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COMMITTEE ON THE PEACEFUL
USES OF OUTER SPACE

REPORT OF THE SCIENTIFIC AND TECHNICAL SUB-COMMITTEE
ON THE WORK OF ITS SEVENTH SESSION

INTRODUCTION

1. The Scientific and Technical Sub-Committee of the Committee on the Peaceful Uses of Outer Space held its seventh session at United Nations Headquarters, New York, from 14 to 24 April 1970, under the chairmanship of Professor J.H. Carver (Australia).
2. Representatives of the following Member States attended the session: Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Czechoslovakia, France, Hungary, India, Iran, Italy, Japan, Lebanon, Mexico, Mongolia, Morocco, Poland, Romania, Sierra Leone, Sweden, Union of Soviet Socialist Republics, United Arab Republic, United Kingdom of Great Britain and Northern Ireland and United States of America.
3. Representatives of the International Labour Organisation (ILO), the Food and Agriculture Organization of the United Nations (FAO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Health Organization (WHO), the International Telecommunication Union (ITU), the World Meteorological Organization (WMO), the United Nations Development Programme (UNDP) and the Committee on Space Research (COSPAR) attended the session.
4. A list of the representatives of States members of the Sub-Committee, of the representatives of the organizations participating in the Sub-Committee's proceedings as observers, and of the members of the Secretariat attending the session, is given in appendix II.
5. Mr. L.N. Kutakov, Under-Secretary-General for Political and Security Council Affairs, opened the session. On the proposal of the representative of Italy, supported by the representative of India, Professor J.H. Carver (Australia) was unanimously elected Chairman of the Sub-Committee in place of the late Dr. D.F. Martyn (Australia).

6. Agenda. At the opening meeting of the session the Sub-Committee adopted the following agenda:

1. Election of a Chairman.
2. Consideration of scientific and technical aspects of international co-operation and use of outer space (General Assembly resolutions 2600 (XXIV) and 2601 (XXIV); A/7621, paras. 11-18, and A/7621/Add.1, paras. 9-12).
3. Report of the Sub-Committee on the work of its seventh session.

Annexed to the agenda was an extract from the Chairman's statement at the thirteenth session of the Committee on the Peaceful Uses of Outer Space.

7. Meetings and documentation. The Sub-Committee held sixteen meetings, of which ten meetings were covered by summary records (A/AC.105/C.1/SR.63, 64, 66, 68, 69, 70, 71, 74, 77, 78).

8. In conducting its work, the Sub-Committee followed the agreement reached in the Committee on the Peaceful Uses of Outer Space that it would be the aim of all members of the Committee and its Sub-Committees to conduct the Committee's work in such a way as to be able to reach agreement without need for voting.

9. The Sub-Committee had before it the following documents:

- (a) Review of the activities and resources of the United Nations, its specialized agencies and other competent international bodies relating to the peaceful uses of outer space (A/AC.105/77 and Add.1);
- (b) Review of national and co-operative international space activities (A/AC.105/L.51 and Add.1-3);
- (c) World Meteorological Organization, "World Weather Watch - Planning Report No. 30";
- (d) Information on the technical aspects of the registration of objects launched into outer space (A/AC.105/C.1/CRP.1); ^{1/}
- (e) Model of plans for a developing country to establish participation in an operational earth resource survey satellite system within the decade (A/AC.105/C.1/CRP.2);
- (f) An outline of a proposed programme for the dissemination of information on space technology utilization in the developing nations (A/AC.105/C.1/CRP.3);
- (g) The Outer Space Affairs Division Library (A/AC.105/C.1/CRP.4);
- (h) Note by the Secretariat on the applicability of space and other remote sensing techniques to the management of food resources (A/AC.105/C.1/CRP.5);

^{1/} Subsequently reissued as document A/AC.105/L.52.

(i) Summary of sounding rocket launchings from Thumba Equatorial Rocket Launching Station (A/AC.105/78);

(j) Report of the Scientific Group established at the request of the Government of Argentina to visit the rocket launching site at Mar Chiquita Station near Mar del Plata (A/AC.105/69 and Add.1) and Progress report (A/AC.105/C.1/L.29) (The report of the Scientific Group was considered by the Committee at its 70th meeting on 12 November 1969);

(k) Economic and Social Council resolution 1480 (XLVIII) on natural resources satellites;

(l) "Use of remote sensors in earth-orbital space for the discovery, inventory, evaluation, development and conservation of Earth's natural resources" (Report prepared by the Outer Space Affairs Division in 1967 and submitted as Background Information Paper No. 13 to the Conference on the Exploration and Peaceful Uses of Outer Space);

(m) Report of the Secretary-General to the Economic and Social Council on natural resources satellites (E/4779); (The Report was discussed at the forty-eighth session of the Council (E/SR.1664, 1665, 1666, 1667, 1668, 1670) and the Council adopted the resolution mentioned in (k) above);

(n) Report of the Secretary-General to the Advisory Committee on the Application of Science and Technology to Development entitled "Progress reports - space technology" (E/AC.52/L.85);

(o) Report of the Secretary-General to the Advisory Committee on the Application of Science and Technology to Development entitled "Space technology: A review of the progress in space technology and its possible application in the developing countries" (E/AC.52/L.71);

(p) Working papers on the technical aspects of registration by Canada (A/AC.105/C.1/L.31) and the United States of America (A/AC.105/C.1/L.30); working papers on earth resources survey by Argentina, Sweden, Italy and the United States; and a working paper on opportunities for education and training by the United States.

