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A journal devoted to the legal problems arising
out of man's activities in outer space

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THE UNITED NATIONS COMMITTEE ON THE PEACEFUL USES OF OUTER SPACE: PAST ACCOMPLISHMENTS AND FUTURE CHALLENGES

*S. Neil Hosenball**

I. Background

The United Nations Ad Hoc Committee on the Peaceful Uses of Outer Space came into being on December 13, 1958,[1] one year after the launch of Sputnik and almost simultaneous with the birth of NASA.[2] A part of its charter was to explore "the nature of legal problems which may arise in the carrying out of programs to explore outer space."[3] One year later, the Ad Hoc Committee was transformed into a standing committee of the United Nations. The Committee, which initially consisted of representatives from 24 countries, was increased in 1961 to 28, in 1974 to 37, and today, after the addition of 10 new members in 1977, has 47 member nations participating. The member nations on the Committee mirror the UN membership as a whole, having African, Asian, Latin American, Western European, Eastern European, Mid East, First World countries, Third World countries, and countries in every stage of development.[4]

These recent increases in membership evidence the ever growing international interest in the purposes for which outer space is explored and used and in the achievement of an orderly basis for the conduct of space activities. They also demonstrate that many nations are eager to participate directly through international cooperation in various aspects of outer space in such applications as those involved in scientific research, weather forecasting, communications, and remote sensing.

The Committee has a permanent UN staff in the Outer Space Division of the UN Secretariat, which includes a space application expert whose prime role is to facilitate the exchange of scientific and technical information among member States of the United Nations and, in particular, to assist the developing countries so that they may become familiar with and participate in space applications that can serve their special interests and needs.

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[1]For discussions of the Ad Hoc Committee, *see* Jessup and Taubenfeld, The Ad Hoc Committee on the Peaceful Uses of Outer Space, 53 Am. J. Int'l. 877 (1959).

[2]National Aeronautics and Space Act,P.L. 85-568, 42 U.S.C. 2451 *et seq.*

[3]*Supra* note 1.

[4]U.N. Doc. A/AC.105/218.

The Committee established two subcommittees, a Legal Subcommittee and a Scientific and Technical Subcommittee. The Legal Subcommittee holds a four-week session in the spring of each year, and the Scientific and Technical Subcommittee also meets in the spring for a two or three-week session, usually prior to the Legal Subcommittee meeting. Each subcommittee at the conclusion of its session prepares a report to the parent Committee on the Peaceful Uses of Outer Space (COPUOS) to be considered during a two or three-week session in late spring or early summer. Similarly, the parent committee at the end of its session issues a report for discussion in the General Assembly's Special Political Committee. The Special Political Committee then drafts a resolution for submission to and subsequent adoption by the General Assembly.

II. Consensus Procedure

All members of the committee on the Peaceful Uses of Outer Space are represented on its two subcommittees. Generally, the delegates to the Legal Subcommittee are lawyers or diplomats, whereas most delegates to the Scientific and Technical Subcommittee have a scientific or technical background. The Committee and its subcommittees work on the basis of consensus. The alternatives to operating by consensus would be to decide issues by majority vote. The Committee recognized at an early stage of its history that dealing as it would be in an entirely new area of human activity the most authoritative way of proceeding would be through a common appreciation of the problems and common agreement on its solution. The principle of consensus was adopted as the only acceptable procedure for obtaining workable effective solutions.[5]

Conflicting positions must be resolved by unanimous agreement or, if not unanimous agreement, by the dissenting member noting or reserving its objections or position on the record. Of course, each member State, whether on the Outer Space Committee or not, can later decide if it wishes to become a party to the treaty and be bound by its terms. In general, the space treaties have received widespread, though not universal, acceptance by the international community. The Outer Space Treaty, for example, has been signed by 90 countries, and ratified by 56.[6]

The consensus principle has worked well to date, and its usefulness was recently reinforced by the approval in the last session of the Committee of the Agreement Governing Activities of States on the Moon and Other Celestial Bodies.[7] It has worked

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[5]*Supra* note 1.

[6]U.S. Senate Comm. on Commerce, Science, and Transportation: Space Law, 95th Cong., 2d Sess. 36 (2nd ed., Comm. Print, 1978).

[7]Agreement Governing Activities of States on the Moon and Other Celestial Bodies, U.N. GAOR, Supplt. 20, Doc. A/3420 (1979), [*hereinafter* cited as Moon Treaty]. For a text, see Current Documents in this issue of the Journal of Space Law *cf.*

notwithstanding that Committee membership consists of countries with differing systems of jurisprudence, political philosophies, social customs, and levels of scientific and economic development. The process has worked probably because nations have perceived, if not a unity of interests, at least roughly parallel interests in securing outer space for the peaceful pursuit of its potential benefit for all nations and mankind.

III. Accomplishments

What has the Committee on the Peaceful Uses of Outer Space and it subsidiary bodies actually accomplished in 20 years? Taking note of the problems and limitations which inhere in its methods of operations and given the fact that this new organization was dealing not only with the new milieu of outer space but a new frontier of law with virtually no precedent, the number of treaties and conventions presently in force dealing with outer space is surprising, especially when one considers the intricacies of international law and diplomacy and the fact that many disparate interests are involved in outer space. In the scientific and technical area, it has fostered international cooperation and provided a framework for the discussion and dissemination of the results of space activities.

The early work of the Committee, although brought to a halt several times as the result of cold-war tensions, eventuated in General Assembly Resolution 1721 (XVI) in December 1961 which commended to States the following guiding principles: (a) that international law, including the Charter of the United Nations, applies in outer space; and (b) that outer space, including celestial bodies, is free for exploration and use by all States in conformity with international law and is not subject to national appropriations.[8] Six years later, these principles became the main pillars of the 1967 Outer Space Treaty.[9]

In the short span from 1958 to 1974, the Legal Subcommittee has produced four space treaties which have entered into force: 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;[10] The 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space,[11] the 1972

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[8]U.N.G.A. Res. 1721 (XVI) of December 20, 1961.

[9]Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, January 27, 1967 *(hereinafter* the Outer Space Treaty), [1967] 18 U.S.T. 2410, T.I.A.S. 6347, 610 U.N.T.S. 205 (effective October 10, 1967.

[10]*Ibid.*

[11]The Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched Into Outer Space, [1968] 19 U.S.T. 7570, T.I.A.S. 6599, 672 U.N.T.S. 119 (effective December 3, 1968).

Convention on International Liability for Damage Caused by Space Objects,[12] and the 1974 Convention on Registration of Objects Launched into Outer Space.[13]

It is generally accepted that the Outer Space Treaty of 1967 is the basic charter or constitution governing space activities. The extensive history behind the Outer Space Treaty can be inferred from the lapse of six years from Resolution 1721. The Outer Space Treaty includes articles establishing a number of basic principles, such as State responsibility for damage caused by the launching of space objects,[14] provision for the rescue and return of astronauts and objects launched into space,[15] and provision for the registration of space objects so as to identify ownership of the object.[16] The three treaties that followed elaborated these basic principles first established in the Outer Space Treaty. Other articles in the Outer Space Treaty provide that, unlike airspace, outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty;[17] outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind;[18] the placing in orbit around the earth, stationing in outer space, or the placement on celestial bodies of any objects carrying nuclear weapons or any other kinds of weapons of mass destruction is proscribed;[19] the Moon and other celestial bodies shall be used exclusively for peaceful purposes;[20] States parties to the Treaty bear international responsibility for national activities including activities of nongovernmental entities in outer space, including the Moon and other celestial bodies;[21] and several provisions providing that space activities should be conducted so as to promote international cooperation in the exploration and use of outer space, including the Moon and other celestial bodies.[22]

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[12]Convention on International Liability for Damage Caused by Space Objects, March 29, 1972, [1973] 24 U.S.T. 2389, T.I.A.S. 7762 (effective October 9, 1973).

[13]Convention on Registration of Objects Launched into Outer Space, January 14, 1979, [1976] T.I.A.S. 7762 (effective September 15, 1976).

[14]Outer Space Treaty, Arts. VI and VII.

[15]*Id.* Art. V.

[16]*Id.* Art. VIII.

[17]*Id.*, Art. II.

[18]*Id.*, Art. I.

[19]*Id.*, Art. IV, para. 1.

[20]*Id.*, Art. IV., para. 2.

[21]*Id.*, Art. VI.

[22]*Id.*, Arts. I, III, IX, X, XI, and XIII.

IV. The Moon Treaty

At its recent 1979 session, the COPUOS reached consensus on a fifth treaty, the Agreement Governing Activities of States on the Moon, and Other Celestial Bodies.[23] This treaty, like its three predecessors, is an elaboration of basic principles first established in 1967 Outer Space Treaty. In 1971, the U.S.S.R. proposed for inclusion in the agenda of the twenty-sixth session of the General Assembly an item entitled "Preparation of an international treaty concerning the Moon."[24] On November 5, 1971, at the twenty-sixth session of the First Committee of the General Assembly, the U.S.S.R. submitted a "Draft Treaty Concerning the Moon."[25] On November 29, 1971, the General Assembly adopted resolution 2779 (XXVI) in which it took note of the draft treaty submitted by the U.S.S.R. and requested the COPUOS and its Legal Subcommittee to consider, as a matter of priority, the question of the elaboration of a draft international treaty concerning the Moon and to report thereon to the General Assembly at its twenty-seventh session.[26]

During the eleventh session of the Legal Subcommittee, a substantially revised and expanded text consisting of a preamble and twenty-one articles was approved as the basis on which work should be pursued during the following session of the Legal Subcommittee as a matter of priority.[27] In the years following 1972, it soon became apparent that there were only three outstanding issues preventing consensus; the scope of the Treaty, *i.e.*, whether it should be restricted to the Moon or apply to other celestial bodies; information to be furnished; and exploitation of natural resources.

During the seventeenth session of the Legal Subcommittee (March 13-April 7, 1978), a concerted effort by the Austrian delegation to resolve the outstanding issues through the medium of informal consultations resulted in a draft text of an "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies" being submitted to the Legal Subcommittee as a working group paper.[28] Because the draft had been circulated so close to the end of the session, neither the working group, the Legal Subcommittee nor the COPUOS had the opportunity to either review or discuss this draft text. Action on the text was deferred to the 1979 session of the Legal Subcommittee so as to permit review and consideration by the delegates and their respective governments. The informal consultations held during the

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[23]Moon Treaty, *supra*, note 7.

[24]U.N. Doc. A/C.1/L.568 (Nov. 1971).

[25]*Ibid.*

[26]U.N. Res. 2779 (XXVI) of November 29, 1971.

[27]U.N. Doc. A/AC.105/101.

[28]U.N. Doc. A/AC.105/218, Annex I, Appendix, WG.I (1978)/WP.2 of 3 April 1978.

1978 Legal Subcommittee and COPUOS sessions concentrated on the natural resources article and, in particular, the inclusion of "the common heritage of mankind" concept, it being informally understood the other outstanding issues of information and scope of treaty could be resolved if the natural resources issues could be successfully compromised.

During the eighteenth session of the Legal Subcommittee (March 12-April 6, 1979), the Austrian draft text was reviewed and discussed.[29] Brazil, speaking for the developing countries, proposed one amendment to the natural resources article (Article XI) which, if acceptable to the rest of the Legal Subcommittee, would be referred to their Governments for acceptance. It was proposed that the "common heritage of mankind" concept be reformulated to read:

> "The moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement and in particular in paragraph 5 of this article."[30]

This resulted in brackets being placed by other delegations around other provisions, *i.e.*, treaty scope, advance notification of placement of radioactive materials, natural resources exploitation review conference, and ratification.

The COPUOS, at its 1979 session, was able to reach consensus due to the acceptance by the U.S.S.R. of the Brazilian formulation of the "common heritage" principle and the agreement of the developing countries not to insist on a provision imposing a moratorium on the exploitation of natural resources pending the establishment of an international regime to govern such exploitation.[31]

Before discussing in greater depth the natural resources Article XI and some other issues of importance in the Treaty, it is noted that the Treaty adds to or usefully clarifies existing international space law in the following respects:

a. It usefully details certain specific prohibitions to ensure peaceful use of the Moon and other celestial bodies;[32]

b. It provides for notification and specified information upon completion of a mission or, for a mission of long duration, every 30 days; provisions in regard to multiple use of areas or orbits, possible discovery of organic life, and danger to human life;[33]

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[29]U.N. Doc. A/AC.105/240.

[30]*Id.* Annex III.

[31]U.N. GAOR, Doc. A/34/20, at 11 (1979).

[32]Moon Treaty, Art. III, para. 2.

[33]*Id.*, Art. V.

c. It confirms right of States to collect and remove samples for scientific investigation and the right to use appropriate quantities of substances on the Moon and other celestial bodies to support scientific missions;[34]

d. It provides for environmental protections;[35]

e. It stipulates advance notification of radioactive materials' use;[36]

f. It requires reporting of areas of special scientific interest and designation of such areas as international scientific preserves;[37]

g. It enunciates the principle of using only such area of the Moon and other celestial bodies as is required for the needs of a station;[38]

h. It imposes the obligation to safeguard human life and to regard all persons on the Moon and other celestial bodies as entitled to Astronaut Agreement treatment;[39]

i. It imposes the obligation to offer shelter to those in distress;[40]

j. It assures the right to humanitarian emergency use of lunar facilities of others;[41]

k. It provides for notification regarding crash landings;[42]

l. It recognizes that a detailed liability regime may be necessary;[43]

m. It provides for the establishment of principles calling for orderly and safe development and rational management of natural resources, expansion of opportunities in use of such resources, equitable sharing in benefits, and special consideration of the interests and needs of developing countries and for the efforts of space powers;[44]

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[34]*Id.* Art. VI, para. 2.

[35]*Id.* Art. VII, para. 1.

[36]*Id.* Art. VII, para. 2.

[37]*Id.*, Art. VII, para. 3.

[38]*Id.*, Art. IX, para. 1.

[39]*Id.*, Art. X., para. 1.

[40]*Id.*, Art. X., para. 2.

[41]*Id.*, Art. XII., para. 3.

[42]*Id.*, Art. XIII.

[43]*Id.*, Art. XIV, para. 2.

[44]*Id.*, Art. XI, para. 7.

n. It details provision for effective consultations in disputes situations.[45]

Coming back to the "common heritage of mankind" principle which is enunciated in Article XI, paragraph 1, and is tied to the future international regime that may be established to govern the exploitation of natural resources, it was the United States which introduced this language in 1972.[46] It confirms that all the States parties to the treaty have a sufficient interest in the possible future exploitation of the natural resources of the Moon and other celestial bodies, that their views are to be given serious consideration at any future international conference which may attempt to establish an international regime. The United States, in an on-the-record statement by the U.S. Representative at the Legal Subcommittee on May 3, 1972, stated the following:

> "On the broadest level of generality, it seems right to state that such resources are of 'the common heritage of all mankind. . . .' On the other hand we would not want to preclude in any way the use of natural resources of celestial bodies for scientific investigation; U.S. activities in returning lunar samples and in sharing them with scientific institutions around the world are well known, as are the Soviet Lunokhod returns and exchanges. We would also want to be careful to ensure that celestial body resources may be used where found for supporting life systems as, for example, in uses by astronauts of liquids or gases of a particular celestial body. Finally, we would need to contemplate a special treaty-drafting conference in the event of the discovery of commercially exploitable resources. At such a conference participants would need to bear in mind not only common goals of economic advancement but the need to encourage investment and efficient development as well."[47]

A further explanation of the meaning attached to the "common heritage" principle by the United States was presented to the Legal Subcommittee by the U.S. Representative on April 19, 1973, as follows:

> "My delegation wants also to place on record United States views concerning the problem of celestial body natural resources. As we have seen the matter, what is involved is not so much a problem but only a conceivable possibility. Essentially, the question is what rules and procedures should reasonably apply in the event of the future discovery of exploitable natural resources on, for example, the Moon.
>
> "Last spring the United States proposed that, and I quote, 'The natural resources of the Moon and other celestial bodies shall be the common heritage of all mankind. . . We also proposed to protect current or possible future uses of these resources for scientific research, such as the return of lunar rocks, for example, the hypothetical use by an astronaut of water or some other liquid found in rocks on a celestial body. In addition, we proposed that if and when practical exploitation of lunar resources should become a reality, the parties to the treaty should join in an international conference, and again I

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[45] *Id.*, Art. XV, paras. 2 and 3.

[46] U.N. Doc. A/AC.105/C.2 (XI) WP 12 (April 13, 1972).

[47] U.S. Representative's statement before the Legal Subcommittee of UNCOPUOS, May 3, 1972. For the Report of the Subcommittee, U.N. Doc. A/AC.105/101 (1972).

quote, 'with a view to negotiating arrangements for the international sharing of the benefits of such utilization.'

"As far as they go, these proposals have met with very wide acceptance. When there was some reluctance to proclaim the current applicability of the 'common heritage' principle, we agreed that the Moon Treaty might instead put the matter in a somewhat different context by providing that the purpose of such a future conference should be 'on the basis' of the common heritage principle. On the other hand, as I have at this session repeatedly, although I hope politely, made clear, the United States is not prepared to accept an express or implied prohibition on the exploitation of possible natural resources before the international conference meets and agrees on appropriate machinery and procedures and a treaty containing them takes effect. In our view, the Moon agreement cannot reasonably seek to require that exploitation must await the establishment of the treaty-based regime.

"We have sought to meet concerns of other delegations by accepting the suggestion that the current treaty should call for States conducting missions to the Moon and other celestial bodies to report not only on scientific results but on natural resources. A provision of this character would help ensure that all parties to the treaty would be informed and could take action to prepare for and meet in the international conference.

"One or two particular points should be made concerning these matters as they are reflected in Working Paper 15 which the United States delegation introduced on April 17. As is apparent from the text, this working paper excludes the concept of a pre-regime moratorium. References to the words 'in place' in the first sentence of that paragraph and to paragraph 7 of Article X make this clear. More particularly, the words 'in place' in the first sentence of paragraph 2 are intended to indicate that the prohibition against assertion of property rights would not apply to natural resources once reduced to possession through exploitation either in the pre-regime period or, subject to the rules and procedures that a regime would constitute, following the establishment of the regime. Also with regard to the last sentence of paragraph 2 of Article X, the 'without prejudice' clause would apply to exploitation whether by a State, government entity, nongovernmental enterprise or international organization."[48]

These statements by the United States were not contradicted and constitute a part of the legislative history of the treaty negotiations. (The phrase "in place," referred to in the above statement, is contained in the first sentence of paragraph 3, Article XI, of the Moon Treaty text.)

On the last day of the 1979 COPUOS session, July 3, 1979, after consensus was reached on the Moon Treaty, I, as the U.S. Representative, made the following statement which was again not contradicted by any of the delegations which spoke subsequently:

"Article XI of the draft Moon agreement, which declares that celestial bodies other than the Earth, and the natural resources of such celestial bodies, are the common heritage of mankind, was initially suggested by Argentina but was formally proposed by my delegation in 1972. It makes clear that the parties to the agreement undertake, as the

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[48]U.S. Representative's statement before the Legal Subcommittee of UNCODUOS, April 19, 1973. For the Report of the Subcommittee, see U.N. Doc. A/AC.105/115 (1973).

> exploitation of the natural resources of the celestial bodies other than the Earth is about to become feasible, to convene a conference to negotiate an international regime to govern the exploitation of those mineral and other substantive resources which may be found on the surface or subsurface of a celestial body. The draft agreement—and I am particularly pleased about this, as a member of the National Aeronautics and Space Administration (NASA)—as part of the compromises made by many delegations, places no moratorium upon the exploitation of the natural resources on celestial bodies, pending the establishment of an international regime. This permits orderly attempts to establish that such exploitation is in fact feasible and practicable, by making possible experimental beginnings and, then, pilot operations, a process by which we believe we can learn if it will be practicable and feasible to exploit the mineral resources of such celestial bodies. My Government will, when and if these negotiations for such a regime are called for, under Articles XI and XVIII, make every effort to see that the regime is successfully negotiated.
>
> "We note also with satisfaction that Article XI, paragraph 8, by referring to Article VI, paragraph 2, makes it clear that the right to collect samples of natural resources is not infringed upon and that there is no limit upon the right of States parties to utilize, in the course of scientific investigations, such quanitites of those natural resources found on celestial bodies as are appropriate for the support of their missions. We believe that this, in combination with the experimental and pilot programmes, will foster and further, and perhaps speed up, the possibility of the commercial or practical exploitation of natural resources."[49]

In connection with the "common heritage" principle, the 1979 COPUOS Report will record the Committee's agreement that "by virtue of Article I, paragraph 1, the principle contained in Article XI, paragraph 1, would also apply to celestial bodies in the solar system other than the Earth and to its natural resources."[50] The plain meaning of this Committee agreement is to limit application of the "common heritage" principle to the celestial bodies themselves and to the natural resources of such celestial bodies. Clearly, there is no intent to apply the principle to orbits and trajectories of space objects. Further, nothing in the text suggests that all countries are to share equally in the Moon's resources. Any sharing of resources would have to be agreed to in an international conference. Article XI, paragraph 7, uses the phrase "equitable," not "equal" sharing. In determining "equitable" sharing, special consideration is to be given not only to the needs and interests of the developing countries but also to "the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon."[51]

Regarding Article I, the 1979 COPUOS report will also record the Committee's agreement that "the trajectories and orbits mentioned in Article I, paragraph 2, do not

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[49]U.N. Doc. A/AC.105/PV.203 (July 16, 1979).

[50]*Supra* note 31, at 11.

[51]*Id.* Moon Treaty, Art. XI, para. (d).

include trajectories and orbits of space objects between the earth and such orbits."[52] In my July 3, 1979, statement for the record, I affirmed the U.S. understanding of the Article's meaning as follows:

> "We accept the Committee's conclusions as to this Article—namely, first, that references to the Moon are intended to be references also to other celestial bodies, other than the Earth; secondly, that references to the Moon's natural resources are intended to comprehend those natural resources to be found on these celestial bodies; and thirdly, that the trajectories and orbits referred to in Article I, paragraph 2, do not include trajectories and orbits of space objects in Earth orbit only, or trajectories of space objects between the Earth and Earth orbit.
>
> "In regard to the phrase 'Earth orbit only,' the fact that a space object in Earth orbit also is in orbit around the Sun does not bring the space objects which are only in Earth orbit within the scope of this treaty; and a space object orbiting the Moon, while the Moon orbits the Earth as well as the Sun, is in fact within the scope of this treaty."[53]

The "Agreement Governing Activities of States on the Moon and Other Celestial Bodies" will be forwarded to the Special Political Committee of the United Nations General Assembly which will draft a resolution to be submitted to the General Assembly. If adopted by the General Assembly, the treaty will be commended to member States for signature and ratification.

V. Second U.N. Conference on the Peaceful Uses of Outer Space

Moving now to the second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, the Committee agreed that the conference would be held in the latter part of 1982 for a period of two to three weeks and deferred the venue question to 1980.[54] The agenda would permit discussion of "scientific, technical, social, economic, organizational and other relevant aspects and their interrelationships." Attempts to add "legal aspects" were made by several delegations, but they were persuaded to withdraw their proposal by arguments that to include "legal aspects" would change the character of the conference from a scientific and technically oriented meeting to one of political debate, thus possibly frustrating the major purpose for which the conference was designed.[55]

The Committee also agreed that the consensus procedure is to be included in the Rules of Procedure for the Conference to be established, as follows:

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[52]*Supra* note 31, at 11.

