JOURNAL OF SPACE LAW

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out of man's activities in outer space

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CONTENTS

PREFACE

The Journal of Space Law is pleased to include in this issue the presentations made at the "Law and Security in Outer Space" Symposium organized as a Law Professors Workshop and held at the University of Mississippi Law Center on May 21-22, 1983. The Workshop was cosponsored by the Standing Committee on Law and National Security and the International Law Section of the American Bar Association and the University of Mississippi and its Law Center under the leadership of the Chairman of the Standing Committee *Morris I. Leibman*, its Consultant *Bernard A. Ramundo*, University of Mississippi Chancellor *Porter L. Fortune*, Executive Vice Chancellor *Harvey S. Lewis*, Vice Chancellor for Academic Affairs *Peter E. Wagner*, Law School Dean *Parham H. Williams, Jr.* and Law Professor *Stephen Gorove*.

The articles included in this issue follow the sequential order of presentations made during the four sessions into which the conference was divided, namely: A. International Perspectives (articles by *Gorove, Gibson, Pedersen, Bourély*): B. National Considerations (articles by *Galloway, Small, Stowe, Wulf*) C. Security-Related Issues (articles by *Dembling, Wagner, and Cheng*) and D. Implications for Private Enterprise (articles by *Finch, Pikus* and *Hoover*). The first and third sessions were moderated by Prof. *Gorove*, the second one by Dr. *Ramundo*, and the fourth session by Mr. *Finch*.

All contributors indicated that they made their presentations in their personal capacities and their articles - unless subsequently revised - reflect their status as of the date of the conference.

The Journal wishes to record its gratitude to all contributors and those whose enlightened leadership made the Workshop an unqualified success.

Stephen Gorove
Chairman, Editorial Board and Advisors,
Journal of Space Law

FOREWORD

The materials that follow reflect the proceedings of the Law Professors Workshop, "Law and Security in Outer Space," which was held on May 21-22, 1982, at the University of Mississippi (Workshop program appended). The American Bar Association's Standing Committee on Law and National Security and its International Law Section are pleased that "Ole Miss," under the leadership of Chancellor *Porter L. Fortune, Jr.*, and Dean *Parham H. Williams, Jr.*, of the Law Center, joined in the Association's enrichment program for law professors by co-sponsoring the Workshop. The program, a continuing series of seminars on contemporary national and international security affairs problems, is intended to improve the legal educational process by making available the views of recognized specialists on a variety of security-related issues which significantly affect domestic and international institutional developments. The Association believes that law students will be better prepared for the traditional leadership role of the Bar in community and national affairs if their instructors have a continuing source of enrichment on these issues. The Committee appreciates the efforts of Professor *Stephen Gorove* of the University of Mississippi Law Center and Dr. *Bernard A. Ramundo* of the National Law Center, George Washington University, in organizing a successful Workshop which was well attended by law professors and legal and technical specialists from the United States and Europe.

The Workshop, prompted by the new horizons, legal and technical, opened by the advent of the space shuttle, sought to focus on international regime development, the security aspects of space utilization, U.S. space policy and its formulation, and commercial possibilities in space. Workshop participants were exposed to future utilization of outer space for such purposes as defense, energy generation, geological exploration, communications, special environment manufacturing and laboratory research, and transportation; and then focused on the consequent and accompanying, increasingly complex legal and political issues. Workshop specialists underscored that thinking of space as a working environment has immeasurably complicated those issues which used to revolve only about the most basic aspects of sovereignty and security. For example, commercial operations in outer space add a special dimension to the security issue. In addition to the traditional concerns of states for their national security and for the safety of their populations from the increasing number of objects which potentially constitute threats as falling objects, there is the concern of private owners of space satellites that space debris and other space objects may destroy their satellites if there is no system for disposing of space objects no longer deemed functional. One speaker suggested use of the space shuttle to tow nonfunctional objects into orbits where they will burn. The general conclusion from the Workshop is that there is a need for measured regime building, through the United Nations' system and other multilateral forums, which keeps pace with technological progress now being accelerated by the enhanced access provided by the space shuttle and other developments.

The ambitious Workshop program necessitated two full days of activities which produced revelations and, at times, stimulating exchanges. The Committee appreciates the enthusiastic participation of its law professors attendees and the galaxy of specialists who generously shared their special insights on the subjects covered. Although the Committee was pleased by the diversity (and, at times, novelty) of the views expressed, it must dutifully note that the views are those of the presenters and do not reflect those

of the Association. Based upon the excellent reaction to the Workshop at the University of Mississippi, the Committee looks forward to sponsoring additional workshops which will provide continuing enrichment in the law and national security area. The happy association in co-sponsoring this Workshop with Ole Miss prompts the Committee to welcome future co-sponsorship arrangements.

Chicago, 1982

Morris I. Leibman
Chairman, Standing Committee on
Law and National Security
American Bar Association

CURRENT ISSUES OF SPACE LAW BEFORE THE UNITED NATIONS +

*Stephen Gorove**

The United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) has been the main instrument of the United Nations responsible for the preparation and drafting of major international resolutions and agreements pertaining to the law of outer space.[1] While the Committee, with the assistance of its two Subcommittees (the Scientific and Technical Subcommittee and the Legal Subcommittee), has had a remarkable track record based on consensus during its short-lived existence of less than a quarter of a century, it was unable to arrive at a general agreement with respect to principles governing direct television broadcasting by satellites which were adopted by the U.N. General Assembly by majority vote last fall.[2] Additionally, the Committee has not been able to reach consensus on three items still on its agenda:

A. Legal implications of remote sensing of the earth from space, with the aim of formulating draft principles;
B. Consideration of the possibility of supplementing the norms of international law relevant to the use of nuclear power sources in outer space and;
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 purpose of this presentation is to identify the basic legal issues in the three agenda items and explain the rationale underlying the different approaches and suggested solutions.

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+ The views expressed in this article are those of the author and do not necessarily represent those of any organization with which he is connected.

[1]There has been a growing literature on the work and accomplishments of the U.N. Committee on the Peaceful Uses of Outer Space. *See,* for instance, Galloway, *Consensus Decisionmaking by the United Nations Committee on the Peaceful Uses of Outer Space,* 7 J. SPACE L. 3 (1977): Gorove, *The 1980 Session of the U.N. Committee on the Peaceful Uses of Outer Space: Highlights of Positions on Outstanding Legal Issues,* 8 J. SPACE L. 174 (1980). Hosenball, *The United Nations Committee on the Peaceful Uses of Outer Space: Past Accomplishments and Future Challenges,* 7 J. SPACE L. 95 (1977): Jankowitsch, *Contributions of the United Nations Committee on the Peaceful Uses of Outer Space: An Overview,* 5 J. SPACE L. 7 (1977): Jasentuliyana, *Report on the Work of United Nations Committee on the Peaceful Uses of Outer Space in 1981,* 9 J. SPACE L. 171 (1981): *idem, The Work of the United Nations Committee on the Peaceful Uses of Outer Space in 1982,* 10 J. SPACE L. 41 (1982).

[2]U.N. Gen. Assembly Res. 37/92 (Dec. 10,1982). Text reproduced in 10 J. SPACE L. 252 (1982).

A. Legal Implications of Remote Sensing

Consideration of the legal implications of remote sensing of the earth from space has been on the agenda of both the Scientific and Technical Subcommittee and the Legal Subcommittee for a number of years. A set of draft principles has been developed, many portions of which are still in square brackets indicating that no consensus on them has been achieved.[3] One of the major issues with respect to remote sensing has been the determination of conditions under which decisions on the acquisition and use of satellite data could be made. More specifically, the basic question continued to be whether there should be unlimited freedom to disseminate data and information gained by remote sensing or whether it was necessary to require consent by the sensed state and impose restrictions.[4]

In course of the discussions many less developed countries opposed the uncontrolled dissemination of detailed space imagery of a foreign state since in their view such dissemination damaged the sensed state's interests and caused international friction.[5] Therefore, in their view it was essential to protect the legitimate rights and interests of the sensed state against the misuse of data and information about its national territory. Otherwise the principle of state sovereignty, which was the keystone of international law, would be violated.[6] In this connection, it was noted that

> due respect for the sovereignty of sensed state, implied the observance of two fundamental principles: first, that the sensed state should have timely and preferential access at nominal cost (reasonable terms) to data obtained by remote sensing of its territory and, second, that such data should not be disseminated to third states without its prior authorization.[7]

With respect to the first principle, the view was expressed that it was unproductive to establish a dividing line between primary data and analyzed information as a basis for the granting of access to such data.[8] However, it was also stated that due regard had to be given to the efforts involved in producing such analyses[9] and that proprietary rights had to be taken into account.[10]

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[3]For a text of the Draft Principles incorporating the changes made at the Twenty-Second Session of the Legal Subcommittee, *see* U.N. Doc. A/AC. 105/320, pp. 16-21 (13 April 1983), reproduced *infra*, pp. 165-169.

[4]Docs. A/AC.105/C.2/SR.382, p. 4 (1983); A/AC.105/C.2/SR.383, p. 8 (1983).

[5]Doc. A/AC.105/C.2/SR.383, p. 2.

[6]*Id.* at 8.

[7]Doc. A/AC.105/C.2/SR.387, p. 4 (1983).

[8]Doc. A/AC.105/C.2/SR.383, p. 7 (1983).

[9]Doc. A/AC.105/C.2/SR.387, p. 4 (1983).

[10]Doc. A/AC.105/C.2/SR.384, p. 6 (1983).

Concerns about free dissemination of data arose from perceptions of new remote sensing techniques which have made it possible to evaluate both agricultural and mineral resources. In this respect it was noted that

> a country with the right technology could acquire a precise picture of the current state and economic potential of another country by remote sensing. The data which could be obtained included natural resources, industrial installations, means of communication and the like and that was the reason why legal principles had to be formulated to regulate properly the problems currently posed by remote sensing.[11]

The theory was also advanced that unlimited freedom to disseminate data and information could place the space powers in an even more advantageous position in international markets by cornering data on resources of other countries[12].

While some less developed countries were of the view that the concept of permanent sovereignty over natural wealth and resources applied to all data and information obtained from remote sensing of the territory of a sensed state,[13] the Soviet-led socialist countries expressed the view that it was necessary to formulate criteria distinguishing between remote sensing data available for free dissemination and data which could not be disseminated without the express consent of the sensed state.[14] In a similar vein, France proposed that data above a certain threshold of resolution (which was yet to be determined) should not be disseminated without the consent of the sensed state.[15] Also, some years ago, the Soviet Union proposed that a resolution finer than 50 meters should not be disseminated without such consent.[16]

More recently, the Soviet Union expressed concern about the possibility that

> a number of receiving stations might in the future belong to private corporations or individuals. States should be responsible for everything connected with remote sensing activities otherwise the latter could become a source of confrontation and conflict. If receiving stations were in private hands and the operators of those stations felt free to treat the data they received as a marketable commodity [in the Soviet Union's view] a very different and unpleasant situation could arise. It was therefore necessary to establish some general principles defining the responsibilities of governments in that regard and work out a set of rules for the dissemination of remote sensing data.[17]

In contrast to the Soviet position the United States believed that any viable set of principles should foster the continued development of remote sensing programs and not inhibit their practical operation. In the view of the United States

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[11]Doc. A/AC.105/C.2/SR.383, p. 8 (1983).

[12] *Id.*

[13] *Id.*

[14]Doc. A/AC.105/C.2/SR.387, p. 2 (1983).

[15]Doc. A/AC.105/C.2/SR.384, p. 6 (1983).

[16]Doc. WG. III (1979)/WP.1.

[17]Doc. A/AC.105/C.2/SR.384, p. 8 (1983).

> the principles on remote sensing must respect the right of all states to conduct remote sensing programs in outer space in accordance with Article I of the Outer Space Treaty. Dissemination of data from civil remote-sensing programs could not be made dependent upon the prior consent of the sensed state since it would impair the usefulness and availability of such data. The principles could not assert the concept of state sovereignty over information obtained from outer space inasmuch as data, analyzed information, and technical information might be subject to proprietory rights that had to be respected. While the United States accepted international responsibility for the outer space activities of its governmental and nongovernmental entities, it could not accept the extension of such responsibility to terrestrial activities, except in accordance with generally recognized principles of international law.[18]

Another view stressed that

> a balance between the two types of factors was needed. The first type of factors were those effecting the freedom to disseminate data obtained by remote sensing and analyzed information based on those data. That freedom promoted the development of remote sensing programs and scientific progress in the field. The second group of factors were concerned primarily with the need to respect the national interests of the sensed states and not to harm their interests on the pretext of the freedom to disseminate data. But they also included both the undeniable right of the sensed state to have timely access to data before they were made available to third states and the responsibility of the state engaged in remote sensing, whether that was done by governmental organizations or by nongovernmental bodies.[19]

In addition to the foregoing views, the observation was made that

> certain states were in a dominant position which threatened to deepen the cleavage between "data rich" and "data poor" countries. Therefore, it was essential to bring about greater equality between technically advanced countries and the others. All countries should have an opportunity to participate in remote sensing activities through international cooperation, and remote sensing data should be as freely accessible as possible since a restrictive regime would favor the growing domination by the sensing states which already have data on all countries. At the same time adequate assistance to developing countries was needed to enable them to enjoy the benefits of remote sensing and interpret and apply data themselves.[20]

In a similar fashion the importance of a step-by-step approach was also advocated to fill the legal vacuum in the area of remote sensing, without prejudicing the development of legal instruments to keep pace with technical performance improvements incorporated into future satellites.[21]

B. International Law and the Use of Nuclear Power Sources (NPS) In Outer Space

Consideration of the use of NPS in outer space and the norms of international law applicable to it came to the fore following the crash on Canadian territory of the Soviet

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[18]Doc. A/AC.105/C.2/SR.387, pp. 8-9 (1983).

[19]Doc. A/AC.105/C.2/SR.384, p. 5 (1983).

[20]Doc. A/AC.105/C.2/SR.382, p. 4 (1983).

[21]Doc. A/AC.105/C.2/SR.383, p. 4 (1983).

Union's COSMOS 954 satellite which carried a nuclear reactor on board.[22] Canada and several other countries favored the idea of supplementing the existing norms of international law while the Soviet-led socialist countries were of the view that it was necessary to make a comprehensive study of relevant international law first.

There were a number of issues which surfaced during the early discussions. Many of them fell into two categories, those involving assistance and those pertaining to liability.

Issues in the first category related to the meaning of "necessary assistance," the launching state's right to participate in search and clean-up operations, the methods of determining the extent and duration of such operations, and the steps immediately to be taken by the affected states. Additionally, the access to the affected state's territory by search groups of assisting states, the extent of local experts' participation, the affected state's right to request assistance from a third state, and the ways of determining the methods of removing debris from the territory of the affected state were considered.[23]

With respect to the issue of liability, some countries expressed the view that liability for damage arising as a result of search and clean-up operations not conducted by the launching state cannot be imposed upon the launching state. As to the so-called "direct" and "indirect" damage, it was pointed out that these concepts were not incorporated in the Liability Convention of 1973. While some countries expressed the view that the special characteristics of nuclear power sources warranted the development of additional specific liability rules, other countries were of the view that the obligation of the launching state for consequences of its NPS use, together with the relevant provisions of the Outer Space Treaty and the Liability Convention, provided adequate bases for resolving virtually all of the issues.[24]

Following the recent entry into the earth's atmosphere of the component parts of the Soviet Union's COSMOS 1402 satellite which carried a nuclear reactor on board, concern was expressed by a number of countries that there was an urgent need for internationally accepted safety regulations providing for the same radiation limits adopted by the International Commission for Radiological Protection in connection with the terrestrial use of NPS. It was also stated that provisions should be made for assistance in case of an accident so that countries which were unable to protect themselves could get assistance on request. While several countries favored the idea of placing a moratorium on putting satellites with nuclear reactors in orbit around the earth until internationally agreed legal regulations on the use of NPS in outer space had been adopted, other countries opposed such a moratorium as neither feasible nor desirable, in particular, since this idea did not include the use of radioisotope sources which qualitatively had the same biological effect.[25]

In the course of the 1983 meeting of the Legal Subcommittee, a Canadian Working Paper consolidating some of Canada's earlier as well as more recent ideas expressed the desirability that each launching state provide information concerning its use of NPS and

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[22]For a detailed legal discussion of the issues raised by the Cosmos 954 accident, see 6 J. SPACE L. 107-170 (1978).

[23]Gorove, *How High is the Sky and Other Cosmic Questions*, 12 THE BRIEF 38 (Feb., 1983).

[24] *Id.*

[25]Doc. A/AC.105/318, p. 13 (1983).

that such use meet generally accepted international standards for radiological protection.[26] It also proposed a specific format for notification prior to anticipated re-entry of a space object containing NPS and requirements to offer all necessary assistance to states likely to be effected by such re-entry. The Working Paper stated *inter alia* that the launching state was liable to pay compensation for all damage caused by NPS, including all reasonable expenses for search and clean-up, and damages related to measures taken to prevent and limit radiation exposure and related to the number of people exposed and the degree of exposure.[27]

Following extensive discussions, the Legal Subcommittee's Working Group agreed that in the event a space object is malfunctioning with the risk of re-entry of radioactive materials to the earth, the launching state should provide timely information to the states concerned and to the Secretary General of the United Nations on system parameters and on the radiological risk of NPS.[28]

C. Issues Relating to the Definition and/or Delimitation of Outer Space and the Geostationary Orbit

While the question of definition and/or delimitation of outer space has been with us since the beginning of the space age, the additional issue pertaining to the geostationary orbit has become the subject of considerable discussion following the Bogota Declaration of 1976 in which eight equatorial countries claimed exclusive jurisdiction and sovereignty over segments of the geostationary orbit lying above their national territories.[29]

The basic issue with respect to the definition and/or delimitation of outer space has been whether to establish a precise demarcation line between air space and outer space and, if so, where such line should be located. The issue has been addressed both from a "spatial" and a "functional" viewpoint. Those advocating the "spatial" approach were in favor of establishing an easily determinable boundary between air space and outer space at a certain altitude above sea level. In this connection some delegations expressed support for the Soviet proposal that had set the boundary at an altitude not exceeding 110 kilometers above sea level and also provided for passage, at lower altitudes, through the air space of one state for space objects of another state for the purpose of reaching orbit or returning to earth so long as such passage caused no adverse effect in the territory of the state whose air space was crossed.[30]

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[26]Doc. A/AC.105/C.2/L.137, reproduced in Doc. A/AC.105/320, pp. 25-28 (1983), *infra*, pp. 172-175.

[27] *Id.* at 27. Another Working Paper by the Federal Republic of Germany made recommendations for the notification prior to re-entry of a nuclear-powered satellite and dealt with the experience from the re-entry of the COSMOS 1402 nuclear-powered satellite emphasizing the need for timely notification and comprehensive information to be given by the launching state to reduce the concern over the re-entry of a satellite with NPS on board. (Doc. A/AC.105/C.2/L.138 of 28 Mar. 1983, reproduced *infra*, pp. 175-179.)

[28]For details, *see* Doc. A/AC.105/320, p. 23 (1983).

[29]For a text of the Bogota Declaration of December 3, 1976, *see* 6 J. SPACE L. 193 (1978).

[30]Doc. A/AC.105/C.2/L.139.

Some countries which were in favor of the spatial approach stressed the importance and urgency of resolving the issue of definition and/or delimitation of outer space. They pointed out that different regimes apply to outer space and air space and therefore it was desirable to have a global and easily determinable boundary. They drew attention to the differences between the two regimes with respect to sovereignty which involved political and security considerations and sensitivities. They stated that the definition and/or delimitation based on altitude was essentially a legal and political, and not a purely scientific or technical, matter.[31] They were not in favor of the functional approach since in their view such an approach would lead to the applicability of two different regimes to the same geographical area and would also result in the weakening of the principle of national sovereignty over air space. A resolution of the problem based on altitude would prevent the occurrence of disputes and would facilitate international cooperation without impeding technological development.[32]

In the course of the discussions, the view was also expressed that a customary rule of international law had in fact developed, as states had now accepted the area above the lowest possible perigee of satellites as constituting outer space. A definition along these lines could be easily ascertainable and provisions could be made for the passage of space objects through air space.[33]

In contradistinction to the "spatial" method some countries favored what may be characterized as a "functional" approach, pointing out that it would be more productive to direct efforts toward the establishment of regulations to avoid possible interferences among space activities and adverse consequences for human life on earth. They stressed that such an approach would be for specific purposes rather than general as implied in the spatial approach and would better serve small states whose space objects, for geographical reasons, would more likely have to transverse the air space of another state.[34]

In line with the functional approach, it was also brought out that a definition and/or delimitation of outer space was not necessary nor feasible at the present time inasmuch as the development and application of space law had proceeded satisfactorily without it and additionally, because there was no scientific basis for such a definition and/or delimitation. The latter could only give rise to difficulties which might hamper space technological developments.[35] Additionally, it was stated that the existing outer space treaties were in fact based on a functional approach and a spacial definition would establish a vast, clearly defined area of air space over which states would not generally have the means to enforce their sovereignty.[36] It was also pointed out that air space and outer space were not distinguished by boundaries but by different activities and,

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[31]Doc. A/AC.105/32), p. 8 (1983).

[32] *Id.*

[33] *Id.*

[34] *Id.* at 9.

[35] *Id.* at 8.

[36]Gorove, *supra* note 23, at 9.

therefore, the future study of the definition of outer space should include the definition of outer space activities.[37]

A third view, which has been characterized as "pragmatic" was also advanced to the effect that a boundary between air space and outer space would not be responsive to any practical need now evident and could have unforeseen negative effects on the progressive development of space activities and space law.[38]

With respect to the issue of the geostationary orbit, a number of developing countries expressed the desirability of formulating regulations governing use of the orbit which they regarded to be of a *sui generis* character and a limited natural resource whose use would soon become saturated. They pointed out that the equatorial states had a special physical relationship with the geostationary orbit which necessitated the establishment of a special juridical regime. They recalled the decisions of UNISPACE 82 Conference as well as the 1982 Plenipotentiary Conference of the International Telecommunication Union in Nairobi. They expressed the view that the question relating to the geostationary orbit was not considered at the time of the drafting of the Outer Space Treaty and that not all states were parties to the treaty. Furthermore in their view continuation of the "first come, first served" practice would place the less developed states at a disadvantage. It was the technological advancements that underscored the pressing need for the promulgation of new legal regulation and appropriate technical planning which would take into account the needs of the developing countries and the special interests of equatorial countries in the rational and equitable use of the orbit.[39]

Other countries, including the space powers, did not question the right of all countries to equitable access to the orbit on an efficient and economical basis but pointed out that it was difficult to define the orbit's limit because technological developments were continually expanding it. They pointed out that the special characteristics of the orbit were due to its relation to the earth as a whole and not merely to a relationship to the equator. In their view, the orbit issue was essentially a question of the utilization of the radio frequency spectrum and as the matter was under consideration by the International Telecommunication Union (ITU), it was inappropriate for the Legal Subcommittee to prepare regulations with respect to it. It was stressed also that continued technological advancements would increase orbital capacity and keep pace with the demand for services. In view of this, orbital positions should be granted in accordance with demand at a particular time but without barring access to those who apply later. Thus appropriate management of the orbit through the ITU, rather than long-term inflexible planning, was required.[40]

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[37] *Id.*

[38] Doc. A/AC.105/32, p. 9 (1983).

[39] *Id.*

[40] *Id.* at 10.

D. Assessment and Suggestion for a Possible Compromise

The preceding brief overview of the current space law issues before the United Nations reveals considerable differences of opinion in practically all of the areas under discussion. To the extent that such differences are rooted in fundamental political or ideological beliefs, such as freedom of information versus state sovereignty, they are likely to remain very difficult to resolve. This appears to hold true in the field of remote sensing where the major stumbling block is the question whether a state that carries out remote sensing activities of the earth could without the approval of the sensed state freely disseminate the acquired data or information to third states, international organizations, and public or private entities. Those championing free dissemination of information regard it as a fundamental human right whereas those opposing it predicate their case on the principle of sovereignty and their inalienable right to dispose of their natural resources and of information concerning such resources.

While the matter of formulating draft principles governing remote sensing of the earth from space has been on the agenda of UNCOPUOS for many years, it may be recalled that initially many states entertained the view that remote sensing should not be carried out without the consent of the sensed state. This position, although also based upon sovereignty, was subsequently not pressed due largely to the fact that it appeared contrary to the principle of freedom of exploration and use of outer space, a fundamental principle of the Outer Space Treaty of 1967. As a result there is no requirement of consent by the sensed state to remote sensing in the draft principles under consideration. It is important to emphasize this because it clearly reveals that if all states had at present the ability to engage in remote sensing activities then they would be able to get on their own the very same information that they get under a system of free dissemination which many states are objecting to. This observation, should it be correct,appears to point in a direction which could conceivably carry a potential chance for a compromise. Such solution could be predicated on the recognition that there is a possibility of someone taking unfair advantage of remote sensing data by satellite. Presumably, the invocation of the principle of sovereignty and the insistence by a number of states on the requirement of consent by the sensed state to the dissemination of data is to protect such state's vital,mostly economic, interests in their natural resources from possible harm. Such harm might result if the intentional,unfair use of remote sensing data resulted in the user gaining economic benefits to the ascertainable detriment (damage) of the sensed state.

The taking of unfair advantage of remote sensing data by a user in the indicated manner could be declared unlawful and states could undertake to pass appropriate legislation to punish offenders. The laws pertaining to unfair competition and unfair trade practices might conceivably provide some guidelines in dealing with such problems. The possibility or likely incidence of unlawful use of remote sensing data in the indicated manner or whether it has ever occurred is not known since no specific instances or accusations have come to the limelight. This does not necessarily mean that it could never occur and, in view of this, a specific ban on such activity may allay some of the general concerns and fears.

Insofar as NPS is concerned differences of opinion do not seem as far apart as in the field of remote sensing. Thus it can be somewhat more realistically hoped that eventual consensus will emerge regarding notification, assistance and other requirements involving the use of NPS by satellites in low earth orbit.

The resolution of the issue of definition and/or delimitation of outer space appears to be the least pressing at the present time. The development of what may be regarded as a customary rule of international law that regards the area where satellites orbit the earth as outer space appears to make a precise physical determination no longer of immediate urgency. Such determination may entail or revive the troublesome question of where airspace ends and also raise the issue of the precise status of the area between airspace and outer space, should airspace not extend to the lowest boundary line of outer space.

Finally the issue of equitable access to the geostationary orbit/spectrum resource may well have a better chance for resolution by consensus in the scientific/technical setting of the 1985 World Administrative Radio Conference which is expected to consider the problem in detail.

LAW AND SECURITY IN OUTER SPACE
INTERNATIONAL REGIONAL ROLE - FOCUS ON THE EUROPEAN SPACE AGENCY +

*Roy Gibson**

Europe's combined space efforts started in 1960 with the separate establishment of the European Space Research Organisation (ESRO)[1], and the European Launcher Development Organisation (ELDO).[2] Both organisations were the result of international conventions, but, regrettably, with somewhat different sets of signatories. It took fifteen years before ESRO and ELDO could be fused to form the European Space Agency (ESA).[3]

Thus in May 1975 the ESA Convention[4] was signed, and eleven European countries became Member States. Those countries were Belgium, Denmark, Federal Republic of Germany, France, Ireland, Italy, Netherlands, Spain, Sweden, Switzerland and the United Kingdom. In recent years, Austria and Norway became Associated Member States of the Agency, bringing the total to thirteen. Austria and Norway had in fact signed the preparatory ESRO Convention in 1960, but at the last moment they failed to become members. Their present association is therefore a welcome homecoming to the European space community.

It is relevant to the present subject to point out that ESA groups together all the members of the European Community (with the exception of Luxembourg) and the four traditional "neutrals" - Spain, Sweden, Switzerland and Austria. There are few other European organisations which are actually concerned with high technology programmes and which have such a wide membership. Desirable as this characteristic may, in general be, it complicates the task of reconciling individual national, foreign and security policies to the point where the Agency can be given clear operating instructions. To be complete it must be added that ESA also has an important non-European element: Canada. In December, 1978, Canada signed a memorandum[5] of association with the

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+ The views expressed in this article are those of the author and not necessarily those of any organization with which he has been or is connected.

[1]European Space Research Organization (ESRO) was set up by the Convention for the Establishment of a European Space Research Organisation, Paris, June 14, 1962, 58 U.N.T.S. 35 (1965).

[2]European Launcher Development Organisation was set up by the Convention for the Establishment of a European Organisation; for the Development and Construction of Space Vehicle Launchers, with Annexes, Financial Protocol and Protocol Concerning Certain Responsibilities in Connection with the Initial Programme, London, March 29, 1962, 507 U.N.T.S. 177 (1964).

[3]European Space Agency (ESA): Basic Texts of the European Space Agency, Vol. 1 at A-6 (Paris, Sept. 1, 1977).

[4] *Id.*

[5]The Memorandum of Association between Canada and ESA was signed on December 9, 1978 and has an initial period of validity of five years.

Agency, and now plays a significant role in ESA's affairs. In fact, only the geographical location of Canada - which was difficult to alter - prevented it from being formally accepted as an Associate - with a capital "A" - member.

ESRO, ELDO and ESA are all organisations with a strong legal basis, not to say bias. Quite apart from the basic Conventions, the three organisations - and in particular ESA - have produced a veritable mountain of legal arrangements, memoranda of understanding and such, and these have often become the butt of both critics and wits. They are, however, the natural product of the complicated legal world in which ESA was born and operates. The Agency has a legal personality and is therefore under continual obligation to define its responsibilities and those of its Member States, not to speak of the many important international arrangements to which ESA is a party. The Agency therefore, perforce, built up a considerable expertise in the practical application of traditional juridical techniques to space problems, and this became extremely useful when the Agency became involved in international space law affairs outside Europe.

The 1967 Space Treaty[6] places responsibility on the signatories - sovereign states - but the subsequent international agreements negotiated through the United Nations, although still not open to international organisations as signatories, enable their provisions to be extended to cover international organisations engaged in space activities. This provision was introduced largely at the prompting of the UN members of ESRO and ELDO, and it in fact obliges members of a relevant international organisation to take the necessary steps to extend to the international organisation such UN agreements as they are signed. This extension requires that the majority of Member States of the organisation in question have signed, and ratified both the 1967 Space Treaty and the specific agreement, and that the organisation itself makes a formal declaration accepting its rights and obligations under the agreement.

The Council of ESA, the governing body consisting of two delegates from each Member State, is invited to approve each accepting declaration, which is thereafter sent by ESA's Director General to the Secretary General of the United Nations. ESA activities are thus not directly but indirectly affected by the 1967 Space Treaty through its Member States who remain responsible for its implementation. The subsequent UN agreements are directly applicable to the Agency. They impact both on the Agency's external relations and on relations between Member States.

The Agency's acceptance of the UN Convention on the registration of Space Objects[7] shows that an international organisation can maintain a register of the satellites it launches and can acquire the responsibility for notifying such launches to the Secretary General of the United Nations. This is logical though not always a criterion, because the Agency is legally the owner of the "space objects" which it develops and launches for its Member States, although the Agency cannot, of course, itself directly assume the governmental responsibilities for these space objects as envisaged under the Space

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[6]Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967 [1967], 18 (3) U.S.T. 2410, T.I.A.S. 6347, 610 U.N.T.S. 205 (effective Oct. 10, 1967).

[7]Convention on Registration of Objects Launched into Outer Space, January 14, 1975, [1978], 28 U.S.T. 695, T.I.A.S. 8480 (effective Sept. 15, 1976).

Treaty. It is clear, however, that the Agency cannot launch its satellite or spacelab or have them launched by others without creating a regime to cover its legal responsibility. This is contained in a Resolution approved by the ESA Council in 1977.[8]

Although perhaps rather more academic in nature, at least for the present, ESA has also formally accepted the UN Convention on the rescue of astronauts,[9] and in so doing has specifically accepted that she considers herself a "launching authority" as defined in the Convention.

All of this has been provided to sustain the thesis that since ESA's activities - present and future - can be affected by the UN's legal activities, the Agency needs to be directly associated with the discussion and resolution of these problems in the UN committee framework.

The Agency in fact seeks at two levels to participate in the formulation of new international space regulations. The first level of participation is through encouraging and organising a consultation between its Member States. The second level is by direct representation at meetings of COPUOS and other international meetings.

Internal coordination on space matters being discussed in the United Nations has long been a tradition in Western Europe. Before the formation of the European Space Agency, Western European governments used a somewhat ineffectual body, known as the European Space Conference,[10] as a mechanism for discussing important space questions at ministerial level. This Conference established a Working Group to discuss matters being dealt with from time to time in the United Nations committees. With the establishment of ESA, the new Convention provided the possibility for the ESA Council to meet at ministerial levels and therefore the European Space Conference ceased to exist, and with it the UN Working Group. In the latter's stead was established the International Relations Advisory Group (IRAG)[11] which the ESA Council made responsible for consultation between Member States on all matters related to the United Nations' family and, in particular, the Outer Space Committee and its sub-committees.

The presence of the word "Advisory" in IRAG's title will come as a surprise to no one, for, although the ESA Convention makes the Agency responsible for coordination in European space affairs generally, the creation of the Agency has in no way reduced the value which each Member State places on national sovereignty. Nowhere is this felt more strongly than in the field of international relations and international regulation. Once its advisory nature is accepted, however, it is surprising and gratifying to see how frank and constructive many of the IRAG debates have been. One needs contantly to incant that the IRAG deliberations are not a substitute for national policy declarations, and even more firmly and frequently to stress that the Agency cannot have the pretension of speaking collectively for its Member States. Inspite of such, IRAG has

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[8]Resolution ESA/C/XXII/Res. 3 of 13 Dec., 1977.

[9]U.S. Dept. State Treaties in Force; A List of Treaties and Other International Agreements of the U.S. in Force on January 1, 1983, p. 202 (1982).

[10]The European Space Conference, April 1975, 1 E.S.A. B [8] (June 1975).

[11]The International Relations Advisory Group (IRAG) was set up by a decision of the ESA Council. Such decisions are not published beyond the ESA delegations.

proven a most valuable instrument. It brings together the representatives of thirteen European countries, plus Canada, and there is no other formally constituted consultative committee which can bring influence to bear on such a large number of members of the UN committees in which space matters are debated. More recently IRAG has had its title and status changed, and it is known now as IRAC,[12] The International Relations Advisory Committee, and it reports directly to ESA Council.

It is true that there are many questions on which there are strong disagreements between Member States, but in comparison with the whole range of opinions which one finds in the UN, ESA's International Relations Advisory Committee is a relatively homogenous group. This group contains both Sweden and Canada, whose delegations have together been active in the UN Space Committee in trying to find compromise solutions.

The ESA influence, through IRAC, is particularly important because the very concrete interests of the European Space Agency tend to concentrate attention on real and practical problems and to discourage debating club type discussions. The relevance of these international discussions to every day space activities is becoming increasingly obvious. One particularly good example of ESA's activity in this field of cooperation was in the preparations for the 1979 World Administrative Radio Conference (WARC). In this instance ESA acted as a focal point for Member States and was able to undertake a great deal of preparatory work which might have been difficult for at least some Member States to have carried out with their own resources. As is the case with the UN Space Committee meetings, the Agency also provided a sort of European Secretariat during the WARC and acted as a clearing house and source of technical advice to Member States.

