Assembly of the United Nations 2222 (XXI);

Decides to put on the agenda of its next session, in connexion with the item

"Study of questions relative to

(a) the definition of outer space

(b) the utilization of outer space and celestial bodies, including the various implications of space communications",

the question:

"The utility of the elaboration of the legal principles on which the creation and functioning of space communications should be based."

Sweden: proposal (A/AC.105/C.2/L.49)

The Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space,

Having in mind paragraph 13 of General Assembly resolution 2260 (XXII), Report of the Committee on the Peaceful Uses of Outer Space,

Conscious of the importance and urgency of the problem of the potentialities of the operation of direct broadcasting satellites,

Recommends to the United Nations Committee on the Peaceful Uses of Outer Space that the question of direct broadcasting satellites be placed on the agenda of the Scientific and Technical Sub-Committee as a separate item with a view to preparing a study of the technical problems involved, enlisting whenever appropriate the assistance of the competent specialized agencies of the United Nations.

France: proposal (A/AC.105/C.2/L.50/Rev.1)

I

The Legal Sub-Committee,

Desiring to continue its studies on the definition of space,

Recommends to the Committee on the Peaceful Uses of Outer Space to place consideration of the question of the definition of outer space on the agenda of the next session of the Legal Sub-Committee.

II

The Legal Sub-Committee,

Desiring to obtain the technical and scientific documentary material necessary for consideration of the question relating to the peaceful uses of outer space,

Considering the technical and scientific competence of the specialized agencies and the International Atomic Energy Agency in respect of the peaceful uses of outer space which come within their terms of reference,

Considering the need to give effect to Article 58 of the United Nations Charter in order to promote co-ordination among the various specialized agencies concerned with certain aspects of the peaceful uses of outer space,

Recommends to the Committee on the Peaceful Uses of Outer Space:

(a) to request the specialized agencies and the International Atomic Energy Agency to examine the particular problems which arise or may arise from the use of outer space in the fields within their competence and to report their findings to it;

(b) to place on the agenda of the next session of the Legal Sub-Committee, under the item concerned with the study of the peaceful uses of outer space, consideration:

of the draft convention on the registration of objects launched into space for the exploration or use of outer space;

of the results of the investigations which the specialized agencies and the International Atomic Energy Agency will have communicated to it, in order to give effect to Article 58 of the Charter concerning co-ordination among the various specialized agencies.

APPENDIX III

PAPER PRESENTED BY THE INTERNATIONAL TELECOMMUNICATION UNION

DIFFICULTIES LIABLE TO ARISE FROM THE LAUNCHING AND/OR OPERATION OF A SPACE OBJECT THROUGH NON-COMPLIANCE WITH INTERNATIONAL REGULATIONS GOVERNING THE USE OF THE RADIOFREQUENCY SPECTRUM

The launching of a rocket designed to place a space object (an earth satellite or a space probe) in orbit involves the use and the efficient operation of a whole series of radiocommunication facilities for guiding the rocket and transmitting telemetry data. Moreover any space object launched in this way, whether it is a communication satellite or not, is equipped with radio equipment, which is used for determining its position, for remote control from the earth of the equipment on board and for the exchange of information with the earth.

The successful launching of a space object and its operation once in orbit thus depend to a very large extent on the proper use of radiocommunications, i.e. essentially on the absence of harmful interference on the radiofrequencies used, to ensure which very thorough precautions are taken from the outset, particularly as regards the coding of the information transmitted and received.

The fact nevertheless remains that the incorrect use of radiofrequencies by any station under the jurisdiction of a country other than that responsible for the space object and for its launching may cause harmful interference to the radiocommunications used for that purpose and thus give rise to considerable difficulties in, or even lead to the complete failure of, the launching or operation of a space object. It is quite conceivable, for example, that improper command signals transmitted on the frequencies used could result in damage to the rocket and the space object and also cause harm to persons or property.

The use of radiofrequencies is regulated by the International Telecommunication Union and specifically by the Radio Regulations drawn up by it, which it revises from time to time and which are annexed to the International Telecommunication Convention, which binds the 134 member countries of ITU. The fundamental purpose of the Radio Regulations is to ensure that harmful interference does not occur in the transmission medium which is common to all. These Regulations contain provisions specifying measures to be taken to eliminate interference and others relating to the allocation of the frequency spectrum among the various services (aeronautical, maritime, space, etc.) and the co-ordination of frequency usage by the various countries.