10. At its 63rd meeting, the Sub-Committee decided to continue to have summary records for some of its meetings, particularly those at the beginning and at the end of its session, but to dispense with summary records whenever possible.

11. At the opening meeting on 14 April 1970, the representative of Canada made a statement on behalf of the Sub-Committee in tribute to the memory of Dr. D.F. Martyn. The Sub-Committee decided to send a cable to the Australian National Academy of Sciences expressing the condolences of the Sub-Committee.

12. During the session of the Sub-Committee, the representatives expressed their hope that the astronauts of Apollo 13 would return to Earth safely, and subsequently expressed their gratification at the successful return of the Apollo 13.

13. The members of the Sub-Committee also expressed their satisfaction at the steps taken for the appointment by the Secretary-General to the Outer Space Affairs Division of Professor Humberto Ricciardi of Argentina as the specialist on applications of space technology - pursuant to General Assembly resolution 2601 (XXIV) - who will also be associated with the Office of the Secretary-General through the Chairman of the Inter-Departmental Working Group on outer space in carrying out his liaison responsibilities with the other departments and offices concerned and with the specialized agencies.

14. At the opening meeting on 14 April 1970, after hearing statements by the Chairman and the Chief of the Outer Space Affairs Division, the Sub-Committee began a general discussion of scientific and technical aspects of international co-operation in the peaceful uses of outer space. Statements were made by the representatives of Canada, Italy, France, the United States of America, the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland, Argentina, Mexico, Brazil, India, Japan, Australia, Poland, Sweden, Sierra Leone, the United Arab Republic, Iran, Bulgaria, and Romania. The statements are reported in the summary records of the 64th, 66th, 68th, 69th and 74th meetings. The Sub-Committee also heard comments by representatives of ITU, UNESCO and WMO. The statements are reported in the summary records of the 64th, 69th and 78th meetings. The representatives of the Office of Technical Co-operation and the Office for Science and Technology of the Department of Economic and Social Affairs also made statements.

15. Following the general discussion, the Sub-Committee undertook a more detailed discussion of the specific topics at its 63rd to 74th meetings and in informal meetings.

16. The recommendations approved by the Sub-Committee are set out below under appropriate headings.

RECOMMENDATIONS ON SPECIFIC TOPICS

A. Exchange of information

17. The Sub-Committee took note of the two reviews of space activities (A/AC.105/77 and Add.1 and A/AC.105/L.51 and Add.1-3).

18. With regard to the review of national and co-operative international space activities (A/AC.105/L.51 and Add.1-3), the Sub-Committee expressed its appreciation to the States supplying information to the United Nations on their national activities, and expressed the hope that other States would do so in the future. In that regard, the Sub-Committee expressed its concern that the number of Member States supplying information had decreased even though the number of Member States engaged in space activities had increased.

19. The Sub-Committee recognized that the national reports could provide useful information to developing countries in the field of international co-operation by citing examples and by drawing attention to programmes and opportunities in this field. In addition, these reports represented a means whereby a Member State could draw attention to recent developments in that country which might prove of interest and utility to other Member States. Accordingly, the Sub-Committee recommends that:

(1) Reports should continue to be submitted on an annual basis as at present, and those Member States which do not at present do so, should be encouraged to make a contribution;

(2) The individual national reports should cover the preceding calendar year and place special emphasis on those aspects of the Member States' activities which are relevant to:

(a) Co-operative international space activities;

(b) New developments likely to be of particular interest to developing countries;

(3) The Secretariat adopt a time-table of request and submission of contributions aimed at distributing the reports to Member States at least one month prior to the start of the new session.

With respect to the Review of the activities and resources of the United Nations, its specialized agencies and other competent international bodies relating to the peaceful uses of outer space (A/AC.105/77 and Add.1) the Sub-Committee recommends that annual supplements be issued to this report in order to provide current information.

20. The Sub-Committee recognized that the present and potential benefits of the practical applications of space were often insufficiently recognized and expressed the belief that such recognition was especially important on the part of government administrators responsible for economic and technical development in their States.

21. The Sub-Committee therefore recommends that the Secretary-General study and report on the cost and execution of an initial modest programme of publishing three documents of perhaps ten to fifteen pages each, written entirely in non-technical language, published in the working languages of the United Nations and illustrated if possible. These publications should be devoted to such subjects as the nature and benefits of broadcasting by satellites, with community receptions, earth resources surveying by satellites, and weather prediction based in part on data derived from satellites. In canvassing the possibilities for such publications, consideration should be given to whether any existing publications might serve or be adapted to serve the purposes. The Secretary-General in his report on this subject, should also devote special attention to a plan for dissemination of such publications which would give maximum assurance that they would reach the administrators described above, especially in developing States.

22. The Sub-Committee considered the possibilities for the Sub-Committee to hold a future meeting at the headquarters of one of the United Nations regional economic commissions, or in countries which may invite the Sub-Committee to meet there, with a view to stimulating further interest in the applications of space technology on a co-operative basis among the member nations of these regional commissions, and with a view to disseminating information on the potential of space technology for economic development. The Sub-Committee requests the Secretary-General to prepare a statement on the financial and other implications and advantages of this proposal, and further requests the Committee on the Peaceful Uses of Outer Space to consider this proposal and its implications at its next meeting.