In 1971 the ESRO's Director of Administration, who was responsible for international and juridical matters, had limited sympathy for those who wished to put more effort into following closely the work of the United Nations Outer Space Committee. One could perhaps try in retrospect to fabricate a respectable justification for such a barbaric attitude by pleading that we were at that time overwhelmed by the problems of building up the necessary infrastructure for the European space efforts, and with the novel complexities connected with multi-national programmes with a high technological content. The truth is, however, that the subjects under international discussion seemed far-removed from the realities of the space business and the ritualistic nature of the debates encouraged one to believe that the Space Agency's priorities lay elsewhere. This was wrong. May it not be that the debates at that time suffered from a rather general feeling that the process did not warrant high priority or effort?

Whether or not this was the case, it is astounding that so much has been done by way of international regulation. Some items appear on the agenda with the regularity of turkey at Thanksgiving, but this is inevitable when one is looking for international agreement. Our concern should be to ensure that the regulation making keeps pace not only with technological progress, but also with practical needs. The coming of space stations and of international projects which will take the NASA/ESA/Canadian Shuttle programme cooperation a significant step farther, will create a maze of legal problems to

[12]The International Relations Advisory Committee (IRAC) was established by a decision of the ESA Council. Such decisions are not published beyond the ESA delegations.

which we presently have no answers. Such advances must not be delayed or shelved because we are not smart enough to organise ourselves in time.

There is perhaps something to be learned from the development of international law in the field of nuclear energy. There are, in fact, many resemblances between the developments in nuclear energy and in space. Twenty years ago there was a flourish of international activity within the nuclear energy field because of the acknowledged need to transport radioactive materials beyond national boundaries and the absence of acceptable safety regulations. The division of responsibility which evolved, was approximately as follows:

> the International Commission for Radiological Protection (ICRP) provided the necessary acceptable level of exposure to radiation and contamination;
>
> the International Atomic Energy Agency (IAEA) arranged first specialist panels to build up codes of practice based on the current practices of those Member States with nuclear energy programmes, (this often necessitated very expensive supporting research work by the major national atomic energy agencies), and later governmental conferences were convened and invited to approve model sets of regulations, and
>
> international transport organisations, such as IATA, IMCO and European railways (CIM), then convened their traditional regulatory bodies to transform the IAEA model regulations into specific regulations for the transport of radioisotopes, nuclear fuel, etc. by land, sea and air.

Few people sitting in a commercial aircraft are bothered today by the possibility that they are positioned a few feet above a container of radiation-emitting radioisotopes bound for some hospital or factory. Nor do trainloads of nuclear fuel arouse the same passions that were evident in the early 60's.

The whole exercise was discreetly orchestrated by the IAEA, and, as is so often the case in these things, was highly dependent on the initiative and far-sightedness of a single IAEA officer, Dr. Jacques Servant. This same orchestration is very must needed now in space law, and a reinforced Secretariat of the UN Outer Space Committee would be the best place for this to be done. Using the nuclear energy analogy, the UN Secretariat could draw more on the expertise not only of Member States but also international governmental and non-governmental organisations, as indeed is already being done in connection with the 1982 UN Space Conference - UNISPACE [13] - to be held in Vienna in August this year. But the Secretariat urgently needs additional qualified staff in order to service the committees and to provide an active liaison with the other bodies such as ITU and others who will rightly wish to become involved in the space aspects of their traditional work as we progress down the road to the general exploitation of space techniques.

There is renewed talk of creating a global space agency, but one view is that we need first to prove that we are prepared to use and reinforce the existing UN machinery,

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[13]This Conference was held in Vienna, August 9-21, 1982. *See* Report of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (hereinafter "UNISPACE"), U.N. Doc. A/CONF. 101/10 (1982).

before we launch a new agency. Without universal support and encouragement, an international space agency would be doomed to failure and would do more than provide an alibi for those space powers who tend to find international cooperation irksome anyway. We must first use the existing organisations. ESA, because of its technical competence and its wide membership, could be used to a greater extent as a catalyst in identifying those problems and areas which are on the critical path.

One worry is that in these particularly delicate political times, there may be a temptation for the UN committee to occupy themselves with further intellectually titillating analyses of such fascinating subjects as the difference between "the province of all mankind" and "common heritage". But the practical problems connected with direct broadcast satellites, remote sensing, use of geostationary orbit are upon us now, and they require pragmatic rules if the space nations are not to be encouraged politely to ignore international regulation. In many cases we can hope for - and indeed need - only international coordination and codes of practice, rather than full-blown treaties, but the urgency is great. If we cannot deal with the present problems, we have no hope of being able to tackle the even greater complexities surrounding the next generation of programmes such as international space stations, solar power satellites, multi-purpose antenna farms. The jurists have been exceedingly active and far-sighted, but they cannot (or, at least, should not) carry the burden alone because there are complex technical problems involved, plus serious political conundrums. Delegates to the UN committee must understand the situation and must be prepared to lend their support to working out practical solutions. The European Space Agency has a direct interest in seeing these problems tackled. It seems that it also has a role to play. One which could well be increased, and could help to direct attention to the problems on this critical path of future technological development.

INTERNATIONAL COOPERATION AND COMPETITION IN SPACE: A CURRENT PERSPECTIVE +

*Kenneth S. Pedersen**

From its inception, the United States civilian space program has been conducted with a high degree of international involvement. The 1958 National Aeronautics and Space Act (NASA)[1] specifically charges NASA to conduct its activities "so as to contribute materially to . . . [c]ooperation by the United States with other nations and groups of nations . . . ."[2] In fulfillment of this mandate, and in pursuit of its own objectives, NASA has entered into over 1,000 agreements with over 100 countries. These relationships have covered a full spectrum of collaborative endeavors, ranging from major space hardware exchanges to the sharing of mission data among scientists around the globe. Two particularly visible examples of international cooperation associated with the Space Shuttle are the Remote Manipulator System (RMS) built by Canada at a cost of about $100 million and the Spacelab system produced by the European Space Agency (ESA) for around $1 billion. Today, virtually every major NASA program incorporates international contributions.

Benefits of International Involvement

It is important to emphasize that NASA's commitment to international cooperation is grounded solidly in self-interest. NASA enters into joint programs only after ascertaining that the United States' space program will benefit from each undertaking and assumes that its prospective partners do likewise. The advantages accruing to the United States from its international space agreements are significant.

Foreign contributions to NASA programs reduce the costs of these programs to the United States and/or permit a more expansive effort. Financial benefits already realized by NASA through international cooperation are substantial; the value of foreign contributions to NASA programs to date exceeds $2 billion.

The United States gains access to first-class foreign science and technology relevant to its programs. In some cases, foreign assistance, such as through NASA's worldwide tracking system, has been essential to the success of United States missions.

International involvement helps to demonstrate support for proposed programs, easing their acceptance and helping to sustain subsequent domestic political and financial sustenance during their multi-year development phase.

International space collaboration also serves broader national foreign policy goals aimed at retaining positive, productive relationships with the many countries, both developed and developing, which are benefiting from the space programs.

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+ The views expressed are those of the author and not necessarily those of NASA or of any organization with which he is connected.

[1]National Aeronautics and Space Act of 1958, Pub. L. No. 85-568, 72 stat. 426 (1958).

[2]National Aeronautics and Space Act, § 102(c)(7), 72 stat. at 427.

On this last point, NASA's history of international cooperation has afforded the United States freedom of action in programs like Landsat which might otherwise have been viewed with suspicion abroad. Foreign experience in utilizing valuable worldwide Landsat data has enhanced international acceptance of global remote sensing programs, including those programs contributing to world peacekeeping. Similarly, widespread international participation in United States civil programs underscores the essential openness of these programs and underscores the United States' commitment to the peaceful, free use of outer space by all nations.

The Growth of International Competition

A discussion of international space cooperation would not be complete without countervailing reference to increasing international competition. Growing capabilities and expenditures have produced a group of mature foreign space powers, capable of competing effectively with United States firms for worldwide business.

Many foreign space budgets rose steadily throughout the 1970s, although there has been some leveling off recently as other countries experience a period of fiscal restraint similar to the United States situation. However, the budgets have been maintained at fairly high levels compared to the past. Furthermore, recent foreign budgets have shown an increased emphasis on areas of potential commercial payoff: communications, remote sensing and launch vehicle development.

Concrete examples of this trend are easy to find. ESA has successfully completed the testing of its Ariane launch vehicle, and the first operational flight is scheduled for later this year.[3] ESA recently approved funding to further upgrade the Ariane vehicle, with plans to develop and test the Ariane 4 vehicle by late 1985.[4] Several countries, most notably France and Japan, are developing land and ocean remote sensing satellites. Communications satellites have been developed and are being sold by a number of foreign firms, and both ESA and Japan are emphasizing experimental work in the commercially promising 30/20 GHz band.

This competition should come as no surprise. The potential market for space hardware and services is large and technically challenging. Indeed, it would be surprising if the United States leadership in this area was not challenged. However, industry-to-government relationships in many other countries differ significantly from the United States' practice. Although the private sector abroad is active, foreign government intervention is high. In some countries, a close relationship between government and industry, particularly in high technology areas, is traditional. Many governments abroad support their space industry not only through research and development (R&D) funding, but also by price subsidization and financing assistance, development of attractive package deals, and creation of quasi-governmental marketing organizations.

For example, the Europeans have established Arianespace, a semi-private corporation, with extensive French government involvement, to market Ariane launch services. Arianespace has contracted with Grumman Corporation to be its United States Marketing agent. Arianespace's marketing strategy combines aggressive salesmanship

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[3] 10 J. Space L. 78 (1982).

[4] Joint ESA/CNES Press Release, Feb. 2, 1982, Info. No. 5.

with attractive prices, made even more attractive by government supported financing terms.

A similar situation is emerging in remote sensing. Here, France has created a largely government-owned corporation called SPOT-Image to market the data products produced by its land remote sensing satellite, SPOT, now scheduled for launch in 1984. In addition to the marketing of SPOT data, SPOT-Image will promote the sale of related French commercial equipment and services. Like Arianespace, SPOT-Image will establish a United States subsidiary to pursue business here.

Besides being inevitable, this competition can be very useful. For example, as the United States moves into the Shuttle operational era, a viable launch alternative like Ariane strongly motivates NASA to monitor closely the efficiency of its launch program. Partly in response to the newly competitive environment, NASA has initiated improvement programs to lower STS production and operating costs, and facilitate user relationships.

Cooperation—What Lies Ahead

It would be unfortunate if a fascination with competition were allowed to divert attention from those areas where international cooperation can continue offering significant benefits. Competition and cooperation are not necessarily mutually exclusive. For example, the same increasing capabilities abroad which foster economic rivalries can also make foreign nations more capable partners.

To reap the benefits of cooperation without jeopardizing the competitive position of United States industry, care must be exercised in selecting, defining and implementing joint programs. Projects leading to the early development of commercially useful technology are not usually open for international participation. In projects where there is foreign involvement, that involvement is structured so as to avoid technology transfer. Generally, foreign participants undertake to provide a discrete piece of the overall project and are then responsible for developing the resulting technology and hardware. Only the minimum amount of technical information necessary to ensure effective interface among the various elements of a project is exchanged. Although concerns are periodically expressed about technology transfer, the facts appear to show that very little significant technology escapes the United States as the result of NASA's cooperative programs.

At the moment, NASA is discussing a number of new cooperative projects with prospective partners. Of these, perhaps the most interesting is the possible development of an earth-orbiting manned space station.

At this point, it is not clear if and when NASA will receive Executive Branch and Congressional approval to move ahead with a space station or exactly what form a station would take. Similarly, whether and to what extent there will be international involvement in the development of a station are open but highly interesting questions. An exploration of how NASA is approaching these questions and the issues they raise can offer some valuable insights into both the complexity and challenge of international cooperation in today's world.

International interest in NASA's space station planning is already high. Representatives from most of the free world's space-faring nations have visited NASA to familiarize themselves with the efforts currently underway and to become acquainted

with what the future might hold. This early involvement is itself rather unique. The more traditional pattern has been for NASA to develop its plans to a rather advanced stage before inviting expressions of foreign interest. While offering some advantages, this historic approach has tended to discourage potential partners and to deprive NASA of the useful contributions others can make to the creative process.

Relatively early discussions are also particularly suited to two key space station objectives. First, the station is not viewed as a "space spectacular," but as a working orbital facility; as such, NASA wishes to gain as much information as possible now about user requirements. Gaining first hand knowledge about how a space station, in one form or another, fits into the prospective worldwide pattern of space utilization is thus an important aspect of NASA's planning activities. Secondly, the very scope and complexity of the space station project argues that foreign participation, should it occur, will need to entail sizable financial and political commitments. The growing technological competence and economic strength found abroad make such commitments feasible. At the same time, it is not unreasonable for others to want to be part of the planning process prior to deciding on whether to join the United States in such an ambitious undertaking.

For NASA's part, the ultimate decision about international participation will turn on the ability to resolve several critical questions. To some extent these questions are present in every cooperative project. The size and unique nature of the space station, however, give them added importance.

1. Can such a major project as a space station be undertaken on an international basis and still be effectively managed?

Management of a project as large as a space station is going to be difficult under any circumstances; adding foreign involvement will complicate the management tasks further. For example, foreign companies cannot be treated as subcontractors to a United States prime contractor. Schedule advances or slips can become delicate issues of diplomacy rather than simple items of project management. To be quite frank, added managerial complexity is one of the factors that tends to come with the territory and must be traded off against the advantages offered by international cooperation.

NASA's record of successful international dealings suggests, however, that the management burdens are not overwhelming. Several principles of operation seem particularly critical here. First, foreign contributions to a space station would need to take, insofar as possible, the form of discrete hardware packages that lend themselves to clean technical and managerial interfaces. Second, the specific responsibilities and obligations of each partner must be clearly defined and documented. Third, control of the overall station design and development should reside in a single "project manager," presumably in this case NASA. Much would depend on the final configuration of the station. A station design incorporating a number of free-flying components or clearly discernible modules will obviously lend itself more readily to diverse management modes than will a single, highly integrated structure.

2. Don't major international space projects just result in technology leakage abroad?

Past NASA international programs have not transferred technology abroad in any unacceptable degree. However, to say that NASA has done a good job in protecting against unwarranted outflows of technology is not the same as saying there is no risk. The potential for technology transfer exists in any cooperative project. Normally, careful steps must be taken on all sides to minimize the risk of undesired transfer. In this regard, it should be emphasized that foreign partners are increasingly concerned about protection of their technology as well. Protection against unwarranted technology transfer is accomplished primarily through insistence that each party to the cooperative project undertake to develop a discrete piece of hardware for which it is fully responsible and for which it has the necessary technological capability. The assessment that each cooperative partner possesses the ability to carry out its obligations without undue assistance from the other parties is an important part of the negotiations underlying any major NASA international project. In part, the growing technical sophistication of many countries abroad acts to lessen the risk that exclusive United States' technology will be lost.

3. Is international involvement consistent with possible military utilization of the space station by the United States?

While use of the space station for certain national security functions can complicate foreign participation, it does not rule it out. In the case of the Space Shuttle, for example, international cooperation and military use have co-existed quite comfortably to date. One can conceive of many designs for a space station which could accommodate a diversity of activities with a minimum of impingement and adequate accessibility of all parties to their areas of interest. Strong expressions of foreign interest in exploring the possibilities of a space station will have the effect of assuring that attention is given to those configurations which make multiple uses of the station possible and productive.

4. What are the quid pro quo for foreign contributions to a space station?

International space cooperation is not a charitable enterprise; countries cooperate because they judge it to be in their interest to do so. In return for helping to defray the cost of developing a space station, other countries will undoubtedly seek tangible benefits for themselves. First and foremost, these benefits must revolve around the opportunities afforded their industries to participate in a high technology project of the first magnitude. The spin-off effects of investments made in the space area are well documented. Beyond this, however, one can conceive of foreign contributions to a space station being directly reciprocated through such mechanisms as priority access to the station and its services and/or discounted prices on related launches or services. The balancing of interests and benefits is always the most difficult and fascinating aspect of international negotiation. The expressions of interest from foreign officials received to date suggest strongly that, in their minds, a sufficient case exists to warrant continuing a serious dialogue.

It is important to re-emphasize that no United States Government commitment to a space station has yet been made. Over the course of coming months, many important

discussions bearing on this nation's next steps in space will be held. An extremely important dimension of these debates will focus on how this country should balance its programs in response to the challenge and the promise from abroad. A space station could emerge as the centerpiece of this national dialogue and, as such, ought to serve as an interesting case study for observers of the space scene everywhere.

THE SPACELAB PROGRAM AND RELATED LEGAL ISSUES +

*M. G. Bourély**

The purpose of this paper is to illustrate the impact of the Spacelab on law and security in outer space. To this effect Spacelab will be considered from the technical, political and legal points of view.

I. What is Spacelab from the technical point of view?

The Spacelab is a modular space laboratory carried out in the cargo bay of the Space Shuttle Orbiter, offering a great degree of flexibility to accommodate various experiments. Spacelab is therefore an integral part of the NASA Space Transportation System (STS). It is carried by the orbiter, to which it remains attached throughout the flight and is fully reusable.

Spacelab can be assembled in a variety of configurations. The basic elements of the assembled unit include pressurized module sections and unpressurized pallets. The module provides the working environment for the payload specialists who will man the laboratory in orbit, while the pallet is a platform on which instruments are mounted. Also included in the program is the delivery of an Instrument Pointing System.

The pressurized module is a cylindrical unit made of aluminum alloy. It can have one or two segments, according to mission requirements. Each segment is 4 meters in diameter and 2.7 meters long. When the two segments are used together the module can carry a payload of up to 4.6 tons and provides a usable working volume of 22 cubic meters of experiments. One of the two segments is known as the core module because it houses the essential sub-systems—monitoring equipment, electrical supplies, computers and thermal regulation and some experiments. The other segment is the experiment module housing experiments only.

Unlike the experiment module, the pallets are not pressurized and are, indeed, directly exposed to the space vacuum. A Pallet Train can consist of up to five segments and can carry approximately 9000 kilograms of instruments. The payload could include telescopes and antennae or radars. These may either function automatically, or may be controlled from the module, the orbiter or the ground. The Spacelab module and a pallet can be used together for a particular mission, or, either one of them may be used separately. Hence the unit has considerable flexibility as a research medium.

The Spacelab is linked to the orbiter by a tunnel, 1 meter in diameter, which enables the payload specialists to enter the Spacelab and return to the Shuttle and share the astronauts' living accommodation. Normally two Payload specialists will man the Spacelab.

What are the results of the Spacelab program achieved so far? To date the Spacelab program as seen from the European side is nearing its completion and has reached some interesting results for Europe - to be evaluated against the 950 millions of dollars spent by the European partners. The following events evidence some of these results:

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+ The views expressed in this article are those of the author and not necessarily those of the European Space Agency.

The first Spacelab element arrived at Cape Kennedy in mid-December 1980.

Delivery of the Spacelab flight Unit was made in two batches - the first was delivered to NASA in December 1981 and solemnly handed over to the United States in the presence of Mr. George Bush, Vice-President of the United States, the 2nd of February 1982. The second batch was delivered in mid 1982.

The European payload for the first flight was integrated at ERNO, Bremen, under the management of the ESA facility called SPICE in Germany. The payload was flown to the United States during the summer of '82 for final integration with the United States payload at KSG.

The first flight of Spacelab in the Orbiter (SL-1) is due to take place in September-October of 1983 and the second Spacelab mission (SL-2) in November 1984. In addition one dedicated flight of Spacelab has been booked by Germany (D1 mission) for May 1985.

It is understood that the flights of Spacelab after SL-1 will be under the sole responsibility of NASA and any European participation will be on a commercial basis.

The training of the European selected as payload specialist for SL-1 is in good progress. In addition, one ESA astronaut is completing training as a mission specialist at KSC and could therefore fly on further Spacelab flights if NASA so decides.

A lot of specialized equipment has been developed in Europe as part of the program. In particular it should be mentioned that during the second and third orbital flight tests of the Orbiter a pallet manufactured in Europe carried a set of scientific instruments provided by NASA.

Finally it is worth noting that NASA purchased, in accordance with its obligation, a second Spacelab and additional equipment required for the Spacelab program. In January 1980 NASA signed a contract with ESA for the purchase of the second Spacelab; the contract was extended in May to include a second Spacelab Instrument Pointing System.

II. What is the Spacelab program from the political point of view?

Europe participates in the major United States space program which is the United States Space Transportation System. In this cooperative venture Europe undertook in 1973 to finance, design and develop a manned space laboratory. NASA would operate the laboratory as part of the United States Space Transportation System. It is the biggest cooperative venture between ESA and NASA. For Europe it is of particular significance since it heralds the entry of the European scientific and technological communities into the realms of manned space flight.

Europe is entirely responsible for the funding, the design and development of the Spacelab. NASA is to provide the launcher and the Space Shuttle which will carry the laboratory in orbit for each mission and bring it back to Earth once a mission is terminated. On the European side, ESA is fulfilling its obligations in the development of this major program, which will open new fields for basic and applied scientific research in space. Nine Member States (Belgium, Denmark, France, Germany, Italy, Netherlands, Spain, Switzerland and the United Kingdom) and one State with associate member status (Austria) are pooling the technical, financial and intellectual resources in the interests of the program.

Germany is the main contributor to this program, providing over 50% of the budget. The prime contractor is the German firm VFW-ERNO in Bremen. Some 40 companies in Europe have been involved in construction of the Spacelab. At the height of the development phase an industrial workforce of about 2000 was employed on the program.

The Spacelab program includes the right for Europe to obtain half of the first mission free of charge and to fly a European payload specialist in the first flight. During this flight half of the payload will be provided by the United States and half by Europe. It also obliged NASA to purchase from ESA a second set of Spacelab hardware identical to the first one provided to NASA by ESA free of charge.

III. What are the legal issues arising from the Spacelab program?

The Spacelab program, being a cooperative program, should be seen on two separate counts. Firstly, Spacelab is being constructed on a cooperative basis by a number of European States grouped within the European Space Agency (ESA)[1]; and, secondly, it is being incorporated in the Space Shuttle, which itself constitutes the first element of the space transportation system developed by the United States. It will be seen, then, that Spacelab involves two sets of legal relations - one set bearing on its development and the other on its utilization. These relations encompass not only the Europeans and the Americans but also third parties, in particular the users. To the intrinsic complexity of these relations must be added the fact that since Spacelab is not designed to fly on its own, it is closely dependent on the Shuttle, a situation that entails major legal consequences. Two such legal consequences are as follows: A. Spacelab as an international cooperative program. This will provide the occasion for describing the legal scaffolding that has been erected to permit its development and utilization. B. Spacelab as an integral part of the Space Shuttle. This will lead one to identify the legal differences, vis-a-vis space law, that distinguish Spacelab from the Space Shuttle.

A. Spacelab as an International Cooperative Program

The development of Spacelab by ESA for delivery to NASA - which is responsible for its integration in the Shuttle - and the use of Spacelab on Shuttle flights are the subject of a series of legal texts that define the relations between the various parties concerned. Spacelab has given rise to two series of texts, one consisting of agreements between Europe and the United States, and the other of intra-European agreements.

The first category comprises:

> The Agreement between the Government of the United States of America and certain Governments, Members of the European Space Research Organization (now the European Space Agency), for a Cooperative Program concerning Development, Procurement and Use of a Space Laboratory in conjunction with the Space Shuttle System. This Agreement, which was signed on 14 August 1973, lays down the general principles of a transatlantic cooperative program for the development of Spacelab and defines the program's objectives and general characteristics.[2]

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[1] *Convention for the Establishment of a European Space Agency*, BASIC TEXTS OF THE EUROPEAN SPACE AGENCY, Vol. I at A-6, entered into force, Dec. 9, 1976.

[2] *Agreement Between the Government of the United States of America and Certain Governments, Members of the European Space Research Organization, for a Cooperative Programme Concerning Development, Procurement and Use of a Space Laboratory in Conjunction with the Space Shuttle System*, BASIC TEXTS OF THE EUROPEAN SPACE AGENCY, Vol. II, at G9b, entered into force, Aug. 14, 1973.

> In conformity with the foregoing Agreement, a Memorandum of Understanding between NASA and ESRO (now ESA), which was also signed on 14 August 1973, sets out the modalities governing the implementation of the program and specifies, inter alia, the respective responsibilities of the two Agencies.[3]

The second category comprises the intra-European agreements that preceded, or have followed, these two texts. They comprise:

> An arrangement between certain Member States of ESRO (now ESA) and the Organization, itself, which was signed on 15 February 1973. The purpose of this arrangement was to determine the rules under which the European countries were prepared to discharge the commitments that they would be entering into with the United States and NASA. In the context of the present paper it should be noted that this arrangement includes a provision that gives the Agency ownership of Spacelab.[4]
>
> A series of texts relating to the constitution of the European structure for assuring integration of Spacelab in the Space Shuttle. The structure in question is an Agency team (SPICE-Spacelab Payload Integration and Coordination in Europe) set up in the Federal Republic of Germany.[5]

Spacelab utilization, like Spacelab development, has given rise to two series of agreements. In the category comprising agreements between the American and European partners one again finds the two texts already mentioned:

> The inter-governmental Agreement lays down the general principle that the United States Government will make the Space Shuttle available to the Europeans for their Spacelab missions (experiments and applications) on either a cooperative or a cost-reimbursable basis. Special rules are provided for the first Spacelab unit. It will pass under full American control once it is delivered and its first flight will be a cooperative mission in which Europeans will participate as Spacelab payload specialist.
>
> The Memorandum of Understanding between the two Agencies lays down, inter alia, the conditions under which subsequent Spacelabs will be acquired by the United States. The Memorandum establishes the principle that the United States must refrain from separate and independent development of any Spacelab that would constitute a duplication of the one developed by the Agency.

In the category comprising intra-European agreements, the Member States of the Agency have agreed to execute a Spacelab utilization program within the framework of the Agency.[6] Implementing Rules were adopted by the participants and approved by the ESA Council at a later stage on 10 February 1982. For the execution of this program, which, for the first time, is confined to the first flight of the first Spacelab, a number of texts have also been adopted with regard to:

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[3] *Memorandum of Understanding Between the National Aeronautics and Space Administration and the European Space Research Organization for a Cooperative Programme Concerning Development, Procurement and Use of a Space Laboratory in Conjunction with the Space Shuttle System*, BASIC TEXTS OF THE EUROPEAN SPACE AGENCY, Vol. II at G9c, entered into force, Aug. 14, 1973.

[4] *Arrangement Between Certain Member States of the European Space Research Organization and the European Space Research Organization Concerning the Execution of the Spacelab Programme*, BASIC TEXTS OF THE EUROPEAN SPACE AGENCY, Vol. II at G9a, entered into force, Aug. 10, 1973.

[5] *See generally*, BASIC TEXTS OF THE EUROPEAN SPACE AGENCY, Vol. II at G9a—e.

[6] Council Resolution of October 4, 1977; Declaration by the Participants on December 12, 1977.

The provision by certain Member States of general-purpose or special instruments for the conduct of the experiments; and,

The conduct of the experiments by the Agency on behalf of the experimenters.

By the date of the first Spacelab mission it will be necessary to settle certain outstanding issues. In the first instance, those that stem from the legal status of Spacelab in relation to the Space Shuttle must be dealt with.

B. Spacelab as an Integral Part of the Space Shuttle

It emerges very clearly from the texts just mentioned that it is impossible in practice to dissociate the Spacelab from the Space Shuttle. This is true despite the fact that these two elements of the same space transportation system have different owners. Because the notion of ownership of a space object leads, under space law, to a number of consequences, it is necessary that a solution be found to the situation created by the discordance between the Arrangement and the Agreement. Either the Agency will seek to exercise its right of ownership over the first Spacelab - even after it has been delivered to NASA - and in that case the appropriate conclusions will have to be drawn at all levels; or the Agency will refrain from doing so, in which case formal transfer to NASA of the title to ownership will have to be envisaged. This issue is currently being examined by the European Space Agency and will be the subject of discussions with the U.S. authorities with a view to clarifying the situation.

1. Ownership of Spacelab

As already indicated, the Arrangement between European States stipulates that the elements of the first Spacelab developed under the program are the property of the Agency, acting on behalf of the participants, as are the facilities and equipment acquired for the execution of the program. Article VII sec. D of the Agreement between the United States and Europe, on the other hand, stipulates that this first Spacelab shall be delivered to the American Government and that it shall be placed under the full control of the latter which may, in addition, decide to modify it. Although the first mission is a cooperative one, the American Government alone will have the responsibility for its successful execution, both from the technical viewpoint and from the aspect of liability for any damage occurring to the Spacelab itself (with the exception of damage resulting from the launch, flight or descent of the Space Shuttle). Lastly, the American Government will have unrestricted use of the first Spacelab for other missions, free of cost. In other words, the Agency, which is the owner of the first Spacelab cannot exercise its ownership rights once it has delivered the unit to NASA.

2. Registration

According to the Convention on Registration of Objects Launched into Outer Space: "When a space object is launched into orbit or beyond, the launching State shall register the space object by means of an entry in an appropriate registry. . . ."[7] This

[7]Convention on Registration of Objects Launched into Outer Space (hereinafter "Registration Convention"), January 14, 1975, 28 U.S.T. 695, T.I.A.S. No. 8480.

leads one to ask whether Spacelab is a "space object." In the absence of any definition of the term in the various space agreements, we think that the answer is "Yes", notwithstanding the fact that Spacelab is dependent on Space Shuttle during its flight. Thus the Agency, having launched a space object, would be entitled to register it independently from the registration of the Space Shuttle as a whole. This latter registration is naturally the responsibility of the United States.

3. Jurisdiction Over Personnel and Materials

This issue covers civil, criminal and disciplinary jurisdiction as well as intellectual property rights. According to the 1967 Space Treaty, registration of a space object entitles the registering State to retain jurisdiction and control over the object and over any personnel thereof.[8] But this provision only applies to States, and the Agency could not, therefore, avail itself of it. Moreover, operational imperatives would render inoperative any rights that might be recognized with respect to Spacelab, since once it is integrated in the Space Shuttle - and all the more so when it is in flight - it is an integral part of the latter.

4. Liability for Damage

This issue can arise under various aspects depending on whether one is dealing on the one hand with damage caused to the United States, the Agency or its Member States, or on the other hand with damage caused to third parties. In the case of the first group, such damage would be covered by the existing agreements between the American and European partners. This leaves the question of damage caused to third parties. The latter might invoke the Conventions on liability[9] and on registration[10] as a means of directly involving the liability of the Agency, as owner of Spacelab.

5. U.S. Domestic Legislation

One should also mention that since 1973, some U.S. domestic legislation governing persons and property involved in STS flights has been adopted by the U.S. Government for its own purposes. The following provisions will have to be taken into consideration when trying to solve the issues referred to above:

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

[9]Convention on International Liability for Damage Caused by Space Objects, March 29, 1972, 24 U.S.T. 2389, T.I.A.S. No. 7762.

[10]Registration Convention, *supra* note 7.

A regulation on objects likely to be carried on the STS flights.[11]

A regulation on the authority of the STS Commander.[12] Under this regulation, the authority of the Commander applies to all persons aboard the Shuttle, including Spacelab, whether they are of American nationality or not.

A regulation on the safety of personnel. The purpose of this regulation was to establish criteria and procedures to ensure that personnel having access to the STS should meet safety standards.[13]

A regulation on insurance in the event of damage to third parties. The NASA Act was amended by the Congress in order to introduce a new section 308 authorizing NASA to provide, in certain cases, liability insurance for the users. The customer can obtain an insurance covering his liability and that of the American Government for damage to third parties up to a ceiling of 500 million dollars. Beyond this amount NASA remains liable. As regards relations between users and NASA and between users, the risk theory prevails; each one is liable for his own damage and waives recourse against other parties.

Finally it is worth mentioning that NASA and ESA have already discussed guidelines for the conduct of Spacelab experiments using humans as test subjects in order to achieve common standards.

Conclusion

Besides this legal aspect, the implementation of the Spacelab program may be a basis for a certain amount of reflections on both sides on how difficulties arising from the execution of a cooperative program may be solved. Europe has certainly encountered a lot of problems from the fact that, for obvious reasons, the Spacelab program was totally dependent on the development of the orbiter which was NASA's responsibility. Thus, the European partners had to comply not only with NASA's technical demands concerning the Spacelab itself - which were a consequence of NASA's control of the Space shuttle program as a whole - but also with the consequences in terms of the calendar of NASA's decision on the Orbiter development program. In both cases the effect was a significant increase (or 40%) of the overall cost of the Spacelab development program. On the other hand, the European partners found that the only reward they had, that is the right to fly half of the first Spacelab payload free of charge and to sell only one other Spacelab - with some additional equipment - was really too small in comparison with their financial effort. In addition, no further extension of this cooperative venture has been agreed to yet, which is contrary to the expectations of the European States.

The future of Spacelab is an important issue in the planning of the European Space Agency program in the years to come. ESA has already decided to start a Spacelab follow-on program comprising a free flying European Retrievable Carrier (Eureca). Also included are some improvements to the Spacelab itself provided that NASA provides increased power to the payload and enables longer duration Shuttle missions (Now 7 to

[11]43 Fed. Reg. 204 (October 26, 1978).

[12]45 Fed. Reg. 47, at 14, 845 (March 7, 1980).

[13]44 Fed. Reg. 131 (July 6, 1979).

12 days). In addition, ESA would also like to participate with NASA in the studies of large space stations.

If the decision is taken to continue the US/Europe cooperation in such a direction, one may be sure that numerous legal problems will arise, on the one hand for improving the mechanism of such cooperation, and, on the other hand for solving the legal issues which we are already facing. I am confident that after Apollo/Soyuz, Intercosmos and Spacelab flights, international manned space flights will be more and more frequent in the years to come. This will certainly be a challenge for all people involved: politicians, scientists, technicians, administrators and, of course, lawyers.

LAW AND SECURITY IN OUTER SPACE: THE ROLE OF CONGRESS IN SPACE LAW AND POLICY

*Eilene Galloway**

I. Introduction

Twenty-five years ago, the first satellite was launched into outer space with such sudden and spectacular success that worldwide attention was directed toward the new frontier. Scientists and engineers had known for some years that rocket technology could be developed to explore outer space and that this new capability could be used for peaceful purposes but also had the potential for warfare.[1] Space experiments were planned by the United States and the USSR as part of the investigation undertaken by scientists of 67 nations in the International Geophysical Year, an 18-month period from July 1, 1957 to December 31, 1958. Global scientific studies were planned for four environments: the earth, oceans, atmosphere and outer space. The United States plan, announced in 1955, called for a modest space program using conventional rocketry. The USSR did not make an advance announcement of its plans which turned out to involve the use of rocketry launching heavy payloads and consequently raising questions of national security.

Congress had played only a minor role up to this point, appropriating funds for the National Advisory Committee on Aeronautics, the National Science Foundation and Defense rocketry research. But with the dramatic first orbiting of a satellite by the Soviet Union, Congress began to give immediate and continuing attention to United States space activities.

Even before the new environment's variety of beneficial uses had developed, the motivation to prevent space wars was paramount. The choice was between Heaven and Hell in modern terms. To attain security in outer space, which includes the Moon and other celestial bodies, immediate attention was given to formulating laws to govern space activities for the benefit of mankind.

Aggression for destructive purposes is among several ways in which outer space could be rendered unfit for use and for the greatest adventure—exploring the Universe. Space debris, some of which might be radioactive, could cause harmful interference with communications, weather prediction and navigation. Contamination could occur between the Earth and outer space; harmful influences could affect the atmosphere of the Earth. Scientists and engineers have been anxious to prevent any type of irreversible damage from experiments or operational systems. We have suffered on Earth from unintentional irreversible damage and the experience compels planning to protect the environment. To guard outer space from all harmful influences is an overriding motive in designing space systems.