[53]*Supra* note 49.

[54]See *supra* note 31, at 22.

[55]*Id.* at 16.

> "It is proposed that best endeavors would be made to ensure that the work of the conference and the adoption of its final report would be accomplished by general agreement."[56]

This language is similar to that pursuant to which the COPUOUS itself operates by consensus. It was recommended that a conference secretariat be established, headed by a secretary-general and three deputies, as well as a conference bureau headed by a president, several vice presidents and chairmen of the three main committees: (1) State of Space Science and Technology; (2) Applications of Space Science and Technology; and (3) International Cooperation and the Role of the UN. If the proposed agenda, which was developed in the Scientific and Technical Subcommittee and approved by the full Committee, is adopted by the UN General Assembly, it will be circulated to all member States in January 1980 with an invitation to submit national papers to be reviewed by the conference secretary-general by spring 1981.[57]

The Committee endorsed the recommendations of the Scientific and Technical Subcommittee that the agenda for its 1980 session should include the following priority items:

> "(a) Consideration of the United Nations Programme on Space Applications and the co-ordination of space activities within the United Nations system;
>
> (b) Questions relating to remote sensing of the Earth by satellites;
>
> (c) Use of nuclear power sources in outer space;
>
> (d) Co-ordinating role of the United Nations in the use of space science technology, particularly in the developing countries.[58]
>
> "With regard to the item on remote sensing, the Subcommittee recommended that its future examination of questions relating to remote sensing also include the specific areas of applications of remote sensing technology so as to enable it to further assess the needs of Member States, particularly the developing countries, in the various areas of current and future applications."[59]

It endorsed the recommendation that the agenda of the Scientific and Technical Subcommittee's seventeenth session should also include the following items:

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[56] *Id.* at 20.

[57] *Id.* at 18.

[58] *Id.* at 22. For a report of the Scientific and Technical Subcommittee, See U.N. Doc. A/AC.105/238 (1979).

[59] *Supra* note 31, at 22.

(a) Questions relating to space transportation systems;

(b) Examination of the physical nature and technical attributes of the geostationary orbit.[60]

The Committee further endorsed the Scientific and Technical Subcommittee's recommendation that the Working Group (WG) on Nuclear Power Sources should meet during the session in order to continue its consideration of questions related to the use of nuclear power sources in outer space.[61] The WG has recommended that to assist its future work further studies should be made in the following subject areas:

(1) Elaboration of an inventory of the safety problems involved in the use of nuclear power sources in outer space; (2) Implementation of the recommendations of the International Commission on Radiological Protection (ICRP) relating to populations and the environment in the context of space vehicles utilizing nuclear power sources; (3) Evaluation of existing methods for understanding orbital mechanics to determine if improvements may be made in predicting re-entry phenomena; (4) Definition of technical considerations with regard to a format for notification.[62]

To this end the UN Secretary General has requested member States and international organizations to contribute by September 1979 studies on the technical aspects and safety measures relating to the use of nuclear power sources in outer space, including the above-mentioned aspects identified by the WG as requiring further examination.[63] An informal meeting of technical experts to discuss these papers is expected later this year in preparation for the 1980 Scientific and Technical Subcommittee session.

VI. Legal Subcommittee Agenda for 1980

Regarding the 1980 agenda of the Legal Subcommittee, the Committee recommended that the Legal Subcommittee should continue its work on items pertinent to:

(a) Legal implications of remote sensing of the Earth from space, with the aim of formulating draft principles;

(b) Elaboration of draft principles governing the use by States of artificial earth satellites for direct television broadcasting. . . .

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[60]*Ibid.*

[61]*Supra* note 31, at 9.

[62]*Ibid.*

[63]Note from United Nations Secretary General to U.S. Permanent Representative to the United Nations, dated March 29, 1979.

> [(c)] . . . Matters relating to the definition and/or delimitation of outer space and outer space activities, bearing in mind, *inter alia*, questions relating to the geostationary orbit . . . . [The Committee further recommended] that the Legal Subcommittee should continue to include on its agenda an item entitled 'Other matters.'[64]

The subject of nuclear power sources was added as a separate item to the agenda of the Legal Subcommittee under the title, "Review of existing international law relevant to outer space activities with a view of determining the appropriateness of supplementing such law with provisions relating to the use of nuclear power sources in outer space."[65] In this connection, at the suggestion of the U.S. Representative, the UN will request views of States on the question of relevant international law to be submitted by December 15, 1979.[66] The UN will circulate such submitted views by February 15, 1980.

VII. Remote Sensing

As to remote sensing and direct television broadcasting from satellite, the Committee did not go beyond the work accomplished at the 1979 session of the Legal Subcommittee. There are seventeen (17) draft principles dealing with remote sensing under discussion in the Legal Subcommittee.[67] Because of space limitations, I will only discuss those that form the center of controversy.

While much redrafting of the principles remains to be done, there is one unresolved key issue reflected in a number of the draft principles on which a diversity of views still exists despite extensive discussion over the last four or five years. The issue is access to and the dissemination of remote sensing data and/or information derived therefrom. In very early discussions, questions were raised about the right of a sensing State to sense the territory of another State without the latter's prior consent.[68] With more and more States having this capability and recognizing the potential value of this space application, this argument has largely disappeared and in its stead many delegations now seek to impose a prior consent regime on the dissemination of data and/or information.[69] Other delegations, including the United States, support the right of a sensing State or of a receiving ground station State to openly disseminate remote

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[64]*Supra* note 31, at 22 and 23.

[65]*Id.* at 23.

[66]*Id.* at 10.

[67]*Supra* note 29, Annex I, Appendix A.

[68]U.N. Doc. A/AC.105/147, Annex III.

[69]*Supra* note 29, Annex I.

sensing data without the prior consent of the sensed State.[70] The USSR has proposed that data having a resolution no better than 50 meters photographic be openly disseminated while data better than 50 meters resolution be subject to the prior consent of the sensed State.[71]

Those delegations desiring a prior consent regime argue that remote sensing data and information derived therefrom have economic, political and national security implications. The U.S. delegation has asked delegates for the past three years to cite a single example where Landsat data has damaged the economic, political or national security interest of any State. None has been forthcoming. There are numerous examples where it has benefited States, particularly the developing countries. Benefits usually have some burdens associated with them. The U.S. believes that Landsat-type systems can continue to provide significant national, regional, and international benefits that far exceed the slight risk of injury to the economic, political or national security of any one or more countries.

In addition, if a prior consent regime were adopted, the international cooperative program under which the Landsat ground stations abroad have come into being would have to be ended since data is not only in the possession of the space segment countries but also in the hands of the ground receiving station countries. In response to the Soviet proposal, the U.S. and other delegations pointed out that spatial resolution from a technical standpoint was not a reliable or standard reference, a conclusion supported by the Scientific and Technical Subcommittee as well as by COSPAR, the Committee on Space Research of the International Council of Scientific Unions.[72]

VIII. Direct Broadcast Satellite (DBS)

Regarding the status of the agenda item on elaboration of draft principles governing the use by States of artificial earth satellites for direct television broadcasting a short explanation of what the principles are intended to cover is required. The principles are intended to apply to satellites which will transmit a TV signal from space directly into a home TV receiver. The technology capable of doing this exists today. Japan with the launch assistance of NASA has deployed such an experimental DBS,[73] and a consortium of Nordic countries is planning one for the early 1980s.[74] In order to receive the TV signal, a dish-type antenna approximately one meter and a converter attached to a standard TV set are necessary. In addition, the antenna has to be accurately

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[70]*Ibid.*

[71]*Id.* at Annex I, Appendix B, WG III (1979)/WP1/Rev. 1.

[72]U.N. Doc. A/AC.105/164.

[73]Launched by NASA using Delta vehicle, April 7, 1978.

[74]U.N. Doc. A/AC.105/PV.193.

pointed at the satellite stationed in geostationary orbit. This item has been on the agenda since 1972 and has been the subject of intense debate since completion of the Registration Convention in 1974.[75] A draft preamble and 12 draft principles have been elaborated,[76] but no consensus has been reached though a great deal of time and effort has been expended looking for a compromise solution.

There are in essence only two issues which appear to be blocking consensus, and it is on these issues that various compromise formulations have been proposed. These issues relate to the formulation of the principle on consultation and agreement between States. Both involve the concept of prior consent. But before discussing the issue, some additional background is needed.

In 1977, a World Administrative Radio Conference was held under the auspices of the I.T.U. and a result of the conference was the adoption of a plan consiting of national assignments of frequencies and orbital slots for direct television satellite broadcasting for Regions 1 and 3, which include the world except for North and South America in Region 2.[77]

It would be a breach of the plan adopted at the 1977 conference for a country that has agreed to adhere to the plan to use in Regions 1 and 3 an orbital position or frequency channel not assigned to it in order to broadcast to another country in those regions. The 1977 conference also treated the question of spillover. Broadcast satellites transmit a wide beam. The beam is shaped by the antennas aboard the spacecraft, but it is impossible to shape the beam to conform with national boundaries and so you have what is called "spillover" into neighboring countries. The 1977 conference established limits on this unavoidable spillover, seeking to reduce it to a minimum.[78]

With this background, I can proceed to the issues. The U.S.S.R. and the Eastern Bloc countries insist, notwithstanding the I.T.U. regulations which because of the need for rational management of the radio frequency have imposed by technical regulations what is in effect a prior consent regime for direct broadcast satellites in Regions 1 and 3, that there ought to be UN/DBS principles which establish politically a requirement that direct broadcast signals cannot cross national borders, whether intentional or unintentional, without the prior consent and agreement of the neighboring State.[79] A large group of delegations would exclude the requirement for prior consent in the case of unintentional spillover but would apply it to the case where a State intends to

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[75] *Supra* note 13.

[76] *Supra* note 29, Annex II, Appendix A.

[77] 1977 World Administrative Radio Conference.

[78] *Ibid.*

[79] *Supra* note 29, Annex II.

broadcast its signal into some State other than its own.[80] The U.S. and a very small number of other delegations view the present language of the proposed principle on consultation and agreements between States as limiting and eroding the principle of free flow of information, a fundamental human right[81] recognized in such international instruments as the Universal Declaration of Human Rights in Article 19 which declares the right of people "to seek, receive, and impart information and ideas through any media and regardless of frontiers" and reaffirmed in Resolution 33/115 of the General Assembly and most recently in the UNESCO Declaration on the Mass Media.[82] The U.S., fully supports a principle providing for full consultations prior to the establishment of any international DBS by a State, consultations which could include the subject of program content, but not consultations that must end with an explicit agreement or the prior consent of a receiving state before such broadcasting may begin. The issue is therefore ideological and political and may be difficult to resolve. It remains to be seen whether consensus will ever be reached as long as this issue remains.

IX. Definition of Outer Space

On the issue of definition of outer space, the U.S.S.R. introduced at the 1979 COPUOS session a working paper which set forth draft provisions for a UN General Assembly resolution governing both the definition question and the legal status of geostationary satellites' orbital space.[83] Essentially, the Soviets propose: (1) that the region above 100/110 km from sea level is outer space, (2) that space objects of States have the right to fly over the territory of other States at lower altitudes for the purpose of reaching orbit and returning to earth in the launching State's territory, and (3) that the geostationary satellites' orbital space is inseparable from outer space and all relevant provisions of the 1967 Outer Space Treaty are applicable to it, *i.e.*, it is not subject to national appropriation.[84]

While the U.S. agrees with the U.S.S.R. as to its characterization of the geostationary orbit (GSO) as being part of outer space, the U.S. has expressed the view that definition is not necessary at the present time as no delegation has identified any problem that would be solved by adopting a definition.[85] Further, activities in space have been going on for over 20 years without hindrance or problems caused by lack of a demarcation line. It may also be noted that COSPAR in one of its reports indicated that

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[80]*Ibid.*

[81]*Ibid.*

[82]UNESCO Decision 4/9.3/2, adopted November 22, 1978.

[83]*Supra* note 7, at 8.

[84]U.N. Doc. A/AC.105/L.112.

[85]*Supra* note 29, at 9.

past estimates of the lowest altitude at which satellites had survived had been too high, and this argues against adopting an arbitrary altitude at this time.[86] At this point no drafting of either principles or a Treaty document on these matters has started.

Within the UN Committee on the Peaceful Uses of Outer Space and its two subcommittees, several equatorial States have asserted that segments of the geostationary orbit are subject to the sovereignty of the underlying States located on the equator.[87] The argument made in support of the claims of sovereignty over the geostationary orbit by the equatorial States is based upon the assertion that the geostationary orbit is not part of "outer space" because the existence of the orbit depends exclusively upon the gravitational phenomena caused by the territory of the underlying States.[88]

Such an argument has no scientific or technical basis. The Scientific and Technical Committee had earlier concluded that there were no scientific or technical characteristics of the earth's upper atmosphere that would be a basis for a definition/delimitation and had requested the Legal Subcommittee to identify problems to be solved by such definition. The geostationary orbit is but one of an infinite number of orbits into which satellites can be placed, and its particular characteristics are functions of both the total gravitational field of the Earth and the rotation of the whole Earth. There is no relationship between the GSO and any underlying country. Entry into the GSO can be achieved through launch from any country on Earth, though energy requirements for insertion into the GSO vary with payload mass and latitude of launch among other factors. The orbit is completely unaffected by national boundaries on Earth, and satellites require adjustment maneuvers to maintain a steady GSO. Further, the GSO is roughly 35,000 kilometers above the Earth's surface, far beyond the altitudes of most satellites currently in Earth orbit. GSOs were understood and utilized before and during the negotiation of the 1967 Outer Space Treaty, and there is no basis for treating the GSO differently than any other Earth orbit. The provisions of Article II of the 1967 Outer Space Treaty preclude any claims of national sovereignty over geostationary orbits or portions thereof.

For all these reasons, I disagree with the recommendation of the panel which in the International Space Activities report of the Subcommittee on Space Science and Applications of the House Committee on Science and Technology urged that "action should be initiated and vigorously pursued to establish an international codicil to the 1967 Outer Space Treaty which specifically forbids any individual nation's claiming

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[86] *Supra* note 72.

[87] *Supra* note 29, at 9.

[88] U.N. Doc. A/AC.105/PV.198, p. 31.

sovereignty over the geostationary''[89] since such a codicil is unnessary as the legal status of the GSO is well established both by treaty and customary international law. Further, there is no reason to believe that the equatorial States would become signatories to such a codicil and abate their claims of sovereignty over such orbits. The second recommendation of the panel is a far better solution; this is to seek ways of reducing through technological developments and improvements the demand for geostationary locations so as to meet the future needs of the international community, and in particular those of the developing countries, including, if feasible, the development of multipurpose space platforms.[90]

It is my belief that there is no need to add a codicil to the 1967 Outer Space Treaty since it is absolutely clear that under that treaty the geostationary orbit is in outer space and is not subject to national appropriation by any means. This is the position of the U.S., U.S.S.R., and the overwhelming majority of member States of the Committee on the Peaceful Uses of Outer Space.

X. Conclusion

As reviewed above, it appears that the 1980 sessions of the COPUOS and its two subcommittees will be dealing with a number of important issues that are difficult to resolve. However, the history of the COPUOS demonstrates that it is a dynamic body with an enviable record of achievement, and there is no reason to expect that the Committee on the Peaceful Uses of Outer Space will not move forward on the matters under consideration.

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[89]Subcomm. on Space Science and Applications of the Comm. on Science and Technology: U.S. House Report on International Space Activities (Nov. 1978).

[90]*Ibid.*

OUTER SPACE ACTIVITIES *versus* OUTER SPACE +

Luboš Perek *

There is little doubt that future satellites will be larger and will have longer lifetimes than those in use at present. This will be a consequence of need as well as opportunity. The opportunity will be provided by space transportation systems which are being developed by several launching countries and agencies. By way of example, the Space Shuttle will radically lower launching costs and will make possible servicing of satellites in low orbits. The supply vehicles Progress can prolong the lifetime of space stations and enable cosmonauts to stay in space for periods of time never attempted before. The Ariane promises to be an efficient launching rocket of an advanced design.

The need for large satellites and space stations arises from the success in space communications, space meteorology, and remote sensing from satellites. In the future, space communications will most probably use large stations and antenna farms with exchangeable components. Meteorology and remote sensing will profit from specialized missions and instrumentation placed on multi-purpose platforms.

New applications, which as recently as a few years ago were considered more a fiction than science, are now entering a stage of thorough study including the design of feasibillity experiments. Collecting solar power in space and transmitting it to earth is one possible source of energy. Projects of space manufacturing show that it would be possible to build large stations, even those which would serve as habitats, mostly from materials found on celestial bodies. Many of these projects of the future were reported at past congresses of the IAF and certainly will be discussed further. One aspect of these projects which is rarely considered is the manner in which the individual projects and missions relate to each other.

At present, with approximately 1000 earth orbiting satellites the only important relation between satellites is the proper use of the frequency spectrum for communications. This question is very expertly and adequately handled within the International Telecommunication Union which devised an elaborate set of rules to be followed for co-ordinating frequency assignments and for preventing any possible interference in communications.

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A. *The Problem of Collision*

Another possible relation between two space objects, a collision, is usually waved aside by noting how many cubic kilometers each satellite has at its disposal and how large a distance separates on the average any two space objects.

The problem of collision of space objects cannot, however, be disposed of that easily. Three parameters determine the collision probability. Besides the number of objects in a unit of space there are also the collision cross sections of the satellites and their relative velocities.

The relative velocity is determined by laws of celestial mechanics. It is largest at perigees of satellites in highly eccentric orbits but cannot be neglected even for satellites in circular orbits. It seems that the most dangerous place in outer space is the equatorial plane which is intersected by each satellite or piece of debris twice during each revolution, *i.e.* up to 32 times per object per day. Therefore, the velocity component perpendicular to the equatorial plane may be the determining factor for collisions.

The satellite crosssection will assume importance in the more distant future. Since the collision probability is proportional to the area of the satellite, the picture will be entirely different for solar power stations with an area of several square kilometers than it is for small present day satellites.

Finally, the number of space objects is not only the 1000 satellites which are now in orbit, it is also the 3500 objects of debris large enough to be tracked by radar and an unknown number of smaller objects of debris; nuts and bolts, and other fragments weighing a fraction of a gram, which escape tracking and detection but which move with a speed exceeding that of projectiles. The smaller debris is not without danger. According to D. J. Kessler and B. G. Cour-Palias,[1] a collision at 10 km/s would eject from a satellite 115 times the mass of the impacting debris. Two recent malfunctions of satellites have, indeed, been ascribed to possible collisions with space debris.[2] Satellites are of course protected against natural meteoroids, *e.g.* Skylab had a 300kg shield to protect it against meteoroid impacts of 0.01g.

The amount of debris is steadily increasing and so is the probability of damage to a satellite. At present it is in the range of 10% for a 100m sphere in orbit for 1000 days,[3]

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[1]Kessler and Cour-Palais, Collision Frequency of Artificial Satellites: the Creation of a Debris Belt, 83 Journal of Geophysical Research 2637 (June 1, 1978).

[2]Wrenn, Geos 2 in Space Collision, 274 Nature 631 (August 17, 1978); Sedov, Cosmos 954, 30 Spaceflight 184 (May 5, 1978).

[3]See D. Brooks, A Comparison of Spacecraft Penetration Hazards Due to Meteoroids and Man-made Earth-orbiting Objects, NASA TMX - 73978 (November, 1976).

and it is proportionally smaller for smaller satellites and for shorter missions. This does not yet pose an unacceptable risk to manned missions, but new debris associated with the launch or breakup of a payload or rocket are being generated faster than they decay in the earth's atmosphere. Satellite collisions also provide another source of space debris. It has been shown by the two authors mentioned above that once the collisional breakup begins—and it has already begun—the debris flux will increase exponentially with time, that it may quickly exceed the natural meteoroid flux, and that it may lead to the growth of a debris belt around the earth, where only heavily protected spacecraft would survive.

Thus, collisions which could have been easily ignored in the first 23 years of space activities may be an important factor in the coming decades. *Preventing* all collisions is impossible. *Minimizing* their effects is and will be expensive; but it is a bargain price compared to the repair of damage.

B. *How to Reduce Collisions*

Reducing the number of collisions is possible but would require planning and action well before the problem gets out of hand. Among the avenues deserving closer scrutiny are:

1. *Reducing the number of debris* produced during the launching phase and during the lifetime of the satellite in the form of jettisoned shrouds, covers and other parts;

2. *Bringing inactive satellites down to earth* by landing as is already done in manned and some unmanned missions; or by a crash at a planned site such as the middle of the ocean; or by total burn-up in the atmosphere which of course is not possible for compact satellites; or by pick-up by a reusable spacecraft such as the Space Shuttle;

3. *Placing of inactive satellites into disposal orbits.* This principle has been already used by Intelsat in 1977 when three satellites of the Intelsat III series were switched off and boosted up several hundred or a few thousand kilometers beyond the geostationary orbit. Quite recently, the intention has been announced to proceed likewise with ATS 6. Besides the disposal area beyond the geostationary orbit there might be other areas of lower altitudes convenient for such a purpose. *E.g.* satellites in the heavily travelled area at 500 to 1000 km altitude might be boosted up to altitudes above 1700 km which are rarely used for active satellites and which have lifetimes of some twenty thousand years. In general, specific areas of outer space could be designated for disposal orbits by an international agreement.

4. *Using non-intersection*[4] *orbits in specific areas of outer space.* This is automatically done in the geostationary orbit where assignment of orbital positions and station-keeping practically removes the possibility of a collision of two active satellites. There is, however, one exception to this safety rule. In the plan adopted at the 1977 WARC for the Planning of the Broadcasting-Satellite Service, up to a dozen assignments have been made for the same orbital position. Should these assignments be filled by separate satellites, there is no provision at present for keeping them apart. The principle of non-intersecting orbits might prove useful also for other frequently used areas of outer space, such as the area of sun-synchronous orbits.

In this context we can also consider collisions of space objects with the earth. Since 1957 almost 6000 space objects were on collision course with the earth. Most of them burned up in the atmosphere giving rise to nothing more than a few UFO sightings. Several hundred pieces of debris, which did not have sufficient time to burn up, hit the ground. Very few of them have been noticed and only two recent occasions received worldwide attention. In general, it can be said that adverse publicity connected with these events exceeded actual damage. But with the increasing size and weight of space objects and with the importance of having the public on the side of space ventures and not on the other side of the fence demonstrating against all space activities, the conclusion should be drawn that space missions should be planned through their actual termination, not just up to the end of the useful life of space objects.

The remedies mentioned above, especially bringing inactive satellites down to earth or placing them into disposal orbits, could relieve this problem as well.

Some of the measures suggested here could be applied to space objects already in orbit. The majority of the measures would, however, have to be introduced in the early planning stage of each space mission. The planners should be aware of the fact that space missions which are now on their drawing boards may fly only in the next decade and may decay even later. At that time, mankind, which is already concerned about environmental impact and unnecessary risk, may be even more so. Attractive but relatively slight budgetary economies made at the cost of safety precautions may, in the end, prove very costly in monetary terms and what is more serious, may adversely affect the acceptance of technological progress in general.