B. Encouragement of international programmes: promotion of the applications of space technology

23. The Scientific and Technical Sub-Committee, having been requested by the Committee on the Peaceful Uses of Outer Space to consider the scientific and technical aspects of the development and use of remote earth survey techniques, with a view to promoting international co-operation within the framework of the United Nations so as to ensure that as the practical benefits of this new technology are achieved they are made available to both developed and developing countries, 2/ recommends that:

(1) The Secretary-General should prepare and distribute at the earliest date a brief, selective bibliography on earth resources surveying by remote sensing; the bibliography should be topically organized to list comprehensive items as well as specialized items in the various fields of earth sensing, such as agriculture, cartography, forestry, hydrology, mineral and marine resources, and monitoring of the human environment.

(2) Members of the Committee on the Peaceful Uses of Outer Space in the period before the next meeting of the Scientific and Technical Sub-Committee and with a view to thorough preparation for that meeting, give careful study to the following:

(a) The various documents on earth resources noted at the April 1970 meeting of the Sub-Committee:

"Model of plans for a developing country to establish participation in an operational earth resource survey satellite system within the decade" (A/AC.105/C.1/CRP.2);

"Note by the Secretariat on the applicability of space and other remote sensing techniques to the management of food resources" (A/AC.105/C.1/CRP.5);

"Use of remote sensors in the earth-orbital space for the discovery, inventory, evaluation, development and conservation of earth's natural resources" (Report prepared by the Outer Space Affairs Division in 1967 and submitted as Background Information Paper No. 13 to the Conference on the Exploration and Peaceful Uses of Outer Space);

"Report of the Secretary-General to the Economic and Social Council on natural resources satellites" (E/4779) and the comments on this report by the Sub-Committee as set forth below;

(b) Working papers on this subject submitted by Argentina, Italy, Sweden and the United States;

(c) The results, when available, of the studies on earth resources work projected by FAO, the Advisory Committee on the Application of Science and Technology to Development and the Economic and Social Council;

2/ A/AC.105/PV.84, p. 3.

(d) The Secretary-General's assessment of requirements in this field as requested in paragraph 27 of the report of the Committee for 1969;

(e) The study of environmental applications announced by the Outer Space Affairs Division in the statement presented by the Secretary to the Sub-Committee meeting on 14 April 1970, which study is welcomed by the Sub-Committee;

(f) The reports of any panels which may have been established in the interim period in accordance with paragraph 24 of this report;

(g) Any additional relevant material submitted by Member States, specialized agencies and others. Such submissions are invited and should be made available three months prior to the next meeting of the Sub-Committee;

(3) The Secretary-General should seek to ensure that such of the above material as is not yet available be supplied to the members of the Sub-Committee well before the next session, in order to allow for an informed discussion; and that the existence of all relevant documents listed above should be drawn to the attention of those Member States which are not represented on the Sub-Committee, and to all points of contact where these have been designated;

(4) The Sub-Committee should be authorized to determine at its next meeting, after reviewing the above materials, whether, at what time and in what specific frame of reference to convene a working group on earth resources surveying with special reference to satellites. If such a working group is organized, it should report its results to the Committee or Sub-Committee, whichever meets first thereafter.

24. The Sub-Committee expressed the desire to facilitate the most effective dissemination of information to Member States, especially the developing States, regarding opportunities and conditions for activities relating to the practical applications of space. In this regard the Sub-Committee believed that such information could be obtained effectively through direct observation of activities in progress in States where relevant technology was under development and in developing States where pioneering tests and applications were in progress. It also recognized that the Secretary-General had appointed a specialist in practical applications and encouraged the establishment of contacts within Member States to facilitate the co-ordination and promotion of the practical applications of space.

25. The Sub-Committee therefore recommends that:

(1) Member States conducting programmes relating to the practical applications of space be encouraged to invite close observation and study of those programmes by technical panels composed principally of representatives of the interested Member States, particularly developing States;

(2) Such panels should undertake concentrated programmes of observation and study of activities relating to the practical applications of space in Member States conducting such programmes and extending appropriate invitations;

(3) The Secretary-General should organize appropriate technical panels for the above purposes, consulting as appropriate with the specialized agencies concerned and interested Member States;

(4) The Secretary-General, consulting with such panels, with those States extending invitations to such panels and with the appropriate specialized agencies, should work out adequate schedules for on-site observation and studies with a view to enabling the technical panels to report in full to the Scientific and Technical Sub-Committee and/or the parent Committee, as well as to the concerned specialized agencies, and the specific contacts nominated by Member States for the promotion of space applications, and to respond to questions on the programmes they shall have examined as to their character, cost, equipment, and personnel requirements, opportunities, benefits, problems, and assistance available to them;

(5) Individual panel members should report to appropriate institutions in their own States;

(6) Panels should be continued as long as there is interest, rotating personnel so as to provide adequate opportunities for participation by interested States;

(7) The travel and subsistence of panelists should be funded by their national States. The United Nations may extend timely assistance to exceptional cases within the existing programmes of the United Nations where this appears necessary both to defray costs and to stimulate interest in special areas;

(8) The Scientific and Technical Sub-Committee should review the panel programmes after a year of experience with it;

(9) The endorsement of this resolution by the General Assembly will strengthen its effect and is therefore recommended. However, the extension of invitations to panels by Member States would permit immediate implementation of the panel procedure on a purely voluntary basis even prior to endorsement of the resolution. In the interests of early and effective progress in the practical applications of space, such early implementation is strongly recommended.