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[1] *International Cooperation and Organization for Outer Space*, S. Doc. No. 56, 89 Cong., 1st Sess. (1965) (staff report by Eilene Galloway for Senate Comm. on Aeronautical and Space Sciences).

National security is a broad term encompassing all those elements essential for maintaining a society in peace and prosperity, including the right of national defense. At a time when the organization of United States civilian and military space activities is being evaluated, a retrospective of some major decisions will be useful in explaining the attention given by Congress to space activities and their implications for the future.

II. Definition of Space Law

Space law has four characteristics: it is national and international and applies both to outer space as a geographic area and to functions performed in that area. Since the space environment is being used to improve many functions required on Earth, it follows that law to regulate these activities applies to the Earth. In fact, the Earth is the location for the manufacture, employment, funding, analysis and use of data and information collected from outer space; the legal problems that arise are the result of the impact upon society of using and exploring this fourth environment which we have added to land, sea, and air.

A codification of all space and space-related law would require several volumes. The purpose of this analysis is to examine some of the main policies embodied in national space law (particularly with reference to the United States), and international space law as presented in the major treaties to which the Senate has given its advice and consent to ratification. After twenty-five years, some of the fundamental policy concepts can be evaluated to determine trends that have been set in motion.

III. Unique Characteristics of Space Science and Technology

Space science and technology have some unique features which facilitate the formulation of laws that ensure compliance whether internationally or within the jurisdiction of nation States. *First,* space vehicles are inevitably international as they orbit the Earth in approximately 90 minutes without regard for national boundary lines. *Second,* all spacecraft require communications which involve allocation of the radio spectrum; non-compliance with assigned frequencies would result in chaos both in terrestrial and space communications. The technical requirement for successful operation enforces legal regulation by the International Telecommunication Union whose authority is derived from a treaty. *Third,* there are special safety and health conditions which must be met by spacecraft entering this unusual environment, and nations engaged in this expensive pursuit realize they must comply with technological imperatives. *Fourth,* the variety and spectacular success of space applications during the first twenty-five years of the space age have strengthened the demand that nothing be allowed to interfere with peaceful pursuits. Perhaps to a greater degree with space activities than with any other subject, noncompliance with the required technology will result in failure whereas adherence to technical regulations will bring success. All technical characteristics must be taken into account initially by those working with any type of space problem. If a technical solution can be found there may not be a legal problem.

IV. Initial Congressional Reaction

Reacting to the knowledge that Soviet rocket technology was capable of launching intercontinental ballistic missiles, the Senate Armed Services Committee's Preparedness Investigating Subcommittee began hearings under its chairman, Senator Lyndon B. Johnson, on November 27, 1957. By July 24, 1958, almost 2,500 pages of testimony had been published, recording the opinions and judgment of experts in science, engineering, industry, and the Government's civilian and military officials.[2]

The Senate and House moved swiftly to pass interim legislation while they figured out how best to organize the Government to achieve preeminence in space for the United States. On February 12, 1958, Public Law 85-325 authorized the Secretary of Defense to engage in advanced research projects, and for one year be responsible for nonmilitary space projects designated by the President. On February 11, 1958, Public Law 85-322 appropriated $10 million to supplement the fiscal 1958 budget, giving transfer authority for advanced research. This temporary legislation was necessary because the Department of Defense did not have statutory authority to develop a nonmilitary civilian space program.

Several reasons were advanced for creating a civilian space agency:

1. National security requires an outstanding space program which will ensure preeminent United States leadership in a broad field encompassing many beneficial civilian applications which are not military in nature.

2. Since space technology has become a factor in the position of the United States in the world, the conduct of foreign policy is often more related to the mission of the Department of State than that of the Department of Defense.

3. The space program should be funded on a long-term basis and not depend upon shorter term military appropriations or have to compete for funds within the Department of Defense.

4. The national space effort could not develop its own essential priorities if it were under the administration of one military service or subject to dispersal among the three services.

5. The Department of Defense must prove it has a military requirement for new projects and would be unlikely to undertake space programs which are primarily scientific, commercial, and cultural in nature.[3]

V. Creation of Congressional Special Space Committees

The comprehensive nature of space activities had become evident during the 1957 hearings of the Senate Preparedness Investigating Subcommittee. United States security required consideration of the total aspects, civilian and military. Many different subjects cut across the jurisdiction of a number of existing Senate and House Committees. A focal point for consideration of total United States space concerns was provided by the

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[2]*Inquiry into Satellite and Missile Programs*, 1957-58: *Hearings Before the Subcomm. on Preparedness Investigating of the Senate Comm. on Armed Services*, 85th Cong., 1st & 2nd Sess. (1957-58).

[3]*Peaceful Uses of Outer Space and the Military Role*, 1962: *Hearings on H.R. 10100 superseded by H.R. 11737. Before the Subcomm. on Manned Space Flight of House Comm. on Science and Astronautics*, 87th Cong., 1st Sess. (1962) (statement of Eilene Galloway, Part 2: 1051-1065).

creation, on February 6, 1958, of the Senate Special Committee on Space and Astronautics.[4] The then Senate Majority Leader, Lyndon B. Johnson, was chairman and the other twelve members were either chairmen or ranking minority members of standing committees that could be concerned with various aspects of outer space: the Committees on Foreign Relations, Armed Services, Commerce, Government Operations, Appropriations and the Joint Committee on Atomic Energy.

On March 5, 1958, the House of Representatives followed suit by establishing the House Select Committee on Astronautics and Space Exploration,[5] also with 13 members chosen from committees likely to have legislative authority and oversight responsibility for space activities. Congressman John W. McCormack, then Majority Leader of the House, became chairman.

There was some speculation at first that legislation for atomic energy could serve as a precedent for outer space, but it was pointed out that outer space was a place where a variety of activities could occur whereas atomic energy was a form of energy. Although the advent of each development was sudden and dramatic, and both had the same potential for peaceful and destructive purposes, it was evident that the law for outer space activities had to be considered according to their unique characteristics.[6]

The nation's foremost scientists and engineers had already taken the initiative in recommending to the Congress and the President some basic ideas about goals and organization before the committees began their consideration of legislation for United States space activities. On November 21, 1957, the Rocket and Satellite Research Panel, chaired by James A. Van Allen, proposed *A National Mission to Explore Outer Space.* By January 4, 1958, the American Rocket Society, whose president was George P. Sutton, proposed the *National Space Establishment. America's Role in the Exploration of Outer Space* was published by the National Society of Professional Engineers on February 13, 1958, and the following day the National Academy of Sciences-National Committee for the International Geophysical Year 1957-58 issued its report on *Basic Objectives of a Continuing Program of Scientific Research in Outer Space.*[7]

These proposals favored the creation of a civilian space establishment separate from the Department of Defense and with independent statutory status. The Department of Defense was to have jurisdiction over space activities relevant to its mission. United States leadership and continuity of adequate funds were emphasized as well as scientific, commercial and cultural objectives. The scientists and engineers explained to the Congress in January 1958 that,

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[4]S. Res. 327, Report No. 1925, 85th Cong. 2d Sess., 104 Cong. Rec. 13772, 13772-73 (1958).

[5]H.R. Res. 580, 85th Cong., 2d Sess., 104 Cong. Rec. 3443, 3443-44, 14513-14 (1958).

[6]*The Problems of Congress in Formulating Outer Space Legislation,* 1958 by Eilene Galloway in *Hearings on H.R. 11881 Before House Comm. on Astronautics and Space Exploration,* 85th Cong., 2d Sess. (1958).

[7]*Staff of Senate Special Comm. on Space and Aeronautics,* 85th Cong., 2d Sess., 1 Compilation of Materials on Space and Astronautics 14-22 (Comm. Print 1958).

> There will be a rich and continuing harvest of important practical applications as the work proceeds. Some of these can already by foreseen—reliable short-term and long-term meteorological forecasts, with all the agricultural and commercial advantages that these imply; rapid, long-range radio communications of great capacity and reliability; aids to navigation and to long-range surveying; television relays; new medical and biological knowledge, . . . and these will be only the beginning.[8]

The exploration of Mars and Venus was foreseen. Manned satellites were predicted along with the landing of a man on the moon and his safe return to Earth.

VI. National Aeronautics and Space Act of 1958[9]

There was unanimity between the Executive and Legislative Branches of the Government on the Declaration of Policy and Purpose in the NASA Act: "The Congress hereby declares that it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind."[10]

Agreement on this policy was solid even before April 2, 1958, when President Eisenhower sent a message to Congress proposing the establishment of a National Aeronautics and Space Agency which would absorb the existing National Advisory Committee for Aeronautics (NACA) while the Department of Defense would be responsible for space activities relevant to its mission.

The hearings before the House Select Committee on Astronautics and Space Exploration dealt with the proposed organization and the nature of Outer Space. Since the Senate Special Committee on Space and Astronautics already had before it the results of the inquiry into the Missile-Satellite Situation by the Senate Preparedness Investigating Subcommittee, its hearings were concentrated on government organization for United States space activities. Dividing space between civilian and defense agencies never became an issue; it was well understood that United States security depended upon developing both approaches.

But a policy concept of organization, different from the Eisenhower proposal and advanced by the Senate Committee, was written into the NASA Act. Instead of an internal advisory committee patterned after the old NACA practice, the NASA Act had a title on "Coordination of Aeronautical and Space Activities" based on the judgment that an internal NASA committee could not exercise authority over other agencies; that numerous agencies would have space and space-related programs which required coordination; and that such coordination should take place at the highest level of government. The National Aeronautics and Space Council was established to allow the President to preside over meetings with the Secretary of State, Secretary of Defense, NASA Administrator, Chairman of the Atomic Energy Commission, an additional member from a Federal department and not more than three distinguished persons from private life. When Kennedy became President, the NASA Act was amended so

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[8] *Id.* at 19.

[9] National Aeronautics and Space Act of 1958, Pub. L. No. 85-568, 72 Stat. 426 (1958) (codified as amended at 42 U.S.C. § 2451 (1976 & Supp. IV 1980)), *reprinted in* 1958 U.S. Code Cong., & Ad. News at 503.

[10] *Id.*

that the Vice President, Lyndon B. Johnson, became chairman, the other members being the Secretary of State, Secretary of Defense, NASA Administrator and the Chairman of the Atomic Energy Commission. The Council's function was to advise and assist the President "as he may request," and although it was not a strong administrative mechanism, there was a permanent expert professional staff to give continuing attention to the Council's functions of surveying all significant aeronautical and space activities, and providing for "effective cooperation among all departments and agencies of the United States" and resolving any differences that might arise.[11]

President Nixon used Reorganization Plan No. 1 of 1973 to abolish the National Aeronautics and Space Council, effective July 1, 1973.[12] This action was evidently part of a general move to eliminate functions from the Executive Office of the President. It is an example of the movement in government between centralization and decentralization as methods of management. Reorganization plans are handled by House and Senate committees with responsibility for government operations in general and are thus not referred to the substantive committees, and unless the Congress takes action against such a plan, it goes into effect. Rejection of such plans has proved difficult. Abolishing the Space Council was the first step taken in the Executive Branch which had the effect of diminishing top-level priority for outer space.

Although the Council as an organization was abolished, together with its functions, the need for overall comprehensive attention to expanding the United States' space activities remained and could not be met by delegating portions to existing agencies; none of these agencies had sufficient authority over other government entities involved in space activities. Thus was lost the analysis made in 1958 by the Senate on the necessity for overall coordination.

Congress provided another method in the NASA Act for overall consideration of United States space activities by requiring the President to send to the Congress each year a report to include—

> (1) a comprehensive description of the programmed activities and the accomplishments of *all agencies* of the United States in the field of aeronautics and space activities during the preceding calendar year, and (2) an evaluation of such activities and accomplishments in terms of the attainment of, or the failure to attain, the objectives described in section 102 (c) of this Act. (emphasis added)[13]

The President was requested to recommend additional legislation if necessary to attain the objectives set forth in the declaration of policy and purpose. This report was valuable both to executive and legislative officials because it revealed in brief form the space activities of every agency engaged in space or space-related programs with descriptions of their activities and an account of specific funding, if any. Some agencies have significant space roles but do not have or need itemized space budgets; for example, the

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[11]*Final Report of the Senate Special Comm. on Space and Astronautics*, S. Rep. No. 100, 86th Cong., 1st Sess. 5-8 (1959).

[12]Reorg. Plan No. 1. of 1973, 3 C.F.R. 1157 (1973), *reprinted in* 87 Stat. 1089 (1973).

[13]Space Act of 1958, *supra* note 9, at Pub. L. No. 85-568, § 206 (a), 72 Stat. at 432 (codified as amended at 42 U.S.C. § 2473 (a) (1976 & Supp. IV 1980)), *reprinted in* 1958 U.S. Code Cong. & Ad. News at 509.

Department of State's use of space science and technology in the conduct of foreign policy, particularly in negotiations at the United Nations leading to treaties which become the law of the land. The report was also valuable in informing all government officials with segments of space programs of the United States' total space activities and where they could expect to find others in the government with responsibilities for communications, meteorology, remote sensing, navigation, etc. The report, organized in a convenient form, could be used to supplement information in Congressional hearings. These reports were sent in compliance with the NASA Act beginning with President Eisenhower until the end of the presidency of Gerald Ford. Thereafter, for three years, the reports lost their usefulness because it was decided by the Office of Management and Budget to develop them by topics chosen according to agencies with specific space budgets, perhaps on some basis of cost-effectiveness, thus eliminating programs of most of the federal agencies, including the Department of States' international responsibilities as well as NASA's international space program authorized in Section 205 of the NASA Act. The 1980 annual report, while almost a year late in reaching the Congress, is in compliance with the NASA Act but unfortunately does not include all space agency activities, omitting, for example, the Arms Control and Disarmament Agency at a time when questions are being raised concerning its role in outer space.[14]

The original NASA Act provided that all agencies cooperate and that there should be "no unnecessary duplication" which, of course, implies that there can be some necessary duplication when programs are divided between agencies that have different purposes.[15] Within these general parameters an administration can be flexible in making practicable technical and economic decisions.

Experience with the NASA Act proved the prudence of the foresight with which it was originally formulated except in the provision on "definitions." The definitions in Section 103 lay the basis for NASA as a research and development institution. This concept applied to aeronautics and the National Advisory Committee on Aeronautics which was the nucleus for NASA. The relation between the government and aviation was clear: the government engaged in research and development (development for research purposes) and the aviation industry manufactured and flew planes. The extent to which astronautics would develop a multiplicity of operational programs not centered in any one industry was not foreseen, and the definitions are not equally applicable to astronautics as they are to aeronautics. This fact was not immediately perceived because NASA was able to do research and development for space communications and turn the activity over to a vigorous existing communications industry. Similarly, meteorological space developments could be turned over to that part of the government which had historically been responsible for weather predictions. It was not until remote sensing of the earth by satellites developed into a great variety of applications which were potentially operational that difficulties arose with NASA's role as stated in the Act's

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[14]*The 1980 Aeronautics and Space Report of the President,* U.S. Gov't Printing Office, Washington, D.C.

[15]Space Act of 1958, *supra* note 9, at Pub. L. No. 85-568, § 102 (c) (8), 72 Stat. at 427 (codified as amended at 42 U.S.C. § 2451 (c) (8) (1976 & Supp. IV 1980)), *reprinted in* 1958 U.S. Code Cong. & Ad. News at 503.

definitions. The products derived from remote sensing were of interest to many nations and industries within the United States but there was not one industry to which they could be turned over. The Congressional space committees were enthusiastic about LANDSAT and urged the Executive Branch to make remote sensing operational, and this was true even when there were different chairmen and committee members. NASA's insistence upon its limited role as only a research and development agency was probably one of the factors which prevented an amendment to the NASA Act whereby NASA could operate certain programs as designated by the President or by Congress. Whatever the reasons, the problem of the relation of government to industry in a variety of space applications has still not been worked out. The role of NASA in aeronautics is clear but a comparable report cannot be made at this time for space activities.

International space cooperation is included in the declaration of policy which calls for "cooperation by the United States with other nations and groups of nations in work done pursuant to this Act and in the peaceful application of the results thereof." The international concept is emphasized in Section 205 which provides that— "The Administration, under the foreign policy guidance of the President, may engage in a program of international cooperation in work done pursuant to this Act, and in the peaceful application of the results thereof, pursuant to agreements made by the President with the advice and consent of the Senate."[16] In signing the bill on July 29, 1958, President Eisenhower stated that he regarded "this section merely as recognizing that international treaties may be made in this field, and as not precluding, in appropriate cases, less formal arrangements for cooperation. To construe the section otherwise would raise substantial constitutional questions."[17]

When the Special Committee submitted its Final Report to the Senate on March 11, 1959, it "recognized the need of the Administration to provide for various types of cooperation as approved by the President."[18] Using this legislative directive and with strong support from both House and Senate space committees, NASA developed through the years an impressive international space program with bilateral and multilateral arrangements with most of the world's nations and major international space organizations. Such programs require close cooperation between NASA and the Department of State.

A significant amendment was made to the NASA Act when annual authorizations were required for NASA's funds. On August 21, 1958, two appropriation bills, one on military construction and the other on supplemental appropriations, were amended to provide for an annual authorization. The requirement was at first temporary but became a permanent feature of the legislative process for outer space: "Notwithstanding the provisions of any other law, no appropriation may be made to the National Aeronautics

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[16]Space Act of 1958, *supra* note 9, at Pub. L. No. 85-568, § 205, 72 Stat. at 432 (codified as amended at 42 U.S.C. § 2472 (1976 & Supp. IV 1980)), *reprinted in* 1958 U.S. Code Cong. & Ad. News at 509.

[17]*Final Report, supra* note 11, at 18.

[18]*Id.* at 18, 31.

and Space Administration unless previously authorized by legislation hereafter enacted by the Congress."[19] This provision gave the House and Senate space committees authority to make an in-depth annual review of NASA's programs and budgets. These hearings constitute an overview of United States space policy and programs year by year, including the interaction with Department of Defense space programs. The legislative process involves hearings by the House and Senate space committees as well as the House and Senate Appropriations Committees, resulting in two laws each year.

VII. Congressional Organization for Space Activities

After the NASA Act had been signed on July 29, 1958, the House and Senate special and select space committees considered how to organize the Congress for legislation on space matters. Four alternatives were studied: (1) a joint House and Senate space committee; (2) division of jurisdiction among existing committees; (3) referring space legislation and review to the Joint Committee on Atomic Energy; and (4) establishing new separate standing committees in the House and Senate. The fourth option was chosen and the House established its Committee on Science and Astronautics on July 21, 1958. The jurisdiction defined in the House rules was broader than that adopted by the Senate, including the addition to space matters of the Bureau of Standards, National Science Foundation, science scholarships, scientific research and development. Most of the subcommittees dealt with various parts of NASA's programs, but experience during succeeding years indicated increased concern with aeronautics and a number of different scientific and technological subjects. A new name and an expanded jurisdiction were adopted by the 93rd Congress in House Resolution 988 so the committee became the Committee on Science and Technology on January 3, 1975.[20] Added to the committee's jurisdiction were research and development for civil aviation, environment, energy and the National Weather Service. Outer space became one among numerous subjects included in science and technology generally and this was reflected in the composition of the subcommittees, resulting in loss of the highest priority for space matters.

The Senate passed resolution 327 on July 24, 1958 creating the new standing Committee on Aeronautical and Space Sciences with jurisdiction over aeronautical and space activities and its scientific aspects except those

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[19]Act of 1959, Pub. L. No. 86-45, § 4, 73 Stat. 73, 75 (1959) (codified at 42 U.S.C. § 2460 (1964)). *See also Senate Comm. on Commerce, Science, and Transportation,* 95 Cong., 2d Sess., National Aeronautics and Space Act of 1958, as Amended and Related Legislation (Comm. Print 1978) (document prepared so all laws pertaining to NASA would be available in single document).

[20] *House Select Comm. on Comms.,* 93rd Cong. 2d Sess., *Monographs on Committees of the House of Representatives* 133 (Comm. Print Dec. 13, 1974). *See Staff Report of the House Select Comm. on Comms.* 93rd Cong., 2d Sess., *Committee Reform Amendments of 1974: Explanation of H. Res. 988* 49. 215 (Comm. Print Oct. 8, 1974). *See generally Constitution, Jefferson's Manual and Rules of the House of Representatives,* H.R. Doc. No. 663, 94 Cong., 2d Sess. 390 (1977) (by Wm. Holmes Brown, Parliamentarian) (stating jurisdiction of House Comm. on Science and Astronautics).

> . . . peculiar to or primarily associated with the development of weapons systems or military operations; . . .
> Such committee also shall have jurisdiction to survey and review, and to prepare studies and reports upon, aeronautical and space activities of *all agencies of the United States*, including such activities which are peculiar to or primarily associated with the development of weapons systems or military operations. (emphasis added)[21]

Legislative jurisdiction over defense matters remained with the Senate Armed Services Committee but the new space committee could include military space matters in its overview of the executive branch. There was thus a focal point for overall consideration of all space-related questions of the United States in the legislative branch comparable to that originally planned for the executive branch when the National Aeronautics and Space Council was created. This concept was lost, however, when the Senate Committee on Aeronautical and Space Sciences was abolished and its functions transferred to the Committee on Commerce, Science and Transportation on February 4, 1977. At that time the Senate passed Committee System Reorganization Amendments of 1977.[22] Jurisdiction over outer space became a function of several subcommittees with authority over communications, oceans, the weather, and "science, engineering, and technology research and development and policy."[23]

The House and Senate Armed Services and Appropriations Committees play the same role in space national defense as the committees with jurisdiction over civilian programs. The authorization and appropriation processes for defense result in two laws each year. NASA's appropriation for fiscal 1981 was $5,541,000,000; plans for fiscal 1982 called for $5,940,000,000; and the 1983 request was for $6,613,000,000. The Department of Defense funding for space-related items grew from $4,797,000,000 in fiscal 1981 to $6,362,300,000 in fiscal 1982 while the request for fiscal 1983 rose to $8,451,700,000.[24]

In addition to the Space and Armed Services Committees which handle the bulk of space legislation and oversight, in any given session of Congress there are other committees which include space items on their agendas. If there is a space treaty, the Senate Foreign Relations Committee has jurisdiction; if aid to developing countries by means of space technology is proposed, both the House Foreign Affairs Committee and the Senate Foreign Relations Committee may become involved; House and Senate Committees on Agriculture can have legislative concerns when space technology is required for land management problems. Surveillance satellites used as a national means of verification for the SALT treaty could concern numerous Congressional Committees: Armed Services, Appropriations, Foreign Affairs, Foreign Relations and the Select Committee on Intelligence. The greatest dispersion can occur with space

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[21] 104 Cong. Rec. 13772, 13772 (1958).

[22] S. Rep. No. 4, 95 Cong., 1st Sess. 1 (1977).

[23] *Senate Comm. on Aeronautical and Space Science, Tenth Anniversary 1958-1968*, S. Doc. No. 116, 90th Cong., 2d Sess. 109 (1980). *See generally Senate Comm. on Rules and Administration*, 95th Cong., 1st Sess., 30-31 (1977) (stating jurisdiction for Senate Comm. on Aeronautical and Space Science).

[24] *Space Policy and Funding: NASA and DOD, Cong., Research Serv.*, Issue Brief No. IB 78093, 16 (May 14, 1982) (By Marcia S. Smith).

communications which cuts across numerous committee jurisdictions. The dispersion within the Legislative Branch reflects not only that within the Executive, but is to be expected from the nature of space science and technology as its application has expanded into numerous areas. The implications for the lawyer, the political scientist and the economist are that the assumption must be made that all space problems are multidisciplinary and every element must be identified and weighed, and then analyzed in terms of all the institutions involved. It is seldom that a space problem can be completely handled by analayzing one institution and it is therefore necessary to follow the ramifications wherever they may lead.

VIII. The Communications Satellite Act of 1962, as amended[25]

This Act provides for the establishment, ownership, operation, and regulation of a commercial communications satellite system. The Communications Satellite Corporation (COMSAT) was created and the relationship between government and the communications industry was worked out. The Act recognized the interrelations between national and international influences. It was the second act passed to establish an institution specifically designed for a space application; the NASA Act is general in its application while the COMSAT Act deals foresightedly with what has become an economically successful enterprise providing a variety of communications services. Legal problems arising from using outer space for communications on the Earth have become a unique specialty in the legal profession. The Act was unusual in providing in Section 102 the basis for international cooperation: U.S. policy is to cooperate with other countries and establish as soon as practicable a global commercial communications satellite system, serving the United States and other countries, and the services are to be directed toward provision for "economically less developed countries and areas as well as those more highly developed. . ."

Creation of the COMSAT Corporation provided an effective means for the United States to play its role in INTELSAT. The act was amended on November 4, 1978, to provide national authority for the United States to participate in the International Maritime Satellite Organization (INMARSAT).[26]

IX. National Science and Technology Policy, Organization, and Priorities Act of 1976[27]

This was the third major law establishing policy and institutions which affect the conduct of the United States' space activities. In this act, Congress recognized "the profound impact of science and technology on society, and the interrelations of scientific, technological, economic, social, political, and institutional factors."[28] Among

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[25]47 U.S.C. §§ 701, 702, 721, 731-735, 741-744 (1962) (codified as amended at 47 U.S.C. §§ 701, 702, 721, 731-735, 741-744 (1976)).

[26]Pub. L. No. 95-564, 92 Stat. 2392, 47 U.S.C. §§ 751-757 (1978) (currently codified at 47 U.S.C. §§ 751-757 (Supp. 1980)).

[27]42 U.S.C. § 6601 (1976).

[28]42 U.S.C. § 6601 (101) (a) (1976).

the priority goals to which science and technology should contribute are "advancing the exploration and peaceful uses of outer space."[29] The other twelve priority objectives would benefit from or require the application of space science and technology, such as the objectives of fostering leadership for international peace; contributing to economic opportunity; assuring an adequate supply of food, materials, and energy; contributing to national security; improving health care; preserving the environment; promoting full employment through technological innovations; increasing the quality of educational opportunities; conserving natural and human resources; improving housing, transportation and communications; and eliminating air and water pollution.

A number of organizations provided by Congress in this Act were considered unnecessary by President Carter who changed them by Reorganization Plan No. 1 of 1977. While the plan abolished some units or transferred them to different agencies, the Office of Science and Technology Policy (OSTP) was retained in the Executive Office, being one of the ten units that President Carter decided to work with directly because he needed "their constant advice and counsel, almost on a daily basis."[30]

X. The Role of Congress in the Peaceful Uses of Outer Space

Congressional leadership emphasizing the policy of peaceful uses of outer space was demonstrated not only by the enactment of laws but in actions taken by the Majority Leaders and others. On January 14, 1958, Senator Lyndon B. Johnson addressed the Columbia Broadcasting System Affiliates:

> We should, certainly, make provisions for inviting together the scientists of other nations to work in concert on projects to extend the frontiers of man and to find solutions to the troubles of this Earth. . . . Further, it would be appropriate and fitting for our Nation to demonstrate its initiative before the United Nations by inviting all member nations to join in this adventure into outer space together. The dimensions of space dwarf our national differences on earth.[31]

Congressman John W. McCormack introduced a resolution which passed the House on June 2, 1958 (and the Senate on July 23) calling attention to "the devout wish of all peoples everywhere, in every nation, in every environment, that the exploration of outer space shall be by peaceful means and shall be dedicated to peaceful purposes." The resolution stated "That it is the sense of the Congress that the United States should strive, through the United Nations or such other means as may be most appropriate, for an international agreement banning the use of outer space for military purposes . . . ."[32]

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[29] 42 U.S.C. § 6601 (101) (a) (13) (1976).

[30] *Science and Technology in Policy Formulation at the Presidential Level: Recent Developments, Cong. Research Serv.*, Issue Brief No. IB 78927, 20 (1979) (By Dorothy M. Bates).

[31] Address by Senator Johnson, *Columbia Broadcasting Affiliates,* Shoreham Hotel, Washington, D.C. (Jan. 14, 1958).

[32] *Final Report, supra* note 11, at 7-8.

Senator Hubert Humphrey, chairman of the Subcommittee on Disarmament of the Senate Foreign Relations Committee, was responsible for a report on "Control and Reduction of Armaments" (October 13, 1958) which included a section on "Arms Control in the Space Age." Foreseeing that space weapons would have to be considered in plans for arms control, the subcommittee pointed out that the United Nations would be a favorable place to promote United States policy on international cooperation for peaceful space exploration and development, outlawing military purposes in space; and prohibiting nations' claims to any area or body in space.[33]

On November 17, 1958, Senator Lyndon B. Johnson, on behalf of President Eisenhower, addressed United Nations Committee No. 1 (Political and Security) in support of a United States sponsored resolution which was destined to pass the General Assembly on December 13, 1958. This resolution established the Ad hoc Committee on the Peaceful Uses of Outer Space. Pointing out the dangers of nations proceeding unilaterally and aggressively, Senator Johnson said that "Today outer space is free. It is unscarred by conflict. It must remain this way. . . . We know the gains of cooperation. We know the losses of failure to cooperate. . . . Men who have worked together to reach the stars are not likely to descend together into the depths of war and desolation." He emphasized the unanimity of the government on this policy: "On the goal of dedicating outer space to peaceful purposes for the benefit of all mankind there are no differences within our Government, between our parties, or among our people. The executive and the legislative branches of our government are together."[34]

XI. Law and Security Through Treaties

U.S. delegations from the Department of State, NASA and other departments participated in the formulation of space treaties in the United Nations Committee on the Peaceful Uses of Outer Space and its Legal Subcommittee. Following consideration by the Senate Foreign Relations Committee, the Senate has given its advice and consent to four space treaties which have been ratified by the President. The USSR and many other nations have ratified these treaties.[35] The Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water went into force on October 10, 1963, before the COPUOS treaty-making which led 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. This Treaty, which entered into force on October 10, 1967, was the subject of considerable analysis by the Senate Foreign Relations Committee which decided to report understandings to the Senate. The report states that:

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[33] *Senate Comm. on Foreign Relations, Subcomm. on Disarmament, Control and Reduction of Armaments*, S. Rep. No. 2501, 85th Cong., 2d Sess. 14 (1958).

[34] *Final Report, supra* note 11, at 58-62.

[35] *Senate Comm. on Commerce, Science, and Transportation, Space Law: Selected Basic Documents 2d ed.*, 85th Cong., 2d Sess. 600 (Comm. Print, 1978).

> Article I of the treaty provides that "the exploration and use of outer space . . . shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."

The reaction of the Committee was that—

> It is the understanding of the Committee on Foreign Relations that nothing in article I, paragraph 1 of the treaty diminishes or alters the right of the United States to determine how it shares the benefits and results of its space activities.

In examining Article VII on international liability for damage to another state party to the treaty,

> The committee wishes to record its understanding that article VII pertains only to physical, nonelectronic damage that space activities may cause to the citizens or property of a signatory state.

This was before the Convention on International Liability for Damage Caused by Space Objects had been formulated and the Committee took note of its negotiation and stated that a separate convention was needed "to establish detailed rules."

Particular concern was expressed about "the implications for American security of the first sentence of article IV: 'States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner'." Pointing out that inspection privileges, provided in article III, do not apply to objects in orbit, the committee questioned whether the U.S. was "committing itself to an arms control measure that was not safeguarded from violation by either the right of physical inspection or an effective national detection system."

Secretary of Defense McNamara testified that "We have looked at the implications for weapons development programs and at verification considerations, and we have concluded that this treaty will enhance our national security." The Joint Chiefs of Staff stated their preference for a "national verification of bodies in orbit." Secretary of State Rusk testified that, "We have no doubt we can monitor effectively a weapons system placed in outer space." With these assurances the Committee approved the Treaty.[36]

The next three space treaties to which the United States is a party are: Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (December 3, 1968);[37] Convention on International

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[36]Treaty on Principles Governing the Activities of States in the Exploration and use of Outer Space, Including the Moon and Other Celestial Bodies, Oct. 10, 1967, 18 U.S.T. 2410, 2412, T.I.A.S. No. 6347, 610 U.N.T.S. 205, 207; *see generally* 133 *Cong. Rec.* 10, 593-10, 598 & 10, 677-10, 687 (1967) (detailed debates regarding whether treaty should be ratified).

[37]Agreement on the Rescue of Astronauts, the Return of Astronauts and The Return of Objects Launched in Outer Space, April 22, 1968, 19 U.S.T. 7570, T.I.A.S. No. 6599 (effective December 3, 1968).

Liability for Damage Caused by Space Objects (September 15, 1976); [38] and the Convention on the Registration of Objects Launched into Outer Space (September 15, 1976).[39]

The fifth treaty negotiated by the United Nations Committee on the Peaceful Uses of Outer Space—the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies,—was approved by the UN General Assembly on December 5, 1979, and opened for signature. Neither the United States nor the USSR has signed this treaty, and although ratification by only five nations is required for entry into force, such actions had not been taken during 1982. The reasons for this lack of enthusiasm are probably (1) lack of imminent plans for using the natural resources of the Moon and other celestial bodies; (2) differences of opinion on the provision declaring the Moon and other celestial bodies to be "the common heritage of mankind;" (3) differences over the concept and timing of establishing an international regime; and (4) lack of agreement on the implications of "equitable sharing" of the resources covered by the treaty.

Even though the United States has not signed the Moon Agreement, and thus it has not been sent to the Senate, nevertheless its provisions became issues in the Congress because of lobbying against some of its provisions. The issues were of interest to a number of committees and the Congress needed objective analytical studies. The Senate Committee on Commerce, Science, and Transportation arranged for staff reports and three volumes in four parts were published in 1980.[40]

The Treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems, with Associated Protocol was favorably reported by the Senate, ratified by the President and entered into force on October 3, 1972.[41] Article V, paragraph 1 of this treaty provides that, "Each Party undertakes not to develop, test, or deploy ABM systems of components which are sea-based, air-based, space-based, or mobile land-based."

Article XII of the SALT treaty provides:

1. For the purpose of providing assurance of compliance with the provisions of this Treaty, each Party shall use national technical means of verification at its disposal in a manner consistent with generally recognized principles of international law.
2. Each Party undertakes not to interfere with the national technical means of verification of the other Party operating in accordance with paragraph 1 of this Article.
3. Each Party undertakes not to use deliberate concealment measures which impede verification by national technical means of compliance with the provisions of this Treaty. This obligation shall not require changes in current construction, assembly, conversion, or overhaul practices.

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[38]Convention on International Liability for Damage Caused by Space Objects, March 29, 1972, 24 U.S.T. 2389, T.I.A.S. No. 7762 (effective October 9, 1973).

[39]Convention on Registration of Objects Launched into Outer Space, January 14, 1975, [1976] 28 U.S.T. 695, T.I.A.S. No. 8480 (effective September 15, 1976).

[40]*Senate Comm. on Commerce, Science, and Transportation, Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 96th Cong., 2d Sess. (1980).

[41]*Salt Verification, Cong. Research Serv.* Report No. 78-142F 92 (1979) (by Mark M. Lowenthal).

The International Telecommunication Convention and Radio Regulations have guided the conduct of nations for many years prior to the use of satellites. Since space technology has been applied to national and global space communications systems, an extensive body of law, rules and regulations has developed.[42] Space communications are highly technical and generate legal problems. Congressional committees with jurisdiction over communications play an active and continuous role in monitoring this complex activity.