C. *Extended Functions of a Space Object*

It is not only the physical contact of space objects which has to be taken into account. The functions of satellites or space stations exceed their physical dimensions in

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[4]These orbits would have to be non-intersecting in the four dimensional space-time continuum.

several respects. Besides the communication links with the ground which we mentioned earlier, intersatellite links are being considered for some communication satellites. Solar power stations would need a clear path for the energy beam. It has been recently suggested that solar power stations might use a low earth orbit and that such a system would have some advantages over the geostationary orbit. If both systems, in low orbit as well as in the geostationary orbit, are developed, and both systems have numerous satellites, then steering clear of other energy beams and preventing undesirable reflections might be an interesting but highly ambitious exercise in coordination.

Space manufacturing activities more than any other would exceed the physical dimensions of space stations. A manufacturing station would require a free path between the celestial body which is being tapped for material and the mass catcher. The trajectory certainly should not be traversed by another body if the mass driver is in operation. Besides, a shipment of material, even if it misses the catcher, should not impact on another active space object.

Closer at hand is the problem of shadowing. Most satellites and stations use as a primary energy source solar radiation backed up by batteries. Should solar radiation be cut off for a longer period than what the batteries had been designed for, some functions might be interrupted. The shadow of a space object is long; it is more than one hundred times as long as its dimension. A 20 km solar power station would throw a shadow extending over 2000 km which in the geostationary orbit corresponds to almost 3^0 in longitude. A small communication satellite designed to work in a close neighborhood of a solar power station would have to have either a capability of steering out of the shadow or to have an alternate source of energy.

D. *Technical and International Solutions*

Some of the above problems require a technical solution. It is just a question of taking into consideration, at an early state in the planning process, all possible relations with other space objects which might be encountered by that particular space mission during its active as well as inactive lifetime.

Other problems require a solution by international regulation. Space traffic may, at first, not need traffic rules as firm as those which apply to road traffic or to collision avoidance in air traffic. Some rules for space traffic could follow the idea of the noncompulsory Traffic Separation Schemes adopted by IMCO or the spirit of the Rule of Good Seamanship. It may be a challenging task for the IAF to provide scientific and technical background for all measures which would increase safety of space traffic and would accomodate space missions side by side. It would then be up to the international community to adopt regulatory or recommendatory measures wherever and to whatever degree is found necessary. After all, the operators of space objects discharge larger responsibilities than the many operators of vehicles on roads, in the sea, and in the air.

MANAGING TORT LIABILITY RISKS IN THE ERA OF THE SPACE SHUTTLE

*Gerald J. Mossinghoff**

On August 8, 1979, the President approved the National Aeronautics and Space Administration ("NASA") Authorization Act, 1980,[1] which, in addition to authorizing NASA's fiscal year 1980 program, added a new section 308 on "Insurance and Indemnification" to the National Aeronautics and Space Act of 1958[2] (the "Space Act"). That new section gives NASA broad and flexible authority to facilitate an orderly and equitable allocation of third-party tort liability risks among those involved in the operation and use of the Space Shuttle. The underlying purpose of the new section 308 is to further Congress' and the Administration's policy of encouraging widespread commercial and other non-U.S. Government use of the new national capability that the Space Shuttle represents.

In this article, the author will summarize the reasons why NASA proposed the new section, discuss its provisions, and outline the steps NASA is now taking to implement those provisions. The new section 308 itself is set forth in Appendix A, and its formal "sectional analysis" is provided in Appendix B.[3]

A. *Reasons for the New Authority*

Since early in NASA's history it has launched payloads for commercial users into space on a reimbursable basis. Typically, these payloads fly alone aboard one of NASA's

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[1]National Aeronautics and Space Administration Authorization Act, 1980, Pub. L. No. 96-48, 93 Stat. 348 (1979). The new section 308 was added by section 6 of Pub. L. No. 96-48, the "National Aeronautics and Space Administration Authorization Act, 1980." That section 6, which was effective October 1, 1979, also amended paragraph 13 of subsection (c) of section 203 of the National Aeronautics and Space Act of 1958 [42 U.S.C. 2473(c)(13)] to increase NASA's settlement authority "for bodily injury, death, or damage to or loss of real or personal property resulting from the conduct" of NASA's functions from $5,000 to $25,000. Prior to the effective date of section 6 of Pub. L. No. 96-48, claims against NASA under section 203(c)(13) in excess of $5,000 had to be certified by the Comptroller General before appropriations were available to pay the claims [31 U.S.C. 724 (a) as amended by Pub. L. No. 95-26, 91 Stat. 96 and Pub. L. No. 95-240, 92 Stat. [107]; NASA now has authority to settle claims up to $25,000 without such certification. (Text of section 308 is included in Appendix A and an analysis of this section is included in Appendix B, *infra*).

[2]National Aeronautics and Space Act of 1958, 42 U.S.C. 2451 *et seq.* (1979).

[3]Section 308 was enacted exactly in the form recommended by the NASA Administrator in his letters of January 30, 1979, to the Speaker of the House of Representatives and the President of the Senate. The sectional analysis forwarded with the Administrator's recommendation therefore provides an authoritative exposition of the intent underlying the new section. See H.R. Rep. No. 52, 96th Cong., 1st. Sess. 221 (1978); S.Rep. No. 207, 96th Cong., 1st Sess. 43 (1978).

expendable launch vehicles, for example, the Delta launch vehicle or the Atlas Centaur vehicle. Under NASA's current policies, commercial users are required to obtain third-party liability insurance (or self-insure for third-party liability) and that insurance (or self-insurance) must protect the United States from potential tort liability resulting from injury to third parties, *i.e.*, those not a party to the launch agreement.

This policy has worked well. Under it non-U.S. Government users of expendable launch vehicles have procured substantial amounts of liability insurance, up to $300 million, for premiums of approximately $50,000 per launch. Undoubtedly, one reason the premiums have been reasonable is because of the proven safety of the launch vehicles used; there has been no third-party property damage or bodily injury resulting from any of NASA's launches.[4]

As those familiar with the United States Space Program know, the Space Shuttle is a manned reusable launch vehicle which, when operational, will replace all of this Nation's expendable launch vehicles. The Space Shuttle is capable of carrying a variety of payloads on a given launch. Its cargo bay measures 60 feet in length by 15 feet in diameter and it can carry up to 65,000 pounds of payloads. It can separate and deploy free-flying payloads into Earth orbit and, with a European-developed Spacelab in its cargo bay, can serve as a self-contained space station for periods of up to 30 days.

Payloads which will be carried in the Shuttle will include free-flying spacecraft for deployment in Earth orbit, owned by the United States, foreign governments, intergovernmental organizations or commercial concerns; "small self-contained payloads" which NASA would fly for small businesses, universities and others for research and development purposes at a low transportation cost, *e.g.*, $10,000; and the European-developed Spacelab in which experiments will be performed by NASA, the European Space Agency, other governments and commercial concerns. These payloads will be flown under NASA's existing policies either under reimbursable bases where NASA is reimbursed for the costs involved or under cooperative or interagency arrangements. A given Shuttle flight may also include one or more payload specialists (who are not Government employees) to operate onboard scientific instruments.

Under traditional United States tort law, if the Shuttle and/or its contained payloads were to cause damage to a third person, all of the users and NASA would have potential liability to the injured third person, based upon concepts either of negligence or absolute liability, *i.e.*, liability without proof of fault or negligence. Actual liability, of course, would depend on proof of a causal relationship between the damage or injury and the acts or failures to act of a user. Under the Convention on International Liability for Damage Caused by Space Objects, ratified by the Senate on October 6, 1972, and

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[4]There have been claims filed with NASA as a result of the well publicized Skylab reentry, but no allegations of physical bodily injury or property damages have been made. Since Skylab was a NASA program, the Government acted as a self-insurer; no commercial insurance was involved.

entered into force on October 9, 1973,[5] the United States Government would be absolutely liable to citizens of foreign States which are party to the convention, but all users could be liable as well to any injured person under conventional tort law.

The mix of payload users outlined above all but prevents an orderly and equitable allocation of risks of liability absent special authority. For example, if a university professor were to fly a small self-contained payload for a payment of $10,000 to NASA, third-party liability insurance could cost up to five times that much. Moreover, if a number of commercial users each attempted to acquire adequate insurance protecting itself on a given Shuttle flight, the estimated $500 million capacity of the liability insurance market could well be exceeded. Similarly, the employer of a payload specialist would, under the doctrine of *respondeat superior,* be required to insure against potential negligence of the payload specialist who could cause substantial third-party liability. In that later vein, NASA currently has contracts with the Massachusetts Institute of Technology and the University of California to provide payload specialists for a Shuttle/Spacelab flight, but those contracts are contingent upon NASA and the institutions' working out appropriate insurance/indemnification clauses. Finally, the amount and terms of insurance protection available are not known since the Shuttle has not yet flown in space, and since it potentially could cause damage not only on launch but also on landing.

Moreover, any system of third-party liability coverage, to be operationally sound, must permit last-minute changes to the manifest of any given Shuttle flight without renegotiation of insurance or indemnification provisions. This means there must be a standard provision agreed to in advance to accommodate changes in the mix of payloads to be flown on Shuttle flights.

B. *Section 308*

Under the newly enacted section 308 NASA is authorized "on such terms and to the extent it may deem appropriate" to provide liability insurance for any user of the Space Shuttle to compensate all or a portion of claims by third parties for death, bodily injury, or loss of or damage to property resulting from activities carried on in connection with the launch, operations or recovery of the Space Shuttle. NASA's appropriations are specifically made available to acquire such insurance, but only on the condition that they "shall be reimbursed to the maximum extent practicable" by the Space Shuttle users. That reimbursement is to be facilitated under reimbursement policies which have been established under section 203 (c) of the Space Act.

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[5]Convention on International Liability for Damage Caused by Space Objects, done at Washington, London and Moscow, March 29, 1972, entered into force for the United States, October 9, 1973; [1973] 24 U.S.T. 2389; T.I.A.S. 7762. For a text, see 1 J. Space L. 86-97 (1973).

Subsection (b) of the new section 308 specifically authorizes NASA to indemnify a Shuttle user against claims, including reasonable expenses of litigation or settlement, by third parties for death, bodily injury, or loss of or damage to property resulting from the launch, operations or recovery of the Shuttle, but only to the extent that such claims are not compensated by liability insurance of the user. The Administration is specifically empowered to issue regulations regarding the exercise of the authority to so indemnify users, and it is required that those regulations must take into account "the availability, cost and terms of liability insurance." Also, it is provided that such indemnification "may be limited to claims resulting from other than the actual negligence or willful misconduct of the user." In commenting on that provision, NASA pointed out in its sectional analysis that if NASA deems it appropriate, it is able "to tailor the extent of the indemnification to the particular circumstances of a given flight, indemnifying the user totally or, for example, indemnifying the user only with respect to damage or injury which did not result from the user's willful misconduct."[6] The proviso by its very terms is permissive, and not mandatory, and in general it would seem that the overall intent of the new section 308 will be best achieved by indemnification of broad rather than limited coverage. Thus it is anticipated that, at least initially, NASA will not limit its indemnification in any way, even though it has the express authority to do so.

In subsection (f) of the new section 308 "space vehicle," a term used earlier in the Space Act in section 103, is specifically defined to include the Space Shuttle and other components of a Space Transportation System.[7] The term "user" is defined to include "anyone who enters into an agreement with the Administration for use of all or a portion of a space vehicle, who owns or provides property to be flown on a space vehicle, or who employs a person to be flown on a space vehicle." The definition of the term "user" was not intended to be broad enough to encompass NASA's research and development contractors who provide components of the Space Transportation System under procurement contracts with NASA.

The term "third party" under the new section is defined to mean "any person who may institute a claim against a user for death, bodily injury or loss of or damage to property." Normally, this would not include persons who have contracted with NASA for the use of the Shuttle. With respect to those persons, NASA has under existing authority adopted a no-fault, no-subrogation approach whereby NASA and each user agree not to bring a claim against the other or any other user for damage to its property or for injury or death of its employees.

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[6]H.R.Rep. No. 52, 96th Cong., 1st Sess. 224 (1978); S.Rep. No. 47, 96th Cong., 1st Sess. 47 (1978).

[7]Section 103 of the Space Act, 42 U.S.C. 2452, refers to "aeronautical and space vehicles." The definition of "space vehicle" in the newly enacted section 308(f) is wholly consistent with the position of the Chief Counsel of the Federal Aviation Administration that the Space Shuttle is a "space vehicle" and not an "aircraft" under the Federal Aviation Act of 1958, 72 Stat. 731, 49 U.S.C. 1301 *et seq.* See 6 J. space L. 65 (1978).

C. *NASA's Implementation of Section 308*

NASA had indicated that in implementing the new authority of section 308 it will to the best of its ability require commercial users to insure against third-party liability.[8] This will be done either by requiring users to purchase insurance from commercial sources or by use of NASA appropriations to procure such insurance from commercial sources, with those appropriations being reimbursed to the maximum extent practicable by prorating the premiums for that insurance among several users. Also, if a given Shuttle flight is a predominantly Government flight, in which the Government would normally act as a self-insurer, but if the flight included one or more commercial payloads, NASA would be authorized to indemnify the owners of those commercial payloads for any third-party liability. It is NASA's intent to implement the proposed section in a way that requires commercial users to pay their proportionate share of insurance protection unless those users are flying small self-contained payloads, for example, or are sponsoring institutions providing payload specialists services to NASA.

NASA intends through a formal notice in the *Federal Register* to solicit on-the-record comments and suggestions from interested parties on how best to implement the new authority. Although that authority specifically allows NASA to use its appropriations to acquire insurance for users of the Shuttle, that way of proceeding is viewed as being far more complex, and therefore far less desirable, than having the users themselves deal with insurance underwriters through established brokerage arrangements. An overriding requirement, however, as pointed out above, is that whatever mechanism is established, it must allow for last-minute changes in the manifests of Shuttle flights without opening insurance and liability provisions to renegotiation.

At the same time NASA is requesting comments on the implementation of section 308, it is negotiating allocation-of-risk provisions with early users of the Space Shuttle to be included in the launch services agreements with those users. Although the final versions of those provisions have not been agreed to, it is anticipated that they will require the user to obtain, at no cost to NASA, liability insurance protecting the user and the United States Government in an amount which would cover all "worst-case" accidents that can be foreseen. Currently, that amount is projected to be $500 million. In return for that coverage, NASA would use its authority under section 308 (b) to indemnify the users for any liability in excess of that amount. NASA is also proceeding to insert in its contracts for payload specialists services, appropriate indemnification provisions running to the contractors providing payload specialists to be flown on the shuttle. Similarly, NASA is drafting indemnification provisions to be included in the agreements under which NASA will fly small self-contained payloads.

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[8]U.S. House Comm. on Science and Technology, Hearings Before the Subcommittee on Space Science and Applications on H.R. 1786, 96th Cong., 1st Sess. (Feb. 22, 1979).

D. *Conclusion*

The "Insurance and Indemnification" provision recently added to the Space Act was tailored specifically to permit NASA to allocate third-party liability risks among the users of the Space Shuttle in a fair and orderly way. In the "clearance" of that section within the Executive Branch,[9] prior to its being recommended to the Congress, there was a view that it could serve as a precedent in other areas. One can speculate whether that will prove to be the case. However, it is clear that NASA's implementation of the new authority and the experience thus gained will provide valuable data to the Government concerning the allocation of risks among those involved in new public programs.

[9]Such clearance—which in the case of section 308 involved the Department of Justice, the Department of the Treasury, the Department of Commerce, the Department of Housing and Urban Development, and the Office of Federal Procurement Policy—is required by Office of Management and Budget Circular A-19.

APPENDIX A

INSURANCE AND INDEMNIFICATION

Sec. 308. (a) The Administration is authorized on such terms and to the extent it may deem appropriate to provide liability insurance for any user of a space vehicle to compensate all or a portion of claims by third parties for death, bodily injury, or loss of or damage to property resulting from activities carried on in connection with the launch, operations or recovery of the space vehicle. Appropriations available to the Administration may be used to acquire such insurance, but such appropriations shall be reimbursed to the maximum extent practicable by the users under reimbursement policies established pursuant to section 203 (c) of this Act.

(b) Under such regulations in conformity with this section as the Administrator shall prescribe taking into account the availability, cost and terms of liability insurance, any agreement between the Administration and a user of a space vehicle may provide that the United States will indemnify the user against claims (including reasonable expenses of litigation or settlement) by third parties for death, bodily injury, or loss of or damage to property resulting from activities carried on in connection with the launch, operations or recovery of the space vehicle, but only to the extent that such claims are not compensated by liability insurance of the user: *Provided,* That such indemnification may be limited to claims resulting from other than the actual negligence or willful misconduct of the user.

(c) An agreement made under subsection (b) that provides indemnification must also provide for:

(1) notice to the United States of any claim or suit against the user for the death, bodily injury, or loss of or damage to the property; and

(2) control of or assistance in the defense by the United States, at its election, of that suit or claim.

(d) No payment may be made under subsection (b) unless the Administrator or his designee certifies that the amount is just and reasonable.

(e) Upon the approval by the Administrator, payments under subsection (b) may be made, at the Administrator's election, either from funds available for research and development not otherwise obligated or from funds appropriated for such payments.

(f) As used in this section—

(1) the term "space vehicle" means an object intended for launch, launched or assembled in outer space, including the Space Shuttle and

other components of a space transportation system, together with related equipment, devices, components and parts;

(2) the term "user" includes anyone who enters into an agreement with the Administration for use of all or a portion of a space vehicle, who owns or provides property to be flown on a space vehicle, or who employs a person to be flown on a space vehicle; and

(3) the term "third party" means any person who may institute a claim against a user for death, bodily injury or loss of or damage to property.

APPENDIX B

SECTIONAL ANALYSIS OF SECTION 308, "INSURANCE AND INDEMNIFICATION"

The new section 308 includes six subsections, (a) through (f).

Subsection (a) authorizes the Administrator to provide liability insurance to any user of a space vehicle to compensate them for claims by third parties for damage resulting from described activities. The Administration is authorized to provide such insurance in its sole discretion on such terms and to the extent it may deem appropriate. Thus, for example, the Administration could require certain Shuttle users to obtain through NASA and pay for an equitable share of third-party liability insurance. On the other hand, the Administration could, in its discretion, exempt other Shuttle users, for example, small self-contained payloads, from the requirement of obtaining insurance or paying for it.

This subsection authorizes the Administrator, for example, to procure insurance for a number of Shuttle flights in the future based on a projected schedule. In doing so, he is authorized to use for the purchase of such insurance appropriated funds available to the Administration. In turn, he is required to seek reimbursement of the appropriation used, to the maximum extent practicable, from the users under general Shuttle reimbursement policies established pursuant to section 203(c) of the National Aeronautics and Space Act of 1958, as amended. This could be accomplished by charging users a fixed price for the insurance based upon an estimate of the cost of insurance, the number of Shuttle flights and users to be protected by the insurance policy, and other relevant factors. Any other reasonable method of charging users for such insurance may be adopted, depending on NASA's experience and the insurance coverage available. It is not anticipated that NASA would use its appropriated funds to protect the U.S. Government (including NASA when flying its payloads) from liability; however, the subsection is broad enough to permit that if the Administrator determines that to do so would be desirable and appropriate in any particular case, for example, depending on the mix of payloads to be flown on a given Shuttle flight.

Subsection (b) authorizes NASA, in its discretion, to provide in any agreement entered into by it and a user of a space vehicle (as defined in subsection 308 (f), for the indemnification of the user against claims by third parties (as defined in subsection 308 (f)) for damage resulting from activities carried on in connection with the launch, operations, or recovery of the space vehicle, but only to the extent that such claims are not compensated by liability insurance of the user. It requires the Administrator to issue implementing regulations which take into account the availability, cost, and terms of liability insurance.

The agreement to indemnify may be inserted in several different types of agreements with users of a space vehicle, including but not limited to, agreements under which NASA provides Shuttle launch services and other Government services and agreements under which non-U.S. Government persons provide to NASA payload specialist services onboard Shuttle flights.

It is specifically provided that the indemnification may, if the Administration deems it appropriate, be limited to claims other than those resulting either from the actual negligence of the user or from willful misconduct of the user, or both. Under this authority, the Administration will be able to tailor the extent of the indemnification to the particular circumstances of a given flight, indemnifying the user totally or, for example, indemnifying the user only with respect to damage or injury which did not result from the user's willful misconduct.

Indemnification is only applicable to claims of third parties who are defined in subsection 308(a)(f)(3) as "any person who may institute a claim against a user for death, bodily injury or loss of or damage to property." It is envisaged that a third party would not normally include persons who contract with NASA for launch services, since NASA expects to include in its launch agreements a provision under which the person procuring launch services agrees that he will not make a claim (and that he will hold NASA and other users harmless) for damage to his property or employees caused by NASA, other users or any other person involved in space transportation system operations during such operations. In turn, NASA and other users would promise not to bring a claim against the user for damage to their property or employees. The result would be that each person flying on a space vehicle would be required either to insure or self-insure his own property.

The indemnification authority is applicable to damage resulting from activities carried on in connection with the launch, operations, or recovery of a space vehicle. The term "space vehicle" is defined in subsection 308(f)(1) to include spacecraft and other payloads that may be launched, with the term specifically including the Space Shuttle. The Administrator's implementing regulations would define technically and in detail the activities carried on that would be protected by indemnification and the extent and duration of such protection.

Subsection (c) provides that certain described conditions must be contained in any agreement providing for indemnification under section 308. Specifically, it requires that (1) notice be given to the United States of any claim or suit against a user for damage; and (2) control of or assistance in the defense by the United States, at its election, of that suit or claim.

Subsection (d) provides that no indemnification payment made under subsection (b) may be made unless the Administrator or his designee certifies that the amount is just and reasonable.

Subsection (e) provides that upon the Administrator's approval, indemnification payments under subsection (b) may be made either from any funds available for NASA's research and development activities not otherwise obligated or from funds appropriated specifically for such indemnification payments. A decision on whether to use existing appropriations or seek additional appropriations from Congress specifically to pay meritorious claims rests with the Administrator. It is the intent of this subsection that no authorized NASA program should be curtailed or terminated because of such indemnification payments.

Subsection (f) provides a definition of three terms used in section 308.

The term "space vehicle" is defined in subsection (f)(1) as any object intended for launch, launched or assembled in outer space, specifically including the Space Shuttle and other components of a space transportation system, together with related equipment, devices, components and parts. This is intended to include, but not be limited to, Spacelab, upper stages, and any payload to be flown onboard a Shuttle for a user.

The term "user," as defined in subsection (f)(2), includes anyone who enters into an agreement with the Administration for use of all or a portion of a space vehicle, who owns or provides property to be flown on a space vehicle, or who employs a person to be flown on a space vehicle. It could include as one "who owns or provides property to be flown on a space vehicle", a person who intends and has made appropriate arrangements to retain ownership of property at any time during flight; *e.g.*, a manufacturer of an upper stage who may retain title to the upper stage during space flight. The definition also includes as one "who employs a person to be flown on a space vehicle" an entity such as a university which would provide under a contract with NASA its employee's services as a payload specialist for a particular Shuttle flight.