26. The Sub-Committee noted that the United Nations will hold an interregional seminar on aerial and satellite survey methods for mapping and resource inventories, with the assistance of the United Nations Development Programme, as described in detail in documents A/AC.105/55/Add.1 and A/AC.105/77, with regard to the activities of the Resources and Transport Division. The Sub-Committee expressed the desire to receive a report on the proceedings of the seminar.

27. The Sub-Committee took note of the panel that is being organized by FAO, in co-operation with the United Nations, for discussion of the applicability of satellites and other remote sensing techniques to the management of food resources as reported in document A/AC.105/C.1/CRP.5. The Sub-Committee noted with pleasure FAO's proposal to hold the panel in September 1971 and expressed its preference for the holding of the panel at the FAO headquarters in Rome.

28. The Sub-Committee also considered the list of items for preparation of working papers as suggested in document A/AC.105/C.1/CRP.5, and suggests the elimination of items 1c and 2a and the addition of a new subject 9 on "Data processing" with sub-paragraphs (a) analysis and elaboration of data for global food management and (b) problems of education and training specialists.

29. The Sub-Committee noted that considerable exploratory and practical work has been carried out in some Member States regarding the transfer of space-generated technology to non-space applications. It further noted that at least one specific study of potential transfers of such technology to developing States has been published (Pilot Study - Space Technology Transfer and Developing Nations by the Arthur D. Little Co., Cambridge, Mass.), and believed that specific experiments and test cases in technology transfers of this kind could be valuable in extending the benefits of space activity to all States.

30. The Sub-Committee therefore recommends that the Committee on the Peaceful Uses of Outer Space call to the attention of the General Assembly, and, through it, of other appropriate organs including the Economic and Social Council, as well as United Nations specialized agencies and other bodies, the desirability of experiments in the transfer of space-generated technology to non-space applications in developing countries, utilizing as appropriate the assistance of national space agencies maintaining relevant data banks.

C. International rocket launching facilities

1. United Nations-sponsored launching facilities

31. The Sub-Committee welcomed the reports on the Thumba Equatorial Rocket Launching Station (TERLS) in India, and the CELPA Mar del Plata Rocket Launching Station in Argentina.

32. The Sub-Committee noted with complete satisfaction the work being carried out at the ranges in India and Argentina in relation to the use of sounding rocket facilities for international co-operation and training in the peaceful and scientific exploration of outer space, as reported by India and Argentina to the Sub-Committee, and recommends that the United Nations continue to grant sponsorship to the TERLS range in India and the CELPA Mar del Plata in Argentina.

2. Statements on other launching facilities

33. The Sub-Committee welcomed the statements made by the representatives of Italy and France to the effect that the Italian San Marco mobile range and the French Space Centre at Kourou in French Guyana are available for international co-operative projects.

D. Education and training

34. The Sub-Committee noted the interest of some States in education and training opportunities which are sponsored internationally, and draws the attention of Member States to the offer by the United States to support up to ten graduate university fellowships each year nominated by the United Nations according to the following procedure:

(a) Developing States would make application on behalf of specific candidates to the Secretary-General, who would, after consultation with the appropriate specialized agencies, transmit acceptable applications to the National Research Council of the United States;

(b) Applicants must be acceptable to the National Research Council and to the universities where the studies will be pursued;

(c) The cost of travel to and from the United States and of subsistence while in the United States would be met by institutions in the applicants' own State;

(d) The cost of tuition, academic fees, authorized research activities and travel while in the United States will be met by the National Research Council under grants provided by NASA;

(e) All fellows accepted must agree in writing to return to their own countries to support space research activities there on expiration of their fellowships.

35. The Sub-Committee further draws the attention of Member States to the offer by Italy to support up to ten free training courses each year, on communication satellites, earth stations technology maintenance and operation, to individuals from developing States nominated by the United Nations according to the following procedure:

(a) Developing States would make applications on behalf of specific candidates to the United Nations Development Programme, which would recommend acceptable applications to the Italian Government;

(b) The cost of travel to and from Rome and the subsistence while in Rome would be met by institutions in the applicant's own States;

(c) All costs of the training of the fellows at the Fucino Training Centre near Rome will be met by Italy.

36. The Sub-Committee noted that opportunities already exist in some other Member States and urges States in a position to do so to provide similar opportunities for education and training in specific space-related skills in the interests of the developing States, and noted with satisfaction that UNESCO has been including information in its publication Study Abroad on fellowships and training courses in space research and space technology.

37. The Sub-Committee calls to the attention of all Member States the information currently available in the United Nations publication International Directory of Facilities for Education and Training in Basic Subjects related to the Peaceful Uses of Outer Space 3/ and reiterates its invitation to Member States desirous of having their nationals take advantage of training to make their specific interests and needs known to the Secretary-General.

38. The Sub-Committee recommends that the Secretary-General, making full use of the facilities at his disposal and in the manner he deems most appropriate, provide prompt and full implementation of the tasks entrusted to the Secretariat with reference to the dissemination of information concerning the opportunities available to Member States in the field of education and training.

3/ United Nations publication, Sales No.: E.68.I.4.