XI. Conclusions

When space technology suddenly reached the state where outer space could be opened for use and exploration, the Congress quickly reacted by passing interim legislation to ensure United States progress while attention was given to the problem of how best to organize the government for conducting a space program. Special committees were established in the House and Senate and the National Aeronautics and Space Administration was created, thus dividing institutional management between the Department of Defense, NASA and all other federal agencies that could have space and space-related programs. Permanent standing committees were created in the Senate and House so that continuous attention was given by means of annual authorizations for space funds and programs. This legislative process was in addition to consideration for annual appropriations and resulted both in steady oversight by Congress and in expertise on space matters by Members of the House and Senate.

The concept of overall coordination of United States total space activities was lost in the Executive Branch by elimination of the National Aeronautics and Space Council. With the rise in power of the Office of Management and Budget (OMB) and the delegation of overall functions to various agencies, there was no one central place for a permanent professional staff to analyze continuously interacting forces. The functions legislatively planned for the Office of Science and Technology Policy have not yet been fully implemented. In both the Executive and Legislative Branches, space activities have lost their original high priority at the top level of government and outer space matters have become one among many scientific and technical subjects.

If space technology were just another invention similar to the telephone which can be used by many without unusual difficulties, peculiar problems would not be expected. But space activities have unique characteristics which make them an integral part of any assessment of national security. They cannot be evaluated without taking into account the overriding responsibility of the Federal Government for supervision of launchings, health and safety standards, defense requirements, and the full development of peaceful space applications for universal benefit. All these unique elements place demands upon the legal community for laws, for policies which can be feasibly implemented by programs which are funded. Harmony between national and international space activities must be achieved, not only because of laws already enacted and treaty provisions to which the United States is a party, but because avoiding conflicts is the only way of achieving the full potential of using and exploring outer space.

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[42] *Space Law: Selected Basic Documents*, *supra* note 35, at 77-173.

SECURITY ASPECTS OF THE CURRENT UNITED NATIONS SPACE LAW AGENDA +

*David H. Small**

The Current Agenda

The current space law agenda of the United Nations is largely a familiar one. Four items on the formal agenda are before the UN Committee on the Peaceful Uses of Outer Space (COPUOS) and its Legal Subcommittee. The subject of arms control in outer space, which was referred in 1981 to the 40 member Committee on Disarmament,[1] is also before these two committees.

A few countries opposed to military uses of outer space, even for purposes other than deployment of weaponry, have been raising with some insistence an issue broader than the dangers of an arms race in outer space. This is the issue of outer space militarization, which has not yet been placed on the UN's formal space law agenda. Even though the relationship of arms control and militarization of space to security in the classical sense is evident and of great importance, security implications are not always of predominance on the outer space law agenda. The current agenda consists of the following four items:

> (i) legal implications of remote sensing of the earth from outer space, with the aim of formulating draft principles;
> (ii) consideration of the possiblity of supplementing the norms of international law relevant to the use of nuclear power sources (NPS) in outer space;
> (iii) 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; and
> (iv) elaboration of draft principles governing the use by states of artificial earth satellites for direct television broadcasting (DBS).

This article sketches the disposition of three of these issues, which are remote sensing, NPS, and the definition and/or delimitation of outer space. Since DBS is a security issue only in the view of closed societies which fear the free flow of information and ideas, the legal regulation of the geostationary orbit, and outer space arms control, and since others are addressing this topic, this article does not deal with it.

Remote Sensing

Remote sensing remains a priority item of the Legal Subcommittee agenda. In fact, it is currently the only priority item. Despite the fact that this is a priority item and

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+ The views expressed are those of the author and not necessarily those of the Department of State.

[1]This body is the principal international forum for the consideration of multilateral arms control and disarmament agreements.

eleven meetings of the 1982 Legal Subcommittee's working group have been held, no new areas of consensus have been achieved and no brackets have been removed from the heavily bracketed subcommittee working text.[2]

The principal issues in this negotiation are: the scope of the principles; whether the remotely sensed state must consent before data or certain categories of data obtained from space may be disseminated; what access to data must remote sensing states provide others; and what responsibility, if any, will states have for the dissemination and use on earth of data remotely sensed from space.

The principal concerns which have been expressed by the majority of participants in the remote sensing negotiations have been related to the exploitation of natural resources. Some COPUOS members have expressed this anxiety in ideological terms, asserting that "permanent sovereignty over natural resources" includes sovereignty over data on those resources gathered from outer space and information derived from such remote sensing data.

The Soviet Union has supported this and has asserted as well that states have an obligation not to use or disseminate remote sensing data for use against the interests of any other state. The latter is a particularly pernicious suggestion, despite the surface appeal it has for some, since, if adopted, it would end open dissemination of data by making the sensing state responsible for the use to which others put data received. Further, endless disputes may arise over what is contrary to the interests of another state, a standard which is as unrealistic as it is unworkable. The Soviet Union would also restrict non-consensual dissemination of fine resolution data, while permitting dissemination of gross resolution data such as that derived from meteorological satellites. This restriction would be accomplished by the latest Soviet proposal that continues to draw the line at a spatial resolution of 50 meters,[3] even though they have indicated that the actual figure is open to negotiation.

The French also support some such restrictions. Their representatives profess to see no conflict between doing so and proceeding with their commercial Spot remote sensing program with its finer 10 meter resolution.

The United States (operating a Landsat program with 30 meter resolution) has responded that sovereignty over resources does not include sovereignty over information about those resources obtained from a platform in space any more than it does information obtained by any other means. The United States further asserts that the principles under consideration would not affect the freedom to gather information from space; such restrictions on dissemination would serve only to enforce a monopoly of information by the states with remote sensing systems, end the open Landsat type system with its public data centers and direct readout to foreign ground stations, and impair drastically the continuity and utility of remote sensing data.

The United States has pointed out that information obtained from remote sensing is used for the study of problems and phenomena which do not necessarily correspond to the contours of an individual state. Furthermore, the United States has expressed great

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[2]The text can be found in the Legal Subcommittee's 1981 and 1982 reports, UN Doc. A/AC.105/288, Annex I, appendix, and A/AC.105/305, Annex I, appendix.

[3]USSR Working Paper, WG/RS (1982) WP.4, 5 February 1982, A/AC.105/305, Annex I, p. 18.

skepticism about concerns that dissemination of remotely sensed data without sensed state consent would impair the ability of the sensed state to protect its rights over the timing, terms and conditions of the exploitation of its natural resources.

This point has been developed by the United States in a different context. During the 1981 Legal Subcommittee session the Soviet Union's delegate theorized that exporters' wheat prices could be effected by information obtained and disseminated about a poor Soviet wheat crop. The U.S. responded that this suggestion fails, since wheat prices would increase anyway when a country with a poor wheat crop conceals such information and then attempts to make up its shortfall on the international market. The cost of failure is merely shifted to the more successful growers and their traditional foreign buyers and domestic consumers. Furthermore, the information genie cannot be put back in the bottle with such a tremendous amount of information now available from non-space and space sources. Not only would very few countries be in a position to benefit from restricting dissemination of space derived crop information, but the attempt to restrict rather than to improve the international supply and demand information base is not worthy of protection by developing space law principles.

The foregoing may have contributed to a significant shift which has begun to occur on this issue in favor of the position that sovereignty over natural resources does not include sovereignty over information obtained about or from those resources. More important factors contributing to this significant shift are growth in state participation in the Landsat program through regional ground stations, and investment in use of remote sensing data. One Latin representative questioned whether the Third World had properly assessed its real interests in asserting that the right to restrict dissemination of data from space was part of permanent sovereignty.[4] An African representative stated that this point should be taken into account as the number of sensing states increases. In addition, further erosion of the previously united front on the issue occurred during the 1982 Legal Subcommittee session when Brazil introduced a package proposing the deletion of the prior consent principle (Principle XV)[5] entirely, together with the strengthening of the principle on access by sensed states to remotely sensed data (Principle XII).[6] While the Soviet Union continued to assert that prior consent must be obtained before surveillance of a state's natural resources, there was a noticeable shift of emphasis on the part of many delegations from restricting dissemination to gaining guaranteed access to remotely sensed data.

While open and non-discriminatory access to civil remote sensing data has been and remains United States policy, the United States is in the process of working out a transfer of operational civil land remote sensing to the private sector. It is not altogether clear what implications commercial operation will or should have for that policy.

The issue of high resolution data does have another more direct security aspect. One facet of the issue was emphasized in political terms at the 1982 Legal Subcommittee

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[4]This was done despite the fact that a Mexican comprehensive draft set of principles introduced in that session had included an unqualified prior consent requirement. Mexico: Working Paper, WG/RS (1981)/WP.2, 19 March 1981, Report of the Legal Subcommittee, Doc. A/AC.105/288, Annex I, p. 13.

[5]Brazil: Working Paper, WG/RS (1982)/WP.11, 8 February 1982, Report of the Legal Subcommittee, A/AC.105/305, Annex I, p. 20.

[6]*Id.*

session when the Soviet Union's representatives repeatedly adverted to the damage which could be caused to the security of countries in the Middle East if high resolution remote sensing data were provided Israel. There is, of course, an undeniable military importance to surveillance of the earth's surface, and this would be no less true for high resolution surveillance from space than from drones or high altitude aircraft.

The Soviet Union asserts, however, implausibly, that the remote sensing principles are to be broad in scope and cover all remote sensing, which by implication includes any national security programs. Their definition, which is purely technical, would not distinguish between programs of different purposes or nature. They have not yet accepted the United States' view that the draft principles can only apply to civil remote sensing such as our Landsat or the French Spot systems.

To attempt to draft remote sensing principles to cover anything beyond civil remote sensing would immediately make it impossible to draft acceptable language for a good many of the matters now included in the draft. For example, the draft now has principles on such matters as making available to sensed states opportunities to participate in remote sensing programs and the duty to provide sensed states with timely and non-discriminatory access to the remotely sensed data. Can anyone seriously envisage international consensus on a principle that the states conducting surveillance must allow the sensed state an opportunity to participate in the program and have access to the result? Moreover, such a principle, if adopted, would probably have detrimental effects in the area of arms control, where it is generally considered an important safeguard against violation that each party can never be quite sure precisely how good the other party's national technical means of verification are. Further, a ban on sharing high resolution remote sensing data and information with other states, including allies, without the sensed state's consent would be not only unrealistic, but completely unverifiable. In fact, the application of the proposed principles to anything other than civil remote sensing is so implausible that one would hesitate to take the ostensible Soviet position as either literal or immutable. Rather, it is possible that the purely technical and inclusive Soviet proposed definition has led them to include a certain number of potential loopholes in the various draft principles allowing them a means of frustrating any unwanted efforts to apply the principles to gain access to closed Soviet systems. Such an approach does not seem as promising as to define the scope of the principles straightforwardly as applying to civil remote sensing.

In assessing the security implications of the dissemination of high resolution remote sensing data, one has to bear in mind the increasing numbers of countries which will possess both the technology and the means to carry out sophisticated remote sensing programs. A ban on dissemination would only deny information to countries or groups lacking either their own capability or access to data from a sensing state willing secretly to violate the principle. Further, what principle would justify barring a state without the means to maintain its own remote sensing system from obtaining data about a potential or actual adversary who possesses such a system?

There is a variant on this issue which raises somewhat different considerations, that is, the impact on security of states from the routine public dissemination of high resolution data from some future civil system with very high resolution. Would this routine availability of data provide significantly better targeting data for and heighten the danger of aggression, armed attack or sabotage in various parts of the world by non-remote sensing states, political terrorist groups, or lunatics? Are there civil

requirements which make the operation of such high resolution systems likely? If so, are the risks associated with them sufficient to offset the benefits and justify constraints of some sort? Further, even if the potential risks were deemed significant, would the appropriate constraint be an international norm prohibiting public disclosure without sensed state consent? I do not propose to answer these questions, but offer them for reflection.

Nuclear Power Sources

This topic was thrust onto the international space law agenda when a Soviet satellite carrying a nuclear power reactor, Cosmos 954, malfunctioned and descended over Canada on January 24, 1978. Following that accident, the Canadian government moved to bring the issue of use of nuclear power sources before the United Nations and, in 1978, the General Assembly recommended that the Scientific and Technical Subcommittee establish a working group of experts to deal with "consideration of technical aspects and safety measures relating to the use of nuclear power sources in outer space."[7] In 1979, the Assembly recommended that the Scientific and Technical Subcommittee continue its work and that the Legal Subcommittee include on its agenda 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 use of nuclear power sources in outer space."[8]

The Scientific and Technical Subcommittee's expert working group produced a consensus report in 1981,[9] which, together with replies of governments to a Secretariat questionnaire,[10] a series of working papers submitted by Canada in 1980 and thereafter, and papers submitted by other governments in 1981 and 1982, forms the basis of the Legal Subcommittee's current work. The name of the item has evolved and the Subcommittee is now charged with "consideration of the possibility of supplementing" existing international law. That obscure change in mandate, plus the formation of a working group to deal with the matter mark, in UN terms, substantial progress since the Legal Subcommittee began on its work on NPS.

The principal issues under this item now are related to whether international safety standards can and should be articulated; whether those standards are adequately identified in the S & T experts working group report; whether nuclear power reactors, as contrasted with radioisotopic power generators, must be subject to further restriction or actual prohibition in certain cases; whether nuclear power sources require a special liability regime; and whether special rules on notification, including pre-flight notice, and on assistance to states should be articulated. The United States, the Soviet Union and several other countries have noted with approval in the Legal Subcommittee the Scientific and Technical Subcommittee experts working group conclusion that nuclear

[7]UNGA Resolution 33/16.

[8]UNGA Resolution 34/66.

[9]Report of the Scientific and Technical Subcommittee, A/AC. 105/287, Annex II.

[10]UN Doc. A/AC.105/C.2/14 and Add. 1 to 3.

power sources can be used safely in outer space, provided that all necessary safety measures it described are met. Despite this consensus at the technical level, achieved to a large degree through the constructive efforts of the Canadian participants in the experts group, Canada took a different point of departure at the 1981 Legal Subcommittee session; Canada suggested that most missions using NPS did not benefit all the states subjected to risk and that the governing principle for use of NPS should be "no benefit no risk."[11] This was rejected by a number of delegations, not merely the leading space powers, as unrealistic.

The real bone of contention as far as the safety issues are concerned is the use of nuclear power reactors in low earth orbit. That was the nuclear power source involved in the flight of Cosmos 954, and that is the use requiring the most stringent safety precautions. Published sources to which people discussing such esoterica usually refer, such as *Aviation and Space Weekly* and *Defense Daily,* would have it that Cosmos 954 and others in this series are ocean radar surveillance satellites, designed to function for a period of up to two months in low earth orbit before being reboosted to a 600 mile orbit where the reactor's radioactive constituents would have sufficient time to decay to safe levels before re-entry. These same sources had reported the launching of as many as fifteen of these satellites from the start of the program through 1981. Following the failure of the reboost when Cosmos 954 malfunctioned, there was a breakup of the satellite and extensive dispersal of the radioactive material upon re-entry.

With regard to nuclear power reactors, the experts working group had reached consensus on the following:

> If reactors are intended for use in low orbits where radioactive materials do not have sufficient time to decay to an acceptable level, safety depends on the start of operation in orbit and the success of boosting NPS to a higher orbit after operation is completed. In the event of an unsuccessful boost into higher orbit, the system should in all credible circumstances be capable of dispersing the radioactive material so that when the material reaches the earth the radiological situation conforms to the recommendations of ICRP when relevant.

Canada subsequently rejected the use of low earth orbit nuclear power reactors, as it had rejected other aspects of the experts' consensus. In a statement made to the Legal Subcommittee on February 10, 1982, the Canadian representative stated that "the risks created by nuclear reactors in low-earth orbit cannot be sufficiently reduced so as to render them acceptable." Canada challenged the adequacy of dispersal by citing the plating of radioactive material onto components of the re-entering spacecraft which they found in the Cosmos 954 incident. The United States pointed out that designs, such as that of Cosmos 954, which result in significant plating of highly radioactive materials on sizable components surviving re-entry, obviously do not meet the criterion set out in the experts group report, but that this did not detract from the appropriateness of the criterion.

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[11] A Canadian perspective on the NPS issue through the 1981 Legal Subcommittee, including the rationale for the shift away from the experts group consensus, can be found in an article by a member of their delegation, Jason Reiskind, *Toward a Responsible Use of Nuclear Power in Outer Space - The Canadian Initiative in the United Nations,* 6 ANNALS OF AIR AND SPACE L. 461, 1981.

The current Canadian proposal for a safety regime for nuclear power sources in space reflects the shift in Canadian view, albeit with some peculiar wrinkles. The principle features as they relate to nuclear power reactors in low earth orbit are:

> 1. A general prohibition on the use of nuclear power reactors in low earth orbit;
> 2. Exceptions may be made only for national security reasons, and then only subject to the following conditions:
>
> a. it must be announced that an NPS is being used in low earth orbit for national security purposes;
> b. treble damages must be paid for any damage caused;
> c. the number launched per year and in orbit at any time may not exceed a limit (to be set);
> d. the amount of radioactive fuel may not exceed a specified limit; and
> e. there must be two reboost backup systems where it is not planned to bring the object back to earth in a controlled re-entry, and a level of control at least meeting the standard for manned spacecraft is required where the space object is to return to earth at the completion of its mission.

The Canadian proposal does not appear entirely well conceived. Although the United States has only flown one nuclear power reactor, an experimental one in 1965 in earth orbit sufficiently high that the reactor will have essentially no radioactivity when its orbit decays in approximately 4,000 years, nuclear power reactors may be the most promising source for meeting high energy requirements in future space missions. If, for example, mankind is to send scientific missions to Jupiter and beyond, it may have to be done with NPS, both radioisotope power sources and nuclear reactors—and we cannot exclude the possibility that such missions would require the start-up of the reactor in a low earth orbit. Similarly, there may be high energy requirements for other civil applications in low earth orbit, such as industrial processing. If, as the experts had agreed, nuclear reactors can be used safely in space, such proposed missions should be evaluated on a case-by-case basis, taking into account the technical need, the benefits to be derived, and the probable risks associated with the proposal. Like any national security missions, civil missions should be flown only with stringent safety precautions after rigorous safety analysis. But the Canadian proposal would totally rule out these possible civil applications now, *a priori*, while making purported exception for national security missions. Further, the exception the Canadian paper would make for low earth orbit nuclear reactors does not appear to be genuine, since it is hedged with conditions unlikely to be acceptable to agencies responsible for national security activities, and certainly not to those of the Soviet Union. Should such a high energy source be required for future United States missions of national security significance, such missions would, in all probability, require classification and confidentiality precluding the public announcements called for by the Canadian proposal. The suggestion of treble damages is perhaps even more improbable as a candidate for consensus, if not for the financial burden, then for the implication of tortiousness in such use of nuclear power reactors.

The United States continues to support the effort to elaborate an international regime regarding the use of nuclear power sources. It is likely, however, that the consensus achieved in the experts' working group of the Scientific and Technical Subcommittee will be the basis of any consensus on the legal side concerning safety.

Definition and Delimitation of Outer Space

The UN's consideration of the question of definition of outer space is the longest standing item on the agenda of the Legal Subcommittee. It was on the agenda, without mention of delimitation, outer space activities, or the geosynchronous orbit (GSO) at the Seventh Session of the Legal Subcommittee, in Geneva, Switzerland, in 1968. While the literature has been filled with discussions of the question both before and since that time, and it has been discussed and debated year after year in the Legal Subcommittee, it appeared no nearer an answer and no more in need of an answer when the 1981 Legal Subcommittee met.

The two basically opposed approaches to the definition and delimination of outer space are illustrated by Vladimir Kopal[12] and Stanley Rosenfield.[13]

Kopal, now a member of the UN Outer Space Division secretariat, recites the standard arguments for a definition and delimitation of outer space, finding such need in a variety of factors, including the growth of space legislation and the number of space objects, the development of aerospace transport, the prospect of solar power satellites and the equatorial states' claim to the geostationary orbit. He asserts that the lower limit of outer space is the most important line to fix and that a right passage for space objects, including a freedom of transit airspace of other states, should be recognized. In so doing, he suggests that "where sovereignty ends" should be left aside.[14] In addition, he endorses the lowest satellite perigees as the approximate lower limit and unsurprisingly finds the proposal of the Soviet Union to be a well founded suggestion for agreement that a boundary between air space and outer space be no higher than 100/110 km above sea level. In something of a contradiction of his assertion that only the lower limit of space, not the upper limit of sovereignty, be dealt with, Kopal states that placing that lower limit too high would impair space activities since penetration below that limit would require the consent of any subjacent state.

Rosenfield considers that after more than twenty years of space activity, "there is still no need for a specific line distinguishing air space from outer space."[15] He notes that treaties have either avoided the problem or taken the functional approach. He does not consider that the shuttle raises any current problem of delimitation since, on ascent it is like any other launcher and on descent it is not highly maneuverable and its descents have not to date raised the issue.

The urge to define outer space or delimit a boundary between it and airspace does not appear to be driven by any real need. It seems beyond legal challenge that satellites orbiting the earth are operating in outer space and under the outer space legal regime. Proposals to agree that the lower limits of outer space are no higher than that would clarify or add nothing regarding activities in orbit or beyond. Further, the geosynchronous orbit issue which has been attached to this item is extraneous to the

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[12]Kopal, *The Question of Defining Outer Space*, 8 J. SPACE L. 154, 1980.

[13]Rosenfield, *Where Air Space Ends and Outer Space Begins*, 7 J. SPACE L. 136, 1979.

[14]Kopal, *supra* at note 12.

[15]Rosenfield, *supra* at note 13.

boundary question since, whatever the scientific, logical or legal basis for the peculiar claim of equatorial state sovereignty over that orbit, not even the equatorial states claim that the GSO is part of airspace. To date, no space system operation, including the return of the United States shuttle orbiter, has raised a problem requiring definition or delimitation. Nor has anyone identified a credible security advantage to states from setting a boundary at the limits usually discussed. I should point out, in passing, that the proposal of the Soviet Union, usually cited as favoring establishment of a boundary at 100 to 110 kms, does not do so. Instead, it proposes in effect that the lower limit of outer space is no higher than that altitude and leaves the issue of the boundary between airspace and outer space and, with it, the upper limit of airspace for future agreement. Thus, the Soviet proposed approach would do nothing to advance the cause of those concerned to know how high they can assert sovereignty and, in their view, protect their security interests.

One should be fairly skeptical that a boundary would have significant benefit for subjacent state security or that it could be adopted without disadvantage to the legitimate interests of states in the use of space. Is it reasonable to fear that better surveillance or reconnaissance could occur from the area below the lowest satellite perigees and above the upper limit of flight with air-breathing engines than can be carried out from orbit? If not, what other non-war activity of adverse security impact could be conducted more advantageously there? Or is it feared that the zone might provide advantages in the delivery of destructive force to military targets? For the latter fear, in what way would delimitation help? A legal boundary between airspace and outer space would be devoid of significance between combatants during hostilities. At the same time, to raise a boundary significantly higher than the upper limit of flight powered by air-breathing engines without also agreeing to an unqualified right of passage or transit to and from outer space could inhibit access to space. It could do so with unequal effect, burdening many states more than it would the United States with vast oceans of international airspace to our east and west for launch and descent trajectories.

Absent a real need, or the prospect of one, it would be rash to define outer space or delimit a boundary, particularly since a likely necessary corollary, which is acceptable regime for access to outer space through an area of extended airspace claims, is more easily defined in unilateral proposals of theoretical seminars than it is diplomatically achieved and made binding on the global community of nations.

Militarization

In addition to the foregoing topics, militarization of outer space as an issue extending beyond the concern of an arms race in outer space should be noted. This issue is being raised with some persistence by a group of countries which includes Brazil, Egypt, India, Nigeria and Yugoslavia. Statements of the concern of "some delegations" about the increasing militarization of space have been included in the reports of COPUOS and its subcommittees this year. During the recent session of the Preparatory Commitee for UNISPACE '82, the global space conference to be held in Vienna in August, those delegations sought to include statements against military use of space in virtually every section of the draft conference report. These were not to be expressed as the views of some delegations, but as a consensus of the conference. To the extent the

United States and the Soviet Union have been investing in the deployment of non-weapons military satellites, we must consider them important to the protection of our security and that of our allies. It is, or should be, evident that there is no real consensus available to label military use of space as an entirely negative phenomenon, a significant obstacle to the peaceful use of outer space and to the enjoyment of the benefits of outer space by all. Nevertheless, the proponents of such language have refused to settle for a more moderate possible consensus text on the matter and have kept the subject open as one of the relatively small number of passages of the draft report on which the Preparatory Committee is not able to submit a consensus recommendation. Thus, militarization of outer space is potentially open for political confrontation at UNISPACE '82. However, it is unlikely to be transformed into an item of serious substantive negotiation on the UN's outer space law agenda.

Conclusion

While the UN's formal space law agenda does have certain implications for international security, there is not a large measure of agreement on the evaluation of those implications and on acceptable measures for dealing with them. The COPUOS Legal Subcommittee's agenda is reduced, and progress toward consensus principles or agreements is likely to remain slow.

THE LEGAL AND POLITICAL CONSIDERATIONS OF THE 1985 WORLD ADMINISTRATIVE RADIO CONFERENCE +

*Ronald F. Stowe**

The dependence in the United States, both by government and by commercial entities on the use of satellites for telecommunication services has grown dramatically during the last ten years. This paper examines the legal and political implications of the 1985 World Administrative Radio Conference (WARC) for Space Services. That conference will not only debate important policy issues; it will also adopt legally binding international norms which will have world-wide effect.

In 1985 the 155 members of the International Telecommunication Union (ITU) will gather at the WARC to address questions relating to the efficiency and allocation of radio frequencies and the geostationary orbit.[1] The United States and other members of the ITU are committed by treaty to work within that organization to develop standards and regulations for the use of the radio spectrum and of the geostationary orbit. Once ratified by member states, those standards and regulations become legally binding.

Because of the practical and legal consequences of ITU decisions, it is very important that we be fully aware of and fully prepared for efforts to change the ground rules to which we have agreed in the past. That is not to say that all change is undesirable. It is, however, to say that change in this forum may have profound implications for us in both the commercial and national security areas. ITU negotiations are not simply passing political debates.

There are several key factors which distinguish specialized agencies such as the International Telecommunication Union from many other agencies of the United Nations. Until recently, the ITU has made its decisions based primarily on technical considerations, and it has articulated those decisions in technical jargon. In recent years, with the growing sophistication and involvement of a larger number of developing countries, ITU decisions have been increasingly motivated by a variety of political as well as technical goals. This fact has sometimes been slow to surface, principally because the jargon of the debate and the jargon of the decisions largely remains a technical one. However, the motivations and the goals of many of the delegations are increasingly political. It should also be noted, of course, that developing countries have always viewed the ITU as a political organization, which has in the past been dominated by industrialized nations.

The negotiation of the mandate of the 1985 WARC, as well as the opening salvos of public posturing and preparation for it, are solid evidence that the world of overt politics has in fact come to the ITU, and to the procedures which decide our vital radio frequency allotments and our rules for use of the geostationary orbit. Regardless of whether that is good or bad, it is happening and we have to deal with it.

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+ The views expressed in this article are those of the author and not necessarily those of his employer.

[1]International Telecommunications Convention, Dec. 9, 1932, 49 Stat. 2391, T.S. No. 867, 151 L.N.T.S. 5. superseded by 28 U.S.T. 2497, T.I.A.S. No. 8572 (Oct. 25, 1973). [Subsequent revisions enacted by the 1982 Plenipotentiary Conference in Nairobi have yet to be ratified by the United States.]

The mandate of the conference is to guarantee in practice equitable access to the geostationary orbit. To clarify what that really means, we have to review the reasons why the conference is being held in the first place, and that needs to be done on several levels. During the last five years the number and variety of satellite programs in heavily developed and industrialized countries has rapidly expanded. A growing concern has been expressed by a number of developing countries that all or most of the desirable or even the acceptable orbital slots available may be occupied by the time the developing countries are ready and can afford to operate satellites of their own. Arguing, without any real challenge, that all countries should have a reasonable opportunity to share in the use of this international resource, the proponents of the '85 WARC concluded that a new specific formula or regulatory scheme needs to be developed to ensure that late-comers to the satellite game will still have a suitable place to go. The facts are self-evident that some countries do not need satellite communication services now, but may later, and that some countries cannot afford such services now, but may be able to later.

Whether orbital resources for such countries should be ensured as a matter of right or as a matter of good political sense, it would still appear reasonable to make some such arrangements. The critically important question, of course, is how to do so. It is argued by some that the easiest and most obvious way is simply to assign specific slots and frequencies to each country and to prohibit anyone else from using them. Although this approach could be an effective guarantee, it represents an horrendously inefficient and costly approach in terms of scarce resource utilization. As such, it runs the risk, at least in the long-run, not only of being technically inadequate but also of being politically unstable.

On the other hand, in 1977 the countries in Europe, Africa and Asia adopted just such a plan to govern their use of the geostationary orbit and of twelve Gigahertz direct broadcasting satellites.[2] The United States and the rest of North and South America, has refused to go along with that approach, and it appears clear that time has validated that decision. Region 2, the ITU grouping which consists of North and South America, is now preparing for its own direct broadcast satellite conference, which will be held in the summer of 1983, and virtually everyone, developed and developing countries alike, is searching for a more flexible and more efficient formula than that which was adopted in 1977. Indeed, it is increasingly common to hear reports from European, Asian and African administrations that in retrospect the '77 plan may not have been based on optimum assumptions after all. In essence, the problem arises from the fact that in order to assign orbital slots one has to decide first such things as how far apart they are going to be. To calculate how far apart they are going to be, one has to adopt, among other things, some specific assumptions about the state of technology at a particular time.

Unlike a priori plans, however, technology seldom stands still. In the case of the 1977 direct broadcast satellite plan, the result is that 1975 technology is now inbedded in what one might accurately refer to as procedural concrete which dictates that all direct broadcast satellites in Europe, Africa and Asia have to be six degrees apart and have to use a certain extremely high power level in order to provide adequate and desirable reception into home receivers. Those parameters are now fixed in the European plan and

[2]Final Acts of the 1977 World Broadcasting Satellite Administrative Radio Conference, subsequently incorporated as Appendix 30 of the ITU Radio Regulations (1982).

that plan is extremely difficult to change without, in essence, starting from scratch. The result is that very significant and technologically unnecessary limitations exist on the number of TV channels that are available from satellite transmission and on the ways that those channels can be used. It would be extremely difficult, for example, to develop a new regional or sub-regional beam from a single orbital position in Europe or the Middle East or in Africa. If several countries now decide they wish to cooperate to build a single satellite platform and to share programming from it, the '77 plan would effectively preclude that joint effort without some fundamental and complex changes.

If, in light of these constraints, one assumes that assignment of all the orbital slots and channels at a particular time is not a desirable approach to adopt, we are still faced with the challenge of answering the question how to insure that countries who first develop their satellite systems in the 1990's or beyond, will still have a fair shot at an acceptable orbital slot. There are many different planning approaches that are under very active study and active development right now in the United States, in the ITU, and in a number of other organizations. The answer with respect to how North and South American broadcasting satellites will be planned will emerge sometime in mid-'83. The answer with respect to other telecommunication satellites, principally the fixed satellite service, will be addressed at the 1985 WARC.

A great deal of work is going on in order to identify and assess alternatives. To understand what is likely to happen, however, it is important to look back and attempt to understand what the initial and current motivations for this conference are. What are the self-interests involved and the goals that the participants are trying to accomplish? It is not unduly cynical to say that there are at least two fundamental levels. One, as described above, is a goal to insure that all states have a reasonable opportunity to share in the use of the orbit when they desire and are able to use it to provide satellite services. It is the central, purported goal of the conference.

Perhaps equally significant, although certainly not so universally endorsed, is the goal of obtaining national assignment of orbital slots regardless of any intent or need to use them for the essential purpose of obtaining some property or economic right or bargaining leverage which does not now exist. It has been suggested by some that because the geostationary orbit is in international territory it should be considered the property of all states and, in turn, should be sub-divided as a property right among them. A logical extension of that theory, of course, is that equal portions of the orbital arc should be assigned to each country on the basis of sovereign equality. Few have gone that far, judging that position to be politically counter-productive. However, it is quite commonly suggested by spokesmen from at least several developing countries that they should have the right through lease, sale or barter to gain revenue from the use by others of the geostationary orbit.

We are confronted in the 1985 WARC with a serious, broadly-based, and unavoidable attempt to use the ITU's procedures and machinery for purposes which will have much more to do with economic and political ambitions than they do with technical or operating efficiency. This injection of political ambitions into the conference is at variance, if not in outright contradiction of the basic goals of the ITU, at least as expressed in the past, which may be defined as maximizing capacity and efficiency of use of the scarce natural resources of the geostationary orbit and the radio spectrum, and avoiding harmful interference, as increasing numbers of users emerge. Those two fundamental goals of the ITU, have very little to do with the current efforts to try and create a new property right in the geostationary orbit.

Put in its most stark terms, we are confronted with a proposition which could result in the United States Government, in carriers and in users being precluded from or having to pay greatly enhanced prices in order to use orbital and spectrum resources which are not actually needed at that time by anyone else. This possibility is particularly disturbing, because the added contraints and added costs would not arise from any additions of new service or new value by those who would be requesting concessions. Such added costs and constraints would arise simply from a political decision that what is now a free good, that is, the natural resource found beyond the jurisdiction of any state, should be sub-divided into feasible and exlusive national rights.

The national self interest on both sides of this question are fairly self-evident, and there is no need to be reticent about identifying them. At the risk of over-simplification, it is fair to suggest that some countries, particularly those with little or no prospect of operating a significant number of their own satellites, may well consider it in their advantage to establish a new regulatory scheme which gives them a right to obtain revenue or other benefit from other countries due to their use of an international resource. After all, it would cost them nothing, could gain some advantage, and would probably be quite popular at home. On the other hand, as the world's most extensive user of the geostationary orbit, the United States could obviously be a big loser in a decision to charge in the future for what is now free. We should, therefore, pay close attention to the implicit, as well as to the explicit consequences, of this debate.

There are several solutions to this dilemma of divergent interests; however each solution has its own particular drawbacks. In the 1977 plan, assignment of an orbital slot and of frequency channels from that slot, implicitly conveyed the right to prohibit use of that slot and that channel by any other country without the assignee's consent or without a fundamental modification of the plan. Perhaps we need to examine more closely the feasibility of a formula in which a country could be guaranteed access to an acceptable slot or slots when it actually intends to use that orbital slot. However, the formula should be one in which such a guarantee does not convey any right to preclude, limit, charge for or otherwise influence use of that orbital position and frequency channel by others until it is actually needed by the assignee. That kind of approach poses its own practical problems of enforcement. How in fact can the international community reasonably ensure that a country would vacate an assigned slot when the assignee is actually ready to use it. In fact, if a country, company or regional group made an investment and put up a satellite in a slot not assigned or allocated to it, it would simply have to build in the flexibility to move that satellite if the country that was the assignee decided that they were going to put up one of their own. In addition, means could certainly be found to reserve only a minimum number of slots and channels, leaving the rest open to meet actual future requirements.