The term "third party," as defined in subsection (f)(3), means any person who may bring a claim against a user for damage sounding in tort. As explained previously in connection with subsection (b), a "third party" would not normally include users who contract with NASA for launch services; however, there may be circumstances under which such a person could be a "third party" for the purposes of section 308.

THE SECOND UNITED NATIONS CONFERENCE ON OUTER SPACE—AN OPPORTUNITY FOR THE FUTURE

*Marvin W. Robinson**

On 27 August 1968, in Vienna, Austria, Dr. Vikram A. Sarabhai, Secretary of India's Atomic Energy Department and Chairman of the Atomic Energy Commission and India's National Committee for Space Research, was reflecting upon the United Nations Conference on the Exploration and Peaceful Uses of Outer Space at its closing session in his capacity as Vice-President and Scientific Chairman of the Conference. To the representatives of seventy-eight Member States, nine specialized agencies and four other international organizations gathered in the Hofburg Palace, Dr. Sarabhai said:

> . . .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. . ."[1]

In those early years, the conviction that the application of space research would touch every facet of life on earth was shared by many throughout the world. The imagination of people had been fired by the concept of our ability to venture forth from the planet earth into the vast unknown area of outer space. The enthusiasm and public support of outer space research and exploration stemmed not only from an awareness of these achievements in a technological sense, but also from a philosophical and spiritual feeling.

The reservoir of public participation in the spirit of outer space research and exploration peaked in July 1969 when two U.S. astronauts stood upon the surface of the moon. In a message of congratulations, the Secretary-General of the United Nations, U. Thant, seemed to speak for all when he said:

> "Words are inadequate to express the emotions with which we have all witnessed the extraordinary and historic achievement of the past twenty-four hours. The moon, which man has seen throughout his life on earth as a mystery beyond human research, a goddess, an inspiration and a thing of transcendent beauty, as now been reached by two gallant men. . . . ."

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† The views expressed are those of the author alone and do not reflect the views of the United Nations.

[1]Practical Benefits of Space Exploration, U.N. Publ. Sales No. 69. I. 25 (1969).

> "The world has watched the moon landing with emotion, pride and a sense of human solidarity which only the greatest achievements of men can evoke. . . . ."[2]

Indeed the world had watched the moon landing. Through the technology of communication satellites, hundreds of millions of people shared in mankind's grand achievement. The vision of that "fragile blue jewel in a sea of darkness" - the view of planet earth as seen from the moon, became an intensely personal one for many. From this new vantage point, earth and its people were seen adrift upon a voyage - "Riders on the earth together" in the words of poet Archibald MacLeish, It reaffirmed the message of the United Nations *Ad Hoc* Committee on the Peaceful Uses of Outer Space, when, in reporting to the fourteenth session of the General Assembly in 1959, it stated:

> ". . . . Space activities . . . inherently ignore national boundaries . . . and must to a large extent be an effort of the Planet Earth as a whole . . ."[3]

The pace of space research and exploration continued after the historic flight of Apollo 11. New spectaculars of space achievement were accomplished by an ever growing number of nations. The applications of space research increased and Dr. Sarabhai's conviction that such applications would touch every facet of human life was fast becoming a reality. Within the United Nations, and in a variety of bi-lateral and multi-lateral arrangements, Member States were increasing their co-operative efforts, both in the research and use of outer space as well as in the sharing of benefits derived from such activities. The United Nations Committee on the Peaceful Uses of Outer Space and its Legal and Scientific and Technical Sub-Committees laboured over a series of priority agenda items, endeavouring to reach agreements which would lead to international treaties, conventions and co-operative programmes in areas of major importance to Member States. While the problems arose in each of these areas, the international lawyers, scientists and engineers never permitted the spirit of co-operation to lag. As one recent example of this spirit, in 1979, after seven years of detailed discussion involving compromises by all the interested parties, an Agreement Governing the Activities of States on the Moon and Other Celestial Bodies was forwarded by the Outer Space Committee to the 34th General Assembly of the United Nations for approval.[4]

Yet, despite wide recognition that accomplishments in the field of outer space have profoundly affected concepts of mankind's future on the planet Earth, as well as in the universe itself, public interest in and support of outer space research and exploration today has diminished greatly. If one examined the attention given world-wide in the mass media to the 10th anniversary of the Apollo 11 moon landing as compared to the

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[2]Statement by Secretary - General U. Thant. U.N. Press Release SG/SM/1134 (July 21, 1969).

[3]14 U.N. GAOR, Annexes (Agenda Item 25), U.N. Doc. A/14/41 (1959).

[4]34 U.N. GAOR, 2 Annexes (Supp. No. 20), U.N. Doc. A/34/20 (1979).

columns of newspaper space, radio time and television programming devoted to the decay and re-entry of the U.S. spacecraft Skylab, it was clear that the exploration of outer space was being characterized as another technological area which could destroy the quality of life on earth by raining random and uncontrollable death and destruction from the sky.

In the face of this, how is it possible to rekindle the kind of public support which is absolutely essential if nations are to undertake the large-scale outer space projects of the future? What can be done to make people throughout the world understand that, having taken this initial step into outer space, there will be no turning back? The exploration and use of outer space will continue for centuries to come; and, the impact of this new frontier will have a direct effect upon the life of every individual as well as upon the scientific, technological and international political scene of the future. There is no question that the world at present shares a sense of crisis. There is a crisis of morale and identity caused by the disruption of traditional cultures and frustrated expectation. There is the crisis born of outraged human dignity over the often degrading aspects of life even in industrialized societies. Both developed and lesser developed nations share a sense of despair. The problems facing the world at large are of such complexity and of such magnitude and the competition to focus world attention upon specific issues so great that no longer can it be expected that substance alone will be sufficient to focus public attention.

The form in which a subject is presented to the general public becomes an important aspect in the effort to gain attention. This is not to imply that form is to be stressed at the expense of substance, nor that substance be modified to accommodate form. It is only to state a pragmatic concept, i.e., if the objective is to convince people, it is essential that they be persuaded to listen attentively to the facts being presented. The intelligent public support of the exploration and peaceful uses of outer space is important enough, that every opportunity to once again marshall public attention and public support in this field be examined.

The forthcoming second United Nations Conference on the Exploration and Peaceful Uses of Outer Space presents such an opportunity. The Preparatory Committee for the Conference has recommended to the 34th General Assembly of the United Nations that the Outer Space Conference be held in 1982, - twenty-five years from the date that the first man-made satellite was launched into orbit around the earth.[5] A twenty-fifth anniversary of outer space research and exploration can be made an occasion not only to celebrate the achievements of the past and to discuss current projects and problems, but to forecast and highlight the potential achievements and benefits which can be accomplished in the next twenty-five years!

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[5] *Ibid.*

In projecting into the 21st century, it is well to remember that it was the visionary spirit of our political, scientific and technical leaders that so captured the public imagination and support in the early years of outer space research. It is not too late to accomplish this again. Certainly the space projects of tomorrow, so carefully and persuasively put forward by men like Dr. Peter Glaser[6] and Dr. Gerard K. O'Neil,[7] are the kind of imaginative challenges which can rekindle that spirit. And an outpouring of public support can give courage to political and economic leaders to make decisions to take up these challenges in a realistic time frame.

The second United Nations Conference on Outer Space could be the symbolic rallying point to once again raise our sights and spirits to the "High Frontier" of tomorrow. Even the form of the Conference can reflect this spirit. Rather than the usual earth-bound meetings, let this Conference soar into space by the use of satellites. Delegates to the Outer Space Conference could have the opportunity of being addressed by Heads of States, leading international experts, and people throughout the world because the imaginative use of communication and Direct Broadcast Satellites could truly make this a "World Conference." Even the work of United Nations interpreters and other United nations servicing staff could be dramatized by permitting them to remain in their home base and perform their tasks through orbiting satellites. The importance of other satellites could also be highlighted at the Conference in concrete and dramatic terms. If imaginatively conceived, the Outer Space Conference could become of major interest to the mass media.

This recognition of our future goals could also be reflected in the substance of the Outer Space Conference. There should be place in such a conference for the kind of constructive concepts for international co-operative projects which will take use well into the 21st century. We have just begun our journey into outer space and there is need to be even more daring in our approach to the future. It is well to recognize the potential problems in efforts to institute arrangements in the peaceful uses of outer space which will be of benefit to all Member States regardless of their economic or technological development. But is is also well to recognize that an over emphasis upon finding solutions to every specific detailed problem too often prevents consideration of completely new approaches which would at the outset eliminate many of those specific problems.

In this respect, an examination of international statutory law reveals that it comes about usually as a result of the codification of existing rules which have gained universal acceptance. But most of the rules of international space law have emerged out of an imaginative and innovative effort at international legislation. The body of international lawyers can revive that spirit which led to the rapid formulation of a new body of

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[6]Glaser, The Outlook for Solar Power Satellites, Sunsat Energy Council (Mar. 2, 1979).

[7]G. O'Neill, The High Frontier (1977).

international space law and create the kind of new institutional and legal framework which will permit the world community to continue to move daringly into the universe for the ultimate benefit of all.

There is this opportunity, a second world conference on outer space. While it is a conference of governments, the tone and spirit of the conference will be greatly influenced by the thoughts and words of the many individual international experts who deal with the scientific, technical, legal, political, social and economic aspects of outer space exploration. It can be made into an historic occasion which might well set the spirit and pace of an international programme in outer space for the next twenty-five years. The challenge is to all who believe in the value of outer space research and exploration. The time to take up this challenge is now, as governments begin to plan for the second United Nations Conference on the Exploration and Peaceful Uses of Outer Space. It is well to recall the words of Robert Goddard, the American pioneer of rocketry: "It is difficult to say what is impossible, for the dream of yesterday is the hope of today and the reality of tomorrow."[8]

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[8]R. Goddard, The Ultimate Migration, Manuscript dated Jan. 14, 1918, The Goddard Biblio. Log, Friends of the Goddard Library (Nov. 11, 1972).

WHERE AIR SPACE ENDS AND OUTER SPACE BEGINS

*Stanley B. Rosenfield**

I. *Introduction*

The question of where air space ends and outer space begins has been debated for more than twenty years. Considerable discussion and study of the question were centered at the beginning of the space era, and even predated the flight of Sputnik I. It was the principal subject of a Conference held in The Hague in 1958.[1] Since then substantial progress has been made on agreements concerning outer space. Currently there are four treaties concerning outer space in force, and a fifth, the Moon Treaty, is under consideration.[2] As of January 1, 1979, there were 76 adherences to the Outer Space Treaty, and 73 adherences to the Astronaut Rescue Agreement.[3] These figures indicate not only agreement, but agreement by a substantial portion of the world community.

While these conventions give answers to some of the questions raised concerning the status and use of outer space, no answer has been provided to the basic question of where air space ends and outer space begins. The 1967 Outer Space Treaty made this question more acute, because under the Chicago Convention, each state has complete and exclusive sovereignty over the air space above its territory.[4] Under the Outer Space

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[1]Proc. 1st Colloquium on the Law of Outer Space (1958).

[2]Treaty on Principles Governing the Activities of States in Exploration and Use of Outer Space, including the Moon and other Celestial Bodies, January 27, 1967, 18 U.S.T. 2410, T.I.A.S. 6347, 610 U.N.T.S. 205 (effective October 10, 1967) [hereinafter referred to as Outer Space Treaty]; Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space, 1968, 19 U.S.T. 7570, T.I.A.S. 6599, 672 U.N.T.S. 119, (effective December 3, 1968) [hereinafter referred to as the Rescue Agreement];Convention on the International Liability for Damage Caused by Space Objects, March 29, 1972, 24 U.S.T. 2389, T.I.A.S. 7762, (effective October 9, 1973), hereinafter referred to as International Liability Convention; and, Convention on Registration of Objects Launched into Outer Space, January 14, 1975. T.I.A.S. 8480, (effective September 15, 1976) [hereinafter referred to as the Registration Convention]. The draft Moon Treaty, U.N. GAOR, Supplt. No. 20 (A/34/20), Annex II.

[3]Treaties in Force 241, 333 (1979).

[4]Convention on International Civil Aviation of December 7, 1944 (referred to as Chicago Convention), 15 U.N.T.S. 295, Art. 1.

Treaty, outer space is free for exploration and use by all states,[5] and is not subject to national appropriation by any means.[6]

Thus, the question still remains: Where does sovereign air space end and free outer space begin? As the question has been debated for more than twenty years without reaching a solution, it may well be asked whether there is a solution, or why it is now important. Recent events make it important to reassess the question, and at least determine whether it is now time to reach a decision.

The Soviet Union has recently asked the United Nations to consider its proposal that the line between air space and outer space be established at 100(110) km. above sea level. In addition there are two current events which could put to a test, in a substantive manner, the question of a dividing line. One is the imminent use of the space shuttle, which will provide a vehicle for use in outer space, and which will return to earth in at least somewhat the fashion of an airplane. The second event is the claim of the equatorial states to sovereignty over the geostationary orbit.[7]

II. *Definition of Outer Space*

On March 28, 1979, the USSR proposed that the boundary line between air space and outer space be established at 100 (110) km. and that space objects should have the right to fly through the sovereign air space below 100 (110) km. for the purpose of reaching orbit or returning to earth.[8]

Scholars around the world have offered a wide variety of definitions of outer space based on a horizontal line drawn anywhere from a few hundred thousand feet above the earth to several thousands of miles. Each is justified by some scientific evidence. One of the most common bases is the limitation of the earth's atmosphere or air.

Space has been defined as the point of the universe lying outside the limits of the earth's atmosphere.[9] The difficulty with this terminology is agreeing to the limits of the earth's atmosphere. A variety of heights ranging from 30 miles to several hundred or several thousand miles, each purportedly based on the limit of the atmosphere, or lack

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[5]Outer Space Treaty, Art. I.

[6]*Id.*, Art. II.

[7]That point, approximately 22, 300 miles above the earth, at which an object in orbit will remain over the same relatively fixed spot on earth as the earth rotates on its axis.

[8]U.N. Doc. A/AC. 105/C.2/L. at 121 (March 28, 1979).

[9]N.A.S.A., Dictionary of Technical Terms for Aerospace Use 258 (1st ed., 1965).

thereof, have been proposed, indicating the difficulty of a definition merely based on height.[10]

Another approach was that taken by ICAO[11] which defined air space as "only that space in which an aircraft can operate," while it defined an aircraft as "any machine that can derive a support in that atmosphere from the reaction of the air other than the reaction of the air surface."[12] This definition has the same problem as many of the other definitions in that it is subject to change, as the state of aerospace art advances.[13]

One of the most complete reviews of the literature suggests that spatial approaches may be grouped into nine separate categories, with each category having an infinite number of variations.[14] These categories include:

1. The line based upon the concept of atmosphere, which has already been noted.[15]

2. A line based on the division of the atmosphere into four layers, the troposphere, the stratosphere, the mesophere and the ionosphere. Each division has its own scientific characteristics and each has given rise to a variety of different proposals, ranging from 31 miles above the earth to as high as 500 miles.[16]

3. The ICAO theory previously noted, based on the maximum altitude of aircraft flight.[17]

4. The von Kármán line, by which the line would be established at the point where aerodynamic lift yields to centrifugal force, which would put the line at approximately 275,000 feet.[18]

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[10]Lipson and Katzenbach, Report to National Aeronautics and Space Administration on the Law of Outer Space, 14 (1961).

[11]The International Civil Aviation Organization.

[12]Chicago Convention, Annex 7.

[13]An example is the X-15 experimental aircraft of the United States which has been flown at heights in excess of 60 miles. Its pilots have received astronaut wings for piloting it at 50 miles, the altitude administratively established as the basis for qualifying for such. NASA, F light Research Center Release 2-66 (Feb. 7, 1966).

[14]U.N. Doc. A/AC.105/C.2/7 (May 7, 1970).

[15]*Id.* at 36.

[16]*Id.* at 37.

[17]*Id.* at 40.

[18]*Id.* at 43.

5. The line based on the lowest perigee of an orbiting satellite. This is based on the fact that when the earth's atmosphere is too dense, an artificial satellite cannot remain in orbit.[19]

6. The line based on the point where the gravitational pull of the earth ceases. This theory arises from the basic assumption that for state security, the extent of sovereignty should extend beyond the point from which any object may be dropped.[20]

7. The line between sovereign air space and outer space should be drawn at the limit of the underlying state's capacity to effectively apply its authority. This would provide a different limit on sovereign air space for different states.[21]

8. The zonal theory under which air space would be divided into sovereign air space, based upon either the height at which aircraft can operate or some other line of demarcation; a contiguous zone, through which all non-military flights would have a right of free passage; and all that above contiguous space which would be free space.[22]

9. Drawing the line between air space and outer space by a combination of one or more of the previously mentioned proposals.[23]

The major problem with all of these approaches is that no one proposal sets a defined, unchanging line, and each is subject to change with advancing science.

While there has been no general agreement, the closest to an agreement would probably be the resolution passed by the International Law Association in 1968.[24] This resolution provided that the term outer space should be interpreted to include all space at and above the lowest perigee achieved by January 27, 1967, when the Outer Space Treaty was opened for signature. At the same time, this resolution kept open the question of whether it might later be determined that the perigee might be reduced at a later time.[25] This is subject to considerable support on the basis that states accept

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[19] *Id.* at 45.

[20] *Id.* at 48.

[21] *Id.* at 49.

[22] *Id.* at 52.

[23] *Id.* at 54.

[24] 53 ILA Conference Proc., xxii (1968).

[25] *Id.*

artificial satellites orbiting around the earth as being in outer space, and to accept a higher limit would require excluding from outer space, a significant portion of activity currently taking place.

A major problem with the Soviet proposal is the lack of consensus. The basic reason that no agreement has been reached during the more than 20 years of discussion is the failure of any proposal to receive acceptance by any substantial number of states. Is there some critical function currently under consideration which would make the Soviet proposal, or any proposed definition more attractive today? The answer must be in the negative. However, the claim to the geostationary orbit and the flight of the space shuttle are the types of activity that could eventually make a definition of outer space acute.

III. *Geostationary Orbit*

On December 3, 1976, the Declaration of Bogota was issued by the equatorial states of the world,[26] declaring the geostationary orbit, 22,300 miles above the earth, to be part of the sovereign territory of the state whose territory is below on earth.[27] The scientific basis for such declaration was that

> The geostationary synchronous orbit is a physical fact linked to the reality of our planet because its existence depends exclusively on its relation to gravitational phenomena generated by the earth. . .[28]

The legal bases of such claim are two-fold. First, the 1967 Outer Space Treaty does not define outer space. The geostationary orbit is not specifically included in outer space, and therefore, there is nothing in the Outer Space Treaty to prevent the geostationary orbit from being private property. Secondly, it is argued that when the 1967 Outer Space Treaty was enacted, the equatorial states

> could not count on adequate scientific advice and were thus not able to observe and evaluate the omissions, contradictions and consequences of the proposals which were prepared with great ability by the industrialized powers for their own benefit.[29]

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[26]Those states of the world traversed by the equator.

[27]Signatories were: Colombia, Congo, Equador, Indonesia, Kenya, Uganda and Zaire. In addition, Brazil was present as an observer.

[28]Declaration of Bogota, December 3, 1976. For a text, see 6 J. Space L. 169 (1978).

[29]*Id.* par. 4. Brazil, Equador and Uganda are parties to the Outer Space Treaty. Colombia, Congo, Indonesia, Kenya and Zaire have not ratified this treaty.

In regard to the scientific basis for such claim, it has been noted that gravity is not the exclusive force acting on a satellite in geostationary orbit.[30] The geosynchronous orbit, like all other orbits, involves continuous motion around the earth. While a satellite in such orbit appears to be relatively stationary, in fact it is not so. The satellite's path through space is affected by a combination of factors, including the energy imparted by the launch vehicle, the mass of the spacecraft, the attitude at which it moves above the earth, the forces of gravity of the earth, the moon and the sun, and the radiation pressure of the sun. A geosynchronous orbit can be maintained by a satellite only with constant monitoring and adjustment to maintain its position. There is clear scientific basis for recognizing that this orbit derives its main characteristics from the properties of the entire earth, without regard to national or political boundaries.[31]

There can be no validity in a claim based on the law of gravity, since it is the gravity of the whole earth which keeps satellites in orbit, and any attempt to subdivide gravity would be scientifically absurd.[32] No non-equatorial states have supported the claim of the equatorial states.

The answer to the legal claim is no less clear than the answer to the scientific claim. The legal space of the geostationary orbit is inseparable from outer space and is covered by all relevant provisions of the 1967 Outer Space Treaty. Under the 1967 Treaty, the geostationary orbit, like outer space as a whole, was exempted from national appropriation by any means whatsoever.[33] The weakness of the equatorial states legal position is emphasized by Brazil, itself an equatorial state, which, while it attended the Bogota Meeting as an observer, has refused to adopt the equatorial states position.[34]

If no definition of outer space has been agreed upon by the states of the world, why cannot the geostationary orbit, that area 22,300 miles from the earth, be excluded from outer space? While the exact scope of outer space, its precise limits and the point of its beginning, have not been agreed upon, there is general agreement that certain things, such as the flight of a commercial aircraft, are in air space, and certain other things, such as a space vehicle in orbit around the earth, are in outer space. Such agreements do not require definition of the point at which air space ends and outer space begins. It is only the definition which causes disagreement among states of the world.

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[30]U.N. Doc. A/AC.105/C.2/SR.281, at 2 (April 6, 1977)

[31]*Id.*

[32]U.N. Doc. A/AC.105/C.2/SR.269, at 9 (March 17, 1977)

[33]U.N. Doc. A/AC.105/C.2/SR.281, p. 6 (April 6, 1977). Statement of the representative of the U.S.S.R. *See also,* statements of representatives of Canada and Australia, p. 5; Statements of Sweden, Japan and Federal Republic of Germany, p. 7.

[34]*Id.* at 7.

While there is no agreement on the height at which airspace ends and outer space begins, the foregoing discussion indicates that there does seem to be substantial agreement that outer space begins somewhere less than 22,300 miles from earth. The legal status of the geostationary orbit at the current stage of development of space technology and space law should be governed by the principle that geostationary orbit is inseparable from outer space, and is covered by all relevant provisions of the 1967 Outer Space Treaty.[35] Furthermore, regardless of the definition of outer space, the geostationary orbit would be included within the term outer space.[36]

The effect of accepting the proposal of the equatorial states would be to have a sea of private property in the middle of outer space. The alternative would be that outer space would not begin less than 22,300 miles from earth. The vast majority of states would not accept such a proposition. It would open the door to claims of sovereignty over the area in which a large majority of the space missions have been made to the present time. This is not a principle that could or would be accepted by the vast majority of states.

There is no unanimity or even general agreement on where air space ends and outer space begins. Nevertheless, there is general agreement that the geostationary orbit, 22,300 miles from earth, is within the limit of outer space.

One further question might be asked. If a line separating air space from outer space had been drawn previous to the claim of the equatorial states, whether such would have affected the claim of equatorial states. Based on the reasoning of these states the answer to this question would be no. If these equatorial states were not aware of the scientific implications of the treaty when it was entered into, and this were in fact a valid basis for their present claim, then whether a specific point were defined in this treaty or at a later date, would make no difference to their claim.