But the case must be envisaged of failure by stations to comply fully with the provisions of the Radio Regulations, e.g. when a station belonging to a country other than the one responsible for the space object and its launching causes - by accident or otherwise - harmful interference to the radiocommunications used by the launching country, thus giving rise to damage. Such emissions might originate in the territory

of this other country or from a ship or aircraft belonging to that country or a space object launched by it. The interfering station might well be operated, not under the direct authority of the country concerned, but under licence issued by this country to a non-governmental operator. Nor can the possibility be ruled out a priori that the station responsible for the interference causing the damage might come under the jurisdiction of the country in which the damage was sustained.

The representatives of the ITU feel it necessary to draw the attention of this meeting, which is responsible for preparing legislation in the field of space law, to the various possible causes of damage to persons and property which may arise and which could be the subject of international agreements: Such is the purpose of the present declaration.

17 June 1968

APPENDIX IV

LIST OF DELEGATIONS, OBSERVERS AND SECRETARIAT

Chairman: Mr. Eugeniusz Wyzner (Poland)

Delegations

ARGENTINA

Representative	S.E. Mr. José María Ruda Representante Permanente de la República Argentina ante las Naciones Unidas en Nueva York
Alternate	Mr. Luís José Buceta Consejero de Embajada

AUSTRALIA

Representative	Mr. Bernard J. O'Donovan Senior Assistant Secretary Attorney General's Department Canberra
Alternate	Mr. David W. Evans First Secretary Permanent Mission of Australia to the United Nations New York
Adviser	Mr. Stanley B. Murphy Second Secretary Department of External Affairs Australian Embassy Vienna

AUSTRIA

Representative	Mr. Karl Zemanek Professor at the University of Vienna
Alternate	Mr. Kurt Herndl Deputy Permanent Representative of Austria to the United Nations Office at Geneva

BELGIUM

Representative	M. Max Litvine Professeur de droit aérien et de droit de l'espace à l'Université libre de Bruxelles
Alternate	M. A.J. Vranken Inspecteur général au Ministère des Affaires étrangères et du Commerce extérieur, Bruxelles
Adviser	M. Erik Bal Premier Secrétaire d'Ambassade Ministère des Affaires étrangères et du Commerce extérieur

BRAZIL

Representative	M. Renato Bayma Denys Ministre conseiller à la Délégation permanente du Brésil à Genève
Alternates	M. Alcides da Costa Guimaraes Premier Secrétaire d'Ambassade
	M. Luiz Felipe Lampreia Secrétaire d'Ambassade Délégation permanente du Brésil à Genève
Adviser	M. Paulo Fernando Telles Ribeiro Secrétaire d'Ambassade Ministère des Affaires étrangères, Rio de Janeiro

BULGARIA

Representative	S.E. Monsieur Méthodi Popov Ambassadeur Représentant permanent de la République populaire de Bulgarie auprès de l'Office des Nations Unies à Genève
Alternate	M. Hristo Kossev Deuxième Secrètaire, Délégation permanente de la République populaire de Bulgarie auprès de l'Office des Nations Unies à Genève

CANADA

Representative	Mr. John Alan Beesley Head of Legal Division Department of External Affairs, Ottawa
Alternate	Mr. David Miles Miller Legal Division Department of External Affairs, Ottawa
Advisers	Mr. Richard McKinnon First Secretary Permanent Mission of Canada to the United Nations, Geneva
	Mr. Jacques Corbeil Third Secretary Permanent Mission of Canada to the United Nations, Geneva

CZECHOSLOVAKIA

Representative	Mr. Jaroslav Říha First Secretary of Embassy Ministry of Foreign Affairs, Prague
Alternate	Mr. Vladimír Cebis Third Secretary of Embassy Ministry of Foreign Affairs, Prague

FRANCE

Representative	M. Olivier Deleau Conseiller au Ministère des Affaires étrangères
Advisers	M. Robert Lemaître Conseiller juridique au Ministère des Affaires étrangères
	M. François Renouard Conseiller juridique des Affaires étrangères
	M. Jean-Louis Vencatassin Attaché à la Division des Affaires internationales du Centre national d'Etudes spatiales

HUNGARY

Representative	M. Gyula Eörsi Corresponding Member of the Hungarian Academy of Sciences
Alternate	Mr. Rezsö Palotás Second Secretary Permanent Mission of Hungary to the United Nations Office at Geneva

INDIA

Representative	Mr. K. Krishna Rao Ambassador Joint Secretary and Legal Adviser Ministry of External Affairs, New Delhi
Alternate	Mr. N. Krishnan Consul-General of India Consulate-General of India, Geneva
Advisers	Mr. S.N. Sinha Law Officer Ministry of External Affairs, New Delhi
	Mr. Dalip Mehta Vice-Consul of India Consulate-General of India, Geneva