In the past when there has been detailed planning, the common assumption has been that if you are going to plan, you must plan every resource. Every slot must be assigned and every possible channel must be made available for use. Such proposals appear to be generated more as a demonstration of engineering expertise than as a reasonable basis for ensuring the efficient use of a scarce resource. In the mandate for the '83 Region 2 conference, the ITU said that a plan should be developed which will guarantee to each administration a minimum of four TV channels. There are now proposals circulating which, for example, illustrate how each administration could be given twelve, fourteen, sixteen or more TV channels. The question obviously arises

whether it makes any sense at all to assign to each country, regardless of population or geographic size, ten-to-twenty TV channels for satellite broadcasting. As long as we are going to be making political judgments, then we must be bold enough to find an acceptable approach which will permit a real guarantee of access without imposing all the extreme disadvantages that saturation planning would involve.

In short, the United States appears to be faced with yet another significant political as well as technological challenge. On the one hand, the demand for universal access to the orbit to meet actual communications needs appears to be both reasonable and irresistibly appealing. On the other hand, the demand for effective establishment of an artificial commodities market in orbital resources poses major problems which we must neither treat nor accept lightly. Our challenge in this matter is to find the solution to the problem of guaranteed access for others without creating equal or greater problems for ourselves.

ARMS CONTROL - OUTER SPACE +

*Norman Wulf**

In 1790 the Regular United States Army numbered 80 enlisted men. Their basic weapon was the flintlock musket. Almost two hundred years later, the United States has become increasingly dependent on space-based resources to perform a variety of military and civil tasks. The United States currently employs orbital systems for a wide range of purposes, including communications relay, navigation, environmental monitoring, mapping and geodesy, astro-physics, threat surveillance, and strategic and tactical warning.

Arms control in space is inseparable from broader arms control matters and must be considered in the broader context. We cannot, therefore, ignore the experience of earlier attempts at arms control. The history of arms control negotiations demonstrates just how complex, difficult and vital such issues can be.

After World War I, the nations of the world made a serious effort toward world order in the establishment of the League of Nations and the Permanent Court of International Justice and they made a specific commitment to disarmament in the Covenant of the League.[1] In Article 8 of the Covenant, they asserted that "the maintenance of peace requires the reduction of national armaments to the lowest point consistent with national safety."[2] The Committee on Disarmament worked for the next eight years in the attempt to implement Article 8, but agreement on methods and principles broke down over the question of how to assure security before disarmament. General security was recognized as a prerequisite to disarmament, and sanctions against an aggressor as essential to security, but no nation was prepared to trust in the system to the point of disarming.

The Washington Naval Conference of 1922[3] actually achieved the single act of arms control of that time—a limitation of battleships by the United States, Great Britain and Japan in the ratio of 5-5-3. Because Japan held the short end of the 5-5-3 ratio the Treaties ultimately failed. The resulting resentment fed the rising Japanese militarism that led eventually to Pearl Harbor. Attempts during this period to distinguish "defensive" from "offensive" weapons for arms control purposes, failed. British experts maintained that the tank was an offensive weapon and should be controlled. French military planners saw them primarily as defensive weapons and argued that they should be unconstrained. Similarly, Britain, as a maritime power, wanted limits to be placed on submarines. Greece, concerned about offensive threats from the sea, asserted that submarines were defensive arms and resisted any controls.

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+ The views expressed in this article are those of the author and not necessarily those of the United States Arms Control and Disarmament Agency.

[1]For a text of the Covenant *see* 2 TREATIES AND OTHER INT'L AGREEMENTS OF THE UNITED STATES OF AMERICA 48 (1776-1949).

[2] *Id.* at 51.

[3]Limitation of Naval Armament (Five-Power Treaty or Washington Treaty), Feb. 6, 1922, 43 Stat. 1655, Treaty Series 671.

Subsequently, the Locarno Treaties[4] committed Germany and France to mutual guarantees of boundaries and committed Germany to arbitration in any disputes with Belgium, France, Poland or Czechoslovakia. The Kellogg-Briand Pact[5] committed its signatories to the renunciation of war. None of these agreements were structured to deter aggression or to provide for sanctions when violations occurred. Finally, in 1933, Britain, France, Germany and Italy signed a No Force Declaration pledging "not in any circumstances to attempt to resolve any present or future differences between them by resort to force."

This short excursion into the early history of arms control efforts demonstrates the importance of the principle that arms control agreements must truly enhance security. Secretary Haig has made it clear that the United States will seek agreements that make world peace more secure by reinforcing deterrence and has defined the elements of United States arms control policy. This policy, which is also relevant for space purposes, is summarized by the following considerations and principles:

> —Whether a particular agreement undermines or supports deterrence may change with the development of new weapons systems. Arms control agreements therefore must be designed so that they can adapt flexibly to long-term changes.
> —Each arms control agreement must be balanced in itself and contribute to an overall balance.
> —Another important principle of our arms control policy is to seek arms control agreements that include effective means of verification and mechanisms for securing compliance. Unverifiable agreements only increase uncertainty, tensions, and risks. After all, if the parties trusted each other, they would not need the arms that they now seek to control.

Turning then to outer space, we all know there are a considerable number of international agreements applicable to space containing arms control elements. The Limited Test Ban Treaty of 1963[6] prohibits, among other things, the parties to the Treaty from carrying out nuclear explosions of any kind in space. Since the Limited Test Ban Treaty was signed, the importance of the ban on nuclear tests in outer space has increased dramatically. The satellites employed today are more sophisticated than formerly and at the same time their complex onboard systems are more vulnerable to radiation damage from nuclear explosions in space.

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[4] *See* Locarno Treaties, 54 L.N.T.S. 289, 305.

[5] Kellogg-Briand Pact Aug. 27, 1928, 46 Stat. 2343, Treaty Series 796, 94 L.N.T.S. 57.

[6] Treaty Banning Nuclear Weapons Tests in the Atmosphere in Outer Space and Underwater, Aug. 5, 1963, 14(2) U.S.T. 1313; T.I.A.S. 5433; 480 U.N.T.S. 430 (1963).

The Outer Space Treaty[7] which entered into effect in 1967, establishes a general norm of peaceful uses of outer space. Article III states that the space activities of States parties to the Treaty shall be conducted ". . . in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding."[8] Article IV prohibits the placement in orbit, the installation on celestial bodies, or the stationing in outer space of nuclear weapons or any other kinds of weapons of mass destruction.[9] In addition, Article IX requires international consultations prior to any planned space activity or experiment if the state undertaking it has reason to believe such activity or experiment would cause potentially harmful interference with the peaceful space activities of others.[10]

Other international agreements extend specific protections to certain classes of satellites. The United States and the Soviet Union have undertaken expressed obligations not to interfere with each other's national technical means (NTM) of verification under the SALT ONE Interim Agreement,[11] the ABM Treaty,[12] the Treaty on Underground Nuclear Explosions for Peaceful Purposes,[13] the Threshold Test Ban Treaty,[14] and the SALT TWO Agreements.[15] Under the Direct Communications Link Improvement Agreement,[16] both nations have confirmed their intention to take all possible measures to assure the continuous and reliable operation of the emergency

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

[8] *Id.* at art. III.

[9] *Id.* at art. IV.

[10] *Id.* at art. IX.

[11]Interim Agreement Between the United States of America and the Union of Soviet Socialist Republics on Certain Measures with Respect to the Limitation of Strategic Offensive Arms, May 26, 1972, 23 U.S.T. 3463, T.I.A.S. 7504.

[12]Treaty on the Limitation of Anti-Ballistic Missiles, signed at Moscow May 26, 1972; entered into force Oct. 3, 1972. 23 U.S.T. 3435; T.I.A.S. 7503.

[13]Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, Aug. 5, 1963, [1963] 14 (2) U.S.T. 1313, T.I.A.S. 5433, 480 U.N.T.S. 430 (1963).

[14]Treaty Between the United States of America and the Union of Soviet Socialist Republics and Protocol to the Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Underground Nuclear Weapon tests, signed at Moscow, July 3, 1974, (also known as the "Threshold Test Ban Treaty). For text *see* U.S. Arms Control and Disarmament Agency, Arms Control and Disarmament Agreements 158-161 (1977).

[15]For details regarding the SALT TWO Agreements, *see* U.S. ARMS CONTROL AND DISARMAMENT AGENCY: ARMS CONTROL AND DISARMAMENT AGREEMENTS 128*ff.*

[16]Agreement on Measures to Improve the Direct Communications Link, entered into force Sept. 30, 1971, 22 U.S.T. 1598, T.I.A.S. 7187 (1971).

satellite system; and under the International Telecommunications Convention,[17] each party is obligated to avoid harmful interference with the radio services or communications of other parties.

Orbiting satellites may be deployed for attack warning, attack assessment, damage evaluation, civil and military navigation, intelligence collection, target location and identification, arms limitation verification, and long-distance communications. At present, the United States and the Soviet Union together have about 150 active satellites in orbit.

In many cases the functions performed by satellites were formerly carried out by earth-based facilities: by undersea cables and radio, in the communications area, for example, and by radio beacon systems in the navigation area. Theoretically, the United States could, if necessary, revert to ground-based systems in these cases, although at higher costs and provided that they have not been dismantled. In other cases, however, satellites provide unique capabilities that cannot readily be duplicated by ground-based systems. The photographic surveillance mission, so crucial for arms control verification and crises monitoring during regional conflicts, is an important example.

The growing importance of both civilian and military satellites has given rise to considerable concern that anti-satellite weapons could be developed to threaten them. In the face of this concern and the threat of an already tested Soviet ASAT system, the United States is developing an ASAT capability and seeking to improve satellite survivability.

The United Space Defense System Program involves four functional areas: (1) anti-satellite systems; (2) space systems survivability; (3) space surveillance systems; and (4) command and control. With respect to arms control, United States policy with regard to space defense is under review.

The Soviets have a vigorous and constantly expanding military space program. In the past ten years they have been launching in excess of 75 spacecraft per year, four-to-five times more than the United States. We estimate that 70 percent of Soviet space systems serves as a purely military role, another 15 percent serves dual military roles and the remaining 15 percent is purely civil. The Soviet military satellites perform a wide variety of reconnaissance and collecting missions. Military R&D experiments are performed on board Soviet manned space stations, and the Soviets continue to develop and test an ASAT anti-satellite co-orbital interceptor.

Can we make any assessments about the effect of developing space technology upon the space environment over the next decade?

Technological developments and the difficulty to predict them complicate arms control generally and space arms control in particular.

In 1975, Professor Harvey Brooks, writing in the Journal of the Academy of Arts and Sciences, summarized the principal differences between past and future technological advances:

> . . . The revolutionary technological situation that existed [from 1955 to 1965] may have been unique. . . . The revolutionary fifties and sixties were made possible by the confluence of several basic technological advances which came to maturity at more or less

[17]Art. 33 of the International Telecommunication Convention, Malaga-Torremolinos, Oct. 25, 1973, (entered into force for the United States April 7, 1976), 28 U.S.T. 2495, T.I.A.S. 8572.

> the same time—solid fuel rocket propulsion, high-yield-to-weight thermonuclear warheads, inertial guidance, compact solid-state electronics and computers, MIRV and re-entry technology. . . [yet]. . . the cumulative effect of many small evolutionary improvements in the parameters of component technologies can often be as revolutionary as such dramatic basic developments as the transistor or the hydrogen bomb.[18]

It is generally agreed that Brooks' characterization of the direction of technology remains sound, and his expectation of dramatic consequences arising from evolutionary innovation is being fulfilled. We must note, however, that the diverse applications of incrementally improving technologies also seem today of greater significance than the rate of change itself. This is exemplified by the diverse uses for which satellites are employed. Nevertheless, although it is difficult to predict with exactitude the effect of future technological change, we may assume, with Professor Donald Hafner of Boston College, that arms control planning for the next decade will have to deal with the following major categories of space use:

1.) Satellites for the collection and conveyance of information for civil, military and scientific purposes. The increasing numbers within this category of satellites will make it more difficult to regulate military activities in outer space on the basis of provisions which distinguish satellites with military purposes from non-military ones.

2.) Satellites as platforms for weapons to be used against other space objects (ASATs). The term "anti-satellite" (ASAT) is generically used to describe any device that can be used to destroy the operational capability of satellites in Earth orbit. These devices can be based on the ground, in airplanes, or in space. Such systems can involve (a) the direct ascent launch of a missile carrying a warhead; (b) co-orbital devices with explosive warheads; or (c) use of a directed-energy weapon such as a laser beam. Conventional warheads for ASATs could involve explosive devices or impact devices. From an arms control perspective, a major problem will be verification.

3.) Satellites as platforms for weapons to be used against terrestrial targets, *e.g.*, ships, aircraft, cruise and ballistic missiles. There will not be much incentive to attack terrestrial targets from outer space, unless it is possible, using space-based sensors, to direct and track such targets in real time, at long range, and with great precision.

4.) Satellites as platforms for industrial manufacturing, power generation, etc. for terrestrial consumer needs. Many believe that it is unlikely that such activities will constitute a major use of space within the coming decade.

This listing of categories of space activities obviously does not include all changes that could occur in space activities but it does indicate that space will become more crowded, raising the concern for the protection of satellites from accidental or intentional harm.

High on the United States list of space concerns is the protection of American space systems vital to national security from a possible Soviet anti-satellite threat. It is believed that development of a United States anti-satellite system will enhance protection of United States satellites by deterring attacks upon them. The United States is developing a prototype anti-satellite weapon that consists of a modified short-range attack missile, an ALTAIR rocket second stage and a miniature vehicle warhead. The launch platform

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[18]Harvey Brooks, *The Military Innovation System and the Qualitiative Arms Race, DAEDALUS*, Summer 1975, p. 78.

for this anti-satellite weapon would be the F-15 fighter aircraft. The development of high energy directed beam weapons for applications in space also is being investigated. While high energy lasers and particle beams differ in state of development and in the technology required to realize them, if they can be developed as weapons, their implications for possible anti-satellite negotiations and space defense issues generally will have to be considered.

In March 1977, the United States proposed to the Soviets the formation of a joint working group to discuss arms control limitations on anti-satellite systems. The first round of talks was held in Helsinki on June 8-16, 1978. The discussions were exploratory in nature to determine the possibility and basis for subsequent negotiations on limiting certain activities directed against space objects and systems for conducting such activities. Two more rounds of talks were held in 1979.

At this time, the future of ASAT negotiations depends, in part, upon the results of the United States ASAT policy review. It can readily be concluded that no agreement would be acceptable that would either place the United States in an inferior position vis-a-vis the Soviet Union or that was not verifiable.

The United States has supported responsible efforts to control arms in outer space. We have sought in the past, through such major international agreements as the Limited Test Ban and Outer Space Treaties, to limit arms in space. However, the contributions which space systems can make to self-defense, deterrence and arms control verification also must be recognized.

The United States use of space for military purposes has been non-aggressive and has shown restraint. Presently, the United States has no desire to engage in a costly arms race in outer space. Current United States research and development activities in the anti-satellite field are in partial response to the threat created by the Soviet ASAT system.

Space arms control policy is currently undergoing careful study within the United States Government. The issues are complex and must be considered in the context of the broader arms control issues to which they relate. The lessons of history have taught us that such agreements, like all arms agreements, will have to be equitable, balanced, verifiable, and be designed to provide stability and to enhance security.

SOLAR POWER SATELLITES AND SECURITY CONSIDERATIONS: THE CASE FOR MULTILATERAL AGREEMENTS +

Paul G. Dembling and Delbert D. Smith***

It is now feasible to begin planning to tap the sun's energy in outer space via solar power satellites (SPS), and to transmit that energy to ground stations on Earth for use as an economically competitive source of electric power.[1] Such a power source is projected to be operating on an experimental basis in the United States sometime during the 1990's.

The idea of SPS was proposed by Dr. Peter E. Glaser of the Arthur D. Little Company in 1968.[2] He envisioned a gridlike structure in outer space, some 15 miles long and 3.2 miles wide, an area of approximately 50 sq. miles.[3] This giant structure would be located in the Earth's geostationary orbit, some 22,300 miles above the equator. The massive size of the SPS would allow for maximum concentration of sunlight for the purpose of generating electricity. The energy thus generated would be transmitted from the SPS in the form of microwaves to ground stations on the Earth, where it would be transformed back into electricity for use in the national grid.

An operational SPS of the dimensions described herein would produce twice the useable power generated by Grand Coulee, the largest hydro-electric dam in America. Calculations are that it would take 45 of these fully operational structures to match the current electrical generating power of the United States.

There still remain unsolved problems and unanswered questions regarding the technological and financial aspects of SPS. For instance, the cost of developing and constructing even one such platform would be extremely high. In addition, questions regarding the system's effects on the Earth's environment have yet to be satisfactorily answered. These essentially technological problems and questions, however, can presumably, in time and through proper research and development, be eliminated.

The international legal, political, and institutional problems must also be confronted and resolved. These problems pose potential long-term impediments to SPS

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+ The views expressed herein are those of the authors and not necessarily those of the law firm of Schnader, Harrison, Segal and Lewis.

[1] *Solar Powered Satellites: Hearings Before the Subcommittee on Space Science and Applications, and the Subcommittee on Advanced Energy Technologies and Energy Conservation Research, Development, and Demonstration, of the Committee on Science and Technology, U.S. House of Representatives,* 95th Congress, 2nd Session (April 12, 13, 14, 1978) No. 68 at 340. (Testimony of Dr. Peter E. Glaser, Vice President, Engineering Sciences, Arthur D. Little Inc., Cambridge, Mass.).

[2] *Solar Powered Satellites, supra* note 1, at 355 (Statement of Honorable Don Fuqua, Chairman of the House Committee on Science and Technology).

[3] Glaser, *Power From The Sun: Its Future,* 162 SCIENCE 857-61 (Nov., 1968).

feasibility, regardless of technological achievements. One of the most controversial of these problems involves the military implications of the SPS. This is the subject of this paper.

From an "Owner State" point of view, the massive SPS, of which there may eventually be many and on which a State may some day depend for a large percentage of its energy needs, would be a target for any space-capable nation with intentions hostile to the interests of that state.

Conversely, a non-"Owner State" fears that the SPS could be used for military purposes and that in such case the SPS would pose a threat to its national security. Specifically, the concern is that the huge amount of energy absorbed by the SPS could, with proper equipment, be harnessed for use as a tremendously powerful weapon. Such a weapon could be used offensively against objects in space or on Earth. Defensively, it could be used to protect the owner's SPS, its other space objects and the State's land mass from attack.

The premise of this paper is that international multilateral agreements could serve to minimize potential vulnerabilities of the SPS and could also help minimize potential threats attributed to the SPS by foreign States. With the understanding that no agreements are ever absolute assurances against military threats and vulnerabilities, an analysis can be made of the alternative types of multilateral agreements which are available, and the mechanics used in formulating such agreements.

I. Types of Multilateral Agreements

There are three general categories of international multilateral agreements of relevance to the development of SPS facilities. These categories consist of binding agreements, non-binding agreements, and agreements which form the charter of distinct legal entities such as international organizations.

International treaties are agreements of a contractual nature that create legal rights and obligations between the party Nation-States.[4] Treaties are considered binding in the sense that the sanctity of treaties is an integral part of international law which is based on the observance of good faith between States.[5] The usefulness of binding agreements to mitigate against threats or vulnerability associated with SPS facilities would be dependent upon the extent to which parties exercised good faith in their observance of the treaty obligations. Often treaties include provisions by which States can withdraw from their terms and conditions. For example, all four existing multilateral space-related treaties permit parties to withdraw upon notice.[6] Thus, the concept of "binding" when associated with treaties is true only in a temporal sense.

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[4]I. OPPENHEIM, INTERNATIONAL LAW, §491 (8th ed., 1963).

[5]J. L. BRIERLY, THE LAW OF NATIONS 331 (6th ed., 1963).

[6]The four existing multilateral space-related treaties are: (1) Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty), Jan. 27, 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205 (entered into force with respect to the United States, Oct. 10, 1967) (for an analysis of this treaty, *see* Dembling & Arons, *The Evolution of the Outer Space Treaty*, 33 J. AIR. LAW & COM. 419 (1967)); (2) Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched Into Outer Space (Agreement on Rescue and Return), Apr. 22, 1968, 19 U.S.T. 7570, T.I.A.S. No. 6599, 672 U.N.T.S. 119 (entered into force

Certain international agreements are considered nonbinding in the sense that there was never any intention by the parties to be bound by the terms and conditions of such agreements. An important example of this type of agreement is the current effort within the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) to draft "principles" for the conduct of operational direct broadcast satellite activities[7] and satellite remote sensing activities.[8] Presumably, there is also a good faith obligation to non-binding "principles." Thus, the distinction between binding and non-binding multilateral agreements may be more formalistic than practical.

The third general category of international agreements are those which create international organizations. While such treaties and the resultant organizations have traditionally been utilized as tools for the coordination of activities among States for mutual benefit, less developed States have in recent years advocated their use as vehicles to force the sharing of benefits among States. For example, with justification derived from concepts such as the "Common Heritage of Mankind"[9] and the "New Economic Order",[10] some States have demanded that an international authority be established to govern the distribution to all States of benefits from the mining of the ocean floor.[11] It is apparent that, given the growing predilection by States for preserving their rights with regard to space-related resources such as radio frequency spectrum, geostationary orbital slots, and moon resources, there will be an increasing amount of pressure for the creation of administrative international organizations by which to distribute space-related benefits among the nations. This pressure may become apparent with regard to SPS space segment development as well.

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with respect to the United States, Dec. 3, 1968) (for an analysis of this treaty, *see* Dembling & Arons, *The Treaty on Rescue and Return of Astronauts and Space Objects*, 9 WM. & MARY L. REV. 630 (1968)); (3) Convention on International Liability for Damage Caused by Space Objects (Convention on Liability), *opened for signature* March 29, 1972, 24 U.S.T. 2389, T.I.A.S. No. 7762 (entered into force with respect to the United States, Oct. 9, 1973); (4) Convention on Registration of Objects Launched into Outer Space (Convention on Registration), January 14, 1975, XI, 28 U.S.T. 695, T.I.A.S. No. 8480 (entered into force with respect to the United States, Sept. 15, 1976). The sections of the above treaties which permit parties to withdraw upon notice are: (1) Article XVI of the Outer Space Treaty, (2) Article IX of the Agreement on Rescue and Return, (3) Article XXVII of the Convention on Liability, and (4) Article XI of the Convention on Registration.

[7]COPUOS Report on Draft Principles for the Conduct of Operational Direct Broadcast Satellite Activities, U.N. Doc. A/36/20.

[8]COPUOS Legal Subcomm. Report on Satellite Remote Sensing Activities, U.N. Doc. A/AC105/305.

[9]Staff of Senate Comm. on Commerce, Science, and Transportation, 96th Cong., 2d Sess., Agreement Governing The Activities of States On The Moon And Other Celestial Bodies (The Moon Treaty), 452-54 (Comm. Print 1980).

[10] *Id.* at 385, 386 and 452-54.

[11]Informal Composite Negotiating Text/Revision 1, Article 153, U.N. Third Conference on the Law of the Sea, 8th Sess. (March 19-April 27, 1979).

II. Concerns for an SPS Multilateral Treaty

The creation of an international organization for the ownership and operation of SPS facilities might theoretically be the optimum for alleviating the threats to international security associated with an SPS system. However, such an approach has been considered unlikely for the first United States SPS system for a number of reasons. Among these are the delays and excessive costs involved in international projects.[12] In addition, there are foreign policy concerns, including limitations on technology transfer and freedom from dependence on foreign energy sources.[13] Therefore, it would seem unlikely that there would be promulgation of a multilateral treaty that would create a new international organization with regard to the ownership of the SPS. However, given a tendency among developing States to claim portions of the benefits derived from utilization and exploitation of international resources, and given the view that monitoring of SPS facilities should be conducted by an independent authority, there may be pressure to create an international organization which, although not part of the management or control of SPS facilities, would manage the distribution of benefits from or otherwise monitor such facilities. [14]

A multilateral agreement might serve as a means for protecting the security of non-"Owner States" while diffusing pressure for the establishment of a separate international entity to undertake the actual development effort which might better be left to the private sector or might be more efficiently accomplished by a single government. There are a number of forms which a multilateral SPS agreement could take. Since the purpose of the agreement would be to assure against military threats and vulnerabilities associated with SPS facilities, the binding treaty form would be optimal. The principle of good faith adherence to the terms and conditions of binding treaties would afford the maximum amount of assurances to all parties that SPS facilities would not be utilized as offensive military weapons and that they would not be vulnerable to military aggression. It is important to note that the concerns of non-"Owner States" are with regard to offensive, or aggressive use of military force.

> General principles of law with respect to outer space have been adopted, but those relating to "peaceful purposes" do not restrain states from providing for their own self-defense, or using force to protect their space objects if they are attacked, and, more particularly, they do not deny them measures of military preparedness consistent with an advancing military technology.[15]

Given the fact that treaties are temporal, at best, there must be underlying checks and balances which will support the continued good faith adherence of treaty provisions by all parties.

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[12]Staff of Senate Comm. on Commerce, Science and Transportation, 95th Cong., 2d Sess., The Third Law Of The Sea Conference (Comm. Print 1978).

[13]Staff Report on The Moon Treaty, *supra* note 9.

[14] *Id.*

[15]H. Almond, *Military Activities In Outer Space-The Emerging Law* (Paper by Harry H. Almond, Jr., Professor of International Law, The National War College, Washington, D.C.).

III. Multilateral Considerations Affecting a United States SPS

Any agreement associated with SPS development must be based upon underlying benefits to all parties or there will be little motivation for continued good faith adherence to treaty provisions. Thus, it is appropriate to assess the relative benefits to and negotiating positions of various States with regard to the unilateral development by the United States of an SPS system. Any such agreement would contain numerous provisions ranging from standards for environmental protection to prohibition of certain types of weapons systems and, therefore, a complete identification of all possible provisions is beyond the scope of this paper. However, a few salient substantive provisions can be analyzed.

A. Negotiating Positions

The unilateral development of an SPS by the United States will be considered by other nations as an appropriate subject for international accord designed to reduce or eliminate perceived and real threats which such nations may have with regard to the satellite. Thus, the impetus for the creation of an international agreement for SPS development will likely emanate from foreign nations. As a result, the United States might have a favorable negotiating position from which to bargain for provisions designed to diffuse the vulnerabilities of SPS development in return for provisions intended to forestall perceived and real threats.

The United States could choose to refrain from including systems or components in a solar power satellite which would produce threats, and any international agreement designed to eliminate such threats would serve to ratify this unilateral policy. However, from the perspective of foreign nations it is obvious that, once the SPS was in existence, there would be few nations which would have the practical ability to affect the space segment of the facility in order to prevent perceived or real threats should the United States policy change with regard to the military potential of the system. Therefore, foreign nations will seek ways in which to achieve leverage *vis a vis* the United States to help ensure the elimination of threats.

For space powers, such leverage may be in the form of the development and implementation of their own solar power facility or appropriate military systems. For the majority of nations, however, negotiating leverage may derive solely from their combined voting strength within already established international organizations, their united economic strength, and in their united efforts with regard to allocation of international resources, such as the geostationary orbit and radio frequency spectrum. It is likely, therefore, that an international agreement for solar power satellites will be founded on tradeoffs between provisions which attempt to eliminate perceived and real threats from a U.S. developed SPS system, and provisions which attempt to eliminate vulnerabilities of the U.S. system.

It is anticipated that, from the perspective of the United States, the value of a multilateral agreement will be significant in reducing certain types of vulnerabilities. Although an international agreement may not be entirely effective in the elimination of military vulnerabilities, just as it may not be entirely effective in the elimination of military threats attributed to solar power satellites, an international agreement would be very useful in eliminating institutional and international legal vulnerabilities. These

institutional and international legal vulnerabilities may range from claims of right to a portion of the power supplied by the SPS system on the basis of the "Common Heritage of Mankind" theory, to claims that SPS development be banned in order to avoid interference with the established utilization of the radio frequency spectrum for telecommunications purposes.

Since institutional and international legal vulnerabilities will be most critical during the formative stages of the SPS development, the beneficial impact for the United States of an international agreement would necessarily take effect early in the developmental process. Thus, the promise of early elimination of institutional and international legal barriers would be a tangible benefit that foreign nations could offer in return for assurances that the threats attributed to SPS systems will not materialize and, in return for mechanical and systematic methods to verify, monitor and enforce such assurances. Consequently, the United States would achieve the elimination of such vulnerabilities prior to the development of its SPS system. The United States could personally continue minimization of such vulnerabilities as long as it demonstrates adherence to policies and procedures which reduce or eliminate perceived or real threats.

The bargaining position between the United States and those States which possess the capabilities of militarily affecting the SPS space segment is quite different from that between the U.S. and the majority of States. In such cases, bilateral treaties may be adopted between the space powers on the basis of their unique bargaining positions.

B. Selected Provisions

A recent study on military implications of a SPS system identified two salient subjects for an international SPS agreement. The first involves the concept of proximity rules and the second involves the concept of inspection.

Proximity rules have been defined by the study as "specified 'keep out' zones in the vicinity of space facilities which are to be protected,"[16] and, it is stated that "precedent for such rules exists in the form of offshore territorial limits claimed by various nations."[17] However, proximity rules would have to be reconciled with Article II of the 1967 Outer Space Treaty[18] which states: "[O]uter space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means." The specified zones established by such proximity rules, which would be defined relative to the SPS space facility, would constitute a claim over an ascertainable portion of outer space. One commentator has asserted that the concept of appropriation in Article II suggests the existence of two subsidiary elements: temporary nonexclusive use and permanent exclusive use.[19] To the extent that a SPS satellite would not be considered a permanent use of a particular

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[16] *On The Military Implications Of A Satellite Power System (SPS), Draft, Science Applications, Inc., 3-37 (April, 1980).*

[17] *Id.*

[18] Outer Space Treaty, *supra* note 6, Art. II.

[19] Gorove, *Interpreting Article II of the Outerspace Treaty*, 37 FORDHAM L. REV. 352 (1969).

portion of space even though the facility would have a relatively long lifetime, it would follow that such specified zones would also not be considered a permanent use. However, by definition, such zones would be reserved for exclusive use and therefore may constitute an appropriation of a portion of outer space. Thus, an SPS multilateral agreement would be useful to either exempt such zones from the restrictions posed by Article II or to define the word "appropriation" such that the zones would not be within said definition.

The second subject is that of the concept of inspection. Article XII of the 1967 Outer Space Treaty provides that:

> All stations, installations, equipment and space vehicles on the moon and other celestial bodies shall be open to representatives of other States Parties to the Treaty on a basis of reciprocity. Such representatives 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.[20]

Of importance is the fact that Article XII is applicable only to stations, installations, equipment and space vehicles on the moon and other celestial bodies and therefore the Article is not applicable to all facilities in space. If the inspection concept was included in an international SPS agreement, inspections which would be conceptually analogous to those contemplated in Article XII would apply to SPS space facilities. However, the scope of such SPS inspections could be much broader than those contemplated under Article XII if they were to be conducted by resident inspectors rather than visiting inspectors upon notice.

The concept of inspection is somewhat controversial in the United States. As embodied in the United States Constitution, prohibition on unreasonable searches[21] is a principal freedom which has been ingrained in American political philosophy. Clearly, application of this philosophical precept has met with limited success in the context of inspections for safety or health reasons, especially in non-residential property. The true basis for criticisms of international inspection mechanisms is probably linked to notions of sovereignty, or even of national security itself.

In the context of the current debate surrounding the "Moon Treaty,"[22] which has been recently approved by the United Nations General Assembly and opened for signature and ratification, the issue of inspections has again been raised. Some critics of the Moon Treaty assert that the Treaty would expand the right of foreign governments to inspect U.S. space facilities beyond the right already established in Article XII of the

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[20]Outer Space Treaty, *supra* note 6, Art. XII.

[21]U.S. Const. amend. IV.

[22]The proper title of the "Moon Treaty" is "An Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Treaty), U.N. Doc. A/AC.105-L.113/Add. 4 (1979); see also U.N. G.A.O.R. supp. 20, Doc. A/3420 (1979) (it is highly unlikely that the United States will ratify the Moon Treaty in its present form).

1967 Outer Space Treaty.[23] In voicing criticism of this inspection scheme, it has been said that:

> In the interest of verification, the treaty allows any State Party to inspect all facilities in space, whether the facilities are owned by a nation, corporation or individual. While some form of verification is desirable, this provision makes legal the unrestricted searches of private residences as well as government facilities . . . . These are intolerable infringements of human rights.[24]

Thus, although the concept of inspection has at least limited precedent in international outer space law, the concept would probably be subject to criticism in the United States.

Criticism of the residential inspection concept may also be formulated on the basis of undue cost, lack of need, lack of reciprocity of inspections of terrestrial or space weapon systems which would be utilized against SPS facilities, feasibility and practicability. In addition, there is little precedent in international law, politics or relations for the formulation of a supra-national elite cadre of international representatives entrusted with inspection of important domestic facilities. While it is conceivable that such criticisms can be overcome, and unprecedented action is always possible, it might be prudent to consider alternatives to the concept of residential inspection. Remote sensing, system design and periodic inspection might provide the basis for such alternatives.

IV. Mechanics in Researching Multilateral Agreements

Most multilateral space-related treaties have originated within the U.N. Committee on the Peaceful Uses of Outer Space (COPUOS). Traditionally, a draft treaty will not be recommended to the U.N. General Assembly unless it has received unanimous consensus of approval from COPUOS.

Upon approval by the United Nations General Assembly, a multilateral agreement would be open for signature and ratification, and the treaty would enter into force upon deposit of instruments of ratification from a requisite number of States. The ratification

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[23] Article XV (1) of the Moon Treaty states:

> 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 installation 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.

It should be noted that unlike the 1967 Outer Space Treaty, the Moon Treaty does not make inspection the subject of reciprocity.

[24] *The United Nations Moon Treaty*, Draft Position Paper, AIAA Los Angeles Section at 2 (February 14, 1980).

process is unique to each State. A multilateral agreement would not enter into force for the United States until its particular process was completed, even though such agreement would be in force for other States. Moreover, international law is complicated by the procedures which permit States to ratify an agreement with reservations[25] or merely to consent to be bound by an agreement through accession.[26]

A multilateral space-related treaty, however, need not be created through the United Nations. An alternative method would be the convening of a treaty conference, such as was done in the case of the Convention Relating to the Distribution of Programme Carrying Signals Transmitted by Satellite. The text of this treaty was initially formulated during meetings of a Committee on Governmental Experts which was jointly sponsored by the U.N. Educational, Scientific and Cultural Organization and the World Intellectual Property Organization, and was finally completed at a Diplomatic Conference which was especially convened for its consideration and adoption.

Finally, it should be noted that agreements reached in the context of the International Telecommunication Union (ITU) are also a type of multilateral agreement. Although this body concerns itself with questions of technical coordination and frequency allocation for radio communications, it is anticipated that SPS development will be of increasing concern to the ITU and may eventually become the subject of the ITU's Radio Regulations. The ITU, at the 1979 General World Administrative Radio Conference, adopted a resolution "to undertake appropriate studies on all aspects of the effect of such radio transmissions of power from space on radio communication service, and to make appropriate recommendations taking into account the ecological and biological implications."[27]

Conclusion

It is probable that, similar to the case of direct broadcasting satellites, SPS will become the subject of both ITU and COPUOS multilateral agreements. As the foregoing discussion indicates, the development of SPS systems might benefit from the adoption of a unitary multilateral agreement affecting their military role and security. It is of importance that the role of a multilateral agreement for these purposes be addressed now, before any single nation is committed to the development of an SPS system.

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[25]Articles 19 through 23 of the Vienna Convention on the Law of Treaties is a codification of international law with regard to reservations. Vienna Convention on the Law of Treaties, *opened for signature* May 23, 1969, U.N.G.A. United Nations Conference on the Law of Treaties, A/CONF 39/27.