The original question was whether the claim of the equatorial states would require a definition of where air space ends and outer space begins. The answer is in the negative. As there is general agreement that the geostationary orbit is within outer space, regardless of what the definition of outer space may be, this claim would make no critical demand for such a definition.

IV. *The Space Shuttle*

On September 13, 1977, the United States space shuttle orbiter Enterprise was released from the back of a 747 for the second time, and approximately five minutes

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[35]U.N. Doc. A/AC.105/C.2/SR.281, at 5 (April 6, 1977). Statement of representatives of U.S.S.R. *See also,* statements of representatives of Canada and Australia. *Ibid.*

[36]*Id.* at 7, statements of the representatives of Japan and the Federal Republic of Germany.

later, under the manual control of an American astronaut, touched down on a dry lake bed in California. The ultimate test will come when Orbiter 102 is sent into space, followed by the first manned orbiter flight and landing on Earth. This was originally scheduled for the fall of 1979, but delays have pushed this date into 1980. The major advance the space shuttle offers over previous space shots is that it can be controlled by the pilot in a limited fashion and guided back to Earth. While it does not have the control and discretion of an aircraft, it will be a considerable advance over previous manned space capsules which had no manual control in the earth's atmosphere.

Does the orbiter operation in somewhat the fashion of an aircraft require as an imperative, a definition of where air space ends and outer space begins? While the questions raised by the space shuttle are entirely different from those involved with the geostationary orbit, they both present problems relating to the definition of outer space which have not previously been answered. The space shuttle raises the question of whether the limited ability to control such craft is sufficiently novel to require a definition of when such craft is in free outer space and when it is in airspace, subject to the limitations of the sovereign state through whose territory it is passing.

Such inquiry requires examination of the current treaties relating to outer space. The first convention in time was the 1967 Outer Space Treaty [37] which has become the constitution for outer space. It is the foundation by which all activity in outer space is governed. It declares that outer space will be free for exploration and use by all states,[38] and that outer space shall not be subject to appropriation or claim of sovereignty.[39] Once outer space is reached, rules of conduct are set out but nowhere in the treaty is a clue given to when outer space is reached. Where air space ends and outer space begins is omitted, but once outer space is reached, this treaty becomes effective.

The next outer space treaty is the Rescue Agreement.[40] This convention recites as its purpose the rendering of aid to astronauts in the event of distress or emergency, without reference to the place where such emergency may occur.[41] The convention applies to distress in the territory of a contracting party, on the high seas, or any other place not within a state's jurisdiction.[42] The convention is based on the desire to promote aid in the peaceful exploration and use of outer space. There is no requirement that the distress occur in outer space. The purpose is to provide protection to an astronaut who

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[37]Outer Space Treaty, *supra* note 2.

[38]*Id.* Art. I.

[39]*Id.* Art. II.

[40]Rescue Agreement, *supra* note 2.

[41]*Id.* Preamble.

[42]*Id.* Art. I.

does not land in the territory of the launching state. It is based on the provision of the Outer Space Treaty making all astronauts "envoys of mankind in outer space",[43] which entitles them to special treatment in the case of distress, regardless of where such distress occurs. A definition of the line between air space and outer space is unnecessary to the operation of this treaty.

The International Liability Convention,[44] provides that a state launching a space object shall be liable for damages caused by such space object. The launching state is liable whether damage occurs on the surface of the Earth, to aircraft in flight,[45] or elsewhere than on the Earth's surface, to a space object, or to persons or property on board the space object of another state.[46]

The Liability Convention applies to damage to property or injury or death to persons, caused by a space object, regardless of where damage or injury occurred. The obligations of this convention are equally applicable to an aborted space shot which never left air space; the damage caused while proceeding through air space; the damage caused while in outer space; or, the damage on Earth while returning from a space mission. The basis of liability is that the damages or injury is caused by a space object.[47] The launching state[48] or states[49] bears the liability.[50] Thus, it is similar to the Rescue Agreement in that neither depends on a definition of outer space or a determination of air space or outer space for its operation.

Two recent examples of the application of the Liability Convention would include the Soviet Cosmos 954 satellite which landed in Canada in January, 1978, and the United States Skylab which landed in Australia in July, 1979. Both the Soviet Union and the United States are parties to this Convention and both states have acknowledged liability for damages caused by these incidents under this Convention.

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[43]Outer Space Treaty, Art. V.

[44]International Liability Convention, *supra* note 2.

[45]*Id.* Art. II.

[46]*Id.* Art. III.

[47]*Id.* Art. I(d).

[48]*Id.* Art. I(c).

[49]*Id.* Art. V.

[50]*Id.* Arts. II, V.

The final treaty relating to outer space is the Registration Treaty which went into force in 1976.[51] This convention requires registration of any object launched into "Earth orbit or beyond."[52] It does not regulate activity of space objects. Its purpose is to provide information on Earth regarding activity in outer space. While such treaty would be applicable to the space shuttle, it would not require a definition of outer space.

None of these treaties relating to outer space requires a definition of where air space ends and outer space begins. With the exception of the Outer Space treaty, each is based on the purpose of the regulation rather than on the place where such activity takes place.

The treaties are not inclusive of all possible needs, however. There are two possible areas, neither specifically covered by these treaties, which could require definition of outer space in relation to the space shuttle. The first would be the right to use sovereign air space to reach outer space. This problem is no more acute with the space shuttle than with any other space vehicle. It is likely that the space shuttle will be the forerunner of completely maneuverable craft which will pose the legal problems of both aircraft and spacecraft. But such craft are not yet available. Until such time, the problem will only be one of transit to and from outer space. Even this problem has not previously arisen, because to date, launching states have been able to utilize their own territory or the high seas for launching and recovery of space craft. This may change when the space shuttle, or some other type of vehicle, becomes available to other than the largest and most scientifically sophisticated states of the world.

When we reach such point, will it then be necessary to require a determination of where air space ends and outer space begins? Undoubtedly, some limitation would be necessary, simply from a point of safety to avoid the same course at exactly the same time as that of a craft from another state. What will be required will be the right of such state to take off to and return from outer space. The needs of such state will be similar to the needs of a landlocked nation to access to the oceans of the earth. It is submitted, however, that such need would not require drawing a distinction between sovereign air space and free outer space. The needs of the launching state would be within that area clearly defined as sovereign air space.

The second area of possible concern is state security. Security is given as the principal reason for requiring a definitive point where sovereign air space ends and outer space begins. Certainly no state must countenance hostile foreign aircraft or spacecraft in its air space. There is nothing about the present space shuttle to pose a greater security threat than any other spacecraft. Even if the space shuttle had the maneuverability of an aircraft it would still be necessary to ask the height which would be sufficient to protect a state's sovereignty. Would a determination that sovereign air space ends at a specific point, no matter what that point might be, protect the security of a state?.

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[51]Registration Convention, *supra* note 2.

[52]*Id.* Art. II(1).

The current laws of air space guarantee sovereignty of air space to the height ordinary aircraft fly. What greater height is necessary to a state's protection? As science advances, the question may become critical. The main concern of a state must be either surveillance or attack. As science is refined, the exact height of operation becomes less critical. Today, better surveillance can be obtained from craft in outer space than could be obtained by aircraft at considerably lower altitudes just a few years ago. Merely setting a high outer limit to air space would be little advantage to the security of the state if other states could accomplish the same results from outer space. Every state is entitled to be secure on both its horizontal and vertical borders. Nevertheless, it does not appear that under the current state of development of the space shuttle, a definition of where sovereign airspace ends and outer space begins will increase such security.

V. *Conclusion*

After more than 20 years of ever increasing space activity there is still no requirement for a specific line distinguishing air space from outer space. No problem raised in the past, nor the current problems relating to the claim to the geostationary orbit or the space shuttle make imperative an immediate definition. The Soviet proposal to define outer space as above 100 (110) km. above sea level does not present a problem without solution for lack of a definition. Neither are there any current problems that lack solution for failure of a definition of where air space ends and outer space begins. The Soviet proposal is premature.

After more than twenty years of ever-increasing space activity, there is still no necessity for a specific line distinguishing air space from outer space. The future may be otherwise, but to date, the states of the world have avoided putting a precise definition on where air space ends and outer space begins. Because of the current state of the art, any such line would be indefinite. In addition, once a definition is agreed upon, it will be as difficult to change such definition as it was to develop. Yet, future advances in science may point the way toward a simple and relatively easily identified line. At the same time, problems to date have been shown capable of solution without a definite line between air and space.

Solutions without a definitive line have been aided by the language of the treaties currently in force. No treaty has attempted to define where sovereign air space ends and free outer space begins. Either the subject has been avoided entirely, as in the case of the Outer Space Treaty of 1967, or a different approach is adopted. The approach adopted has been the functional approach, based on the purpose of the activity, rather than where it takes place.

In the Rescue Agreement the purpose is defined as rendering aid to astronauts in the event of distress or emergency, without reference to where the incident took place. The Convention will apply, assuming it involves an astronaut or an object launched into outer space, whether such distress occurs in the territory of a contracting party, on the

high seas, or in any other place not within a state's jurisdiction.[53] The same approach is taken in the Liability Convention, which provides for the liability of a launching state for any damage caused, whether such damage occurs on the surface of the earth or to aircraft in flight, or in outer space.[54] If a space object is involved, it is not a question of where the damage took place, but that it took place. The activity is connected with outer space, yet a definition of where outer space begins is not required.

The acceptance to date of this functional approach does not prevent a different approach in the future. It does suggest that this approach is currently being successfully used and should be continued so long as it is of value. Future advances such as the space shuttle, may require a definition of the line between sovereign air space and outer space, but such line should not be arbitrarily drawn when it will regulate that which is today unknown and which cannot today be foreseen.

A definition of the geographic point where sovereign air space ends and free outer space begins may never need to be developed. If the need should arise, there must be, either a clearly defined scientific point upon which the states of the world can agree, or a specific problem that needs solution and which cannot be solved except through such a definition. When either of these conditions may arise cannot be predicted. However, it is clear that neither situation is present today.

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[53]Rescue Agreement, *supra* n. 2, Art. 1.

[54]International Liability Convention, *supra* note 2, Arts. II, III.

REPORT OF THE COMMITTEE ON THE PEACEFUL USES OF OUTER SPACE RECOMMENDATIONS AND DECISIONS*

A. Applications of space science and technology and activities in outer space

1. Remote sensing of the earth by satellites

17. The Committee noted with satisfaction that the Scientific and Technical Sub-Committee, in accordance with the recommendation of the Committee endorsed by the General Assembly in resolution 33/16, gave priority to the consideration of questions relating to remote sensing of the earth by satellites. The Committee also noted that the Sub-Committee had continued to consider both the current pre-operational/experimental phase of remote sensing and possible future operational satellite remote sensing systems. In this connexion, the Committee took note of the various systems in operation or planned, as described in the report of the Sub-Committee (A/AC.105/238, annex I, paras. 50-73).

18. The Committee noted in particular that the Sub-Committee had continued its consideration of questions relating to a proposal for classifying remote sensing data. The Committee noted in this connexion that in accordance with a recommendation made by it at its last session the Secretariat had prepared a report with the assistance of the Committee on Space Research (COSPAR) entitled "Characteristics and capabilities of sensors for earth resources surveys" (A/AC.105/204/Add.1), with a view to facilitating the discussions of the Sub-Committee concerning the classification and dissemination of data.

19. The Committee also took note of the varying views expressed by delegations concerning the need and method of classifying remote sensing data as reported in the Sub-Committee's report.

20. The Committee, noting the view of the Sub-Committee that it was not in a position at its last session to agree upon the need for classification of data nor the manner in which such classification might be made, agreed with the suggestion of the Sub-Committee that the work in this field could be continued. The purpose of such work would be to gather relevant information to relate different classes of data with various applications as well as to elaborate further on the relationship of system characteristics, spatial resolution, instantaneous field of view, modulation transfer functions and the new concept of effective resolution element. The Committee

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*Taken from UNGAOR, 34th Sess., Supplt. 20 (A/34/20), pp. 5-12, 25-41 (1979).

requested therefore that the Secretariat submit supplemental studies thereon to the Sub-Committee for consideration at its next session as requested by it (A/AC.105/238, annex I, paras. 10 and 11).

21. The Committee took note of the various views expressed on the subject of dissemination of data by both the Scientific and Technical and the Legal Sub-Committees (A/AC.105/238, annex I, paras. 12-15, and A/AC.105/240, annex I, para. 17).

22. The Committee noted that its Scientific and Technical Sub-Committee had, for a number of years, considered the extent to which the United Nations could play a co-ordinating role in future operational remote sensing systems, promoting further international co-operation in the field of remote sensing.

23. The Committee recalled in this connexion that in the last few years it had devoted particular attention to the possibility of co-ordination of activities on remote sensing by the United Nations through a panel of experts in that field and noted that, with a view to facilitating the work of the Committee, the Secretariat had prepared several reports and solicited the views of Member States on the question.

24. The Committee noted that having further discussed the matter in the light of the divergent views of Member States, the Scientific and Technical Sub-Committee had concluded that it was not in a position to recommend the establishment of the proposed panel at this time and that the Sub-Committee urged those nations or agencies operating or planning ground or space segments of satellite remote sensing systems to continue and expand the co-operation and co-ordination of their activities. The Committee also noted that Member States were urged to inform the Secretariat of any changes in their views on the question of the panel so that those views could be brought to the attention of the Sub-Committee at future sessions.

25. The Committee endorsed the view of the Scientific and Technical Sub-Committee that remote sensing from outer space should be carried out with the greatest possible international co-operation and participation. In this context, the need to provide assistance to developing countries was recognized. It was also recognized that the United Nations, through its Space Applications Programme and the Remote Sensing Centres of FAO and CNRET and other interested agencies, could play an important role in providing such assistance.

26. The Committee further noted that the principal focus of the activities of the Scientific and Technical Sub-Committee over the past few years had been the problems of the transfer of remote sensing technology to the developing countries and that it had endorsed the suggestion of the Sub-Committee that it begin to focus its attention on developing a comprehensive catalogue of the applications of remote sensing, with particular emphasis upon those in the developing countries. In this connexion, the Committee endorsed the recommendation of the Sub-Committee that the Secretariat undertake action towards the preparation of such a catalogue, as requested by the Sub-Committee (A/AC.105/238, annex I, paras. 29 and 30).

27. With respect to education and training, the Committee noted the importance of providing adequate training facilities, including on-site training in all aspects of remote sensing, particularly to the developing countries, to enable them to derive the maximum benefit from this new technology. The Committee also noted with appreciation that several Member States, specialized agencies and international organizations were conducting several educational and training programmes relating to remote sensing activities (A/AC.105/238, paras. 22-31). It particularly noted the contribution being made through the United Nations Space Applications Programme, the FAO Remote Sensing Centre, the Centre in CNRET, as well as programmes carried out within WMO, the United Nationl Environment Programme (UNEP) and ESA.

28. The Committee endorsed the recommendation of the Scientific and Technical Sub-Committee that the Remote Sensing Centre in Cairo, one of the five institutions recommended by the Economic Commission for Africa (ECA) as regional training and user assistance centres serving Africa, and the four other African international remote sensing centres should receive from the United Nations the technical assistance and co-operation which could be made available for such a purpose.

29. The Committee noted with appreciation the offer made by Argentina to make its CELPA Centre at Mar del Plata available as a regional centre for research and training in remote sensing.

30. The Committee noted that the Legal Sub-Committee, in continuing its detailed consideration of legal implications of remote sensing of the earth from space, had through its Working Group III carried out a principle-by-principle reading of the draft principles formulated by the Working Group to date. The Committee noted however that several key issues remained to be agreed upon before the draft principles could be finalized. Having heard the views of Member States on the outstanding issues, the Committee recommended that the Legal Sub-Committee should continue, on the basis of priority, to give detailed consideration to the legal implications of remote sensing of the earth from space, with the aim of formulating draft principles relating to remote sensing.

2. Direct television broadcasting by satellites

31. The Committee noted that the Legal Sub-Committee, in accordance with General Assembly resolution 33/16, had given priority consideration to the elaboration of draft principles governing the use by States of artificial earth satellites for direct television broadcasting.

32. The Committee in particular noted that the Sub-Committee, through its Working Group II, had carried out a principle-by-principle reading of the draft principles formulated thus far. The Committee noted, however, that the Sub-Committee was once more unable to finalize the text.

33. The Committee further noted the recommendation of the Legal Sub-Committee that its present body, while considering the question of direct television broadcasting at the present session, should also consider whether the elaboration of draft principles on this subject could be concluded, or whether further progress could be achieved during this session.

34. The Committee, having heard the views of its members on the outstanding issues, recommended that the Legal Sub-Committee at its next session continue, as a matter of priority, its efforts to consider the elaboration of principles governing the use by States of artificial earth satellites for direct television broadcasting in accordance with General Assembly resolution 33/16 and previous Assembly resolutions relating to this item.

3. Definition and/or delimitation of outer space and outer space activities bearing in mind, inter alia, questions relating to the geostationary orbit

35. The Committee noted that the Legal Sub-Committee, in accordance with General Assembly resolution 33/16, had continued to discuss matters relating to the definition and/or delimitation of outer space and outer space activities, bearing in mind, *inter alia,* questions relating to the geostationary orbit. The Committee noted, in this respect, that there was a variety of views on this matter, as reflected in the report of the Legal Sub-Committee (A/AC.105/240, paras. 39-47).

36. The Committee noted, in particular, the proposal made by the Union of Soviet Socialist Republics in the Legal Sub-Committee with regard to the establishment of a conventional boundary for air space and outer space not higher than 100 to 110 kilometres above sea level. Also on this topic, a variety of views was expressed in the Legal Sub-Committee, as reflected in its report.

37. At the current session, the Committee had an exchange of views on the subject and while some delegations expressed support for the idea of establishing a boundary between outer space and air space not higher than 100 to 110 kilometres above sea level, other delegations expressed reservations as to the need to establish a specific boundary. The representative of ICAO made a statement reflecting the interest of ICAO in this area and offered, if requested by the Committee, to undertake relevant studies.

38. With regard to the question of geostationary orbit, some delegations from equatorial countries expressed the view that they have sovereign rights over the segment of the geostationary orbit above their territories, and pointed out that in delimiting outer space, account should be taken of the *sui generis* nature of that orbit. Other delegations expressed the need for establishing a special regime to govern the utilization of the geostationary orbit. Some other delegations expressed the view that there is no need for the establishment of a regime for the utilization of the geostationary orbit. Still other delegations expressed the view that the provisions of the outer space treaty are applicable to the geostationary orbit which is inseparable from outer space. Some

delegations, while expressing their reservations over any claims of sovereignty over the orbit, recognized the need for national and equitable consideration of the rights of all States to utilize the benefits of the orbit.

39. During the course of the Committee's current session, a working paper (A/AC.105/L.112) was submitted by the Union of Soviet Socialist Republics and supported by some delegations, proposing draft provisions for a General Assembly resolution on the delimitation of air space and outer space and on the legal status of the geostationary orbital space of satellites.

4. Space transportation systems and their implications for future activities in space

40. The Committee noted that, in accordance with General Assembly resolution 33/16, the Scientific and Technical Sub-Committee had considered the item relating to space transportation systems as one of the priority items at its sixteenth session.

41. The Committee endorsed the recommendation in paragraph 61 of the report of the Scientific and Technical Sub-Committee which requested the Secretariat to prepare a study on the progress being made in the space transportation systems and their scientific, technical, economic and social implications, after obtaining the views of Member States and relevant international organizations on this question.

42. The Committee also requested the Secretariat to prepare a bibliography of the literature on activities that might be carried out using space platforms, including industrial activities, in the next few decades.

43. A view was expressed that it would be necessary to elaborate legal principles on the use of space transportation systems bearing in mind, *inter alia,* the prohibition of removal from orbit of space objects from foreign States without their prior consent, as well as the elaboration of rules of passage of such systems above the territories of foreign States after the first stage of launching. Another view was also expressed that these questions relate to all space transportation systems whether reusable or not and that if any future discussions were to take place on the matter, they should be on that basis.

5. Use of nuclear power sources in outer space

44. The Committee noted that the Scientific and Technical Sub-Committee, in accordance with paragraph 8 of General Assembly resolution 33/16, had established a working group of experts of all its members in order to consider the technical aspects and safety measures relating to the use of nuclear power sources in outer space. The Committee noted that the Scientific and Technical Sub-Committee had adopted the report of the Working Group on the Use of Nuclear Power Sources in Outer Space as contained in annex II of the report of the Sub-Committee.

45. The Committee also noted the conclusion of the Working Group that nuclear power sources can be used safely in outer space, provided the safety considerations outlined in paragraphs 13, 14 and 15 of the Working Group's report are met in full. The Committee also noted the other conclusion of the Working Group as stated in paragraph 39 of its report (A/AC.105/238, annex II).

46. The Committee also noted that the Working Group had agreed that in order to assist its future work further studies should be made on the following subject areas:

(1) Elaboration of an inventory of the safety problems involved in the use of nuclear power sources in outer space;

(2) Implementation of the International Commission for Radiation Protection (ICRP) recommendations for populations and the environment in the context of space vehicles utilizing nuclear power sources;

(3) Evaluation of existing methods in understanding orbital mechanics to determine if improvements may be made in predicting re-entry phenomena;

(4) Definition of technical considerations with regard to a format for notification.

47. In this connexion the Committee endorsed the request of the Working Group that interested Member States and international agencies should contribute studies on technical aspects and safety measures of nuclear power sources in outer space, including those which have been identified by the Working Group as requiring further examination.

48. The Committee further endorsed the request made to the Secretariat to collate and summarize those studies submitted on the question so that this material could be circulated to members of the Working Group in advance of its next session.

49. In this connexion, the Committee noted that informal consultations of interested members of the Working Group would be held in December 1979 at the latest at Geneva in order to facilitate the task of collating and summarizing the studies submitted to the Working Group.

50. The Committee also endorsed the recommendation contained in paragraph 41 of the Working Group's report that arrangements should be made for the Working Group of experts to meet for one week during the seventeenth session of the Scientific and Technical Sub-Committee.

51. The Committee noted the recommendation of the Legal Sub-Committee contained in paragraph 52 of its report and decided to recommend that the Legal Sub-Committee should include in its agenda for the nineteenth session an item entitled "Review of existing international law relevant to outer space activities with a view to determining the appropriateness of supplementing such law with provisions relating to the uses of nuclear power sources in outer space".

52. The Committee decided to recommend that, in connexion with the agenda item set forth in paragraph 51, the Secretary-General should invite Member States to submit their views concerning existing international law relevant to outer space activities. Such views should be received no later than 15 December 1979, in order that they may be compiled and circulated to Member States no later than 15 February 1980.

6. Examination of the physical nature and technical attributes of the geostationary orbit

53. The Committee noted that, in accordance with General Assembly resolution 33/16, the Scientific and Technical Sub- Committee had dealt with the examination of the physical nature and technical attributes of the geostationary orbit.

54. The Committee endorsed the Sub-Committee's recommendation that the study prepared by the Secretariat on the subject (A/AC.105/203 and Add. 1-2) should be further brought up to date when necessary; that an informative paper on the dynamics of the population of satellites should be prepared; and that a study should be undertaken on the most efficient and economic means of using that orbit with a view to assessing its wider use, particularly by developing countries. In connexion with this last study, the Committee noted that the Secretariat would have to ask for additional financial resources to comply with this request.