E. Registration and identification of objects launched into outer space

39. By paragraph 22 of the report of the Committee on the Peaceful Uses of Outer Space, 4/ the Scientific and Technical Sub-Committee was invited to study as soon as possible the technical aspects of the registration of objects launched into space, using materials prepared by the Secretariat, information submitted by ITU, ICAO and IMCO, and the working papers presented by Canada (A/AC.105/C.1/L.31) and the United States (A/AC.105/C.1/L.30).

40. It was clear that the Legal Sub-Committee was concerned primarily with those aspects of any registration procedures which would be of value in the identification of space craft and parts of space craft where such identification was needed for such purposes as the imputation of liability for damage caused by such objects, the avoidance of interference with the proper functions of such space craft, and the prompt return of objects under the terms of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space. Naturally for greatest efficiency in the process of identification, international co-operation among all parties is essential.

41. The Scientific and Technical Sub-Committee sees four principal means of identifying space objects. All four types of aids can be useful in identification, although some are useful only during certain portions of the life of the space craft or of objects into which it may be divided, and each type will be commented on separately as follows:

(a) Special markings. The Sub-Committee considers that special markings which the launching State might place in various ways either on the outside or on the inside of a space object would definitely assist identification but that marking expressly intended for recoverable objects is not the only practical solution that can be found for the identification problem. The Sub-Committee notes that a launching State might wish to mark parts of a space object to facilitate the rapid return to it of the object or its parts. However, the Sub-Committee appreciates the fact that the use of an adequate number of special identifying plates capable of surviving re-entry would increase the weight of space objects and would also increase the incidence of impacts and the possibility of damage on the ground.

(b) Structure, components and materials. Detailed description of the structure of space objects and of the components and materials used could render substantial assistance in identification, especially where use is made of parts commonly employed by the country concerned. Possible future developments in the use of non-harmful radioactive tracer elements could have application to identification. The information which might be relevant to structures and materials is however, mainly in the form of engineering specifications and would form an enormous "data bank", only a small portion of which is likely to be of direct value for identification purposes.

(c) Frequencies of transmitters. The registration of frequencies is the responsibility of ITU, which circulates extensive information on the subject. It is essential that ITU should continue its work in this area.

4/ Official Records of the General Assembly, Twenty-fourth Session, Supplement No. 21 (A/7621).

(d) Information on flight trajectories. The Sub-Committee considers that information on flight trajectories, i.e., on the location and movement of space objects, and on their shape, makes it possible to locate and identify a given object in space at a given moment in time. The data must be kept up to date, and includes planned and possible changes in orbit parameters, particularly at the time of the object's return. It should be kept in mind that in various parts of the world there already exist many tracking and flight analysis centres (for example, the Smithsonian Institution in the United States) which keep current information on all objects in space. Again an enormous data bank is required and again hopefully very little data will be needed for identification purposes.

Conclusions

42. In the light of present knowledge the Sub-Committee concludes that:

(1) No significant difficulty is to be expected in identifying space objects orbiting or surviving re-entry;

(2) For reasons of economy and safety, a marking system to survive re-entry is not considered technically practical at the present time;

(3) Both the basic capabilities for trajectory determinations and materials analysis required to identify orbiting or re-entered space objects are extremely complex and expensive and should not be duplicated on an international scale;

(4) The basic resources commended to States and the Secretary-General in connexion with the identification of space objects orbiting or surviving re-entry lies in the several complementary national capabilities, particularly those of launching States;

(5) It is advisable to retain a system for the registration of space objects as prescribed in General Assembly resolution 1721 B (XVI), as an orderly record, while recognizing that such a registry cannot in itself be of material assistance in identifying returned objects.

43. The Sub-Committee recommends that the working papers submitted by Canada and the United States (see para. 39 above), the paper prepared by the Secretariat (A/AC.105/L.52) which includes the information submitted by ITU, as well as the statement made by Japan at the 75th meeting (A/AC.105/C.1/L.32), be issued as documents and brought to the attention of the Legal Sub-Committee.

F. Efficient use of the Geostationary Orbit

44. The Sub-Committee, recognizing that the geostationary orbit is one of the natural space resources which will be largely used in the future for several kinds of satellite systems, noted that the question of utilization of the geostationary orbit had been under study by ITU and expressed the desire to be kept informed of the results of the ITU studies in this field.

G. Co-ordination of United Nations space activities: comments on the report of the Secretary-General to the Economic and Social Council on natural resources satellites (E/4779) as invited by Council resolution 1480 (XLVIII)

45. The Sub-Committee considered Economic and Social Council resolution 1480 (XLVIII), in which the Council brought the report on natural resources satellites (E/4779) to its attention for information and comments.

46. In that connexion, the Sub-Committee noted that the General Assembly had adopted eighteen resolutions, most of them unanimously, based mainly on the recommendation of the Committee on the Peaceful Uses of Outer Space, calling, inter alia, for a programme of active promotion of the use of outer space. General Assembly resolution 1472 (XIV) specifically assigned to the Committee on the Peaceful Uses of Outer Space the task "to review, as appropriate, the area of international co-operation, and to study practical and feasible means for giving effect to programmes in the peaceful uses of outer space which could appropriately be undertaken under United Nations auspices". Thus the Committee had acted as the "focal point for international co-operation in the peaceful exploration and use of outer space" envisaged by the General Assembly in resolution 1721 (XVI).