[26]"Accession is the formal entrance of a third State into an existing treaty, so that it becomes a party to the treaty, with all rights and duties arising therefrom. Such accession can take place only with the consent of the original contracting parties." Oppenheim, *supra* note 4, Section 532.

[27]ITU Recommendation No. 3 is reproduced as an Appendix to this paper.

APPENDIX

RECOMMENDATION NO. 3

Relating to the Transmission of Electric Power
By Radio Frequencies From A Spacecraft

The World Administrative Radio Conference, Geneva, 1979

considering

(a) that it may become technically feasible in the future to convert some portions of the sun's radiation into electric power on board a spacecraft and to transmit that power to Earth by means of radio transmissions and that such power could augment the world's energy resources;

(b) that the possibility of such high power radiation may adversely affect the propagation of radio waves for other services through the ionosphere;

recognizing

(a) that it would be necessary to ensure that the radio transmission of electric power from sapce did not give rise to harmful interference to radiocommunication services;

(b) that an assessment needs to be made of any likely ecological and biological effects of radio transmissions of power from space, including in particular to aircraft passing through antenna beams used for such transmissions;

noting

that the Special Preparatory Meeting report to the World Administrative Radio Conference, Geneva, 1979, recognized the technical possibility of a solar power satellite;

noting also

the provisions of Article 6 of the Radio Regulations referring to the obligations on administrations not to cause harmful interference to radio communication services operating in accordance with the Regulations;

recommends the CCIR

to undertake appropriate studies on all aspects of the effects of such radio transmissions of power from space on radio communication services and to make appropriate recommendations taking into account the ecological and biological implications;

invites the Secretary-General

to send this Recommendation to the Secretary-General of the United Nations.

CAPTURING THE SUN:
THE NUTS AND BOLTS OF SOLAR CELLS FOR SATELLITE POWER

*Peter E. Wagner**

As with the earth itself, virtually every satellite in our solar system occupied or constructed by human beings derives its power from the sun. Man-made satellites employ very large numbers of solar cells in order to convert sunlight directly into electricity.

These cells are the subject of the present brief article. Its purpose is not to engage in a scientific discussion about solar cell technology for space applications, but rather to describe some of the features of these elegant devices and their organization into enormous arrays which are designed to harvest sunlight in the most efficient and useful way. Also, some related issues of concern to the author, and perhaps to the reader, are raised.

The first figure sets the stage.[1] It portrays a space vehicle which has enough solar cells laid out in the large panels shown as dark planar surfaces to generate about 1,000 watts of power—roughly the same as a portable electric space heater. The scale of this picture attests to the huge number of cells necessary to capture even a modest amount of solar power.

At the heart of the space power package is the single solar cell. An individual cell is a thin, flat square- or disc-shaped object about the size of a credit card or a razor blade. Cells presently in space use invariably are made of silicon, the same element which constitutes the basic stuff of transistors and integrated circuits. It is not necessary to have a detailed engineering understanding of the way a silicon solar cell works in order to appreciate some of the problems associated with its use. Briefly, the cell acts as follows.

The bulk of the cell consists of exceedingly pure silicon to which a trace of chemical impurity has been added with great precision in order to modify the electrical properties. Behind this silicon plate is a solid metal layer, the back electrode of the cell, to which an electrical lead is attached. On top of the silicon bulk is an exceedingly thin layer of the same material, to which a different chemical impurity has been deliberately added. These two regions of silicon compose what is called a p-n junction. It is as if the two silicon layers, one thick and one thin, are bread slices and the interface between them is the meat of the sandwich. Atop the thin, "front" layer of silicon is an array of tiny wires which are deposited on the surface and connected to an electrical lead which constitutes the other electrode. When sunlight shines directly through the thin silicon layer into the bulk, it releases electrons within the silicon. Some of these are able, in a sense, to escape, producing an electrical current through the wire electrodes.

This essentially simple device is in fact an ensemble of design tradeoffs. The thickness of the base silicon layer and that of the thin front layer must be decided. The size of the cell itself has to be determined. Its weight is important, as every one of perhaps 10,000 cells has to be lifted with the space vehicle, and an extraordinary premium is paid for excess weight. Precise control of the chemical impurities that define

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[1]Figure 1. Solar electric power panels generating about 1,000 watts for HEAO-A Observatory. All figures appear on the pages following the text of this article.

the two regions of silicon—the bread slices in the sandwich—is important. The arrangement of the front surface wires also matters. If there are too many, they will block sunlight from penetrating the silicon; if there are too few, they will not capture enough electrons from the front surface to be made available to the external circuit which is powered by the cell.

All of these chemical, mechanical, and electrical factors have been tested for years by a great many scientists and engineers in an effort to maximize the electrical power, the efficiency, the reliability, and the durability of silicon cells while minimizing their weight and size.

How much energy does a typical solar cell provide? Think for a minute of, not a solar cell, but a car battery. When little or no current is being drawn from the battery, it provides a fixed voltage of approximately 12 volts. This voltage, called the open-circuit voltage, is sustained as more and more current is withdrawn from the battery, until rather suddenly the voltage drops to zero at very high current, the so-called short-circuit current. A battery which provides a high voltage and a high current provides high power. As a matter of fact, power is merely the product of the two. Typically this product is perhaps a few hundred watts.

With a solar cell, the open-circuit voltage is about six-tenths of a volt instead of twelve volts. The short-circuit current available is directly proportional to the amount of sunlight incident on the cell (remember, it is sunlight that released the electrons), and at the level of light incident on the earth at midday is about 0.15 amperes. This product gives a maximum available power of a little under 0.1 watts in earth orbit and in direct sunlight. The efficiency, that is, the ratio of electrical energy produced by the solar cell to sunlight incident on it, is typically 15% or perhaps a little higher for the best silicon solar cells now manufactured.

Actual cells deliver electrical power somewhat below the product of the open-circuit voltage with the short-circuit current. The reasons for this reduced efficiency are complex and have been the topic of research for more than a decade. While it would be inappropriate to delve too deeply into this rather specialized subject, it is worthwhile to point out that some of the causes of reduced efficiency do not manifest themselves in routine testing of solar cells at the manufacturing plant or in the laboratory; rather they appear only under environmental conditions of the kind encountered in space. The chief problem is temperature. Cells which test virtually identically at the manufacturing facility vary enormously in their electrical conversion efficiency under the low temperatures that can be encountered in distant space. This unfortunate situation creates a real problem of cell selection. It is completely impractical to test every cell manufactured under the conditions that would be encountered in deep space orbit. Yet one cannot afford to have very many defective cells, once they are in place and hundreds of thousands of miles away from the earth. Research has gone into the understanding of efficiency-limiting flaws and the means to remove them from the manufacturing process.

A major concern is with the lifetime of solar cells. They are exposed to environmental radiation when in space, primarily from energetic electrons. Virtually nothing is known about the long-term effects of this irradiation on the performance of the cells. Laboratory simulations are difficult, because they need to be carried out over periods of five or more years in order to produce a realistic simulation.

Typical solar cells are perhaps eight-to ten-thousandths of an inch thick (not counting a protective cover layer) and about two-thirds of a square inch in area.

The chief problem associated with the manufacture of premium solar cells is simple breakage. As a matter of fact, breakage is the biggest single cost component of cell production. Typically, solar power installed in an array might cost from perhaps $500 to $1,000 per watt of available power in normal sunlight.

One cell does not make a power supply. To provide the kilowatt of power quoted earlier, for example, would take more than 10,000 cells. The mounting and arrangement of cells in arrays is in itself a challenging engineering problem. As always seems to be the case, a combination of, say, 10,000 cells does not produce 10,000 times the power of each cell; there are losses associated with electrical interconnections. In fact, if the tradeoffs involved in the design of a single cell are an ensemble, an array is an entire orchestra of tradeoffs.

Suppose, for example, one wished to design a 10,000-watt power pack for a large space vehicle. Would it be better to use 100,000 small solar cells or 25,000 larger cells? Larger cells would have fewer interconnecting wires, but the loss of a single one through a manufacturing flaw or breakage would be a more serious problem. Another question involves the heat. At 10,000 watts of electrical power, there are another 60,000 watts of heat that must be dissipated. About the only way to do so is by radiation, since the solar cell array is floating in near perfect vacuum; and radiation is not a particularly efficient means of heat transfer. Further, how can one handle the enormous fluctuations in electrical power as the cells go from sunlight to darkness and back? How, in the supporting structure, does one balance strength, on one hand, against undesirable weight, on the other? How should the cells be deployed? Some exotic means have been developed for the deployment of solar cell arrays after the satellite has been placed in orbit.

Accompanying this article are renditions of different arrangements for solar cell arrays. Some of these have been flown[2] and others are still experimental. They have in common the fact that they present a large unshadowed area facing the sun, and they are flat. Otherwise they are quite different in appearance. The photographs also show a closeup display of three representative cells viewed from the front, that is, from the surface facing the sun.[3] The geometrical gridwork is the arrangement of metal wires used to collect the current emanating from the front surface of the cell. The rear surface cannot be seen.

The most modern array is the one shown in the picture which contains the space shuttle.[4] This array has not actually flown as yet and will be tested within the next year or so. As depicted, it is designed to provide 12,500 watts. It, or something like it, could become a standard design. It is a rather novel arrangement. Though shown as a long, rectangular array, it actually unfolds like an accordian and can be stored relatively compactly. Expanded to full length, the array is 120 feet long by about 13 feet wide.

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[2]Figure 2. Solar panels for Skylab generating about 25,000 watts.

[3]Figure 3. Closeups of three representative solar cells viewed from the front. Fine pattern is the metal gridwork which comprises the front electrode. They are 2.3 x 2.3 inches in size and represent state-of-the-art in the mid 1970s.

[4]Figure 4. Solar array proposed for testing space shuttle in 1984. About 12,500 watts.

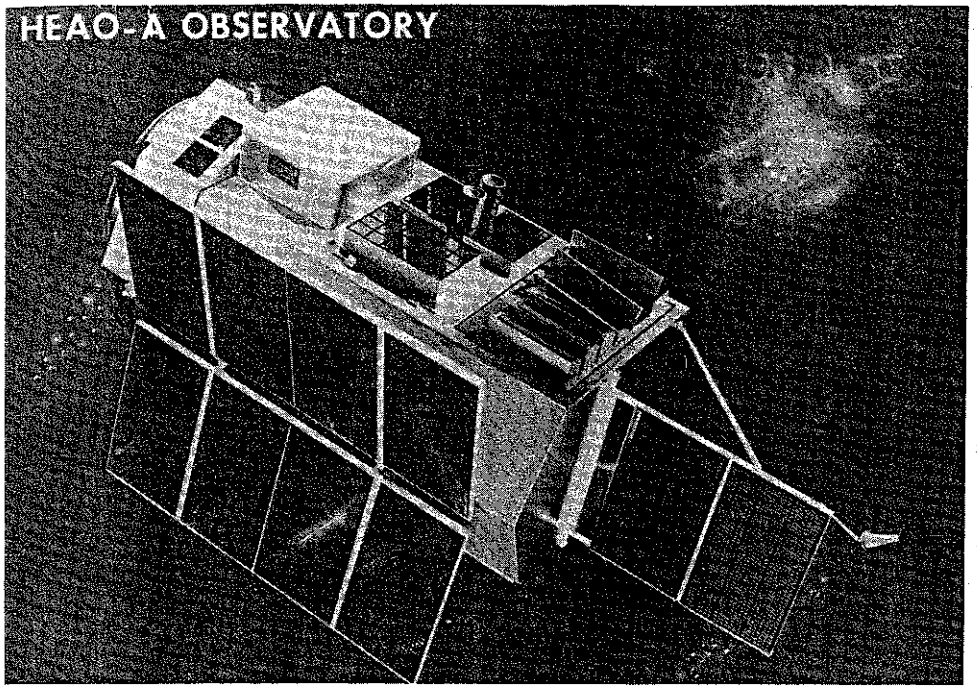
The backing material on which the solar cells are mounted is plastic, and the wires and other paraphernalia, of course, are all flexible. One interesting problem is that such a flimsy device could begin to vibrate or undulate in space. Another problem is to design a way in which it can be folded and unfolded without producing kinks or breaking wires.

Let us now turn to some of the issues associated with electrical power systems for space vehicles. The first has to do with our national posture. It became clear as early as perhaps 1981 that the United States was getting out of the solar cell research and development business. For example, at the major specialists conference which took place that year, one of the chief topics of conversation was the job market for solar engineers and scientists whose employment status was uncertain. Perhaps one-third of the 937 registrants of the conference were seeking employment. Shortly after the conference, one of the leading federal solar electrical research laboratories suffered a budget cut that allegedly was 67%.

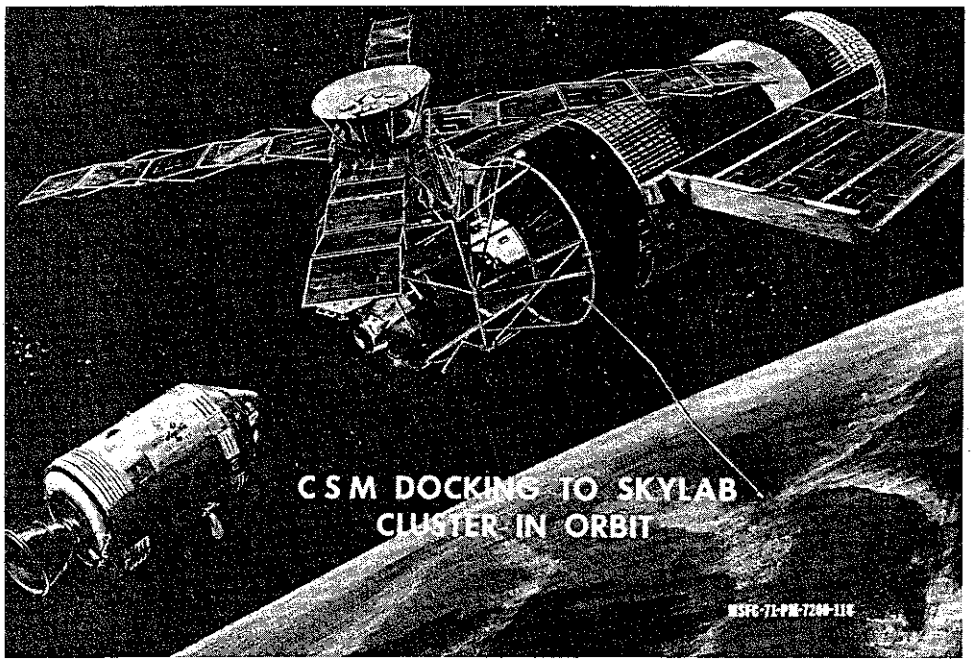
But if the United States is getting out of this technology, the rest of the world is getting in. Some 26% of the registrants at the same conference and 19% of the papers delivered were from Europe, Japan, or other nations outside the United States. Interestingly, there were no Russians. Not too many years ago the number of foreign registrants would have been zero since the solar cell is strictly an American invention.

Of course, the status of military research and development on solar electric power systems is not accessible to the civilian scientist. But an important point should be made in this connection. Imagine satellites in some future time that can see submarines underwater or can neutralize or incapacitate guided missiles in flight. Whichever side (if indeed there are sides) deploys such satellites first has essentially conquered the world. And there are satellites designed to incapacitate other satellites. One of the most vulnerable components of a satellite is its electrical power system. Thus, it would not be prudent to disregard the technical and scientific problems associated with manufacturing efficient, robust, hardened power systems for space vehicles. In fact, it is foolish for this nation to cut back on any technology related to space. Further, the civilian benefits of such research and development can outweigh the military advantages in the long run. This certainly will be true for space technology, which is our key to the future.

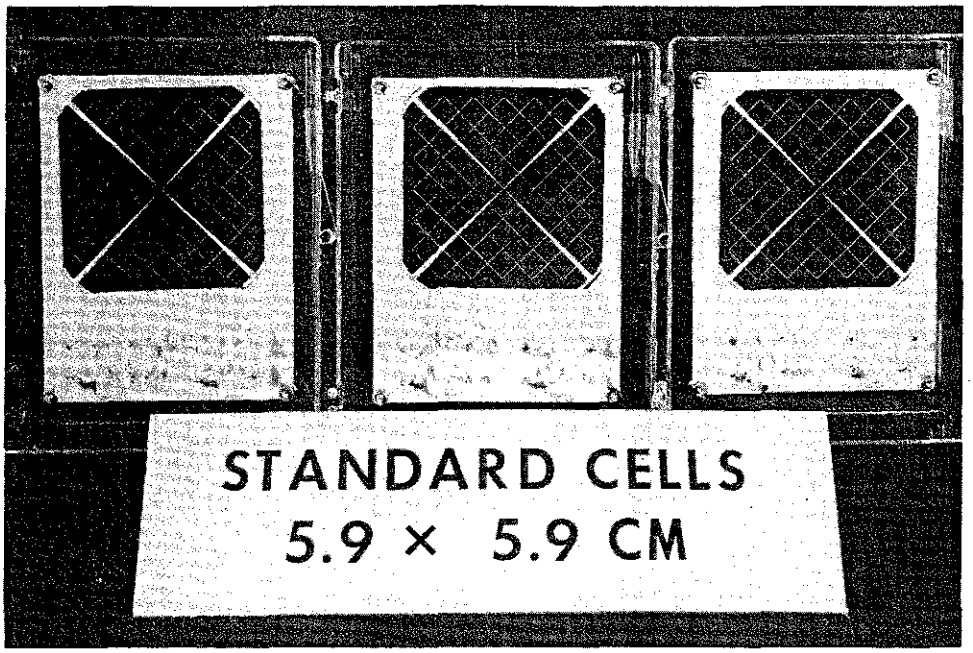
In closing, I would like to cite a quotation by Horace Walpole in the 18th century, who said, "The best sun we have is Newcastle coal." If that were still true, man would have never left the earth.



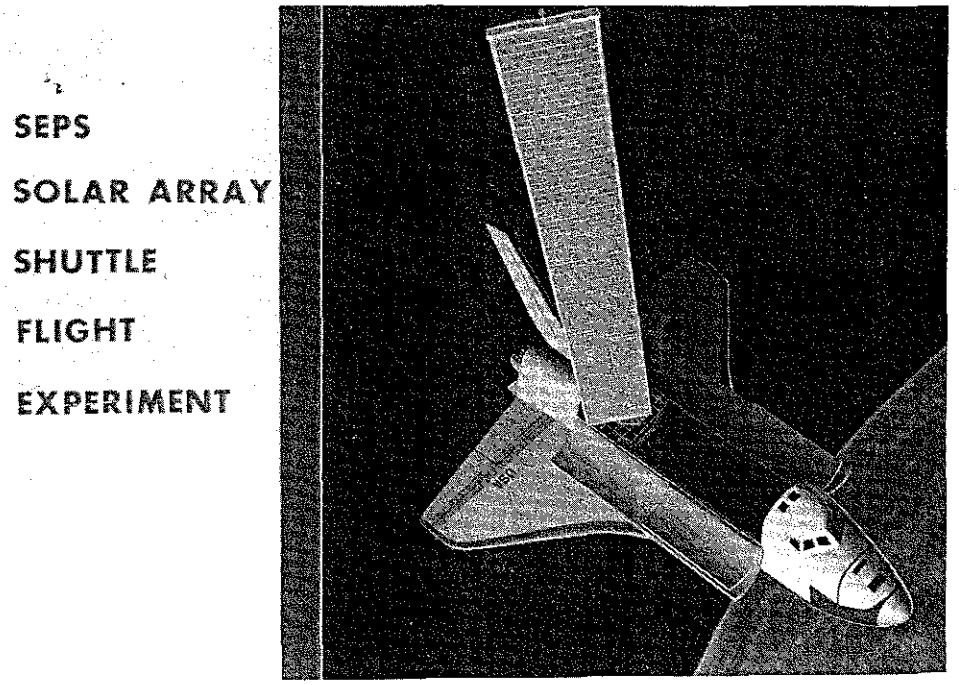
1. Figure 1. Solar electric power panels generating about 1,000 watts for HEAO-A Observatory.



2. Figure 2. Solar panels for Skylab generating about 25,000 watts.



3. Figure 3. Closeups of three representative solar cells viewed from the front. Fine pattern is the metal gridwork which comprises the front electrode. They are 2.3 x 2.3 inches in size and represent state-of-the-art in the mid 1970s.



4. Figure 4. Solar array proposed for testing space shuttle in 1984. About 12,500 watts.

THE LEGAL STATUS OF OUTER SPACE AND RELEVANT ISSUES: DELIMITATION OF OUTER SPACE AND DEFINITION OF PEACEFUL USE

*Bin Cheng**

1. Issues requiring wider discussion

Insofar as the legal status of outer space is concerned, there are two issues regarding which the present development of the law gives rise to grave anxiety. They are: (a) the delimitation of the boundary between airspace and outer space, and (b) the definition of the term "peaceful", particularly as used in Article IV (2) of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Celestial Bodies (hereinafter the 1967 Space Treaty),[1] and Article 3 (a) of the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereinafter the Moon Treaty).[2] The current development, if unchecked, can produce serious consequences in many fields of international law. It, therefore, deserves wide attention and discussion, which should not be confined merely to the specialists.[3]

2. The legal status of outer space

From the physical, geophysical or cosmophysical point of view, one hopes that it is not disputed that rising from the surface of the earth, one finds one is first in the earth's atmosphere (airspace) before gradually leaving it to reach outer space, wherein are to be found at various distances from the earth the (earth's) moon and other celestial bodies.

2.1 Territorial delimitation a basic premise of international law

When it comes to discussing the legal status of outer space, it is well to recall, in the first place, the following words of Judge Max Huber in the *Palmas Island Arbitration* (1928) between the Netherlands and the United States of America. Notwithstanding the anti-historical school's references to "ancestral worship" in regard to precedents, these words remain perfectly valid today:

> The development of the national organisation of States during the *last few centuries* and, as a corollary, the development of international law, have established this principle of the *exclusive competence of the State in regard to its own territory* [national territory] in such a way as to make it *the point of departure* in settling most questions that concern international relations . . . [T]erritorial sovereignty belongs always to one, or in exceptional circumstances to several States, to the exclusion of all others. The fact that

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[1] 18 U.S.T. 2410; T.I.A.S. 6347; 610 U.N.T.S. 205, U.K.T.S. No. 10 (1968) and Cmnd. 3519.

[2] U.N. Doc. A/34/664, 18 INT'L. LEGAL MATERIALS 1434 (1979).

[3] On the dangers of compartmentalized learning and knowledge, *see* Brownlie, *Problems of Specialisation*, in B. CHENG (ed.), INTERNATIONAL LAW: TEACHING AND PRACTICE 109 (1982).

> *the functions of a State can be performed by any State within a given zone* is, on the other hand, precisely the *characteristic feature* of the legal situation pertaining in those parts of the globe which, like *the high seas* or *lands without a master, cannot [res extra commercium] or do not yet [res nullius]* form *the territory of a State*.
>
> *Territorial sovereignty* is, in general, a situation recognised and [N.B.] *delimited in space*, either by so-called natural frontiers as recognised by international law or outward signs of delimitation that are undisputed, or else *by legal engagements* entered into between interested neighbours, such as frontier conventions, or by *acts of recognition* of States within fixed boundaries . . .
>
> . . . [Territorial sovereignty] serves to *divide between nations the space upon which human activities are employed*, in order to assure them at all points the minimum of protection of which international law is the guardian.[4]

It becomes clear that one of the initial premises of international law—evolved through many centuries by a large number of States and not to be swept aside by some newfangled doctrine emanating from a single country—is the territorial division "between nations [of] the space upon which human activities are employed." Traditionally three categories are established for this spatial division, (a) national territory, (b) *res extra commercium*, (c) *res nullius*, to which the 1979 Moon Treaty and the 1982 United Nations Convention on the Law of the Sea[5] have recently added a new one, namely, (d) common heritage of mankind *(res communis humanitatis)*.

From this initial premise of territorial division, certain basic principles of international law have been evolved in order to ensure that there be no gaps in the law—in order to provide what has been called the "logical plenitude of the law" *(logische Geschlossenheit des Rechtes)*. For they in turn furnish some fundamental presumptions onto which one can fall back for resolving any dispute in international law which does not appear to be regulated by any existing rule. In other words, they extend a safety net to catch all seemingly unregulated problems of international law, which occur now or in future. In fact, these principles, which provide the appropriate starting points for approaching issues of international law, are deceptively simple.

Thus within national territory, as the Permanent Court of International Justice pointed out in the case of *The Lotus* (1927) (again *pace* those who do not believe in judicial international law), the presumption is in favour of the State's freedom of action, in respect of anyone or anything located therein, including foreign nationals, and property belonging to foreign States and their nationals, unless the existence of an obligation under international law to act otherwise can be established.[6] In contrast, outside a State's territory, while a State may exercise jurisdiction over its nationals, and ships, aircraft and spacecraft of its nationality or registration when they are not within the territory of another State, the presumption is that it is not entitled to exercise jurisdiction over anyone or anything belonging to a foreign State or its nationals, unless a rule of international law authorises it to do so.

It is on the basis of such a spatial framework of division of State powers that over the centuries the other rules of international law are elaborated (*ratione materiae* or, if

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[4] 2 UNITED NATIONS REPORTS OF INTERNATIONAL ARBITRAL AWARDS, 829, 838-39 (italics added).

[5] U.N. Doc. A/CONF.62/122, and Corrig. 3 and 8; 21 INT'L. LEGAL MATERIALS 1261 (1982).

[6] Permanent Court of International Justice, Series A, No. 10 (1927).

one prefers, functionally) by States in the light of their own perceived interests, either to restrain a State's freedom of action within its own territory, such as the rules on State and diplomatic immunities and on innocent passage of foreign merchant ships through a State's territorial sea, or to extend a State's jurisdiction beyond its territory in respect of foreigners, foreign ships, or foreign aircraft, such as the rules on piracy and on the rights of belligerents in sea warfare, particularly vis-a-vis neutrals. In terms of the terminology which we are subsequently to encounter, functional regulation of the conduct of States comes after, *and not before,* a spatial division of the world into various legal categories; at least this has been so since the rise of the principle of territorial sovereignty several centuries ago.

2.2 Legal status of the space above the surface of the earth under pre-1967 general (alias *customary) international law*

Insofar as general[7] (*alias* customary) international law is concerned, especially that before the 1967 Space Treaty, the legal status of the three different categories of physical space above the surface of the earth[8] is as follows:

(a) *Airspace* essentially shares the legal status of the subjacent surface of the earth, with the following result. Airspace over national territory is under the complete and exclusive sovereignty of the subjacent State, a point of law confirmed by Article 1 of the 1919 Paris Convention on the International Regulation of Aerial Navigation[9], and Article 1 of the 1944 Chicago Convention on International Civil Aviation[10], whilst the airspace above the high seas is *res extra commercium* and that over territory which is not under the sovereignty of any international person is *res nullius.*

(b) *Outer space* is *res extra commercium.*

(c) The *moon* and other *celestial bodies* are *res nullius.* [11]

The legal status of outer space has been modified, as among the contracting States, by various treaties concluded under the auspices of the United Nations. They and their effects on general international law will be examined below.

2.3 Legal status of the space above the surface of the earth under multilateral treaties sponsored by the United Nations

As among the contracting States, Article II of the 1967 Space Treaty stipulates:

> "Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."

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[7] On this question of terminology, *see* B. CHENG, *supra* note 3.

[8] *See supra* section 2.

[9] 11 L.N.T.S. 173; U.N.T.S. No. 14 (1923), Cmd. 1916.

[10] 61 Stat. 1180; T.I.A.S. 1591; 51 U.N.T.S. 295; U.N.T.S. No. 8 (1953), Cmnd. 8742.

[11] *See* Cheng, *The Extra-terrestrial Application of International Law,* 18 CURRENT LEGAL PROBLEMS 132, 147-48 (1965).

It thereby confirms the status of outer space in the strict sense of the term, meaning the space in between all the celestial bodies, as *res extra commercium*. As among the contracting Parties to the Treaty, it also converts the status of celestial bodies (excluding always the earth) from that of *res nullius* to that of *res extra commercium*. Again, as among its contracting Parties, the 1979 Moon Treaty, once it comes into force, in its Article 11 further transforms the legal status of celestial bodies within the solar system other than the earth from *res extra commercium* to the common heritage of mankind, the exact meaning of which is that as defined by the provisions of the Treaty itself.[12]

As regards the effects of these treaties on general international law, reference is made to Article 34 of the 1969 Vienna Convention on the Law of Treaties[13] which merely confirms a well-established rule of general international law:

> A treaty does not create either obligations or rights for a third State without its consent.

This is not to deny the equally declaratory character of Article 38 of the same Convention:

> Nothing in articles 34 to 37 precludes a rule set forth in a treaty from becoming binding upon a third State as a customary rule of international law, recognised as such.

The crucial question to be answered in each case is whether or not a treaty provision has attracted an adequate *opinio generalis juris generalis* before one can say whether it has become a rule of general international law.[14]

In the present case, Article II of the 1967 Space Treaty has probably acquired such general acceptance already, but it is more than doubtful that the same can be said of Article 11 of the Moon Treaty, which has so far not yet even come into force, although this in itself is not fatal to the metamorphosis of a treaty provision into a rule of general international law.

As far as the legal status of airspace is concerned, none of the provisions in the multilateral treaties relating to outer space which have been sponsored by the United Nations purports to derogate from the rule of general international law of airspace sovereignty reaffirmed in Article 1 of the 1944 Chicago Convention.

3.1 Delimitation of airspace from outer space

If, as we have seen, airspace above the territory of a State is under its exclusive and complete sovereignty, which is not presumed to be restricted unless the existence of a rule of international law to that effect can be established, whilst, beyond it (we assume that it is not disputed that outer space lies beyond airspace), unless authorised by a rule of international law, a State is not entitled to extend its jurisdiction, particularly in respect of foreign territory, foreign ships, foreign aircraft or foreign spacecraft, or anyone

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[12] *See* Cheng, *The Moon Treaty*, 33 CURRENT LEGAL PROBLEMS 213 (1980).

[13] U.N. Doc. A/CONF. 39/27, 23 May, 1969; 8 INT'L LEGAL MATERIALS 679 (1969).

[14] *See* B. CHENG, *On the Nature and Sources of International Law*, *supra* note 3 at 201.

or anything therein or there on board, then the logical conclusion would appear unavoidable that the two regions require to be in law clearly separated; for the two legal regimes are fundamentally incompatible. In fact they are diametrically opposed to each other. If one is X, then the other is non-X. Hence the problem of the definition and delimitation of outer space, which has dogged all those concerned with the legal aspects of space flights before space flights even began.

In the United Nations, the question of determining where outer space begins was first raised in the General Assembly *Ad Hoc* Committee on the Peaceful Uses of Outer Space. The Committee, in its Report dated July 14, 1959, did not consider it to be "susceptible of priority treatment."[15] Since then, this topic has been, on and off, the subject of discussion in the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), which succeeded the *Ad Hoc* Committee, and its two Sub-Committees, namely, the Scientific and Technical Sub-Committee and the Legal Sub-Committee. It was formally put on the agenda of the Legal Sub-Committee in 1967. The General Assembly in recent years has repeatedly recommended that the Sub-Committee should continue to discuss the question, bearing in mind also problems relating to the geostationary orbit.

Much of the discussions in the United Nations has been chronicled by the United Nations Secretariat in the background paper which, at the request of the Legal Sub-Committee, it produced in 1970 on *The Question of Definition and/or the Delimitation of Outer Space,*[16] to which there *is an addendum dated January 21, 1977.*[17]

Those who take part in this discussion in or outside the United Nations have broadly been divided into (a) spatialists who believe in the need of some geographical or territorial delimitation of airspace from outer space, and (b) functionalists who spurn the need of such a separation and consider it adequate for international law to regulate space flights simply by reference to the nature of the activity or the nature of the vehicle, or a combination of both. Often subsumed under the banner of functionalists is a third category (c) consisting of "wait-and-seers". Included in the third category are some whom the public opinion poll statistics would label as "don't knows", as well as some government representatives who seem to be saying to other government representatives and the world at large, "Of course we all know where outer space is, but there is really no need for you to worry about it, because it is way beyond you."

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[15]U.N. Doc. A/4141. *See* Cheng, *The United Nations and Outer Space,* 14 CURRENT LEGAL PROBLEMS 247, 260-62 (1961).

[16]U.N. Doc. A/AC.105/2/7.

[17]U.N. Doc. A/AC.105/C.2/2/7/Add. 1. For subsequent discussions in the Legal Sub-Committee, see *Report of the Legal Sub-Committee on its 17th Session* (13 March - 7 April 1978), A/AC.105/218, Part IV (paras. 35-45); A/AC.105/C.2/SR.296-298; *Report of the Legal Sub-Committee on its 18th Session* (12 March - 6 April 1979), A/AC.105/240, Part IV (paras. 39-47); A/AC.105/C.2/SR.314-318; *Report of the Legal Sub-Committee on its 19th Session* (19 March - 3 April 1980), A/AC.105/271, Part III (paras. 29-42); A/AC.105/C.2/SR.332-334; *Report of the Legal Sub-Committee on its 20th Session* (16 March - 10 April 1981), A/AC.105/288, Part IV (paras. 48-67); A/AC.105/C.2/SR.353-357; *Report of the Legal Sub-Committee on its 21st Session* (1-19 February 1982), A/AC.105/305, Part III (paras. 30-44); A/AC.105/C.2/SR.372-378.

The functionalist view was much in vogue at one time. However, over the years, a number of States have switched over to either a spatial approach or wait-and-seeism. A clear example of the former group is Belgium which, previously functionalist, in 1976 changed its mind and suggested a 100 kilometre line in a paper presented to the Scientific and Technical Sub-Committee.[18] While at the time the Soviet Union made light of the Belgian proposal on the ground that it was avowedly arbitrary, the Soviet Union itself put forward the following working paper in 1979[19]:

1. The region above 100 (110) kilometres altitude from the sea level of the earth is outer space.
2. The boundary between airspace and outer space shall be subject to agreement among States and shall subsequently be established by a treaty at an altitude not exceeding 100 (110) kilometres above sea level.
3. Space objects or States shall retain the right to fly over the territory of other States at altitudes lower than 100 (110) kilometres above sea level for the purpose of reaching orbit or returning to earth in the territory of the launching State.

Although champions of pure functionalism continue to be found in the Legal Sub-Committee,[20] the attitude of the United States of America, followed closely by the United Kingdom and the Federal Republic of Germany, has also shifted—however, in their case, more pronouncedly towards wait-and-seeism. The principal reasons advanced by the United States for not wishing to assign a high priority to any concrete discussion of the question of delimitation are:

(a) The inability of most countries to monitor such an altitude frontier;
(b) The lack of adequate examination of the relevant scientific, legal, and political factors;
(c) The possible inhibiting and even stifling effect of such a boundary on future efforts to explore and use outer space.[21]

Between the various approaches, no agreement appears to be in sight at the moment.

3.2 Possible long-term implications of present stagnation

It is not intended here to rehearse all the legal arguments for and against the different approaches to the subject.[22] By now, it is obvious that the operative reasons for the present dilatoriness in the United Nations discussion on the delimitation of outer

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[18]U.N. Doc. A/AC.105/C.1/L.76.

[19] *Approach to the Solutions of the Problems of the Delimitation of Airspace*, U.N. Doc. A/AC.105/C.2/L.121 (reissued version of March 28, 1979).