7. Draft treaty relating to the moon

55. The Committee took note of the work done by the Legal Sub- Committee in accordance with General Assembly resolution 33/16 in its effort to complete the examination of the text of the draft treaty relating to the moon. The Committee also noted that Working Group I of the Sub-Committee had based its discussions on the text of a tentative draft agreement elaborated through informal consultations by the delegation of Austria and that at its eighteenth session an article-by-article reading of this text had taken place.

56. The Committee further noted the recommendation of the Legal Sub-Committee that its parent body, while considering the question of the draft treaty relating to the moon at its current session, should also consider whether the elaboration of a draft treaty could be concluded, or whether progress could be achieved during that session.

57. The Committee established an informal working group of the whole under the chairmanship of Mr. Gyula K. Szelei (Hungary) to consider the matter. The Working Group held four meetings between 26 June and 3 July 1979.

58. The Committee, through the Working Group, considered the compromise text proposed by Austria, which was annexed to the last report of the Committee,[2] with a view to finding a consensus on that text. The Working Group also had before it the text reflecting the outcome of the review at the eighteenth session of the Legal Sub-Committee (A/AC.105/240, annex II, appendix A).

59. During the course of the discussions, several proposals were made to amend the Austrian text.

60. After informal consultations among members on the main outstanding issue, a suggestion was made that article XI, paragraph 1, in the Austrian text should be amended to read:

> "The moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this agreement and, in particular, in paragraph 5 of this article."

This proposal was adopted and article XI, paragraph 1, was amended accordingly.

61. Several further suggestions were made and amendments were agreed upon to article XI, paragraph 7; article XV, paragraph 1; and article XIX. It was also agreed that the title should remain as proposed in the Austrian text.

62. Several suggestions were made to amend article I, paragraph 1. However, after an extensive discussion of the matter, it was agreed not to amend the Austrian text but to include in the report of the Committee a statement reflecting the Committee's understanding of the interpretation that should be given to article I, paragraph 1. That understanding is as follows:

> "The Committee agreed that by virtue of article I, paragraph 1, the principle contained in article XI, paragraph 1, would also apply to celestial bodies in the solar system other than the earth and to its natural resources."

63. Following a suggestion for clarification of article I, paragraph 2, the Committee agreed that the trajectories and orbits mentioned in article I, paragraph 2, do not include trajectories and orbits of space objects in earth orbits only and trajectories of space objects between the earth and such orbits.

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[2] *Official Records of the General Assembly, Thirty-third Session, Supplement No. 20* (A/33/20), annex II.

64. With respect to article VII of the Austrian text which refers to the avoidance of harmful contamination of the moon and its environment, it was suggested to introduce a reference to "especially nuclear material". After an extensive discussion, it was agreed that the Austrian text should remain as drafted.

65. Following a suggestion for further clarification of article VII, the Committee agreed that article VII is not intended to result in prohibiting the exploitation of natural resources which may be found on celestial bodies other than the earth but, rather, that such exploitation will be carried out in such a manner as to minimize any disruption or adverse effects to the existing balance of the environment.

66. The Committee, having thus completed its work on this item, decided to submit, to the General Assembly at its thirty-fourth session, for consideration, final adoption and opening for signature, the draft agreement governing the activities of States on the moon and other celestial bodies, the text of which is annexed (annex II).

B. Program and activities of the United Nations relating to outer space

1. United Nations programme on space applications

67. The Committee noted that the United Nations programme on space applications, as set out in section II of the report of the Scientific and Technical Sub-Committee, had been implemented satisfactorily, and it commended the work of the expert on space applications who had carried out the programme although the funds available to it were limited.

68. The Committee endorsed the United Nations programme on space applications for 1980, as proposed to the Scientific and Technical Sub-Committee by the expert in his report (A/AC.105/233, paras. 21-25), together with its financial implications as provided for in document A/AC.105/L.105. It noted that the view had been expressed that the programme should be extended in both its content and its scope if it were better to respond to the needs of and be of more value to the developing countries.

69. The Committee expressed its appreciation to the Government of the Philippines for hosting and to the Environment Research Institute of Michigan, United States for organizing an international seminar on the benefits of remote sensing for national development, held at Manila from 17 to 19 April 1978; to the Government of Italy and FAO for conducting the third and fourth international training courses on the application of remote sensing, from 15 May to 2 June 1978 and from 14 May to 1 June 1979 respectively; to the Government of Sweden for supporting and to the Government of Kenya for hosting a United Nations training seminar on remote sensing applications co-sponsored by UNEP, held at Nairobi from 4 to 16 September 1978 for the benefit of ECA countries; to the Government of Brazil for having hosted a United Nations regional seminar on the use of satellite technology for disaster applications, co-

sponsored by the Office of the United Nations Disaster Relief Co-ordinator (UNDRO) and UNESCO, from 2 to 11 October 1978 at Sao Jose dos Campos; to the Government of India for hosting and organizing the United Nations/FAO training seminar on remote sensing applications for agricultural resources from 6 to 24 November 1978 for countries in the Economic and Social Commission for Asia and the Pacific (ESCAP) and the Economic Commission for Western Asia (ECWA) regions; to the Government of Japan for hosting a United Nations/WMO training seminar on the uses of meteorological satellites, held in Tokyo from 23 October to 2 November 1978 for the benefit of countries in the ESCAP and Far East regions.

70. The Committee noted with appreciation that a joint United Nations/FAO regional seminar on remote sensing applications would be held at Ibadan, Nigeria, from 13 to 31 August 1979; a United Nations training seminar on remote sensing of earth resources would be held at Damascus, Syria, from 1 to 13 December 1979; and an international training course on the applications of remote sensing with emphasis on non-renewable resources would be held at Buenos Aires, Argentina, from 6 to 23 November 1979.

71. The Committee further shared the appreciation of the Sub-Committee for the continuation of training courses on remote sensing applications at FAO headequarters with the co-operation of the Government of Italy. It noted with appreciation that an international seminar on the benefits of remote sensing for national development would be organized in co-operation with the Environment Research Institute of Michigan at San Jose, Costa Rica, during April 1980; that a training course on remote sensing application for earth resources survey and land use planning would be held at Athens, hosted by the Government of Greece; that a training seminar on remote sensing for vegetation monitoring of agricultural rangeland would be held in the French language at Ouagadougou, Upper Volta, with the assistance of the Centre regional de teledetection de Ouagadougou; further, that a training workshop on remote sensing applications for agriculture and natural resources for the ESCAP region is likely to be held in Tokyo during September 1980, hosted by the Government of Japan, and finally that an international seminar on remote sensing applications in geology and hydrology will be held at Baku, hosted by the Government of the Union of Soviet Socialist Republics, in October 1980.

72. The Committee further expressed its appreciation to the specialized agencies, in particular FOA, UNESCO, UNDRO and UNEP, for the assistance they had provided in co-sponsoring or participating in the seminars and workshops. The Committee also expressed its appreciation to the Governments of Belgium, India and Italy for having offered fellowships through the United Nations to students from developing countries for advanced study and training in areas related to space applications.

73. The Committee noted the views expressed at its present session that the United Nations Space Applications Programme should assist in developing and enhancing the activities in the area of space applications among developing countries and that, for this

purpose, the United Nations should as an initial measure be made the repository of information concerning co-operative programmes in the area of space applications between various countries, especially the developing countries.

74. The Committee noted that Mr. H. G. S. Murthy would be retiring as United Nations expert on space applications, expressed its gratitude to him for having directed the United Nations Space Applications Programme with outstanding success for several years and wished him well in his future undertakings. The Committee also noted that Mr. Murthy's expertise and experience could be very useful in conducting future programme activities and, in particular, in the preparatory work for the forthcoming United Nations conference on outer space. The Committee also welcomed the designation of Mr. A. Padang, Secretary of the Scientific and Technical Sub-Committee, to succeed Mr. Murthy and wished him success in his new assignment.

2. Co-ordination of outer space activities within the United Nations system

75. The Committee noted with appreciation the participation in its work and that of its sub-committees by representatives of United Nations bodies, the specialized agencies and other international organizations, and found the reports they had submitted helpful in enabling the Committee and its subsidiary bodies to fulfil their role as a focal point for international co-operation, especially with respect to the practical application of space science and technology in developing countries.

76. The Committee endorsed the view of the Scientific and Technical Sub-Committee that there continued to be a need for regular meetings among the organizations concerned which would become even more important in view of the input and assistance required of specialized agencies in the preparatory work for the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space.

77. The Committee in this connexion drew attention to paragraph 101 of its report below and noted the observations made at its current session that the assistance of the specialized agencies, as well as their related bodies, such as the International Radio Consultative Committee (CCIR) and the International Telegraph and Telephone Consultative Committee CCITT) of the International Telecommunication Union (ITU) could be very useful in the preparation for the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space.

ANNEX I

Opening statement by the Chairman of the Committee on the Peaceful Uses of Outer Space

I use this occasion first of all to welcome you most cordially to the twenty-second session of the Committee on the Peaceful Uses of Outer Space. I am happy to see here many familiar faces, those of delegates who have attended previous sessions of the

Committee, and also to see the many new persons who have come to strengthen our deliberations.

Let me also welcome the observers from organizations which in the past have given a great deal of assistance to the work of this Committee and its subsidiary bodies. I look forward to working with all of you over the forthcoming two and a half weeks, and I hope that together we can make substantial progress in the work before us.

Let me now for the benefit of all of you review briefly, as we have done on past occasions, the work of our subsidiary bodies, which have provided a great deal of assistance to the Committee. Credit for this is due, above all, to their Chairmen. I wish to pay tribute here to Mr. Carver of Australia, Chairman of the Scientific and Technical Sub-Committee, and to Mr. Eugeniusz Wyzner of Poland, who again presided over the Legal Sub-Committee.

In accordance with General Assembly resolution 33/16, the Legal Sub-Committee, under the chairmanship of Mr. Wyzner, at its last session gave priority to three principal areas of work: first, to the elaboration of draft principles governing the use by States of artificial earth satellites for direct television broadcasting; secondly, to the consideration of the legal implications of remote sensing of the earth from space, with the aim of formulating draft principles; and, thirdly, to the draft treaty relating to the moon.

In order to speed up work on these subjects, the Sub-Committee resorted to the well-tried method of establishing working groups, and these were presided over by Mr. Haraszti of Hungary, Mr. Elaraby of Egypt and Mr. Winkler of Austria. I wish to pay a tribute to the work of these Chairmen of working groups.

The three working groups completed several readings of the full texts of the three drafts before the Sub-Committee. On remote sensing, for one, a principle-by-principle reading of the text elaborated by the working group last year, a report on which can be found in an annex to the Legal Sub-Committee's report, was undertaken and some additional provisions were incorporated on a tentative basis. Members will find the resulting text in appendix A to annex I of the report of the Sub-Committee (A/AC.105/240).

On direct television broadcasting by satellite, the working group made an article-by-article reading of the text elaborated upon last year and reproduced as annex II to last year's report, as well as of the clean text presented by Canada and Sweden. The Canadian/Swedish draft incorporated the text previously elaborated by the Sub-Committee and the Committee, but added compromise formulas for the unresolved issues. The result of the readings was again inconclusive, I regret to say, and the text that was produced is to be found as appendix A to annex II to this year's report of the Legal Sub-Committee. The Canadian/Swedish clean text is also reproduced as appendix B to annex II to that report.

On the draft moon treaty, members will recall that the representative of Austria presented a consolidated text reflecting the level of compromise that it had been possible to attain at the conclusion of the last session of the Sub-Committee. This text was reproduced as annex I to the report of the Sub-Committee last year, and Governments were called upon to study the possibility of accepting that text as a compromise. Unfortunately, there was no such consensus this year and the working group therefore studied the text article by article.

The resulting text still contains several square brackets and is now reproduced as appendix A to annex III of the Legal Sub-Committee's report this year.

Members will note, therefore, that while a useful exercise of an article-by-article or principle-by-principle reading of these drafts was conducted, this exercise failed to resolve the outstanding issues, which remain essentially the same as last year and which are too well known to the Committee to deserve repetition. Indeed, the end result of the work was not altogether encouraging, and we have to face this fact here quite squarely. It would seem, as was noted by several delegations at the Sub-Committee's final session, that what we in fact did was even take some steps backwards.

Although a number of factors contributed to this lack of progress, one problem remains central: the positions of various members on key issues remain virtually the same as the positions taken by them in previous years. In essence, this might have been expected, because the issues which were most easily reconcilable have now been resolved and the hard core issues therefore remain. The latter are the very issues - sometimes just a single issue or subject - that are most complex and that are basic to the fundamental but divergent views of Member States.

The natural consequence of this is that progress by the Sub-Committee on the outstanding issues will take place only as Member States display an active desire and, let me say, a somewhat stronger political will to achieve the necessary compromises. We should take courage from the arduous negotiations that so successfully produced, over 10 years ago now, the Outer Space Treaty and other international agreements, and we should not fail to seek acceptable compromises, in the spirit of our Committee, in order to complete the three important international instruments on which we have been working so hard over the past few years.

In this connexion, the time might even have come for us to reassess our respective positions in order to see whether we cannot really bridge this gap. And if in all honesty we find ourselves unable to do so, the time might also have come to devote our energies - at least for the time being - to other important areas of concern which deserve our attention.

Two such items were discussed in the Sub-Committee this year. First, there was a further exchange of views on the question of the definitions and delimitations of outer space, bearing in mind questions relating to the geostationary orbit. The views of

Member States on this matter are reflected in section IV of the report of the Sub-Committee. Although the Sub-Committee made no formal recommendations concerning this item, extensive discussions were held; particular attention was focused this year on the proposal by the Union of Soviet Socialist Republics to delimit air and outer space at an altitude not higher than 100 to 110 kilometers, leaving the area below that to be the subject of negotiation among States, while providing for freedom of transit for space objects in that region. Many members expressed their support for the serious effort on the part of the Sub-Committee to determine a boundary. However, many recognized the arbitrariness of the selection of criteria for such a boundary and recommended that other criteria also be examined. For instance, it was pointed out that satellites have already orbited at 90 kilometres; as a result, discussions were concluded without any formal action being recommended.

Secondly, there was an active discussion relating to the use of nuclear power sources in outer space under the item "other matters" and the views of Member States on this question are reflected in section V of the report of the Legal Sub-Committee. A proposal was made that this question should be included as a separate item on the agenda of the Sub-Committee next year. There was no consensus on this proposal and, in view of the diverse opinions expressed during the debate, the Sub-Committee considered that the parent Committee, at the current session should, unless it decided otherwise, resume discussion on the matter, in particular, on the advisability of including on the agenda of the Legal Sub-Committee a separate item dealing with the use of nuclear power sources in outer space.

Accordingly, members might wish to consider what action should be taken in this connexion, as well as determine whether further progress can be made at the current session on the questions relating to the draft treaty on the moon and draft principles on direct television broadcast satellites, as requested by the Legal Sub-Committee. The Chairman will, of course, make himself available for any formal or informal discussions which members may wish to have on these matters.

Looking at these subjects, we should be conscious of the fact that our efforts are being closely monitored by world public opinion. The importance that is increasingly attached to the elaboration of modern principles of space law is demonstrated by the attention given to this subject by bodies which are as vitally representative, as, for instance, the Inter-Parliamentary Union. The sixty-sixth Conference of the Inter-Parliamentary Union, which will be held in Caracas next September, will have before it an important resolution on space law, which was adopted by the recent meeting of the Council and Committees of the Inter-Parliamentary Union held in Prague, Czechoslovakia. We welcome the interest expressed in our work by representative bodies such as the Inter-Parliamentary Union, as close co-operation between Governments and parliaments is one of the essential prerequisites for the successful further development of space law.

I shall turn now briefly and summarily to the work of the Scientific and Technical Sub-Committee. Here again we note that priority was given to questions relating to remote sensing. The Sub-Committee had before it several reports prepared by the Secretariat which helped in its discussions. Particular consideration was given to the classification and dissemination of remote sensing data. The Sub-Committee, however, was not able to agree upon specific recommendations concerning the need for the classification of data or the manner in which such a classification might be made. The Sub-Committee therefore agreed that the Secretariat should be requested to submit a supplemental study for consideration at its next session.

The Sub-Committee further noted the importance of providing adequate training facilities, including on-site training, in all aspects of remote sensing, particularly to the developing countries, in order to enable them to derive the maximum benefit from this new important technology.

The Sub-Committee also considered the co-ordinating role of the United Nations in the area of remote sensing. A report was submitted by the Secretariat as requested concerning a proposed panel of experts, to be established under United Nations auspices, which would co-ordinate international activities. Although this matter has been under consideration for several years in the Sub-Committee, no consensus was reached on the establishment of such a panel this year.

In regard to the United Nations Space Applications Programme, continued vigorous efforts were made within its limited financial resources, which have often been the subject of comments in this Committee, to provide to developing countries increased access to space applications. The principal instruments for the achievement of this aim have remained the educational and training activities which can be carried out under the Programme in order to assist the developing countries in all regions of the world. Among the highlights of the Programme during the course of last year were the training seminars and workshops held in Rome with the co-operation of the Food and Agriculture Organization of the United Nations (FAO), in Manila, in Nairobi with the assistance of the United Nations Environmental Programme (UNEF), in Sao Jose dos Campos with the assistance of UNESCO, in India again with the assistance of FAO, and in Tokyo with the assistance of the World Meteorological Organization (WMO). Several other such seminars and workshops are planned for the immediate future, two on remote sensing applications in agriculture to be held in Ibadan, Nigeria, and Damascus, Syria, and another on the use of remote sensing in the area of non-renewable resources, to be held in Argentina later this year. Several other panel meetings and seminars are also scheduled for the coming year, 1980, and these will be held in Costa Rica, Japan, Greece, Upper Volta and the Union of Soviet Socialist Republics. In addition, the United Nations Space Applications Programme administers a number of fellowships offered by Member States in various disciplines relating to space applications. The transfer of technology, which is of such crucial importance to economic and social development in many member countries, will thus receive strong assistance from such efforts.

In concluding my remarks on the Space Applications Programme, I should like to express, on behalf of the Committee, our appreciation to the expert on space applications, Mr. Murthy, for the excellent manner in which he has conducted a very useful programme on space applications, particularly for the member countries of the developing world. We recognize the importance of the work he has accomplished, not only during the last year, but during the past seven years in which he has directed the space applications programme. I make particular note of this today because I have learned, as other members may have done, that Mr. Murthy will retire from United Nations services at the end of this year. I therefore wish to thank Mr. Murthy for the assistance he has given this Committee, particularly for conducting the United Nations Space Applications Programme in such an outstanding manner, and to wish him every success in the future. At the same time, it is with great pleasure that we welcome the news that Mr. Padang, the Secretary of the Scientific and Technical Sub-Committee, will take over as the head of the United Nations Space Applications Programme. I have no doubt that, under his able guidance, the Programme will continue to give useful assistance to the developing countries and, on behalf of the Committee, I wish Mr. Padang every success in his future activities.

I now revert to the work of the Scientific and Technical Sub-Committee. That body also gave consideration to questions relating to space transportation and to the views of Member States on those questions. Those views are reflected in section IV of its report (A/AC.105/238). Similarly, the Committee considered the question of the physical nature and the technical attributes of the geostationary orbit, and the views of Member States on this matter can be found in section VI of the report of the Sub-Committee. On both items, the Sub-Committee proposes to continue its consideration at the next session and has requested the Secretariat to prepare a number of reports in order to assist it in its discussions.

The Scientific and Technical Sub-Committee also discussed questions relating to the use of nuclear power sources in outer space and for this purpose it established a working group of experts as called for in General Assembly resolution 33/16. The report of the Working Group is reproduced as annex II of the report of the Sub-Committee. As members will note, the Working Group has carried out extensive preliminary work on this question and concluded that nuclear power sources can be used safely in outer space, provided certain safety considerations specified in the report are fully met. It stated that the decision to use nuclear power sources in outer space should be based on technical considerations, provided that safety requirements can be satisfied while mission requirements are fulfilled. The conclusions and recommendations of the Working Group are set out in paragraphs 39 to 44 of its report. It has recommended that arrangements be made for it to meet for another week during the next session of the Scientific and Technical Sub-Committee and that Member States and international agencies be invited to contribute studies on the technical aspects and safety of nuclear power sources, particularly regarding four areas of concern which the Working Group has identified for further consideration. These arrangements seem to augur well for successful completion of the future work of this Working Group. In considering the

recommendations of the Working Group we must also bear in mind the relevant recommendation made by the Legal Sub-Committee to which I referred earlier.

Finally, I come to what is perhaps the most important subject considered by the Scientific and Technical Sub-Committee. The Sub-Committee was, as members will recall, particularly active this year in serving in its capacity as the Advisory Committee to the Preparatory Committee of the Second United Nations Conference on the Peaceful Uses of Outer Space. Several important recommendations have been submitted in connexion with the convening of this conference, in accordance with General Assembly resolution 33/16, and these can be found in paragraph 55 of the Sub-Committee's report. They relate most specifically to the title of the conference, its agenda, its preparation and organization, including the form it is to take, its date and venue, as well as its bureau and secretariat.

I am happy to say that on some of these issues the Sub-Committee was able to agree upon detailed recommendations such as those regarding the subjects to be included in the agenda of the conference. However, some of the key issues relating to the preparation of the conference, such as the date, the venue, this Committee, which is entrusted with the task of acting as the Preparatory Committee under resolution 33/16, is expected to make most of these decisions at the current session. I trust that, with the co-operation on at least those questions that must be decided so that the arrangements for the conference can go forward without delay. I am, of course, open to suggestions as to how we may best accomplish this task.

ANNEX II

Draft agreement governing the activities of States on the moon and other celestial bodies

The States Parties to this Agreement,

Noting the achievements of States in the exploration and use of the moon and other celestial bodies,

Recognizing that the moon, as a natural satellite of the earth, has an important role to play in the exploration of outer space,

Determined to promote on the basis of equality the further development of co-operation among States in the exploration and use of the moon and other celestial bodies,

Desiring to prevent the moon from becoming an area of international conflict,

Bearing in mind the benefits which may be derived from the exploitation of the natural resources of the moon and other celestial bodies,

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, the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, the Convention on International Liability for Damage Caused by Space Objects, and the Convention on Registration of Objects Launched into Outer Space.

Taking into account the need to define and develop the provisions of these international instruments in relation to the moon and other celestial bodies, having regard to further progress in the exploration and use of outer space,

Have agreed on the following:

Article I

1. The provisions of this Agreement relating to the moon shall also apply to other celestial bodies within the solar system, other than the earth, except in so far as specific legal norms enter into force with respect to any of these celestial bodies.

2. For the purposes of this Agreement reference to the moon shall include orbits around or other trajectories to or around it.

3. This Agreement does not apply to extraterrestrial materials which reach the surface of the earth by natural means.

Article II

All activities on the moon, including its exploration and use, shall be carried out in accordance with international law, in particular the Charter of the United Nations, and taking into account the Declaration on Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations, adopted by the General Assembly on 24 October 1970, in the interest of maintaining international peace and security and promoting international co-operation and mutual understanding, and with due regard to the corresponding interests of all other States Parties.