IRAN

Representative	M. Sadegh Azimi Ministre Conseiller de la Délégation permanente de l'Iran à Genève
Alternates	M. Ali Kheradmeh Conseiller de la Délégation permanente de l'Iran à Genève
	M. Mehdi Ehsassi Premier secrétaire de la Délégation permanente de l'Iran à Genève
	M. Ebrahim Djahannema Deuxième Secrétaire de la Délégation permanente de l'Iran à Genève

ITALY

Representative	M. Antonio Ambrosini Professeur émérite de l'Université de Rome Faculté des ingenieurs aéronautiques et spatiales
Alternate	M. Emiliano Guidctti Conseiller d'Ambassade Représentant permanent adjoint d'Italie auprès de l'Office des Nations Unies à Genève

JAPAN

Representative	Mr. Shigeru Tokuhisa Counsellor Permanent Delegation of Japan to International Organizations in Geneva
Alternates	Mr. Toshijiro Nakajima Chief, Treaties Section, Treaties Bureau Ministry of Foreign Affairs
	Mr. Atsuhiko Yatabe Chief, Scientific Affairs Section United Nations Bureau Ministry of Foreign Affairs
Advisers	Mr. Soji Yamamoto Professor, Seikei University
	Mr. Masatoshi Ohta First Secretary Permanent Delegation of Japan to International Organizations in Geneva
	Mr. Shigeo Iwai Second Secretary Permanent Mission, New York

LEBANON

Representative	S.E. M. Suleiman el Zein Ambassadeur extraordinaire et plénipotentiaire Représentant permanent du Liban auprès de l'Office des Nations Unies à Genève
Alternate	Madame Rubi Homsy Premier secrétaire

MEXICO

Representative	Mr. Bernardo Sepúlveda Amor Legal Adviser Department of International Organizations Ministry of External Relations

MONGOLIA

Representative	Mr. D. Erdembileg Counsellor, Ministry of Foreign Affairs
Alternate	Mr. Z. Erendo Ministry of Foreign Affairs

MOROCCO

Representative	S.E. M. Nacer El Passi Ambassadeur extraordinaire et plénipotentiaire Représentant permanent du Royaume du Maroc auprès de l'Office des Nations Unies à Genève

POLAND

Representative	Mr. Cezary Berezowski Professor, Law Faculty, University of Warsaw
Alternate	Mr. Slawomir Dabrowa Second Secretary Permanent Mission of Poland to the United Nations Office at Geneva

ROMANIA

Representative	M. Paul Gogeanu Maître de conférences à l'Université de Bucarest Rédacteur en Chef de la revue "Revista romana de drept"
Alternate	Mme Florica Dinu Attaché à la Mission permanente de la République Socialiste de Roumanie auprès de l'Office des Nations Unies à Genève

SWEDEN

Representative	Mr. Folke Persson Head of Department Ministry of Foreign Affairs, Stockholm

UNION OF SOVIET SOCIALIST REPUBLICS

Head of Delegation	Mr. Alexandre S. Piradov Professor, Academy of Sciences Moscow
Members of Delegation	Mr. Yuri M. Rybakov Ministry of Foreign Affairs Moscow
	Mr. Vladimir Aldoshin Ministry of Foreign Affairs Moscow
Adviser	Mr. August Rubanov Professor, Academy of Sciences Moscow

UNITED ARAB REPUBLIC

Representative	Mr. Omar Sirry Conseiller Mission permanente de la Republique Arabe Unie auprès de l'Office des Nations Unies à Genève
Alternate	Mr. Hassan S. Abdel-AAl Premier Secrétaire Mission permanente de la Republique Arabe Unie auprès de l'Office des Nations Unies à Genève

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

Representative	Miss J.A.C. Gutteridge Barrister-at-Law
Alternate	Mr. J.R.H. Evans Second Secretary Permanent Mission of the United Kingdom of Great Britain and Northern Ireland to the United Nations Office at Geneva

UNITED STATES OF AMERICA

Representative	Mr. Herbert K. Reis Assistant Legal Adviser for United Nations Affairs Department of State, Washington
Alternate	Mr. Paul G. Dembling General Counsel National Aeronautics and Space Agency Administration Washington
Advisers	Mr. Harry H. Almond, Jr. Office of Assistant General Counsel for International Affairs Department of Defense Washington
	Mr. Daniel M. Arons Attorney-Adviser National Aeronautics and Space Agency Administration Washington
	Mr. Daniel J. Brockway Office of the Director of Defense Research and Engineering Department of Defense Washington
	Mr. David H. Small Office of the Legal Adviser Department of State Washington

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Mr. S. Chetverikov
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Deputy Secretary of the Sub-Committee

Mr. N. Jasentuliyana
Liaison between the Technical Sub-Committee and the Legal Sub-Committee