[20]For example, Japan, A/AC.105/C.2/SR.314, 2 Apr., 1979 at 3. *See also, Report of the Legal Sub-Committee on Its 21st Session*, A/AC.105/305, para. 39, *in fine* (1982).

[21] *See e.g.*, U.N. Doc. A/AC.105/C.2/SR.316, 4 Apr., 1979 at 2.

[22]For a fuller discussion, see Cheng, *The Legal Regime of Airspace and Outer Space: the Boundary Problem. Functionalism versus Spatialism; The Major Premises*, 5 ANNALS OF AIR AND SPACE LAW 323 (1980). *See also*, debate between Bin Cheng, E. Pepin (for) and Mircea Mateesco-Matte, Michel Bourely, S. Neil Hosenball (against) on *Delimitation of Air Space and Outer Space; Is It Necessary?* in McGill Centre for Research of Air and Space Law, EARTH-ORIENTED SPACE ACTIVITIES AND THEIR LEGAL IMPLICATIONS 229 (1983).

space are not of a legal nature. It is not believed that government legal officers arguing for the lack of a *legal* need for delimitation can really do so with conviction, just as it would be unthinkable that any competent lawyer would advise his client that there is no need to have his land and that of his neighbours delimited.

The real reason for countries to keep on saying that the time for establishing a line separating outer space and territorial airspace "is not yet ripe" must doubtless be, as, for instance, Professor Almond has suggested, because "the determination of the appropriate line raises policy problems that have not yet been resolved amongst States,"[23] and, one may perhaps add, probably not even amongst the different agencies within the same State, particularly amongst the service agencies. One can well imagine the differences in opinion between those concerned with military aviation and those concerned with military activities in outer space. The one would argue for the highest frontier possible, while the other for the lowest possible. But if one were to wait for all the armed services to agree, one could easily wait till the Greek Calends.

All that I wish to do here is simply to point out some of the possible long-term consequences which may flow from the present deliberate or enforced inaction, apart from the obvious one of a possibly disastrous case of conflict of State jurisdiction for lack of a clear-cut delimitation. From the outset, let it be said that the present position appears to favour the space Powers. Already taking advantage of the fact that during the initial period of space flights, which may not yet have come to an end, States generally are well disposed towards such flights, space Powers have more or less succeeded in bringing into existence a rule of general international law that all orbits of artificial earth satellites are considered to lie in outer space with the result that, whatever may be or might have been the precise upper limit of national airspace, it is now deemed not to exceed, in any event, the lowest perigee height of any satellite which has so far been launched into orbit.[24] This explains the various proposals which seek to have an explicit international agreement that outer space begins at least from a height of 100 or 110 kilometres above sea level,[25] which is at present approximately the height in question. Thus space Powers have more or less established the freedom of outer space under general international law above such a height, but, by declining to confirm such a line, they leave the options open for themselves, if they so wish, at some later stage, to claim either a higher or a lower limit according to the wishes, presumably, of the military.

Not only can the space Powers thus afford to sit on their hands in this matter, but they may indeed also hope, while the present on the whole favourable attitude of States towards space flights lasts, to make further gains by not committing themselves at this stage. From this point of view, whilst the approaches of the Soviet Union and of the United States in this matter may appear at the moment to be totally opposed, the interest they are pursuing, *qua* the two major space Powers, is identical.

Thus, on the one hand, the United States speaks of the possible inhibiting and even stifling effect of fixing a boundary now between airspace and outer space on future

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[23] H.H. Almond, Jr., *Legal Definition of Outer Space*, PROCEEDINGS OF THE 21st COLLOQUIUM ON THE LAW OF OUTER SPACE 84 (1979).

[24] *See* Cheng, *Outer Space: The International Legal Framework*, 10 THESAURUS ACROASIUM 41, 66-72 (1979).

[25] *See supra* notes 18 and 19.

efforts to explore and use outer space,[26] while, on the other hand, the Soviet Union in its 1979 proposal, suggested that "*[s]*pace objects of States shall retain the right to fly over the territory of other States at altitudes lower than 100 (110) kilometres above sea level for the purpose of reaching orbit or returning to earth in the territory of the launching State."[27] What is noteworthy is the Soviet use of the expression "retain the right" of space objects to pass through the airspace of other States on reaching their orbit or on their return to earth.[28] The point is that there is no evidence to suggest that under general international law the space object of any State has a right to "fly over the territory of other States", *i.e.*, through their airspace, "for the purpose of reaching orbit or returning to earth". But obviously, this is what the space Powers dearly hope can be achieved, the establishment of a right not merely of "innocent passage" for civilian space objects through the airspace of other States, but one similar to what the 1982 United Nations Montego Bay Convention on the Law of the Sea calls "transit passage" for both civil and military space objects, including ballistic missiles. The Soviet Union wishes to do so by means of a multilateral treaty, pretending that what is asked of other States is a simple confirmation of an already existing limitation of their airspace sovereignty, whilst the wait-and-see school led by the United States is hoping to bring this about imperceptibly by gradual practice—if possible, without the subjacent States being even aware of what is happening.

Those who pretend that such a right already exists will no doubt wish to pray in aid provisions such as Article 1 of the 1967 Space Treaty which provides *inter alia* that "*[o]*uter space, including the moon and other celestial bodies, shall be free for exploration and use by all States. . . ." This is where the wait-and-seers begin to join hands with the functionalists; for there is a tendency for them both to argue that existing United Nations sponsored multilateral agreements on outer space are all based on the functionalist approach, by regulating activities and not areas. According to the functionalists, if an activity is lawful, then it may be conducted anywhere, and if an activity is declared unlawful, then it may be carried out nowhere. Again, one should be aware of the logical consequences of the functionalists' argument.

In the first place, even if an activity is lawful, this by no means implies that it may be conducted no matter where. Thus the German-Venezuelan Mixed Claims Commission (1903) clearly ruled that, while under international law, the high seas are free to all nations, this does not mean that the upper riparian State on a river which flows into the high seas thereby enjoys a right of passage through the territory of another State situated downstream.[29] Secondly, one should by now also have realised what are the true effects of the functionalist approach on airspace sovereignty. What the

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[26] *See supra* note 21.

[27] *See supra* note 19.

[28] For present purposes, we may leave aside the phrase "in the territory of the launching State", which would obviously not suit those space Powers which, like the United States, arrange often for their space vehicles to be picked up from the high seas on their return to earth. Soviet space vehicles normally land within Soviet territory.

[29] *Faber* case, VEN. ARB. 600, 629-30 (1903). *See also*, B. CHENG, GENERAL PRINCIPLES OF LAW AS APPLIED BY INTERNATIONAL COURTS AND TRIBUNALS 69 (1953).

functionalists are really saying is that, insofar as space flights are concerned, the concept of airspace sovereignty is irrelevant. In other words, whatever may be the effects of the principle of airspace sovereignty on other matters, such as aerial navigation, it is simply not applicable to space flights. What they are saying is that, if a space activity is authorised by international law, then the flight may thereby take place within the airspace of another State. This ignores the fact that when people reckon a particular space activity to be compatible with international law, say military reconnaissance, what they have in mind is such activity when conducted *in outer space,* but never for a moment thereby a right for military reconnaissance satellites to pass through the national airspace of other States. The effect of the functionalist doctrine, which is relied upon by the wait-and-seers allegedly only as a temporary expedient, is, therefore, the abolition of the rule of airspace sovereignty in favour of space activities and space vehicles recognised as lawful by international law. Therefore, the functionlists are not really non-believers in the spatial approach. All that they are saying is that, insofar as a State's space activities are concerned, other States' airspace sovereignty begins and ends at sea level; in other words, it no longer exists.

International law is not made by the will of international lawyers. It is made by the will of States. If States wish to create a right of transit passage for space flights through the airspace of other States, or if they wish to abolish airspace sovereignty of States altogether in favour of foreign space flights, they are perfectly entitled to attempt to do so.

There are, however, two things which may be said in this connexion. First, if States wish to do any of these things, it behoves them, especially those which consider themselves leader nations, to do so openly, and not through some legal sleight-of-hand, which in the long run can only undermine respect for international law. While some such tactics may not be uncommon sometimes in municipal law, the arrogance, insensitivity and deviousness which they imply when resorted to in the international arena can in fact be very harmful to a State's international image and relations.

Secondly, in the light of what is happening, it becomes all the more necessary for all States and scholars to examine much more closely than hitherto what is meant by permissible and not permissible space activities. Does permissibility mean solely permissibility in outer space, or does it imply also a right of transit passage for such activities through what other States would normally consider to be their national airspace? This merely shows the inevitability of the delimitation issue, however hard the functionalists and the wait-and-seeists may wish to dodge it. If permissibility means strictly the former, then delimitation becomes a prerequisite and, therefore, a priority issue. But if it is to be given the latter meaning, as the space Powers, whether major or minor, whether spatialist, functionalist or wait-and-seeist, seem now to imply, then this appears to be high time for the other States to take a closer interest in the precise nature of these activities before a right of way is created through their national airpsace in favour of these activities. If the development of air law is any guide,[30] before States would agree to foreign spacecraft—or earth to earth rockets—flying through their national airspace, they would no doubt wish to know whether they are friendly or hostile, nuclear or non-nuclear, peaceful or military, public or private, commercial or

[30] *Cf.* Cheng, *From Air Law to Space Law,* 13 CURRENT LEGAL PROBLEMS 228 (1960).

non-commercial, on a scheduled service or not, as well as most probably a host of other things. At least one of these issues is what we shall examine next, the spurious use of the term "peaceful".

4. The "peaceful use" of outer space, including the moon and other celestial bodies

4.1 The vogue of "peaceful use"

Insofar as pre-1967 Space Treaty general international law was concerned, there was certainly no specific rule relating to the military use of outer space, the moon and other celestial bodies other than those which were applicable to any other areas of *res extra commercium* or *res nullius*. This meant that their military use was in principle permitted, subject only to the observance of the ordinary rules of international law and, as among members of the United Nations, those to be found in the Charter of the United Nations, such as its Article 2(4).[31]

However, especially in the heady atmosphere of the initial period of man's first entry into space, there was a very strong and highly emotional, albeit not very realistic, sentiment among many people, and even governments, that outer space and celestial bodies should be used only for genuinely peaceful purposes and the common benefit of mankind. Proposals to this effect were made respectively by the United States in 1957 and the Soviet Union in 1958.[32] Such proposals in the early days of the space age are reminiscent of similar ones a decade before in the field of nuclear energy, including the 1946 United States Atoms for Peace Plan.[33] From this point of view, the very name given by the United Nations to its organs dealing with space matters is indicative of this pious hope. Thus in 1958 it set up the *Ad Hoc* Committee on the *Peaceful* Uses of Outer Space, and the following year the Committee on the *Peaceful* Uses of Outer Space (COPUOS), the latter reamining the main United Nations organ concerned with outer space. Moreover, various resolutions passed by the General Assembly on outer space during this period, such as Resolution 1348 (XIII) of December 13, 1959, Resolution 1472 (XIV) of December 12, 1959, Resolution 1721 (XVI) of December 20, 1961, Resolution 1802 (XVII) of December 19, 1962, all referred to the "peaceful uses of outer space".

It was in the midst of all this that the United States in 1958 adopted the National Aeronautics and Space Act[34] which, *inter alia*, set up the National Aeronautics and Space Administration (NASA). In Section 101, sub-section (a), it is provided:

"The Congress declares that it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of mankind."

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[31] "All Members shall refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any State, or in any other manner inconsistent with the Purposes of the United Nations" (T.S. 993; 59 Stat. 1031; U.K.T.S. No. 67 (1946), Cmd. 7015).

[32] *See* Cheng, *supra* note 15 at 259, nn. 54, 55.

[33] *See* Cheng, *International Cooperation and Control: From Atoms to Space*, 15 CURRENT LEGAL PROBLEMS 226 (1962).

[34] P.L. 85-568; 72 Stat. 426.

In this connexion, two further factors may be mentioned. First, the 1958 National Aeronautics and Space Act was passed in the very infancy of space flights. Secondly, the late 'fifties also marked the beginning of the Soviet Union's campaign under Premier Khrushchev of "peaceful co-existence", both as a result of, and in response to, which everything one did then was given the vogue label of "peace". The fervour and fever were such that it was reported that the Soviet Ambassador to the United Kingdom had ordered 100 rose bushes of the variety "Peace" to be planted in the ambassadorial country residence. However, inevitably, much of this movement was sheer window-dressing. Thus often, without necessarily altering what one was doing, one found oneself no longer engaged in war studies, but first in defense, and then better still in peace studies. The old adage, *Si vis pacem, para bellum* (If you desire peace, prepare for war) was given a new twist.

4.2 The United States interpretation of "peaceful use"

However, the military potential of space technology soon became more and more apparent. It would seem that it was against this background that the peculiar United States interpretation of the word "peaceful" was born. The official United States position, backed more often than not by United States writers, as well as some foreign ones, has from almost the very beginning of the space era till even now, been that "peaceful" means "non-aggressive" and not "non-military".

Thus, in a statement made before the First Committee of the United Nations on December 3, 1962, Senator Gore, representing the United States, said:

> It is the view of the United States that outer space should be used only for peaceful—that is, non-aggressive and beneficial—purposes. The question of military activities in space cannot be divorced from the question of military activities on earth. To banish these activities in both environments we must continue our efforts for general and complete disarmament with adequate safeguards. Until this is achieved, the test of any space activities must not be whether it is military or non-military, but whether or not it is consistent with the United Nations Charter and other obligations of law.[35]

What Senator Gore said was perfectly understandable, even if his use of words was not necessary defensible. The United States was not prepared without further ado to accept legal restraints on the use of outer space for "military" purposes, but it would of course abide by its obligations under the United Nations Charter and other obligations of law in not using outer space for "aggressive" purposes. Insofar as the substance of what Senator Gore said is concerned, it can hardly be faulted; for, as we have seen, there was nothing in general international law or even the Charter of the United Nations which obliged States not to use outer space for military purposes. In fact, that remains the position even today.

However, by seeking not to ride against the tide of popular opinion on the "peaceful use" of outer space, and bearing in mind possibly Section 101, sub-section (a), of the 1958 National Aeronautics and Space Act, the United States was putting its foot on the slippery slope of distorting the meaning of "peaceful" by interpreting it as "non-aggressive" and not "non-military".

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[35]U.N. Doc. A/C.1/PV.1289 at 13, 3 Dec., 1962. Regarding the Soviet attitude, *see infra* note 40.

Those who defend the United States' use of the word "peaceful" often point to the impossibility of separating "military" from "non-military" activities, seemingly under the impression that there exists some clear-cut and universally recognised and immediately recognisable distinction between "aggressive" and "non-aggressive" space activities. One wonders in this context whether partisans of this view have a ready definition of what paragraph 9 of the Preamble of the 1967 Space Treaty would designate as "propaganda designed or likely to provoke or encourage any threat to the peace, breach of the peace, or act of aggression".

But it is clear from what Senator Gore said that he had no difficulty in distinguishing between military and non-military activities. In fact, while the United States National Aeronautics and Space Act of 1958 says that it is the "policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind", it does not specify that they should be *exclusively* for peaceful purposes. Moreover, the policy in question is not confined to United States activities in space, but activities in space in general. In other words, Section 101 (a) does no more than state a general objective to be pursued by the United States internationally as well as domestically. It is by no means a legal limitation on the type of activity the United States is entitled to engage in outer space.

Besides, the 1958 Act clearly distinguishes between space activities which come under the "civilian agency" NASA and "activities peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the United States (including the research and development necessary to make effective provision for the defense of the United States)" which "shall be the responsibility of . . . the Department of Defense". So the distinction is not between "peaceful" and "military", but between "civilian" or "civil"[36] on the one hand and "military" and "defense" on the other hand. But this is pure semantics; for, in substance, it is the same distinction. This is not to say that there are no problems in demarcating clearly between "military" and "non-military". But, contrary to the contention of those who defend the United States' use of the word "peaceful", in saying that, in practice, it is not possible to separate the military from the non-military, such a distinction, described as one between "defense" (*i.e.*, military) and "civilian" (*i.e.*, non-military) lies at the very foundation of the United States National Aeronautics and Space Act itself.

4.3 Article IV of the 1967 Space Treaty

Reference has previously been made to the use of the expression "peaceful uses" of outer space in various resolutions of the United Nations General Assembly in the early sixties,[37] and to the attitude of the super-Powers to the complete demilitarisation of outer space in isolation from the question of disarmament in general.[38] From this point of view, the exact title of General Assembly Resolution 1962 (XVIII) of December 13,

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[36] *Cf.* also, *Description of a Presidential Directive on National Space Policy,* The White House, June 20, 1978 SPACE LAW. SELECTED BASIC DOCUMENTS. 2d ed., Senate Comm. on Commerce, Science and Transportation, 95th Cong., 2d Sess. 559 (Comm. Print 1978).

[37] *See infra* note 41.

[38] *See supra* note 35.

1963, which is the precursor of the subsequent 1967 Treaty, and that of the 1967 Treaty itself are interesting. The former is the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, the latter Treaties of Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. In neither case, is the word "peaceful" included in the title, although in paragraph 4 of both, the desire "to contribute to broad international cooperation in the scientific as well as in the legal aspects of exploration and use of outer space for peaceful purposes" is expressed. But this is really not all that different from sub-section (a) of Section 101 of the United States National Aeronautics and Space Act of 1958.

Nowhere, however, in the 1967 Space Treaty, is outer space in the narrow sense *(sensu stricto)* of the term, *i.e.*, the void in between all the celestial bodies, confined to "peaceful uses" only.

The relevant provision is Article IV which provides:

> States Parties to the Treaty undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.
>
> The moon and other celestial bodies *[N.B.:* no reference to outer space*]* shall be used by all States Parties to the Treaty exclusively for peaceful purposes. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies 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 of the moon and other celestial bodies shall also not be prohibited.[39]

From the standpoint of international law and according to its rules on treaty interpretation, the structure and interpretation of Article IV are fairly clear. The article is divided into two parts.

4.3.1 Partial delimitarisation of earth orbits and of outer space in the wide sense of the term.

Geographically, paragraph 1 of Article IV, notwithstanding the omission of any specific reference to the moon, is applicable to first, without prejudice to whether or not they are in outer space, earth orbits, and secondly, using the expression favoured in the 1967 Space Treaty, "outer space, including the moon and other celestial bodies", as a whole, *i.e.*, outer space in the wide sense of the term *(sensu lato)*.

Materially, or, to use the "in" word, functionally, it prohibits the installation or stationing of "any objects carrying nuclear weapons or any other kinds of weapons of mass destruction" in any of those places mentioned above or "in any other manner". But, subject to what is provided for in paragraph 2 of the same article, *nothing in Article IV (1) itself* prohibits the stationing of any other type of weapons in outer space, including the moon and other celestial bodies, or in fact the use of outer space, including the moon and celestial bodies, for military purposes in any other way. Insofar

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[39] *See* Cheng, *The 1967 Space Treaty*, 95 J. DU DROIT INT'L. 532, 598-616 (1968).

as Article IV (1) is concerned, apart from the stationing of nuclear weapons and weapons of mass destruction, outer space as a whole has not been demilitarised at all. Such demilitarisation as it stipulates, in the form of the prohibition of the stationing of nuclear weapons and weapons of mass destruction, is strictly partial. Attempts made during the drafting of the 1967 Space Treaty by some delegations to bring about a complete demilitarisation of outer space were clearly rejected by both super-Powers.[40] In other words, under both general international law and Article IV (1) of the 1967 Space Treaty, States are perfectly entitled to use the whole of outer space for military purposes, bar the stationing of nuclear weapons and weapons of mass destruction.

4.3.2. Complete demilitarisation of the moon and other celestial bodies

Paragraph 2 of Article IV, on the other hand, is quite different, different in both its geographical and its material scope. Geographically, it applies only to "the moon and other celestial bodies". Specifically and pointedly, it does not refer to outer space as such, *i.e.*, the empty space in between the celestial bodies. Materially, it delimitarises all celestial bodies other than the earth.

Article IV of the 1967 Space Treaty owes much to President Eisenhower's proposal presented to the United Nations in 1960.[41] In making his proposal, he recalled specifically the Antarctica Treaty of the previous year,[42] even though neither super-Power wished to apply the Antarctica model to the whole of outer space.[43]

Article I of the Antarctica Treaty is very similar to Article IV (2) of the 1967 Space Treaty and is, therefore, very helpful in clarifying the latter's meaning. It states:

> 1. Antarctica shall be used for peaceful purposes only. There shall be prohibited, *inter alia*, any measures of a military nature, such as the establishment of military bases and fortifications, the carrying out of military maneouvres, as well as the testing of any type of weapons.
>
> 2. The present Treaty shall not prevent the use of military personnel or equipment for scientific research or for any other peaceful purpose.

Three points emerge clearly from Article I of the Antarctica Treaty, which *mutatis mutandis* appear fully applicable also to Article IV (2) of the 1967 Space Treaty:

> (a) "Peaceful" means non-military.
>
> (b) References to military installations, military manoeuvres and so forth in the provision are exemplicative and not exhaustive.
>
> (c) The possibility of using military personnel and equipment for scientific research or other peaceful purposes in no way invalidates point (a) above.

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[40] *Cf.* U.N. Doc. A/AC.105/C.2/SR.65 (22 July 1966), 9-10 (U.S.A.); *Ibid.* /SR.66 (25 July 1966), 6-7 (U.S.S.R.).

[41] Official Records of the General Assembly, GA(XV) A/PV.868, 22 Sept., 1960, 45, 48. *See also*, Cheng, *supra* note 15 at 277, n. 43.

[42] 12 U.S.T. 794; 1 T.I.A.S. 4780; 402 U.N.T.S. 71; U.K.T.S. No. 97 (1961), Cmnd. 1535.

[43] *See supra* note 40.

Regarding the last point, there has been a great deal of misunderstanding, resulting in frequent allegations that the last sentence of Article IV (2) of the Space Treaty merely highlights the hollowness of the whole paragraph. But this is not so. In this connexion, the following quotation from the decision of Edwin B. Parker, umpire in the United States-German Mixed Claims Commission (1922), in *Opinion Construing the Phrase "Naval and Military Works or Materials" as Applied to Hull Losses and Also Dealing with Requisitioned Dutch Ships* (1924) is highly pertinent. It shows clearly that the test of whether an activity or an equipment is of a military character is essentially a functional one and not one of nominal status:

> The taxicabs privately owned and operated for profit in Paris during September, 1914, were in no sense military materials; but when these same taxicabs were requisitioned by the Military Governor of Paris and used to transport French reserves to meet and repel the oncoming German army, they became military materials, and so remained until redelivered to their owners. The automobile belonging to the United States assigned to its President and constitutional commander-in-chief of its Army for use in Washington is in no sense military materials. But had the same automobile been transported to the battlefront in France or Belgium and used by the same President, it would have become a part of the military equipment of the Army and as such impressed with a military character.[44]

Thus if the same automobile is subsequently to be sent either to Antarctica or to the moon to carry out scientific research, the same equipment, although it may still belong to the Army, would not be "impressed with a military character", and its use would be perfectly lawful under both treaties, provided there is no abuse which, of course, is a different matter, inasmuch as it would no longer be a matter of treaty interpretation, but one of treaty violation.

4.4. United States interpretation of the term "peaceful" in relation to Article IV needless, wrong and potentially noxious

4.4.1 United States interpretation needless

In the light of what has been said in regard to the proper interpretation of Article IV of the 1967 Space Treaty, it is quite unnecessary for the United States to interpret, or rather to misinterpret, the term "peaceful" in Article IV (2) of the Space Treaty as meaning "non-aggressive" and not "non-military" in order to enable itself to use outer space in the narrow sense of the term for military purposes, as do in fact both super-Powers and a few other States by means of observational, communications, meteorological, geodetic and other types of satellites, space vehicles or space stations. All States Parties to the 1967 Space Treaty remain entitled to do so both under the Treaty and under general international law, unless of course they become so tangled up by their functional definition of outer space that they do not know where outer space is.

It has sometimes been suggested that since the United States has for many years used the term "peaceful" in relation to outer space to mean "non-aggressive" and not "non-military", and has encountered no opposition or protest, this usage must be

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[44] DECISIONS AND OPINIONS 75, 97.

deemed to have been accepted by other States. But this reasoning is invalid, inasmuch as there is no call for other States to protest for as long as the United States has violated no rule of international law or any of its treaty obligations. That some States wish to give their legitimate activities some fancy description such as "beneficial", "the greatest", or "peaceful", is something which is quite immaterial to others, who are entitled simply to dismiss such action as eccentric or propagandist. Neither the law nor their legal position can thereby be changed.

The present United States interpretation of the word "peaceful" in relation to Article IV of the Space Treaty is quite needless for as long as, of course, the United States does not seek to apply it to Article IV (2). The United States position is all the more incomprehensible inasmuch as there is no evidence to suggest that the United States intends to conduct military activities on the moon and other celestial bodies.

4.4.2 United States interpretation wrong

The present United States interpretation of the word "peaceful" to mean merely "non-aggressive" would simply be wrong if applied to Article IV (2) of the Space Treaty, which is where the word appears in Article IV. The same would be true if applied to Article 3 of the 1979 Moon Treaty which likewise provides that all celestial bodies within the solar system other than the earth "shall be used by all States Parties exclusively for peaceful purposes."[45]

Among various reasons, the simplest is that any such interpretation would render the first sentence of Article IV (2) of the Space Treaty completely meaningless and redundant, and cannot, therefore, be valid. The elementary explanation is that "aggressive" acts are contrary to international law and the Charter of the United Nations, particularly Article 2(4) of the Charter,[46] not only on the moon and on other celestial bodies, but also anywhere in the universe. Insofar as Parties to the 1967 Space Treaty are concerned, they specifically undertake in Article III of the Treaty that:

"States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and celestial bodies, in accordance with international law, including the Charter of the United Nations. . . ."

Aggressive acts would, therefore, be prohibited in outer space as a whole and it would consequently be absolutely superfluous in Article IV (2) specifically to provide that "the moon and other celestial bodies shall be used. . .exclusively for 'non-aggressive' purposes". Is anyone seriously suggesting that because Article IV (2) does not mention outer space, *i.e.*, outer space in the narrow sense of the term, States Parties to the 1967 Space Treaty may, therefore, freely engage in "aggressive" acts in outer space *stricto sensu?* The conclusion is inescapable that, if the word "peaceful" in Article IV (2) is to have any meaning at all, it must bear its plain meaning of "non-military" and can certainly not mean "non-aggressive".

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[45] *See supra* note 12.

[46] *See supra* note 31.

4.4.3 United States interpretation potentially noxious

For as long as the United States restricts its idiosyncratic interpretation of the word "peaceful" to some non-existent limitation on the military use of outer space *stricto sensu*, perhaps no more harm is done than the emperor preening himself in his non-existent clothes. But rather whimsical interpretation carries with it seeds of serious consequences.

The United States is a party to the Antarctica Treaty. It is also a party to many multilateral and bilateral agreements for international cooperation in nuclear matters, under which nuclear materials, equipment and facilities which have been transferred from one contracting party to another contracting party may be used by the latter only for "peaceful purposes".[47] Is the United States prepared to allow the word "peaceful" in these treaties to be interpreted by the other parties as meaning also "non-aggressive" and not "non-military"? Is that the reply that the United States is getting from some of the States which have already misused the nuclear assistance they have received in order to make bombs, non-aggressive bombs no doubt? If not, it should not take them long to learn what is the interpretation of the word "peaceful" favoured by the United States, unless the United States itself takes immediate steps to revise its attitude in the matter.

5. Conclusion

The United States occupying as it does a preeminent position in the world, its *opinio juris* must obviously carry great weight in the formation of rules of general international law. However, in regard to both the question of delimitation of outer space and the interpretation of the expression "peaceful", particularly in relation to the 1967 Space Treaty, the United States has persisted in attitudes it took up at the very beginning of the space age. It is hoped that at least a case has been made to show that its "wait-and-see" policy in respect of the former question, and its rather strange interpretation of the word "peaceful" to mean "non-aggressive" and not "non-military", harbour serious consequences for international law. It is to be hoped that the issues they raise will not only be given some thought by the United States, but will also receive attention from space lawyers, and general international lawyers everywhere.

[47] *See supra* note 33.

LAW AND SECURITY IN OUTER SPACE: IMPLICATIONS FOR PRIVATE ENTERPRISE +

Edward R. Finch, Jr. *

Coverage of this topic will be from the point of view of 1) law for national security, 2) applicable treaties, particularly the 1967 Outer Space Principles Treaty[1] and the 1979 Moon Treaty,[2] as well as 3) Private Enterprise and Unispace '82[3] and 4) Financial Incentives.[4]

Outer Space Peace is essential to private enterprise. It is always wise to look historically, even in the relatively new field of international law of outer space. In July, 1970, the American Bar Association published my article "Arms Control is not Disarmament."[5] In that article, I emphasized the importance of a nuclear balance of power in outer space and that outer space holds the keys to world peace. Today, we see again these two basic concepts right up front.

In 1969, at the 16th Convention in Caracas, Venezuela, of the Inter-American Bar Associaton, my published article "Space Liability and World Peace,"[6] also emphasized these two problems. Also in my article, "Outer Space for Peaceful Purposes,"[7] these problems were discussed in relation to the question of the semantic problem of the meaning of "military" peaceful, and non-aggressive, in five languages. We should pause now to again examine the question of outer space nuclear balance of power. In 1967, the Outer Space Principles Treaty clearly prohibits the orbiting of nuclear weapons of mass destruction. It does not prohibit the orbiting of conventional weapons and, in fact, Russia in some fifteen ASAT[8] tests in the last ten years has used a

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+ The views expressed in this article are those of the author and not necessarily those of the International Academy of Astronautics.

[1]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 [1967], 18 U.S.T. 2410, T.I.A.S. 6347, 610 U.N.T.S. 205 (effective Oct. 10, 1967).

[2]Draft Agreement Governing the Moon and Other Celestial Bodies U.N. GAOR, 34th Sess., Supp. H. No. 20 (Doc. A/34/20).

[3]A/CONF/10//NP/53 (March 23, 1982).

[4]20 A.B.A.J. 40 (May 1982).

[5]Finch, *Arms Control is not Disarmament*, 4 INT'L LAWYER (July 1970).

[6]"Space Liability and World Peace", speech made by author before A.B.A. Annual Convention, Aug. 4, 1978.

[7]54 A.B.A.J. 365 (1968).

[8]The term "anti-satellite" (ASAT) is generally used to describe any device that can be used to destroy the operational capability of satellites in earth orbit. These devices can be based on the ground, in airplanes, or in space.

conventional explosion in proximity to another of their satellites to test the operational ASAT capability. Happily, the approximately ninety signatories to the 1967 Outer Space Principles Treaty have observed the prohibition against the orbiting of nuclear weapons of mass destruction or of any weapon specifically for mass destruction and it is hoped that this will continue indefinitely for world peace. We must never forget that in outer space simple debris can become a very serious high velocity weapon of destruction to other satellites in outer space.

Further, with regards to the nuclear balance of power in outer space, many scientists and lawyers believe that Einstein is, for pragmatic purposes, a real keeper of world peace. As of April 7, 1982, without a doubt, manned space stations and satellite reconnaissance objects of the United States and Russia are the vigilant eyes of the two major space powers to be sure that none is launching nuclear weapons of mass destruction against any other nation. On April 7, 1982, the United States had 425 near earth satellites, plus 30 space probes. The United States also had 2,185 pieces of space debris or junk and 44 pieces of space probe debris. Total United States objects in outer space were 2,684. In context, Russia had 642 near earth satellites and 25 outer space probes. Russia had 1,127 pieces of space debris or junk and 111 space probe debris. Russia's total was 1,805. Grand total for all 18 nations currently in outer space were 1,173 near earth satellites, 57 space probes, 3,365 pieces of space junk or debris and 56 pieces of space probe debris. Thus, there are 4,651 objects altogether in outer space, as of April 7, 1982.[9] Further examining the nuclear outer space balance of power, there is currently under discussion in the Committee on Peaceful Uses of Outer Space in the United Nations, an international satellite monitoring agency to use satellite reconnaissance data to verify treaty compliance for world peace.

The importance of keeping outer space peaceful, was also recently re-emphasized by Ambassador Peter Jankowitsch, current Chairman of COPUOS, on the day of the successful third United States Shuttle Launch. He stated "The world has maintained a nuclear free zone in outer space, free of national sovereignty and should remain so." Other than the ASAT developments of the United States and Russia, and the danger arising from outer space debris which could constitute a "weapon", there is presently the destabilizing factor of the continuing persistent demands of the lesser developed countries to gain benefits without cost to them from outer space. To meet this, both the United States and Russia in Unispace '82 mounted considerable exhibits, together with lectures and films there to educate the lesser developed countries.

It would serve no useful purpose to elaborate on the second major principle of my remarks today, mainly that outer space is the keeper of world peace. The reconnaissance satellite proposals already discussed speak loud and clear to that principle, as does existing outer space technology for medicine, food and minerals, etc.

With regard to arms control in outer space, little progress has been made in the ASAT limitation meetings by the United States and Russia, which have been held from time to time in recent years. It is my humble prediction that until the technology of ABM Laser Beam Defense and Particle Beam Defense have exhausted considerably more of their scientific and technological appeal, very little progress can be made in these ASAT arms control meetings. For example, the proposals of Lt. General Daniel Graham

[9]Verbal communication received by author from Public Relations office of NORAD (North American Air Defense) in Colorado Springs.

in his new book entitled "The High Frontier" outlining a peaceful passive defense, premised on global based ballistic missiles, suggests it would seem that the United States and Russia will have to explore this ICBM defense vulnerability before progress can be made in the arms control ASAT meetings. The low cost of such a defense compels this in our stringent United States budget economy today. The same compelling economic reasons apply to the current difficulties of Russia with regards to hard currency availability. We should note that Salyut 6 and 7 with COSMOS 1267 is really a space station based missile alert. Here, we note again the nuclear balance of power in the current scene from the ABM point of view. The U.S. is also pushing a manned space station defense.

In the history of the nuclear arms race, there have been only a few periods of balance when both sides were willing to limit their appetite for new weapons. The present period may last another year, but no longer. If the opportunity is missed, the next may be a long time off, according to Carnegie Endowment. The Geostationary Orbit is thus critical in arms control and outer space, for the next decade. In regard to outer space nuclear balance of power, it must be remembered that science and Law of Outer Space have thresholds of viability for each new process. Science advances in the Geostationary Orbit very rapidly today.[10]

International space law and the "freedom of outer space" must not be impeded in its progress for the benefit of all mankind by alleged claims. It appears that the United States and Russia are substantially in agreement that international law does not recognize the alleged claims of the eight Equatorial Countries. The progress of outer space science and outer space international law for the benefit of all mankind must not be impeded by any nation, whether an LDC (Less Developed Countries) or not, seeking to advance its economic interest at the expense of all other nations, and particularly where the 1967 Outer Space Treaty stands as the guiding principle of treaty and customary international law for the peace of the entire earth. World public opinion solidly supports the 1967 Treaty.

A science-law analysis by professionals of the geostationary orbit, indicates that with the experience gained from the Gemini and the Apollo-Soyuz programs on control, guidance, and stationkeeping, there will be no need for many decades for other than I.T.U. regulations of the use of the limited geostationary orbital "slots."[11] This assumes an energy demand growth factor of 5% per annum. This also assumes that spacing can be as close as two (2) km which is technically possible now. This does not assume a physical linkage of geostationary satellites which is possible with present technology to increase the "slots" in geostationary orbit. Thus, the Bogota conflict[12] claims are postulating a problem which should not eventuate until approximately the year 2100. The Bogota claims also mix present law against future technology. There is no violation of the geostationary orbit now. The Bogota claims also represent a failure to realize that in a timely manner both law and science in outer space have in the past and will in the future advance together for the benefit of all mankind.