Article III

1. The moon shall be used by all States Parties exclusively for peaceful purposes.

2. Any threat or use of force or any other hostile act or threat of hostile act on the moon is prohibited. It is likewise prohibited to use the moon in order to commit any such act or to engage in any such threat in relation to the earth, the moon, spacecraft, the personnel of spacecraft or man-made space objects.

3. States Parties shall not place in orbit around or other trajectory to or around the moon objects carrying nuclear weapons or any other kinds of weapons of mass destruction or place or use such weapons on or in the moon.

4. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on the moon shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration and use of the moon shall also not be prohibited.

Article IV

1. The exploration and use of the moon shall be the province of all mankind and shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development. Due regard shall be paid to the interests of present and future generations as well as to the need to promote higher standards of living conditions of economic and social progress and development in accordance with the Charter of the United Nations.

2. States Parties shall be guided by the principle of co-operation and mutual assistance in all their activities concerning the exploration and use of the moon. International co-operation in pursuance of this Agreement should be as wide as possible and may take place on a multilateral basis, on a bilateral basis, or through international intergovernmental organizations.

Article V

1. States Parties shall inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of their activities concerned with the exploration and use of the moon. Information on the time, purposes, locations, orbital parameters and duration shall be given in respect of each mission to the moon as soon as possible after launching, while information on the results of each mission, including scientific results, shall be furnished upon completion of the mission. In case of a mission lasting more than 60 days, information on conduct of the mission including any scientific results shall be given periodically at 30 days' intervals. For missions lasting more than six months, only significant additions to such information need by reported thereafter.

2. If a State Party becomes aware that another State Party plans to operate simultaneously in the same area of or in the same orbit around or trajectory to or around the moon, it shall promptly inform the other State of the timing of and plans for its own operations.

3. In carrying out activities under this Agreement, States Parties shall promptly inform the Secretary-General, as well as the public and the international scientific community, of any phenomena they discover in outer space, including the moon, which could endanger human life or health, as well as of any indication of organic life.

Article VI

1. There shall be freedom of scientific investigation on the moon by all States Parties without discrimination of any kind, on the basis of equality and in accordance with international law.

2. In carrying out scientific investigations and in furtherance of the provisions of this Agreement, the States Parties shall have the right to collect on and remove from the moon samples of its mineral and other substances. Such samples shall remain at the disposal of those States Parties which caused them to be collected and may be used by them for scientific purposes. States Parties shall have regard to the desirability of making a portion of such samples available to other interested States Parties and the international scientific community for scientific investigation. States Parties may in the course of scientific investigations also use mineral and other substances of the moon in quantities appropriate for the support of their missions.

3. States Parties agree on the desirability of exchanging scientific and other personnel on expeditions to or installations on the moon to the greatest extent feasible and practicable.

Article VII

1. In exploring and using the moon, States Parties shall take measures to prevent the disruption of the existing balance of its environment whether by introducing adverse changes in such environment, its harmful contamination through the introduction of extra-environmental matter or otherwise. States Parties shall also take measures to prevent harmfully affecting the environment of the earth through the introduction of extraterrestrial matter or otherwise.

2. States Parties shall inform the Secretary-General of the United Nations of the measures being adopted by them in accordance with paragraph 1 of this article and shall also to the maximum extent feasible notify him in advance of all placements by them of radio-active materials on the moon and of the purposes of such placements.

3. States Parties shall report to other States Parties and to the Secretary-General concerning areas of the moon having special scientific interest in order that, without prejudice to the rights of other States Parties, consideration may be given to the designation of such areas as international scientific preserves for which special protective arrangements are to be agreed in consultation with the competent organs of the United Nations.

Article VIII

1. States Parties may pursue their activities in the exploration and use of the moon anywhere on or below its surface, subject to the provisions of this Agreement.

2. For these purposes States Parties may, in particular:
   (a) Land their space objects on the moon and launch them from the moon;
   (b) Place their personnel, space vehicles, equipment, facilities, stations and installations anywhere on or below the surface of the moon.

Personnel, space vehicles, equipment, facilities, stations and installations may move or be moved freely over or below the surface of the moon.

3. Activities of States Parties in accordance with paragraphs 1 and 2 of this article shall not interfere with the activities of other States Parties on the moon. Where such interference may occur, the States Parties concerned shall undertake consultations in accordance with article XV, paragraphs 2 and 3.

Article IX

1. States Parties may establish manned and unmanned stations on the moon. A State Party establishing a station shall use only that area which is required for the needs of the station and shall immediately inform the Secretary-General of the United Nations of the location and purposes of that station. Subsequently, at annual intervals that State shall likewise inform the Secretary-General whether the station continues in use and whether its purposes have changed.

2. Stations shall be installed in such a manner that they do not impede the free access to all areas of the moon of personnel, vehicles and equipment of other States Parties conducting activities on the moon in accordance with the provisions of this Agreement or of article I 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.

Article X

1. State Parties shall adopt all practicable measures to safeguard the life and health of persons on the moon. For this purpose they shall regard any person on the moon as an astronaut within the meaning of article V of the Treaty on Principles Governing the Activities of States on the Exploration and Use of Outer Space,

including the Moon and Other Celestial Bodies and as part of the personnel of a spacecraft within the meaning of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.

2. States Parties shall offer shelter in their stations, installations, vehicles and other facilities to persons in distress on the moon.

Article XI

1. The moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement and in particular in paragraph 5 of this article.

2. The moon is not subject to national appropriation by any claim of sovereignty, by means of use or occupation, or by any other means.

3. Neither the surface nor the subsurface of the moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person. The placement of personnel, space vehicles, equipment facilities, stations and installations on or below the surface of the moon, including structures connected with their surface or subsurface, shall not create a right of ownership over the surface or the subsurface of the moon or any areas thereof. The foregoing provisions are without prejudice to the international regime referred to in paragraph 5 of this article.

4. State Parties have the right to exploration and use of the moon without discrimination of any kind on a basis of equality, and in accordance with international law and the terms of this Agreement.

5. States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible. This provision shall be implemented in accordance with article XVIII of this Agreement.

6. In order to facilitate the establishment of the international regime referred to in paragraph 5 of this article, States Parties shall inform the Secretary-General of the United Nations as well as the public and the international scientific community to the greatest extent feasible and practicable of any natural resources they may discover on the moon.

7. The main purposes of the international regime to be established shall include:
   (a) The orderly and safe development of the natural resources of the moon;
   (b) The rational management of those resources;

(c) The expansion of opportunities in the use of those resources;

(d) An equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the moon shall be given special consideration.

8. All the activities with respect to the natural resources of the moon shall be carried out in a manner compatible with the purposes specified in paragraph 7 of this article and the provisions of article VI, paragraph 2, of this Agreement.

Article XII

1. States Parties shall retain jurisdiction and control over their personnel, vehicles, equipment, facilities, stations and installations on the moon. The ownership of space vehicles, equipment, facilities, stations and installations shall not be affected by their presence on the moon.

2. Vehicles, installations and equipment or their component parts found in places other than their intended location shall be dealt with in accordance with article V of the Agreement on Assistance to Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.

3. In the event of an emergency involving a threat to human life, States Parties may use the equipment, vehicles, installations, facilities or supplies of other States Parties on the moon. Prompt notification of such use shall be made to the Secretary-General of the United Nations or State Party concerned.

Article XIII

A State Party which learns of the crash landing, forced landing or other unintended landing on the moon of a space object, or its component parts, that were not launched by it, shall promptly inform the launching State Party and the Secretary-General of the United Nations.

Article XIV

1. States Parties to this Agreement shall bear international responsibility for national activities on the moon whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Agreement. States Parties shall ensure that non-governmental entities under their jurisdiction shall engage in activities on the moon only under the authority and continuing supervision of the appropriate State Party.

2. States Parties recognize that detailed arrangements concerning liability or damage caused on the moon, in addition to the 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 and the Convention on International Liability for Damage Caused by Space Objects, may become necessary as a result of more extensive activities on the moon. Any such arrangements shall be elaborated in accordance with the procedure provided for in article XVIII of this Agreement.

Article XV

1. Each State Party may assure itself that the activities of other States Parties in the exploration and use of the moon are compatible with the provisions of this Agreement. To this end, all space vehicles, equipment, facilities, stations and installations on the moon shall be open to other States Parties. Such States Parties shall give reasonable advance notice of a projected visit, in order that appropriate consultations may be held and that maximum precautions may be taken to assure safety and to avoid interference with normal operations in the facility to be visited. In pursuance of this article, any State Party may act on its own behalf or with the full or partial assistance of any other State Party or through appropriate international procedures within the framework of the United Nations and in accordance with the Charter.

2. A State Party which has reason to believe that another State Party is not fulfilling the obligations incumbent upon it pursuant to this Agreement or that another State Party is interfering with the rights which the former State has under this Agreement may request consultations with that Party. A State Party receiving such a request shall enter into such consultations without delay. Any other State Party which requests to do so shall be entitled to take part in the consultations. Each State Party participating in such consultations shall seek a mutually acceptable resolution of any controversy and shall bear in mind the rights and interests of all States Parties. The Secretary-General of the United Nations shall be informed of the results of the consultations and transmit the information received to all States Parties concerned.

3. If the consultations do not lead to a mutually acceptable settlement which has due regard for the rights and interests of all the States Parties, the parties concerned shall take all measures to settle the dispute by other peaceful means of their choice and appropriate to the circumstances and the nature of the dispute. If difficulties arise in connexion with the opening of consultations or if consultations do not lead to a mutually acceptable settlement, any State Party may seek the assistance of the Secretary-General without seeking the consent of any other State Party concerned, in order to resolve the controversy. A State Party which does not maintain diplomatic relations with another State Party concerned shall participate in such consultations, at its choice, either itself or through another State Party or the Secretary-General, as intermediary.

Article XVI

With the exception of articles XVII to XXI, references in this Agreement to States shall be deemed to apply to any 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 a majority of the States members of the organization are States 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. States members of any such organization which are States Parties to this Agreement shall take all appropriate steps to ensure that the organization makes a declaration in accordance with the foregoing.

Article XVII

Any State Party to this Agreement may propose amendments to the Agreement. Amendments shall enter into force for each State Party to the Agreement accepting the amendments upon their acceptance by a majority of the States Parties to the Agreement and thereafter for each remaining State Party to the Agreement on the date of acceptance by it.

Article XVIII

Ten years after the entry into force of this Agreement, the question of the review of the Agreement shall be included in the provisional agenda of the United Nations General Assembly in order to consider, in the light of past application of the Agreement, whether it requires revision. However, at any time after the Agreement has been in office for five years, the Secretary-General of the United Nations, as depository, shall, at the request of one third of the States Parties to the Agreement and with the concurrence of the majority of the States Parties, convene a conference of the States Parties to review this Agreement. A review conference shall also consider the question of the implementation of the provisions of article XI, paragraph 5, on the basis of the principle referred to in paragraph 1 of that article and taking into account in particular any relevant technological developments.

Article XIX

1. This Agreement shall be open for signature by all States at United Nations Headquarters in New York.

2. This Agreement shall be subject to ratification by signatory States. Any State which does not sign this Agreement before its entry into force in accordance with paragraph 3 of this article may accede to it at any time. Instruments of ratification or accession shall be deposited with the Secretary-General of the United Nations.

3. This Agreement shall enter into force on the thirtieth day following the date of deposit of the fifth instrument of ratification.

4. For each State depositing its instrument of ratification or accession after the entry into force of this Agreement, it shall enter into force on the thirtieth day following the date of deposit of any such instrument.

5. The Secretary-General 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 nations.

Article XX

Any State Party to this Agreement may give notice of its withdrawal from the Agreement one year 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 this notification.

Article XXI

The original of this Agreement, of which the Arabic, 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 thereof to all signatory and acceding States.

IN WITNESS WHEREOF the undersigned, being duly authorized thereto by their respective Governments, have signed this Agreement, opened for signature at New York on

EVENTS OF INTEREST

A. Past Events

1. Conference on Global Interdependence, Princeton University, April 6, 1979.

The 17th annual International Conference on Global Interdependence was held at Princeton University on April 6, 1979. The meeting was jointly sponsored by Princeton, the Federal, Inter-American and Philadelphia Bar Associations and the American Foreign Law Association.

Luncheon speaker was former Supreme Court Justice Arthur J. Goldberg and keynote speaker was Professor John Norton Moore of the University of Virginia. Judge Harold Berger served as Conference Chairman and Professors Cyril Black and Richard Falk of Princeton University served as Conference Vice Chairman.

The conference was attended by highly distinguished scholars, diplomats, scientists and government officials of international renown, who discussed problems of global interdependence and proposed solutions.

Aerospace Law topics included Solar Energy Satellites, problems of Broadcast Satellites, the proposed Moon Treaty, problems connected with the Geostationary Orbit and Frequency Band Allocation. Among aerospace papers delivered were essays by Judge Berger; Katherine Drew Hallgarten, Chairman, Inter-American Bar Association Section on Space Communications; Carl F. Paul, Jr., Administrative Judge, Board of Contract Appeals; and S. Neil Hosenball, General Counsel, National Aeronautics and Space Administration. Professor Stephen Gorove, of the University of Mississippi, acted as Conference Consultant.

Judge Harold Berger
Chairman, Conference on
Global Interdependence

2. Meeting of the Association of U.S. Members of the International Institute of Space Law, Washington, D.C., April 26, 1979.

A meeting of the Association of U.S. Members of the International Institute of Space Law was held in Washington, D.C. on April 26, 1979, in conjunction with the annual meeting of the American Society of International Law. At the business meeting members discussed participation at the forthcoming 22nd Colloquium on Space Law to be held in Munich, Germany, September 17-22, 1979.

The program which followed concerned "The Demarcation Issue: Where Does National Sovereignty End and Free Outer Space Begin?" Martin Menter, the Program Moderator, said that this topic was selected in light of a proposal by the USSR Delegation at the UN COPUOS Legal Subcommittee Meeting (March 12-April 6, 1979) suggesting that objects in space 100 km. above sea level be recognized as being in outer space.

Discussion began with a planned presentation by Professor Robert K. Woetzel, President of the Foundation for an International Criminal Court. Among the participants in the discussion were Neil Hosenball, Harry Almond, Jr., Eilene Galloway, Stephen Gorove, Brownlee Sands Corrin, Stanley Rosenfield, Hamilton DeSaussure, Nicolas Matte and Charles Okolie.

Martin Menter
President, Association of
U.S. Members of the International
Institute of Space Law, IAF.

3. U.S. Senate Symposium on the "Next Steps for Mankind—The Future in Space", Washington, D.C., July 19, 1979.

On Thursday, July 19, 1979, almost exactly ten years after the first landing of men on the Moon, the Senate Committee on Commerce, Science, and Transportation, and the House Committee on Science and Technology held a symposium in the Senate Caucus Room on the Future in Space. The Congress played and continues to play an important role in this country's venture into space; therefore it was appropriate to have a Congressional commemoration of the triumph of Apollo 11. In view of both Committees' concern and interest in developing a new space policy which will enable mankind to realize the benefit of past investments, the Symposium was concerned with the future, rather than celebrating the past. The full transcript of the Symposium proceedings will be published as a Committee document.

Stimulating presentations were given by Mr. George Jeffs, President of the Aerospace Division of Rockwell International, Dr. Noel Hinners, Director of the National Air and Space Museum and recently Associate Administrator for Space Science at NASA, and Professor Carl Sagan, Director of the Laboratory for Planetary Studies at Cornell University and noted author and lecturer. Mr. Jules Bergman of ABC News then moderated discussion among the speakers, the Members of Congress, former Senator Ted Moss (who chaired the Aeronautical and Space Sciences Committee), former NASA Administrator James Fletcher and the audience.

George Jeffs described future opportunities for the utilization of space for new services and products. He is now principally engaged in the development of the Space Shuttle. This program, currently experiencing problems not atypical of those associated

with new hardware development, will lead to a Space Transportation System of far greater capability at less cost for space applications. Jeffs said that he felt ". . . the program is on track and we will soon have an economical transportation system."

He described the special environments that space will offer for the development of new products: "perpetual motion" in orbit, solar energy accessibility, near-perfect vacuum, zero-G and near constant surroundings. He illustrated this by showing film clips of space experiments using these properties. He suggested that many products, such as electronic materials, will continue to be made on Earth, but that new products taking advantage of space properties may be made better and cheaper in space. Such products include chemical compounds; materials such as fibers, films, and filaments; crystals; high-purity items and large structures.

Jeffs also discussed remote sensing and communications as examples of services from space applications. New technology in both these areas will enable broader distribution of technology benefits throughout the world. Information about minerals, oil, food, energy, weather, ocean conditions and land use will be used to help alleviate human suffering and improve the quality of life.

Dr. Noel Hinners, Director of the world's most popular museum, brought a special perspective on the direction of our space program. Although confident of the Nation's commitment to space exploration, he expressed considerable concern about the near future, where the steps we take, or do not take, will chart a course through the end of the century. His fear was that the Nation might opt for a "let's study it" approach leading to stagnation and limited opportunity rather than for a bold and imaginative approach permitting a decade of development, utilization, exploration and new science. To do the latter he supported a commitment to a space policy of goals and objectives for the next ten years.

Dr. Hinners spoke of potential new planetary missions, including a comet mission which would send a probe into Halley's Comet and would rendezvous with another comet; a Venus Orbiter which would pierce the clouds of Venus with a radar beam capable of imaging the planet's surface; and the continued exploration on Mars and the Moon, with automated spacecraft for the former which would provide for return of a sample, and a manned lunar base for the latter. The technological development and national prestige inherent in such missions were discussed.

In closing his presentation, Dr. Hinners referred to President Carter's request to "say something good about our country." He poignantly noted that the civil space program is "an indicator of the great capability of American technology, of the inventiveness of her scientists, of the exploring spirit of her people, and of the openness of her society."

Senator Stevenson was particularly struck by Dr. Hinners' remarks and offered the following prescription for dispelling malaise and restoring confidence in the U.S.: "by

boldness, with imagination, by setting out to do the 'impossible' and then succeeding." He suggested we do this again, as we did ten years ago, and called for consideration of "an international Earth observation system that would subject the nuclear and non-nuclear activities of all powers. . . to observation by all other countries." Such a system might lead to real arms limitation, he opined, as opposed to the much weaker efforts in the SALT process to date. He also spoke of efforts in the Senate Commerce Committee to push forward operational civil remote sensing in an international context.

Professor Sagan, who has the rare ability to take scientific thoughts and communicate them effectively to the layman, noted this was not only the tenth anniversary of Apollo 11, but the third anniversary of the first landing by the U.S. on another planet (Viking I on Mars). "We are at a remarkable moment when the human species for the first time in its several million year history is leaving its planet, exploring the space around us, and finding out something about our local 'swimming hole' in the cosmos," he stated. He began his presentation by showing some slides of Jupiter and its satellites taken on the recent Voyager mission. Included in his fascinating space travelogue were shots of the newly discovered ring of Jupiter, the turbulent atmosphere of Jupiter, and the very different surfaces of the major satellites. The data from Voyager are now being analyzed for new information about the origin and evolution of planetary systems.

Dr. Sagan noted with irony the recent attempts to cancel Project Galileo and slow down the Space Telescope at a time when the astronomical and planetary science gains from such missions are so significant and notable. His remarks led to a broader discussion of the constituency and support for the space program. Professor Sagan also discussed space technology: robotics, environment instruments, etc., describing how their development is an inherent consequence of the exploration program and a benefit to a much wider community than that of the space scientists.

With Jules Bergman providing summary comments about technology and man's intelligent application of it, a discussion was then held among the speakers, Senators Cannon, Stevenson and Schmitt, Congressman Fuqua, former Senator Ted Moss and former NASA Administrator Jim Fletcher. Most of the discussion centered around support for space programs, their cost, and their benefits. Senator Cannon briefly described the budgetary process, how it works in Congress, and noted that the annual give and take was a continuing process which required regular attention. While supporters might wish it otherwise, the Nation must work within budgetary constraints and with the constituencies that all clamor for their share of the federal dollar.

Senator Stevenson decried the shortsightedness of the OMB approach wherein benefits must be quantified on a zero-based budget strategy. "Values such as basic scientific research. . .always unpredictable, but which may have the greatest value—tend to lose out in this process," he noted.

Senators Stevenson and Schmitt discussed space policy and their pending bills and said they hoped to move forward with a compromise bill on space policy and on an operational remote sensing bill before the end of this session of Congress. As Chairman of the full Commerce, Science, and Transportation Committee, Senator Cannon indicated his support for this nonpartisan effort.

Questions from the audience ranged from immediate concerns, such as the status of existing bills, to the far-ranging—the Solar Power Satellite and colonization of Mars.

Jules Bergman closed the Symposium with a final question—where will we be in space, on July 19, 1989, ten years from now? The participants were hopeful—that many of the gleams in our eyes would be born or at least conceived. Energy stations, international remote sensing, lunar bases, Mars sample return and space manufacturing were mentioned. Senator Cannon, while hopeful, worried that we might still be studying the options and waiting on OMB decisions about funding. Carl Sagan summed it up by quoting H.G. Wells: "The choice is the universe or nothing." Sagan hoped: "We will have had the wisdom to choose the universe."

Senator Howard W. Cannon
Chairman, U.S. Sen. Comm. on Commerce,
Science and Transportation

4. Meeting of the Aerospace Law Committee of the International Law Section of ABA, Dallas, Texas, August 10, 1979.

A formal meeting of the Aerospace Law Committee was held on August 10, 1979, in Dallas, Texas, as part of the Annual Convention of the American Bar Association. The session was chaired by Edward R. Finch, Jr. and co-chaired by Judge Harold Berger. A report was made by John E. Cavanaugh, General Counsel of Lockheed, on outer space insurance and indemnification legislation pending before the U.S. Congress.

Edward R. Finch, Jr. presented a paper on Outer Space Liability: Past, Present and Future (Skylab and Post-Skylab) and discussion followed concerning a 1978 amendment which would alleviate present legal monetary restraints to a considerable extent for NASA where claims were certified as meritorious.

A.L. Moore presented a paper on the new Moon Treaty pending before the U.N. General Assembly, and consensus was reached that the treaty was a step in the right direction and definitely did not prohibit mining on the moon for scientific research and development. Similarly, there was consensus among the Committee that the new Section 308(a) of the NASA Authorization Act of 1980 was a highly desirable step in the right direction.

The participants, representing a cross-section of the entire Committee membership in the United States, also discussed the rapidly advancing space technology in the People's Republic of China.

Edward R. Finch, Jr., Chairman
Aerospace Law Committee
International Law Section, ABA

5. Meeting of the Science and Technology Section of the American Bar Association, Dallas, Texas, August 14, 1979.

Members of the ABA Science and Technology Section meeting in Dallas, Texas, August 14, 1979 discussed "Space Commerce and the Space Shuttle Development: Legal, Scientific and Practical Implications".

The meeting was chaired by Arthur M. Dula of Houston, Texas and speakers included: Christopher Kraft, Director of the Lyndon B. Johnson Space Center, Houston; Professor Carl Q. Christol of the University of Southern California; James W. Barrett, President of Corroon and Black, Inc.; Professor S. Houston Lay of California Western School of Law; Delbert D. Smith, Attorney at Law; J. Henry Glazer, Chief Counsel of NASA Ames Research Center and George S. Robinson, Assistant General Counsel of the Smithsonian Institution.