47. Under the mandate given to it by these and other resolutions of the General Assembly, the Committee had concerned itself with the practical applications of space technology, including communications, meteorology, navigation and earth resources surveys. The Committee had established, when the state of the art warranted, working groups to deal with specific matters in these fields. The General Assembly at its last session reaffirmed the mandate of the Committee in this area in its resolution 2601 (XXIV), which welcomed "the decision of the Committee on the Peaceful Uses of Outer Space to promote more energetically the applications of space technology as set out in paragraph 15 of its report and in paragraphs 22 to 31 of the report of the Scientific and Technical Sub-Committee", as well as in resolution 2600 (XXIV), which requested "the Committee on the Peaceful Uses of Outer Space to continue its studies with regard to the possibilities of further international co-operation, in particular in the framework of the United Nations system, in connexion with the development and use of remote earth resources surveying techniques so as to assure that as the practical benefits of this new technology are achieved, they are made available to both developed and developing countries".

48. On the question of earth resources, the Sub-Committee further noted that it had been a subject of concern to the Sub-Committee for some time and that it had been dealt with in detail in various studies submitted by the Member States and by the Secretariat to the United Nations Conference on the Exploration and Peaceful Uses of Outer Space. The Sub-Committee was continuing its study of the area of space applications in general, and on the survey of earth resources by satellites in particular, and had made suggestions which could be implemented by Member States for programmes in this area.

49. The Sub-Committee recommends that the attention of the Economic and Social Council be drawn to this programme, in particular to the following:

(1) In pursuance of a proposal by the Sub-Committee at its sixth session last year, steps have been taken for the appointment of a specialist on space applications by the Secretary-General to the Outer Space Affairs Division, with the full-time task of promoting space applications, including earth resources surveys;

(2) The Sub-Committee has recommended that Member States conducting programmes relating to space applications for practical purposes, as well as developing countries, be invited to constitute panels of a technical character to undertake concentrated programmes of observations and study of current practical activities in this field, and to report, with the assistance of the specialist on space applications, to the Sub-Committee on these programmes in detail, as recommended by the Sub-Committee in the present report;

(3) In pursuance of a proposal by the Sub-Committee at its 1969 session, arrangements are under way for the convening by FAO, in co-operation with the United Nations, of a panel for the discussion on the applicability of space and other remote sensing techniques to the management of food resources.

50. With regard to document E/4779, the Sub-Committee was able to make only a preliminary study of this document and has recommended in paragraph 23 (2) of this report that it be given adequate distribution, together with other material, and that it be brought before the next session of the Sub-Committee for detailed study when the Sub-Committee will be considering the question of forming a working group on this topic, in accordance with paragraph 23 (4) of this report. The preliminary discussions of the Sub-Committee did, however, give rise to the following comments.

51. With regard to paragraph 8 of document E/4779, where the question of convening a panel of experts is examined, the Sub-Committee suggests that the studies of the panels proposed in paragraph 25 of this report would offer the type of experience that should be taken into account in the further consideration of this question by the Economic and Social Council. The Council may also wish to note that the Sub-Committee is requesting authority to convene a working group on earth resources surveying with special reference to satellites, as described in paragraph 23 (4) of this report.

52. The Sub-Committee has a few very general comments about the annex to E/4779. It considers that:

(a) Attention will have to be paid to the balance between cartography and non-renewable resources exploitation on the one hand and photo-interpretation and the management of renewable resources on the other;

(b) Since the processing of data from earth resources satellites, mentioned briefly in the annex, is likely to be a large undertaking, it will be desirable to formulate a specific recommendation calling for a study of the related organizational problems;

(c) On the relative roles of aircraft and satellites for earth surveys, as mentioned in paragraph 21 of the annex, supporting evidence is required that satellites have cost advantages for photographic coverages of more than a million square miles and also that surveys of areas greater than this figure are a common requirement;

(d) The benefits which it is suggested would accrue from participation in aerospace surveys, as outlined in paragraph 67 of the annex, would apply to many types of scientific and technical programmes and do not necessarily constitute arguments for involvement in satellite programmes.

53. In connexion with the recommendations outlined in the annex, the Sub-Committee has the following comments:

(a) With regard to the proposed "Centre for Competence", the Sub-Committee feels that there is not yet sufficient information to allow fruitful discussions of such a centre and that the appointment, actions and findings of the specialist on space applications must be carefully considered in any future discussions of any such centres;

(b) On the question of human environment, regarding which recommendations are made in paragraph 100 (i) of the annex, the Sub-Committee notes that a study is proposed by the secretariat of the Committee on the Peaceful Uses of Outer Space which will be examined by that Committee and which will be brought to the attention of the Preparatory Committee for the United Nations Conference on the Human Environment for such further action as that Committee considers appropriate, including its possible submission at the United Nations Conference on the Human Environment in 1972. This matter is also under study by WMO, as described in the document mentioned in paragraph 9 (c) of this report;

(c) With regard to paragraph 100 (iii), which makes recommendations regarding a catalogue of available space photographs, the Sub-Committee notes that a catalogue of some space photographs can be consulted in the Outer Space Affairs Division Library;

(d) In connexion with the recommendations contained in paragraph 100 (iv), the Sub-Committee also noted that some available space data is being used in sample surveys by bilateral arrangements and has recommended in paragraph 25 of its report that panel studies of these programmes be undertaken;

(e) The Sub-Committee considers that the activities of the specialist on space applications and the panels referred to immediately above are important in connexion with training, as are the fellowships referred to in paragraphs 34 and 35 of this report;

(f) The Sub-Committee welcomes suggestions for more attention for symposia on resource satellites as recommended in paragraph 103 (ii) and (iii), and wishes to draw the attention of the Economic and Social Council to the proposed panel to be convened in 1971 by FAO, in co-operation with the United Nations, following a suggestion made by this Sub-Committee;

(g) The Sub-Committee has requested in paragraph 21 of this report that the Secretary-General should consider the publication of brochures in non-technical language on the benefits of space applications, and it further considers that these brochures, when available, may be of considerable assistance in fostering international acceptance of global satellite surveys as recommended in paragraph 103 (v) of the annex;

(h) On the question of the improvement of national capabilities for resources survey as recommended in paragraphs 104 to 106, the Sub-Committee considers that the panels dealing with specific programmes referred to above will assist markedly. The Sub-Committee also commends for consideration by the Economic and Social Council and by national States the principles contained in the document submitted to the Sub-Committee entitled "Model of plans for a developing country to establish

participation in an operational earth resource survey satellite system within the decade" (A/AC.105/C.1/CRP.2).

54. In view of the fact that the Economic and Social Council will take up the subject of earth resources satellites at its session in July 1970, the Sub-Committee requests the Secretary-General to bring the above recommendations made by the Sub-Committee on earth resource satellites, including comments on document E/4779, to the attention of the Council at that session. Further, the Sub-Committee requests the Secretary-General to prepare an annex to those comments which will reflect the work in this area entrusted to the Committee on the Peaceful Uses of Outer Space by successive resolutions of the General Assembly. The Sub-Committee also requests the Secretary-General to provide the Economic and Social Council at its session in July 1970 with a list of the papers on the question of earth resources satellites presented by Member States to the United Nations Conference on the Exploration and Peaceful Uses of Outer Space in 1968, as well as the papers prepared by the secretariat of the Committee on the Peaceful Uses of Outer Space.

55. In carrying out its task to ensure that as the practical benefits of any new technology are achieved, particularly one so promising as earth resource surveys, they are made available to both developed and developing countries, the Sub-Committee recognizes that it may be difficult to avoid overlap or duplication with other United Nations bodies which may be operating in areas to which space technology may have future applications. In the case of earth resource surveys it is recognized that much work is already being done both nationally and internationally in the field of surveying resources by remote sensors carried in aircraft. The Sub-Committee therefore recommends that when it next meets, the Committee on the Peaceful Uses of Outer Space consider the question of co-ordination, taking into account any results of the Economic and Social Council's consideration of related matters in the interim, and that it make such recommendations to the General Assembly as then appear desirable to ensure that this Committee can carry out its responsibilities to the General Assembly in the most efficient manner.

56. The Sub-Committee welcomes the statement by the Secretary-General (A/AC.103/C.1/CRP.6 of 22 April 1970) appearing in appendix I to this report, which contains assurances that he will guard against the recurrence of the recent lack of co-ordination within the Secretariat in the field of earth resources satellites. The Sub-Committee looks forward to examining the report on this matter that the Secretary-General will submit to the Committee on the Peaceful Uses of Outer Space at its next session.

57. The Sub-Committee expresses appreciation to its Secretariat for the preparation of reports on international and national space activities and of excellent working papers on questions on the agenda of its seventh session, and recommends that the attention of other United Nations bodies interested in outer space should be drawn to these reports and working papers.

Appendix I

STATEMENT BY THE SECRETARY-GENERAL TO THE SCIENTIFIC AND TECHNICAL SUB-COMMITTEE ON 22 APRIL 1970

1. With regard to the question of co-ordination, the Secretary-General has noted the concern expressed by members of the Scientific and Technical Sub-Committee at the failure of the Secretariat properly to co-ordinate some activities and recommendations in the field of earth resources satellites. He regrets this occurrence and wishes to assure members of this Committee that all necessary preventive action will be taken for the future.

2. In addition to the already existing interdepartmental working group on outer space comprised of the heads of departments concerned, close co-ordination and collaboration will be established at the working level between the Secretariat officials of various units. In the report, referred to in General Assembly resolution 2601 (XXIV), which the Secretary-General will make to the next session of the Committee on the Peaceful Uses of Outer Space, he will comment on this matter.

3. The Secretary-General hopes that Member Governments will fully appreciate the difficult organizational problems which are being posed both at the intergovernmental and at the Secretariat levels, by recent scientific and technological developments. New global problems, which concern the whole of humanity, have been brought before the Organization, at a time when traditional fields are undergoing substantial changes and when most scientific, technical, political, human, economic and social problems are becoming increasingly complex and interdependent. Outer space, the sea-bed and the human environment are prominent examples of these new areas of concern. It is understandable that these areas should claim particular attention. It is equally to be expected that traditional preoccupations and disciplines should be enriched and broadened by these new techniques. The particular co-ordination problem which has concerned this Committee has been to some extent an outcrop of this more general problem.

4. Already difficult at the national level, problems of this type are further complicated at the international level by the fact that a large number of countries involved in these activities are at various stages of scientific and economic development.

5. The Secretary-General cannot be expected to face and solve these problems alone and therefore he hopes that Governments will give utmost consideration and thought to these new emerging trends.