Arthur M. Dula
Chairman, ABA Science and
Technology Section

6. Meeting of the Air and Space Law Section of the Committee on Public International Law, Inter-American Bar Association, San Juan (P.R.), August 27-28, 1979.

An international meeting on Air and Space Law was held in San Juan, Puerto Rico on Monday and Tuesday, August 27 and 28, 1979, as part of the biennial convention of the Inter-American Bar Association. The meeting was jointly sponsored by the Inter-American, Federal and Philadelphia Bar Associations. The conference was attended by government officials and legal scholars from various western hemisphere nations.

Judge Harold Berger of the United States served as Chairman and Dr. Mario O. Folchi of Argentina as Vice-Chairman.

Papers were delivered by Judge Berger, who discussed Legal Aspects of Solar Energy Satellites; Dr. Mario O. Folchi, who spoke on Legislative Unification of Air Law in America; John T. Steward, Jr., Assistant Chief Counsel, Federal Aviation Administration, who discussed Lease, Charter, and Interchange of Aircraft; Brigadier General Martin Menter of the U.S.A., who delivered a paper on the Demarcation Line of Air Space and Outer Space.

Professor Stephen Gorove acted as Consultant to the conference and delivered a paper on Environmental Aspects of Solar Energy Satellites.

Judge Harold Berger
Chairman, Air and Space Law Section,
IABA Committee on Public International Law

7. International Colloquium on the Settlement of Space Law Disputes, Munich, Germany, Sept. 13-14, 1979.

On September 13th and 14th 1979, top experts of space law as well as air law, law of the sea, and general public international law gathered in Munich, West Germany, for an international colloquium organized by the Institute of Air and Space Law of Cologne University in cooperation with the Space Law Committee of the International Law Association, the International Institute of Space Law and the German Society for Aeronautics and Astronautics. The two-day-meeting dealt exclusively with the settlement of space law disputes, a topic which has been picked by the Space Law Committee of the International Law Association as a subject of its future work at its last meeting in Manila and which has also found attention of meetings on the national level as for instance in Argentina and West Germany. With the growing importance of space activities in practice as well as due to such spectacular cases as those of Cosmos 954 and Skylab it has become obvious for both specialists and a wider public that disputes caused by space activities are no longer only an academic topic but demand more and more a procedure for their settlement.

After a welcome address and introduction to the topic by the undersigned, the colloquium, in its first session, tried to achieve a most general basis by reports and discussion on dispute settlement in public international law. Under the chairmanship of Prof. Steinberger, Judge of the Constitutional Court of the Federal Republic of Germany, oral reports by Prof. von Mangoldt (Tubingen) on methods of dispute settlement in public international law and by Aron Broches (Past Vice-President of the World Bank and Secretary General of the International Centre for Settlement of Investment Disputes, Washington) on experiences from the practice of an international arbitral tribunal as well as a written report by Prof. Mosler (Judge at the International Court of Justice, The Hague) on the International Court of Justice at its present stage of development supplied most comprehensive information as well as many challenging ideas on international dispute settlement in general. A short but intensive discussion supplemented this session.

In a second session, under the chairmanship of the President of the International Institute of Space Law, Prof. Diederiks-Verschoor, the existing rules for dispute settlement in present space law were presented by reports of Prof. Gorove (Mississippi) regarding the liability convention, Dr. Bourely (Legal Adviser of ESA, Paris) regarding dispute settlement according to the convention on the European Space Agency and also

by Prof. Maureen Williams (Buenos Aires) on dispute settlement according to the conventions on INMARSAT and INTELSAT. These reports as well as the following discussion went beyond mere information on the existing positive space law to identify major problem areas, evaluate the effectiveness of the existing rules and their likelihood of acceptability in other fields of space law.

In the third session of the colloquium which dealt with rules and experiences in comparable fields of the law, Barrister Chowdhury (New Delhi) was in the chair. In a first report Prof. Milde, the Acting Director of the Legal Bureau of ICAO, Montreal, on the basis of a personal experience of many years within the organization gave a most comprehensive and informative report on dispute settlement in the frame-work of the International Civil Aviation Organization. Dispute settlement in bilateral air transport agreements was then discussed in a fascinating presentation which was one of the highlights of the meeting by Prof. Bin Cheng (London) the Chairman of the Air Law Committee of the International Law Association. Perhaps the most direct bearing on the development of settlement techniques in space law can be expected from the third report in that session which was given by Prof. Jaenicke (Frankfurt), the Legal Adviser to the German Delegation at the Law of the Sea Conferences, on solutions for dispute settlement elaborated in the framework of the conferences on the law of the sea. As was also pointed out in the discussion of that session, the fact that inspite of the well-known difficulties to agree on the substantive part of a law of the sea convention, a general agreement could be found on a most sophisticated system of dispute settlement combining international adjudication and arbitration can be evaluated as not only the most recent experience of what seems acceptable in state practice but also as an optimistic indication that also in space law settlement procedures might find acceptance by states in spite of most negative experiences in other fields and in spite of the negative acceptance record of the International Court of Justice.

In the fourth and last session which was chaired by Prof. Goedhuis, the Chairman of the Space Law Committee of the International Law Association, reports and discussion tried, on the basis of the experience and views gathered in the preceding sessions, to shape perspective for further development of space law. Four rapporteurs were asked to present their answers to the following questions: To what extent are further procedures for the settlement of space law disputes considered necessary? (Report by Ambassador Cocca, Argentina). Which method of dispute settlement in space law can be considered being the most effective and which has the greatest chances of realization? (Report by the undersigned). Which method of realization in public international law can be considered most desirable and having the greatest chances of realization? (Report by Mrs. Galloway, Washington D.C., Vice-President of the International Institute of Space Law). Which steps should be taken in research and practice in order to achieve progress? (Report by Prof. Matte, Director of the Institute of Air and Space Law, Montreal). Obviously it is extremely difficult, within the limited space available here, to summarize the conclusions of the reports and discussion at the end of this two-day-meeting, which produced certainly the widest and at the same time

the deepest research and insight ever made on the subject so far. It may therefore be permitted to repeat the conclusions which the undersigned presented in his report to the Space Law Colloquium of the International Institute of Space Law shortly afterwards:

1. If we want progress to be achieved in the development of procedure for the peaceful settlement of disputes in space law, most of the time not enthusiastic recommendations, but rather pragmatic endeavor to choose the settlement method best fit and most acceptable to states for a given type of cases or a specific area of space law seems the wise approach. A number of specific criteria might be taken into account in the deciding process.

2. The method finally required for at least certain practically relevant areas of space law, in order to assure peaceful cooperation or at least coexistance of the international community in space activities, will be compulsory third-party settlement.

3. States can only be expected to be willing to accept this latter method for those areas of space law where a reasonable certainty as to the applicable rules exists, not however for highly controversial areas.

4. A greater number of states may be found ready to accept compulsory third-party settlement if they are given a choice between adjudication and arbitration.

5. Where such a combined system is considered not fit or too complicated for limited areas of space law, a settlement by the more flexible method of arbitration will normally be more effective and easily acceptable to states than the jurisdiction of a permanent international court.

6. Space lawyers have the responsibility to elaborate further criteria and alternative solutions in this field which states may then draw upon.

7. Most probably, if at all progress will be achieved in state practice, it may be in limited areas of space law, especially in the law of space communications and other such fields, where the functioning of the system is in the interest of all states concerned and depends on disputes being settled without delay.

The Proceedings of the Munich Colloquium will be published by the Institute of Air and Space Law of Cologne University some time in Spring 1980.

Karl-Heinz Böckstiegel
Chairman, International Colloquium on the
Settlement of Space Law Disputes

8. 22nd Colloquium on the Law of Outer Space, Munich, September 17-22, 1979.

The Twenty-Second Colloquium of the International Institute of Space Law (IISL) on the Law of Outer Space was held during the XXXth Congress of the International Astronautical Federation in Munich, September 17-22, 1979.

As in the past, the colloquium again had four sessions. The first session which was chaired by the author and where Stephen Gorove served as rappoteur dealt with two separate parts. In part A which had the topic "Energy and Outer Space", papers were presented on "Legal Aspects of Solar Power Satellites" (Gorove, USA), "Institutional Issues in International Solar Energy Utilization" (von Kries, Germany), "Solar Energy Bank for Mankind in Contemporary International Space Law" (Okolie, USA) and "Legal and Political Problems of Solar Power Stations in Space" (Wiewiorowska, Poland). Presentations and discussions centered around the legal problems associated with solar power satellites, such as the claims of equatorial countries to segments of the geostationary orbit, microwave frequency allocation and microwave exposure standards. Also, the advantages and disadvantages as well as other institutional issues of international solar energy utilization were reviewed along with some of the political problems involved.

In part B, which dealt with the topic "Telecommunications," papers were presented on "The International Telecommunication Union and the International Law of Outer Space" (Christol, USA), "Issues in Telecommunications" (Galloway, USA), "Regional Cooperation in International Telecommunications" (Kosuge, Japan) and a written communication was submitted on "Copyright Problems of Direct Broadcasting by Satellites" (Mora, Hungary). In the discussion the role of the International Telecommunication Union with reference to solar power satellites and the international law of outer space were analyzed as well as patterns of regional cooperation. Initiated by both parts A and B, but not restricted to these topics, discussion several times concentrated on the concept of "common heritage of mankind", its applicability and meaning in space law and in the law of the sea. Several times reference was also made to the recently approved draft of the Moon Treaty.

The second session of the colloquium, which was chaired by Kopal (Czechoslovakia) and in which Bourély (ESA, France) served as rapporteur, first dealt with part C on "Status of International Space Flight" and then started the rather large part D on "Other Subjects". For part C, two papers were presented, one by Bourély on the topic "Towards a Convention on the Legal Status of Manned International Space Flight" and one by Menter (USA) on "Status of International Flight". Both the papers and the discussion examined whether there is a need for an international convention on the legal status of persons engaged in international space flight. The need for international agreed general criteria was stressed by several speakers.

In part D ("Other Subjects") a very wide range of topics was dealt with by the papers presented. This part of the colloquium was still continued in the third session

(Chairman: Perek, UN; rapporteur: Padang, UN) and in the fourth session (Chairwoman: Diederiks-Verschoor, The Netherlands; rapporteur: Haanappel, Canada). Since in this part of the colloquium speakers were at liberty to choose subjects which they considered important or interesting, this involved the disadvantage of an extremely wide variety of subjects, on the other hand also the advantage of making it possible to present entirely new subjects which otherwise might not be considered in spite of their importance for the development of space law. Obviously it is not possible to summarize the views presented in this large part of the colloquium. Papers were presented on the following topics: "Outer Space Prospects: Is There the Will to Establish a Widely-Accepted Legal Order in Space?" (Almond Jr., USA), "Some Questions (Without Answer) Concerning the Consent of States to be Bound by Treaties Governing the Activities in Outer Space" (Bakotic, Yugoslavia), "Progress Report on Research Regarding the Settlement of Space Law Disputes" (by the author), "The Settlement of Disputes in International Space Law" (Cocca, Argentina), "Do We Need a Strict, Limited Liability Regime in Outer Space?" (DeSaussure, USA), "Aspects of Space Law and Environment" (Diederiks-Verschoor, The Netherlands), "Airspace and Outer Space-after-Twenty Years" (Gál, Hungary), "United Nations Consideration of Nuclear Power for Satellites (Galloway, USA), "The Stagnating Development of International Space Law and its Causes (Haanappel, Netherlands/Canada), "Problème de la délimitation de l'espace extra-atmosphérique" (Heraud, CNES, France), "Space Technology for Development: Dreams and Realities" (Leister, USA), "Data Protection in the Technique of Remote Sensing by Satellites" (Reijnen, Netherlands), "Art. 11 of the new draft Moon Treaty" (Rosenfield, USA), "The Art of Living in Space" (Sterns and Tennen, USA), "Outer Space Colonization: A Planned Unit Development?" (Tamm, USA), "Conflicts of Law and the Delineation of Outer Space: An Interest Analysis Approach" (Tennen, USA), "The Problem of Demarcation in the Limelight Again" (Williams, Argentina) and on "1979 United Nations Moon Treaty encourages Lunar Mining and Space Development" (Finch Jr., USA). In the discussion, many of these papers were commented upon and some raised controversies between either participants from different political and legal systems or due to traditional or progressive and optimistic approaches to the development of space law.

The proceedings of the 1979 colloquium will be published by the American Institute of Aeronautics and Astronautics, 1290 Avenue of the Americas, New York, New York 10017. The publication is expected to be out by the end of 1979.

Karl-Heinz Böckstiegel, Chairman,
22nd Colloquium on the
Law of Outer Space (IISL)

9. International Colloquium "Librespace," Free Enterprise in Space, Paris, Oct. 18-19, 1979.

An International Colloquium entitled "Librespace," organized by EUROSPACE under the auspices of the University of Paris I, took place in Paris, October 18-19, 1979. The meeting was chaired by Dean C. A. Colliard and 118 persons from twelve different countries from Europe and the Americas participated in it. The purpose of the meeting was to examine the opportunity and possibility of establishing private enterprises in space. It was noted that there were no legal obstacles to the establishment of such enterprises so long as they were authorized by and remained under the continuing supervision of the appropriate governments or international organizations which remained responsible for them.

The four areas which were subject of detailed study included telecommunications and television, remote sensing, industrial activities in space and modes of launching. Two recommendations were adopted which the Secretariat of Eurospace expects to put into effect, namely, the creation of a High Council of Audiovisual Transmission along the lines of the European Parliament's plan and collaboration between the private sectors in the United States and Europe with a view to identifying and bringing together clients in the field of remote sensing.

Y. Demerliac
Secretary General
EUROSPACE

10. Brief News

A Soviet biological spacecraft, carrying experiments from the U.S. and several other nations, recently returned to earth. The Russian mission was the third involving NASA participation . . . Japan intends to become the third nation to fly a space mission beyond earth orbit. . . . Soviet and French space officials discussed selection criteria for a French cosmonaut (man or woman) who will be launched into space in 1982 on board a Soviet spacecraft . . . Pegasus 2 satellite, launched in 1965 fell harmlessly into the Atlantic.

B. Forthcoming Events

A Symposium on "Space Law in Perspective" will be held at the University of Mississippi Law Center on April 21, 1980. The Symposium is cosponsored by the Association of the U.S. Members of the International Institute of Space Law and the American Society of International Law. For further information, please contact, Professor Stephen Gorove, University of Mississippi Law Center, University, MS 38677 (Tel. 601/232-7361, Ext. 503).

An International Colloquium on the "Economic Benefits of Space and Other Advanced Technologies" will be held in Strasbourg on April 28-30, 1980. The Colloquium is organized by the European Space Agency and the University of Louis Pasteur of Strasbourg and is cosponsored by the Parliamentary Assembly of the Council of Europe.

"World Communication: Decisions for the Eighties" is the title of an international invitational conference sponsored by the University of Pennsylvania's Annenberg School of Communications to be held on May 12-14, 1980, in Philadelphia.

The 23rd Colloquium on the Law of Outer Space will be held during the XXXI Congress of the International Astronautical Federation in Tokyo, Japan, September 21-28, 1980. Subjects to be discussed include: (a) Implications of the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies; (b) Implications of the World Administrative Radio Conference (WARC) 1979; (c) Protection of the Environment: Earth, Celestial Bodies and Outer Space; (d) Patterns of International Space Cooperation (international regimes applicable to space activities, regime for international manned flight, etc.).

Aerospace Law: From Scientific Exploration to Commercial Utilization, by Nicolas Mateesco Matte. (Distributed by the Carswell Co. Ltd, Toronto, Canada and Editions A. Pedone, Paris, France, 1977). 354 pages.

The author of this book, Professor Nicolas Mateesco Matte, is the Director of the Institute of Air and Space Law of McGill University who has written extensively in the fields of air and space law. One of his earlier books published in 1969 also bore the title of Aerospace Law, and his recent treatment of the subject matter rightly deserves attention.

The first part of the book is devoted to an analysis of international cooperation at the institutional level and the activities of states pertaining to the exploration and use of outer space. The introductory chapters deal with both nongovernmental and intergovernmental organizations, bilateral cooperation and state activities. Among the nongovernmental organizations the International Council of Scientific Unions, COSPAR, the International Astronautical Federation, the International Institute of Space Law, the International Academy of Astronautics, and the International Law Association are noted. The discussion of intergovernmental organizations extends both to the United Nations (Committee on the Peaceful Uses of Outer Space, its Subcommittees and Working Groups, and the Outer Space Affairs Division) and its specialized or related agencies, including the ITU, UNESCO, ICAO, IMCO, WMO, WIPO (World Intellectual Property Organization), IAEA, and WHO. The institutional patterns of organizations for regional cooperation are analyzed in relation to Western Europe, the socialist countries, and the Post-Apollo project. The significance of bilateral cooperation is presented in a review of the agreements concluded by the United States, the Soviet Union, India, France and other countries. The discussion of state activities focuses briefly on the programs of the United States, the Soviet Union, France, Great Britain, Canada, China, and some other countries.

The second part of the treatise is devoted to an overview of the commercial and cultural utilization of outer space. Included in this section is a concise treatment of the organizational framework of INTERSPUTNIK and INTELSAT and the difficulties involved in the INTELSAT-INTERSPUTNIK rapproachement. An analysis of the problems of working out an international agreement on remote sensing of the earth by satellites and of direct broadcasting by satellites completes this section.

The last part of the monograph encompasses detailed analyses of the Convention on International Liability for Damage Caused by Space Objects, the Convention on Registration of Objects Launched Into Outer Space and the Draft Treaty on the Moon.

The book also contains sizeable annexes incorporating several international conventions, draft agreements, relevant documents and a bibliography. Professor

Matte's book is well organized, interestingly presented, contains a wealth of information and useful documentation. While this reviewer would have preferred a title different from "Aerospace Law", such as "Space Law" or "International Space Law", both students and professionals as well as the general reader will welcome this new addition and contribution to the ever-increasing literature of space law.

Stephen Gorove
Vice-President for Programs
Association of U.S. Members
of the International Institute
of Space Law

Die Produkthaftung in der Luft- und Raumfahrt, Dokementation eines Internationalen Kolloquiums in Köln 1977 (Product Liability in Air and Space Transportation, Proceedings of an International Colloquium in Cologne, 1977), Edited by Karl-Heinz Böckstiegel (Carl Heymanns Verlag KG., Cologne, 1978). 332 pages.

This book is a compilation of contributions by participants at the international colloquium on Products Liability in Air and Space Transportation, which was held in Cologne in 1977 under the auspices of the Institute of Air and Space Law of Cologne University.

The colloquium was an attempt to coordinate an analysis of both products liability and liability arising from air and space transportation. The articles presented in this volume are written by leading authorities in English or German and are summarized in the other language. Included are discussions of the present state of the law in various geographic areas. These are complemented by individual articles analyzing the law from the standpoint of the consumer, the government and industry.

There are three articles dealing specifically with the issue of products liability as it relates to space transportation. The book is, in general, a valuable addition to the literature and, as such, it will be useful to anyone active in the area of air and space law.

La Responsabilidad International por Danos en el Derecho del Espacio (International Responsibility for Damages in Space Law) by C. Gutierrez Espada, (Murcia, Spain, 1979). 312 pages.

In the first part of this book the role of the United Nations and the activities of its committees are recounted to portray the long road to the Convention on International Liability for Damage Caused by Space Objects (Liability Convention).

The second part of the book is a dissection and discussion of the articles of the Liability Convention. The limits and constituent elements of liability principles are discussed.

The Convention on Registration of Objects Launched into Outer Space is similarly dissected and discussed. Its genesis, content, and a critique are provided. The determination of liability and its economic implications are also analyzed and the law applicable to the assessment of damages is discussed.

Planners, thinkers and practitioners of space law will find this book useful for its orderly analysis of the aspects and development of a salient body of law applicable to liability for damage caused by space objects.

Space Transportation Systems 1980-2000, edited by Robert Salkeld, Donald W. Patterson, and Jerry Grey (American Institute of Aeronautics and Astronautics, New York, 1978). 91 pages.

The key to a greater and more economical use of space is the availability of efficient, low-cost transportation.

The space shuttle will be the backbone of efficient transportation during the first half of the 1980's. By altering the shuttle's solid fuel rockets with liquid rocket boosters, the payload capacity of the shuttle can be increased when traffic becomes greater. The shuttle will reach its maximum usefulness when shuttle operations are performed in conjunction with an orbital transfer vehicle (OTV) which can be designed with present technology. Propelled by chemicals, the OTV would be important in geosynchronous orbital work.

The goals of the 1990's would be the development of single-stage-to-orbit (SSTO) vehicles which would lower the costs of placing materials in orbit by fifty times. The propulsion methods by the turn of the century could include nuclear rockets, electric propulsion, the solar sail, the solar thermal rocket, and the mass driver reaction engine (MDRE).

The planners of space ventures certainly must understand the capacities and limitations of space transportation; practitioners of space law also must understand this technology because space law ultimately may regulate such details as payload efficienty, methods of propulsion, and flight configuration.

Chariots for Apollo: A History of Manned Lunar Spacecraft, by Courtney G. Brooks, James M. Grimwood and Lloyd S. Swenson, Jr. (National Aeronautics and Space Administration, Washington, D.C., 1979). 538 pages.

This book was written under the auspices of the NASA history program but primarily incorporates the judgments of the authors. It is a survey of the U. S. Apollo program, its inception, its struggles and triumphs from 1957 to 1969.

Specifically the history of the lunar module, the search for an adequate launch vehicle, the selection and training of astronauts, the guidance and navigation of the command module, and the scientific concerns are treated in depth. Detailed information is provided concerning the site selection procedure, astronaut assignments, Apollo II experiments and lunar samples, the major spacecraft component manufacturers, the funding of the Apollo program, and responsibilities of the manned space centers.

The history of the Apollo program is of interest to space law scholars inasmuch as this book provides an overview of the administrative decisions and technological breakthroughs encountered in the race to complete man's landing on the moon before the end of the 1960 decade. Not only is it a reliable reference tool for information about the Apollo program, but it is a vivid account of dynamic efforts of the United States to reach the lunar unknown.

Moonport, by Charles D. Benson and William Barnaby Faherty (National Aeronautics and Space Administration, Washington, D.C., 1978). 635 pages.

The construction and operation of the Apollo launch facilities are detailed in *Moonport.*

This history begins with a discussion of the policy considerations in the selection of the site of launch facilities. The book goes on to stress the difficulties of labor strife and the sociological and economic effects the launch facilities caused in the Cape Canaveral area. Included are the hearings about the project before Congress and the budgetary battles between Congress and NASA.

Emphasis is placed on the technological and engineering problems the project posed but because of the attention given to some of the policy and other considerations the book should be of more general interest.

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ERRATA

Vol. 7, No. 1 (Spring 1979)

The correct title of the article by I.H.Ph. Diederiks-Verschoor is "Space Law As It Affects Domestic Law". The reference in the "Brief News" section (p. 74) should be to the "Indian" and not the "Pacific" Ocean.

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