Appendix II

LIST OF PARTICIPANTS

A. Members of the Sub-Committee

ARGENTINA

Professor Carlos Federico Bosch, President, National Commission for Space Research

Mr. Rafael Maximo Gowland, Counsellor, Permanent Mission

Mr. Guillermo Jorge McGough, First Secretary, Permanent Mission

Mr. D. Alberto Ham, Third Secretary, Argentine Embassy, Washington, D.C.

AUSTRALIA

Professor J.H. Carver, Professor of Physics, University of Adelaide

Mr. E.G. Hayman, Australian Embassy, Washington, D.C.

Dr. R.S. Merrillees, Second Secretary, Permanent Mission

AUSTRIA

Professor Ferdinand Cap, University of Innsbruck and Austrian Space Commission

Mr. Anton Prohaska, Secretary of Embassy, Permanent Mission

BELGIUM

Professor M. Nicolet, Director, Institute of Aeronautics, Brussels

Mr. Jan Deberg, Counsellor, Permanent Mission

BRAZIL

Mr. Jose Bonifacio de Andrade, First Secretary of Embassy, Permanent Mission

Dr. Fernando de Mendonça, Scientific Director of the National Committee on Space Activities

BULGARIA

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Mr. H. Flynn, Senior Officer, Strategic Planning, Department of Communications

Mr. Lyon Weidman, First Secretary, Permanent Mission

CZECHOSLOVAKIA

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Mr. Alain Dejammet, Secretary of Embassy, Permanent Mission

Miss Sylvie Alvarez, Secretary of Embassy, Permanent Mission

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Professor E.V. Chitnis, Secretary, I.S.R.O.

Mr. S.M.S. Chadha, First Secretary, Permanent Mission

Mr. B. Swaraj, Attaché, Permanent Mission

IRAN

M. Davoud Hermidas Bavand, Third Secretary, Permanent Mission

ITALY

Mr. Giovanni Migliuolo, Minister Counsellor, Permanent Mission
 Mr. Andrea Caruso, "Telespazio" Corporation of Italy
 Mr. Antonio Chini, Ministry of Post and Telecommunications
 Mr. Franco Emilio Fiorio, Scientific Counsellor, Italian Embassy,
 Washington, D.C.
 Mr. Nario Lari, Italian Radio and Television (RAI-TV)
 Mr. Mario Vittorio Zamboni, Second Secretary, Permanent Mission

JAPAN

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 Mr. Shigemichi Sonoyama, Chief, Space Developing Section, Research Coordination
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 Mr. Kunio Kamoshida, Second Secretary, Permanent Mission

LEBANON

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 Mr. Yahya Mahmassani, Second Secretary, Permanent Mission
 Mr. Samir Mobarak, Attaché, Permanent Mission

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 Mrs. Bertha Tufiño Vda. de Jaeger

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Mr. J. Charkaoui, First Secretary, Permanent Mission

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 Dr. Tadeusz Kozluk, Second Secretary, Permanent Mission

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 Mr. Traian Chebeleu, Second Secretary, Permanent Mission

SIERRA LEONE

Mr. S. Touray, Second Secretary, Permanent Mission

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Mr. Björn Skala, Secretary of Embassy, Permanent Mission
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Academician A.A. Blagonravov, Academy of Sciences of the USSR
 Mr. G.S. Stachevski, First Secretary, Permanent Mission
 Mr. V.A. Vertogradov, Expert, Ministry for Foreign Affairs of the USSR
 Mr. V.V. Azarehkov, Expert, Academy of Sciences of the USSR

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Mr. M. Kassem, Counsellor, Permanent Mission
 Mr. Hamdy Nada, Third Secretary, Permanent Mission

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Mr. M.C.S. Weston, First Secretary, Permanent Mission

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Dr. Oscar E. Anderson, Jr., Director of International Organizations, National
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Mr. Paxton T. Dunn, Adviser, Economic and Social Affairs, Permanent Mission

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Mr. Stuart H. McIntyre, Office of United Nations Political Affairs, Department
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Mr. A. Reynolds Smith, Adviser, Political and Security Affairs, United States
Mission to the United Nations

Mr. Philip A. Thibideau, Office of International Affairs, National Aeronautics
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B. United Nations Secretariat

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Mr. Marvin Robinson, Secretary of the Sub-Committee

Mr. E. Elshin, Outer Space Affairs Division

Mr. N. Jasentuliyana, Outer Space Affairs Division

Mr. O.O. Ogunbanwo, Outer Space Affairs Division

C. United Nations Development Programme

Mr. Herman Buzeta, External Relations Division

D. Specialized agencies

International Labour Organisation (ILO)

Mr. W. Knight, Public Information Officer

Food and Agriculture Organization of the United Nations (FAO)

Mr. Donald W. Woodward, Director, FAO Liaison Office with the United Nations

Mr. Octavian Fenesen, Liaison Officer, FAO Liaison Office with the United Nations

United Nations Educational, Scientific and
Cultural Organization (UNESCO)

Mr. Alfonso de Silva, Director of the Bureau of Relations with the United Nations

Mr. Victor Nikolsky, Senior Liaison Officer

World Health Organization (WHO)

Dr. R.L. Coigney, Director, WHO Liaison Office with the United Nations

Mrs. Sylvia Meagher, Liaison Officer, WHO Liaison Office with the United Nations

International Telecommunication Union (ITU)

Mr. F. Dellamula

World Meteorological Organization (WMO)

Mr. A.W. Johnson

Mr. L. Harmantas

E. Committee on Space Research (COSPAR)

Dr. Richard W. Porter, Vice-President