[10] *See*, Orbital Antenna Farms, ASTRONAUTICS AND AERONAUTICS, Sept. 1977, at 20-29.

[11] A Science-Law Analysis was made at the 3rd Princeton Space Manufacturing Conference (May 1979).

[12] *See* Bogata Declaration of Dec. 3, 1976, 6 J. SPACE L. 193 (1978).

In conclusion, there are two fundamental principles which will apply to outer space arms control in the future and this paper has attempted to outline their present status. Never forget that technological breakthroughs continue to come from the science side very rapidly in outer space and it is a tremendously dangerous destabilizing factor. We must face the fact that space is already a military arena and it is not pragmatic to say that outer space is today only for peaceful purposes. Let us hope that by future treaty implementations of the 1967 Outer Space Principles Treaty, we may ultimately be able to reach an ASAT arms control agreement for the continued peaceful purposes of outer space and for the preservation and benefit of all nations and all mankind.

LAW AND SECURITY IN OUTER SPACE: PRIVATE SECTOR INTERESTS +

*Irwin M. Pikus**

This paper is more a "think-piece" than an analytical or historical review. The role of the private sector in space was anticipated from the early days of the space age, but only in the last several years has a broad range of private sector interests begun to be pursued. In light of this increasing role, it seems timely to take up the question of private sector interests in matters of security in outer space.

Conditions in outer space pose a unique and difficult set of problems for the maintenance of peace and mutual security. The space environment itself is inhospitable to life and this requires a great deal of fragile paraphernalia merely to support living beings. Remoteness from civilization creates stresses that can outstrip the ordinary standards of civilized behavior. Moreover, in view of the needs for international cooperation, people from vastly different cultural backgrounds may be thrown together creating further stresses. And finally, as the threat of a military competition in space increases, a concomitant threat to private assets and to people in space also increases.

1. Authority in Outer Space

Space is inherently supra-national and its removal from sovereign control is agreed to in the 1967 Outer Space Treaty.[1] Nevertheless, there is no supra-national authority charged with maintaining security or enforcing laws or resolving disputes in the space environment. States are expected to act in conformance with the Outer Space Treaty (OST) and other relevant elements of international law and, in fact, Article VI of the OST provides that States bear international responsibility for national activities in space whether they are carried on by governmental agencies or non-governmental entities. Thus, while States have no dominion over outer space, they do bear responsibility for activities (and presumably at least civil liability for resulting damages[2]). Since police power is vested only in national governments (or their subordinate entities), the maintenance of peace and security in outer space must center on the role of these national governments. The principle of "self help" in space appears not to have been abandoned and this could support private security measures. But the conclusion is essentially that there is no recognized authority present in space charged with the responsibility and having the capability to maintain peace and security.

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+ The views expressed in this article are the author's and do not necessarily represent positions or views of the National Science Foundation, the U.S. Government, or any other organization or person.

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

[2]This has not been explored in depth sufficient to consider the matter resolved.

2. Private Sector Activities and Interests in Outer Space

While a large variety of space activities are carried out by or for governments, there are important and increasing numbers of private sector space activities. For example, communications satellites are an important part of worldwide communications and promise to play an even more dominant role in broadcasting (*e.g.*, direct broadcasting of television programs). The role of satellites in communications has become fundamental, and most communication satellites are either owned and/or operated by the private sector or have a large private sector involvement. Clearly, actions in space that affect the operation of such assets can have enormous repercussions on the economic systems of advanced nations as well as on their national security.

Private sector remote sensing activities in space are likewise on the increase. There is now the possibility that the U.S. Landsat system and the U.S. meteorological satellite system will be "privatized" in the near future.

Space manufacturing is an early phase in its development. Nevertheless, it promises to become an important element of the industrialization of space. To be sure, this kind of space activity is not likely to be prominent for decades to come; but because it could represent a great investment of funds and expertise by the private sector, its sensitivity to hostile actions is of considerable importance.

Access to space has until now been controlled exclusively by several advanced nations. In the future, we can expect to see space launch capabilities developed by several countries, some among the less developed world, and by several private sector enterprises. The proliferation of space launch capability certainly will complicate the question of security in space, first because it could make it more difficult for ground-based monitors to identify the nationality of space objects, and second because it makes the space arena more subject to conflict-laden activities.

Private sector activities in space are encouraged in order to bring the greatest benefits most efficiently to mankind. Private sector investments likely will be quite substantial and the economics and security of some nations are apt to be substantially reliant on such activities. The natural environment in space is stressful. But if space is to become an arena for resolving or responding to conflicts, whether they be conflicts between governments or between private sector entities, the resulting stresses could be enormous.

3. Governmental Agreements Concerning Security in Outer Space

Currently, agreements dealing with security and outer space primarily concern the question of how space activities can affect the security of nations. For example, the Outer Space Treaty states that activities in space shall be in the interest of maintaining international peace and security.[3] Moreover, the Treaty proscribes orbiting weapons of mass destruction,[4] which presumably are for use against masses on the Earth. The Treaty also contains provisions that deal with the uses of space *per se*.[5]

[3]Outer Space Treaty, Art. III.

[4] *Id.* Art. IV.

[5] *Id. e.g.*, Article IV. This provision declares that the Moon and other celestial bodies shall be "exclusively for peaceful purposes." Note that outer space itself is not included in this provision.

Another pact, the Accident Measures Agreement, aims at averting nuclear war between the United States and the U.S.S.R.[6] Included is an undertaking to notify the other side of any unidentified objects (including objects in outer space) that are detected by missile warning systems,[7] and of any signs of interference with missile warning systems (including those in space)[8] or of any interference with related communications.[9] The sense of the agreement might include an obligation to notify the other side if it is expected that activities in space could create the risk of nuclear war between the United States and the U.S.S.R. through misunderstanding or mistake.

The ABM Treaty[10] between the United States and the U.S.S.R. provides that the parties will not interfere with "national technical means of verification."[11] This provision raises the question of whether the term "national" is meant to include non-governmental interests, as is provided in the Outer Space Treaty.

Finally, in the Enmod (Environmental Modification) Convention,[12] signed by more than thirty countries, the parties agreed not to use environmental modification techniques,[13] on the outer space and other environments, for the destruction, damage, or injury of any other state party.[14] No mention is made of injury to private interests.

In summary, concern over protection of private sector interests is almost completely lacking in existing governmental agreements. The Outer Space Treaty does concern itself with making sure that governments are responsible for the space activities of their private sector "nationals." However, the relevant provisions in the Treaty are not without ambiguity. In particular, it is not clear what constitute non-governmental national activities in space.

4. The Impact of Private Sector Activities on Security Concerns.

Private sector assets in space are generally vulnerable to hostile action because it is quite costly to reduce their vulnerability significantly. Governmental assets, on the other hand, might be hardened or have built in redundancy sufficient to make them survivable in a reasonable range of hostile environments simply because governments

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[6] Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War between the U.S. and U.S.S.R., Sept. 30, 1971, 22 U.S.T. 1590, T.I.A.S. 7186.

[7] *Id.* Art. III.

[8] *Id.* Art. III.

[9] *Id.* Art. III.

[10] Treaty Between the U.S. and U.S.S.R. on the Limitation of Anti-Ballistic Missile Systems, May 26, 1972, 23, U.S.T. 3435, T.I.A.S. 7503, effective Oct. 3, 1972.

[11] *Id.* Art. XII, para. 2.

[12] Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, May 18, 1977, T.I.A.S. 9614; Jan. 17, 1980.

[13] *Id.* Art. I, para. 1.

[14] *Id.* Art. II.

can afford to do so. Therefore, a private space activity can be interfered with or damaged by a less forceful and radical intervention. It is altogether possible that private activities would be the initial targets of hostile actions in space.

Many private sector space activities could be seen as provocative. For example, the direct broadcast of television to territories where the governments object could be seen to incite a response directed against the activity itself. Remote sensing, particularly by systems the products of which are of fine resolution and distributed without prior consent of the sensed state, could also be viewed as provocative.

Finally, with increasing space activity comes the threat of unintentional interference. The Liability Convention[15] provides for compensation for damages caused by space objects. For damages caused in the space environment, however, liability depends upon the demonstration of "fault." The concept of fault is difficult because its limits are not well defined juridically. In the present context, for example, it is not clear whether fault is coincident with causation or whether it excludes negligence.

5. Conclusions

It appears that private sector activities and interests in space a) are in jeopardy from hostile actions between governments, b) may provoke such actions from governments or private entities, c) are important elements in the economic health and national security of some countries, and d) are not adequately provided for in existing space law.

With increasing private investment in space, particularly from the U.S. private sector, it becomes very important for private sector concerns to be brought to bear on governmental deliberations on law and regulation in space. There exist mechanisms for bringing industrial representatives onto delegations, to backstopping teams and into the development of positions. There are also opportunities for private sector views to be heard in connection with proposed legislation or the ratification of agreements. Nevertheless, these are not now used sufficiently to ensure that private sector concerns play their appropriate role. In this matter, it would seem that both the Government and the private sector have responsibilities.

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

LAW AND SECURITY IN OUTER SPACE FROM THE VIEWPOINT OF PRIVATE INDUSTRY +

*By Roger K. Hoover**

I. INTRODUCTION

Much has been written about the effect of the use of outer space on national and international security. Also, there is much written on the principle of reserving outer space for peaceful uses only and the effect of this principle on self-defense and, in turn, on the ability of nations to maintain their security. These are important and complex issues to be addressed and, hopefully, resolved within the context of international law and space law. In this paper I would like to address the issues of law and security in outer space, not from the point of view of the world, of national alliances, or of nations, but from the point of view of private industry. I will review what "security" and some of the elements thereof are to private industry, how these relate to private industry engaged in space activities, the extent to which they are covered by existing space law, the effect of such coverage on private industry and some areas which still need to be addressed by space law to provide security for private industry in outer space.

II. PRIVATE INDUSTRY SECURITY

What does security mean to private industry? Webster defines "security" as "the quality or state of being secure; freedom from danger; safety; freedom from fear or anxiety; freedom from want or deprivation." This definition fits nicely into the concept of security for private industry. The desires of private industry for security translate into a desire for freedom from danger, fear, anxiety and deprivation relating to its right to conduct business, its equipment, its employees, its technology, and its profits.

Once private industry has taken necessary actions internally, it relies on the legal regime in which it is operating for additional assurances of security. The legal regime to support the security of private industry must provide for the authority of private industry to operate in the geographical area and in the business area in which it is interested. It should provide for protection against interference by others in the private industry's legitimate business and protection from harm or damage by others to the industry's technology, equipment, employees and general right to operate. With regard to non-space activities, from the very nature of the existence of private industry to varying degrees around the world, we can conclude that the legal regime as encompassed in local, national, and international law provides to private industry a sufficient degree of security to permit it to continue and even to thrive.

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+ The views expressed in this article are those of the author and not necessarily those of Lockheed Missiles and Space Co., Inc.

III. SECURITY FOR PRIVATE INDUSTRY IN SPACE ACTIVITIES

Any private industry which is considering activities in outer space will seek in those activities the same degree of security which it enjoys in its earthbound activities. The degree to which the elements of security are provided for private industrial activities in outer space will have an important effect on the degree to which private industry will participate in outer space activities. Such security will be dependent upon the legal regime which governs outer space activities. Thus, to analyze the question of security of private industry in outer space we need to review the existing legal status of outer space. In doing this, we will look principally at the four major existing space treaties, which I will refer to as the "Outer Space Treaty,"[1] the "Rescue and Return Treaty,"[2] the "Liability Treaty"[3] and the "Registration Treaty."[4]

IV. EFFECT OF SPACE LAW ON SECURITY OF PRIVATE INDUSTRY ACTIVITIES IN OUTER SPACE

A. *Right to Participate*

The first issue of "security" for private industry involves the question of whether or not it has a right to participate in a particular area of business. To the extent that the right to participate is restricted or doubtful, private industry will feel insecure about its participation.

Does private industry have a right to participate in outer space activities? I believe that under existing space law the answer in general is "yes".

Early in the negotiations of the Outer Space Treaty, it was recommended by some nations that participation in outer space activities should be limited to nations or to the "states". Private industry, it was suggested, should not be permitted to participate. Those suggestions were not adopted and the Outer Space Treaty does not restrict participation to governments.[5] In fact, Articles VI and IX of that treaty make specific

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

[2]Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched Into Outer Space (hereinafter "Rescue and Return Agreement"), April 22, 1968 [1969] 19 U.S.T. 7570, T.I.A.S. 6599, 672 U.N.T.S. 119 (effective Dec. 3, 1968).

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

[4]Convention on Registration of Objects Launched Into Outer Space (hereinafter "Registration Convention"), Jan. 14, 1975 [1976], T.I.A.S. 8480 (effective Sept. 15, 1976).

[5]"Outer Space Treaty," *supra* note 1, art. VI.

references to "non-governmental entities"[6] and to the activities of a state "or its nationals in outer space."[7] Article VI of the Outer Space Treaty does require that "activities of non-governmental entities in outer space, including the moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty."[8]

In addition, Article VII of the Outer Space Treaty makes a State Party "from whose territory or facility an object is launched" liable for damage by such object.[9] This is reinforced by the Registration Treaty which requires all space objects to be registered to a nation[10] and, thus, would require any private industry space objects to be registered to a nation. The Liability Treaty further reinforces the liability of a "launching state"[11] for damage caused by a space object of the launching state.[12]

It can reasonably be expected that any nation, being so subjected to liability, will control and restrict the activities of private industry so as not only to reduce the risk of damage which may be caused by a launch involving private industry of a space object from the nation's territory, but also to pass on to such private industry the liability for such damages. In such a situation, the level of security enjoyed by the private industry will be greatly influenced by the technical risks involved in the contemplated space activity as well as the ability of the private industry to cover such risks by its own financial responsibility, by insurance, or through indemnification from some other party or a combination thereof.

> 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 in conformity with the provisions set forth in the present Agreement. States Parties shall insure 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.[14]

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[6]*Id.*

[7]*Id.*, art. IX.

[8]*Id.*, art. VI.

[9]*Id.*, art. VII.

[10]"Registration Convention," *supra* note 4, art. II, para. 1.

[11]The term "launching state" was defined by the Convention as:
(1) "A state which launches or procures the launching of a space object" and
(2) "A state from whose territory or facility a space object is launched."
"Liability Convention," *supra* note 3, art. 1, §c.

[12]*Id.*, *supra* note 3, art. II.

[13]Draft Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereinafter "Moon Treaty"), U.N. GAOR, 34th Sess., Supp. H. No. 20 (Doc. A/34/20).

[14]*Id.*, art. XIV, para. 1.

Thus, private industry is permitted to participate in outer space activities but only as authorized and supervised by a nation and as controlled or regulated by the nation with regard to the risk of liability for damages faced by the nation as a result of the private industry involvement.

B. *Effect of National Claims of Ownership to Outer Space*

Private industry must determine where in outer space to conduct its activities. This decision may very well be affected by claims of ownership to outer space by individual nations. For example, a private industry intending to conduct outer space activities in the geostationary orbit might not feel very secure about doing so if it were aware of the claims by equatorial countries of ownership of that orbit. Private industry, being aware that in order to get to and remain in an outer space position its space object must pass through or remain in outer space over the area which is within the borders of another nation or nations, might likewise feel insecure in knowing that various nations from time-to-time have claimed ownership and sovereignty over the outer space above their sovereign territories. The degree of security or insecurity would be affected by the extent to which space law supports or rejects such claims.

Claims of ownership of outer space have generally not been recognized by international or space law. The Outer Space Treaty provides that "[o]uter space, including the Moon and other celestial bodies, shall be free for exploration and use by all states without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies."[15] Similarly, the proposed Moon Treaty would provide that "[t]he Moon is not subject to national appropriation by any claim of sovereignty, by means of use of occupation, or by any other means."[16] Paragraph 3, of Article XI would provide that "[n]either 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."[17]

Thus, under the Outer Space Treaty and under the proposed Moon Treaty, private industry need not feel a great deal of insecurity arising out of national claims of ownership to or sovereignity over areas of outer space or celestial bodies.

C. *Harm and Damage to Persons or Property in Transit and in Outer Space*

Private industry would be concerned about the security of its property and employees (if any) while making the commute to and while stationed at an outer space location.

Because of the advanced technological state of outer space activities, there can always be technical risks which affect the security of property and persons in outer space

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[15] "Outer Space Treaty," *supra* note 1, art. 1.

[16] "Moon Treaty," *supra* note 13, art. XI, para. 2.

[17] *Id.*, para. 3.

activity. These would have to be addressed internally in private industry through technical safety and reliability measures. Further, national or international law may impose safety standards or restrictions on the private industrial activities which would have to be met.

If harm or damage arises from collision with a traceable space object, private industry is afforded some level of security by the existing treaties. The Rescue and Return Treaty would require other nations to provide assistance to a damaged spacecraft[18] and its personnel[19] and to return a downed spacecraft[20] and its personnel.[21] The Registration Treaty would hopefully permit identification of the responsible nation.[22] The Liability Treaty would provide a method of obtaining recovery for such damage.[23] However, the ability of the private industry to recover damages is dependent upon the ability of nations to resolve the claims or disputes between them and, failing such resolution, their willingness to accept the determination of a claim commission under the Liability Treaty.

To the extent that damage is caused not by a space object, but by another person, the ability of the private industry to obtain redress is unclear. The Outer Space Treaty forbids interference, but does not provide a clear remedy if such interference does occur. The Liability Treaty provides for redress of damages caused by a space object,[24] but does not clearly provide such redress for damages caused by persons to the property or employees of another in outer space. Private industry would have to rely on the ability of nations to consult and resolve the issues or, if available, on the application of some international law. In this area, private industry is not provided a clear degree of security.

There is a security, or safety, risk which needs to be addressed by space law. This is the risk of collision created by abandoned orbiting manmade space objects which are no longer controlled or controllable. As space activities increase, more space objects are launched, more are abandoned in space, and the danger of collision with abandoned objects increases. Although the Registration Treaty requires that all space objects be registered to a nation[25] and the Liability Treaty places liability for damages caused by space objects on the launching nation,[26] it may be difficult, or even impossible, to determine the nation responsible for a specific abandoned, manmade space object, or portion thereof, after many years in orbit. The lack of control over this area increases the

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[18]"Rescue and Return Agreement," *supra* note 2, art. V, para. 2.

[19]*Id.*, art. II, III.

[20]*Id.*, art. V, para. 3.

[21]*Id.*, art. IV.

[22]*See*, "Registration Convention," *supra* note 4, art. VI.

[23]"Liability Convention," *supra* note 3, art. VIII through XXIII.

[24]"Liability Convention," *supra* note 3, art. II.

[25]"Registration Convention," *supra* note 4, art. II, para. 1.

[26]"Liability Convention," *supra* note 3, art. II.

exposure to financial loss for private industry and its security is thereby decreased. Space law should be expanded to require the responsible party to dispose of a space object when it is no longer useful in some manner that will render it harmless to other orbiting space objects.

D. *Ability to Operate Without Interference*

Private industry would want to be assured that, once having established its operations in some outer space location, it could conduct those operations without interference from others. The Outer Space Treaty on this issue provides that parties shall carry on activities in outer space "in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding."[27] Article IX provides that states shall "conduct all their activities in outer space. . .with due regard to the corresponding interests of all other states. . . ." And, also in Article IX, a state which has reason to believe that an activity or experiment planned by it or its nationals in outer space would cause potentially harmful interference with activities of other State Parties shall "undertake appropriate international consultations before proceeding with any such activity or experiment" and any party which believes that the activities of another party in outer space would cause potentially harmful interference with other activities in outer space may request consultation concerning such activity.

These provisions are not particularly strong security for private industry against interference by others in space except to the extent that such interference may otherwise be covered by international law. If such interference occurs, the private industry would be assured only of a right to seek consultation between nations on the issue. This may be as strong a provision as space law is capable of providing. The question of whether a private industry, or a nation on its behalf, could employ forceful means to protect its activities from interference (i.e., whether it could employ self-defense) appears to be an issue which is unsettled under present space law. The Outer Space Treaty provides in Article IV that the Moon and other celestial bodies shall be used exclusively for peaceful purposes. That Article further forbids the establishment of military bases, installations, and fortifications. In addition, the proposed Moon Treaty would provide that the Moon is to be used exclusively for peaceful purposes[28] and that "[a]ny threat or use of force or any other hostile act or threat of hostile act on the moon is prohibited.[29] 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. . .spacecraft, the personnel of spacecraft or man-made space objects."[30]

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[27]"Outer Space Treaty," *supra* note 1, art. III.

[28]"Moon Treaty," *supra* note 13, art. III, para. 1.

[29]*Id.*, art. III, para. 2.

[30]*Id.*

With regard to interference in its operations by others, I believe there is a substantial degree of insecurity with which the private industry would have to cope and the degree of perceived security would depend upon the degree to which such industry assesses the relief provided by international law and the ability of nations to settle claims among themselves.

E. *Stability of Legal Regime*

Private industry relies heavily upon the stability of the existing legal regime to provide security for its activities. To the extent that the legal regime is uncertain, changing and indeterminable, the insecurity of private industry in its activities will increase.

Under the existing Outer Space Treaty, a certain degree of stability exists for space activities. The right of private industry to participate in outer space activities has generally been established by space law and in practice. The general legal regime with its relative stability provides a certain level of security to private industry in its outer space activities. However, concerns over changes to the particular treaties, laws, or principles which make up that existing regime do introduce an area of instability. Private industry is concerned and, therefore, somewhat insecure about the future of communications satellites with respect to the ability to operate in the geostationary orbit on a first-come, first-serve basis as has been the practice in the past. The allocation of frequencies and the changes which may come about in that area introduce insecurity to private industry.

The proposed Moon Treaty is seen as a potentially destabilizing force for private industry participation in outer space activities. This insecurity arises from the fact that, although the proposed Moon Treaty would seem to permit private industry participation until "the exploitation of the natural resources of the moon. . .is about to become feasible,"[31] the extent and nature of private industry participation thereafter is unclear. At that point, the treaty would require that the States Parties to the agreement undertake to establish "an international regime, including appropriate procedures" to govern such exploitation.[32] Thus, the right to exploit the natural resources of the Moon and other celestial bodies is not necessarily secured for private industry. Such rights would be governed by an international regime, the composition of which is presently indeterminable. To the extent that such legal regime can be divined or determined by reference to the international regime which has been extensively negotiated and defined under the proposed Law of the Sea Treaty,[33] the security of private industry participation in outer space activities would be considerably reduced. Its right to participate, or to continue operating, or to retain its technology, or to retain and control the benefit derived from its activities would all be subjected to the economic, political, and nationalistic considerations of an international body or organization and the member states thereof, and private industry or its nation (state party) may have little or no ability to protect the interests of private industry in outer space activities.

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[31]*Id.*, art. XI, para. 5.

[32]*Id.*

[33]For text, see Draft Convention on the Law of the Sea, U.N. Doc. A/conf. 62/L. 78, of Aug. 28, 1981.

Such insecurity alone could be sufficient to prevent the participation of private industry in outer space activities since it may preclude the industry from investing its own resources and from being able to obtain the financial backing necessary to support outer space activities. Private industry relies heavily upon private financial investment to support its activities. With the knowledge that rules will be established in the future to govern such activity and without any guidelines to allow an economic evaluation of the potential return on such activities, investment sources may hesitate or refuse to provide the financing necessary to support the entry into and continuance in outer space activities by private industry.

F. *Protection of Intellectual Property*

The intellectual property of private industry is vital to its existence. The information and technology which make up the proprietary data and trade secrets of a private industry are the lifeblood of that industry. To the extent that the right to retain and protect such technology is diluted or lost, the industry will be weakened or destroyed. Thus, a vital issue of security to private industry in its outer space activities is its ability to maintain its proprietary position.

The Outer Space Treaty does not specifically address or affect these rights. The statement in Article I that "[t]he exploration and use of outer space. . .shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development" could be interpreted to mean that all countries have the right to participate in such activities and, therefore, have the right to the technology involved therein. Or, this could be interpreted to the effect that all countries should share in the benefits derived therefrom. Without any provision directly addressing technology, I would not interpret the Outer Space Treaty to require private industry to relinquish its proprietary interests in technology.

The Outer Space Treaty also requires states conducting activities in outer space to inform the Secretary General of the United Nations as well as the public and the international scientific community of the "nature, conduct, locations and results of such activities."[34] I believe this requirement can be met without the necessity to reveal proprietary technology.

Article XII of the Outer Space Treaty provides that "[a]ll stations, installations, equipment and space vehicles on the moon and other celestial bodies shall be opened to representatives of other States Parties to the Treaty on the basis of reciprocity." This article does require advance notice of a projected visit[35] appropriate consultation[36] and avoidance of interference with normal operations.[37] Under such conditions, it appears likely, although not certain, that a private industry could take appropriate measures to protect is proprietary technology from disclosure during any such visit by another Party.

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[34] "Outer Space," *supra* note 1, art. XI.

[35] *Id.*

[36] *Id.*

[37] *Id.*

Thus, I would conclude that the security of the private industry's proprietary technology or intellectual property is not substantially threatened by the provisions of the Outer Space Treaty.

The proposed Moon Treaty would include provisions substantially similar to those in the Outer Space Treaty discussed above with respect to exploration and use for the benefit of all countries, and informing the Secretary General of the United Nations, the public, and the international scientific community of space activities. The provisions allowing for inspection by one party of another party's space vehicle, equipment, facilities, stations and installations on the Moon are more detailed than in the Outer Space Treaty. To the extent that exposure of proprietary technology might be required to permit another party to assure the activities are in accordance with the law, an area of insecurity is introduced for private industry.

The proposed Moon Treaty would require that when exploitation of the natural resources of the Moon is about to become feasible, the parties must undertake to establish an international regime to govern such exploitation[38] This in itself does not address proprietary technology. However, drafts of the Law of the Sea Treaty[39] which elaborated on the concepts of "common heritage of mankind" and an international regime, have required the turning over of proprietary technology. This introduces a substantial degree of insecurity for private industry in its attempts to protect its technology. Although one cannot be sure at this time whether the Moon Treaty "international regime" would follow the pattern of the Law of the Sea Treaty, the uncertainty alone creates insecurity for private industry with regard to its future participation in outer space activities on celestial bodies.

G. *Retention of the Benefits of Outer Space Activities*

The ultimate purpose of private industry is to derive a profit from its industrial activities. Generally, without a reasonable opportunity to obtain and retain a profit from an activity, private industry has little, if any, reason to engage in such activity. Likewise, with respect to activities in outer space, the security of private industry is directly related to its ability to obtain and retain a reasonable profit from those activities.

Except to the extent that the Outer Space Treaty Article I provision that "[t]he exploration and use of outer space. . .shall be carried out for the benefit and in the interests of all countries" might be interpreted to require the sharing of the "benefits" or profits of outer space activities, I do not believe that the Outer Space Treaty really affects the ability of private industry to obtain and retain profits on its outer space activities. In practice, private industry presently engaged in outer space communications activities does control and retain its profits. Under the existing Outer Space Treaty, private industry is relatively secure with respect to this all-important issue.

However, the proposed Moon Treaty states that the natural resources of the Moon are "the common heritage of all mankind."[40] It requires the establishment of an

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[38] "Moon Treaty," *supra* note 13, art. XI, para. 5.

[39] *See supra* note 33.

[40] "Moon Treaty," *supra* note 13, art. XI, para. 1.

international regime to govern the exploitation of resources when such exploitation is about to become feasible.[41] It states that a purpose of the international regime shall be "an equitable sharing of the benefits derived from the resources."[42] The ability of private industry to obtain, control and retain profits from outer space activities under the proposed Moon Treaty is not secure. Further, as previously alluded to, the clarification of similar provisions in the negotiation of the draft Law of the Sea Treaty[43] leads to greater insecurity in this area for private industry.

V. CONCLUSION

Under the existing general space treaties, private industry is relatively secure in its participation in outer space activities. This is borne out by the present participation, especially in outer space communications projects. However, increasing numbers of abandoned manmade space objects in orbit introduce a growing area of insecurity which would be an appropriate area to be addressed by additions to the body of space law. More binding liability provisions and dispute resolution provisions would enhance the security of private industry in outer space. To provide security with respect to the initial right to participate, the right to continue activities, the protection of proprietary technology and the ability to obtain, control and retain profits from outer space activities, the uncertainties brought about by the proposed Moon Treaty provisions relating to the common heritage of mankind and to an international regime to govern exploitation must be resolved. Either these provisions must be removed, clarified or restricted, or the projected legal regime must be definitized in the very near future. Without such action, a substantial degree of uncertainty and insecurity will continue to exist with respect to outer space activities governed by the proposed Moon Treaty. So long as such uncertainty and insecurity exist the necessary financial investment will be difficult for private industry to obtain to support the activities necessary to make exploitation of the natural resources of the Moon feasible.

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[41] *Id.*, para. 5.

[42] *Id.*, para. 7[d].

[43] *See supra* note 33.

EVENTS OF INTEREST

A. Past Events

(a) Report

*1. Review of the Work of the United Nations Committee on the Peaceful Uses of Outer Space.**

The Committee on the Peaceful Uses of Outer Space (COPUOS) held its twenty-sixth session in New York from 20 June to 1 July and adopted a report by consensus to be submitted to the General Assembly at its thirty-eighth session in the fall of 1983. The report will be published as document A/38/20. It reviews the Committee's work for the session and that of its two Sub-Committees. It also considers implementation of the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82), held in Vienna from 9 to 21 August 1982.

The Scientific and Technical Sub-Committee, which held its twenty-second session at United Nations Headquarters from 7 to 17 February 1983, considered the issues relating to remote sensing of the earth by satellites, the use of nuclear power sources in outer space, space transportation systems and examination of the physical nature and technical attributes of the geostationary orbit. In addition, it considered the United Nations Programme on Space Applications and Co-ordination of Outer Space Activities within the United Nations system in the context of the recommendations made at UNISPACE 82. The report of the Scientific and Technical Sub-Committee is to be found in document A/AC.105/318.

The Legal Sub-Committee, at its twenty-second session held at United Nations Headquarters from 21 March to 8 April 1983, considered the issues of: legal implications of remote sensing of the earth from space, with the aim of formulating draft principles; the possibility of supplementing the norms of international law relevant to the use of nuclear power sources in outer space; and matters relating to the definition and/or delimitation of outer space activities, bearing in mind, among other things, questions relating to the geostationary orbit. The report of the Legal Sub-Committee is to be found in document A/AC.105/320 and Corr. 1.

In addition to those items contained in the reports of the Sub-Committees, the Committee considered the military use of outer space and the need to take measures to prevent an arms race in outer space. In that regard, there was some discussion on whether or not the issue of the arms race in outer space should be placed on the agenda of the Committee or if the Committee on Disarmament was the more appropriate forum. There was also discussion of the possibility of drafting a treaty concerning the use of direct television broadcast satellites.

Remote Sensing of Earth by Satellite

This year the discussions on remote sensing took place mainly in the Legal Sub-Committee's working group and these discussions are summarized in the report of the Chairman of the working group on the formulation of draft principles on the legal implications of remote sensing (A/AC.105/320 Annex I).

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*The views contained in this review are those of the author and do not necessarily represent those of the United Nations.

The term "remote sensing" refers to the detection and analysis of the earth's resources by sensors carried in aircraft and spacecraft. The four main types of sensing are: meteorological, performed by the global forecasting system under the World Meteorological Organization (WMO); ocean observations, to determine wave heights, currents, sea-surface temperatures and wind patterns (there have been none of these since the United States *Seasat* satellite ceased to function and Japan is planning the next of this kind MOS satellite in 1986); military surveillance and reconnaissance, involving costly, high-resolution photography that could be used to monitor disarmament treaties; and land observations, which might be used in agriculture, forestry, animal husbandry, flood control, and mineral and petroleum prospecting.

The Legal Sub-Committee has been working for several years on legal principles relating to remote sensing, in part to meet concerns of States about being "sensed" without their permission, and about whether, and on what basis, the data so obtained would be made available to themselves and other States. The sensing States have expressed their concern that information gathered by remote sensing should be disseminated without limitation.

Last year a working group of the Sub-Committee reviewed a set of draft principles drawn up at its previous session (document A/AC.105/288, annex I, appendix). It reached no final decision on the matter but the following issues were raised in discussion: access of the sensed States and others to gathered data; whether the prior authorization of the sensed State was required; whether the sensing State could publish the results of its remote sensing; whether the sensed State could oppose such publication; and what method would be used for settling differences.

The draft principles considered by the working group at the present session related to: State's responsibility for all remote-sensing activities whether they are carried out by government or non-government agencies; prior notification to sensed States of the proposed sensing activities; prior consultation, if requested, with the State whose territory is to be sensed; provision to the sensed State of preliminary information, final results and conclusions relating to the natural resources, the territorial sea and maritime areas under its jurisdiction; and to preventing sensing States from disseminating information, results or conclusions relating to the sensed State's natural resources without the approval of the sensed State.

Use of Nuclear Power Sources in Outer Space

The Committee endorsed the elaboration of a notification format in case of malfunction of a spacecraft carrying a nuclear power source on board, which had been developed by the Legal Sub-Committee. In addition, some delegations felt the mandate of the Legal Sub-Committee should be expanded to include the elaboration of additional rules through its working group. Other delegations thought such a change was unnecessary.

The wording agreed on notification is as follows:

"Any State launching a space object with nuclear power sources on board should timely inform States concerned in the event this space object is malfunctioning with a risk of re-entry of radioactive materials to the earth. The information should be in accordance with the following format:

"1. *System parameters*

"1.1 Name of launching State or States, including the address of the authority which may be contacted for additional information or assistance in case of accident

"1.2 International designation

"1.3 Date and territory or location of launch

"1.4 Information required for best prediction of orbit lifetime, trajectory and impact region

"1.5 General function of spacecraft

"2. *Information on the radiological risk of nuclear power source(s)*

"2.1 Type of nuclear power source: radio-isotopic/reactor

"2.2 The probable physical form, amount and general radiological characteristics of the fuel and contaminated and/or activated components likely to reach the ground. The term 'fuel' refers to the nuclear material used as the source of heat or power.

"This information should also be transmitted to the Secretary-General of the United Nations."

In connection with the language adopted, representative of the USSR made two comments for the record. First, the adoption of that provision did not in any way predetermine the legal force or form of any instrument of which that provision may become a part.

The second comment had to do with paragraph 1.4 of the notification format, concerning information required for best prediction of orbit lifetime, trajectory and impact region. The essential elements of that information, he said, were the ballistic co-efficient—the mean co-efficient of de-acceleration of the decaying object—at the moment when the information was transmitted, as well as the projected time and area of re-entry of the object or its component parts into the dense layers of the atmosphere, with the possibility of updating the projections afterwards.

During discussion of the scientific and technical aspects of this item delegations generally reiterated views expressed in the Sub-Committees. Some delegations, citing the entry into the earth's atmosphere of parts of COSMOS 1042, expressed the view that internationally agreed safety regulations concerning the use of nuclear power sources in outer space were needed, while others said the danger presented by the re-entry of that satellite was a remote one and was within safety standards established by the International Commission on Radiological Protection (ICRP). They said the conclusions already reached by the working group provided sufficient guidelines for the use of nuclear power sources in outer space. In view of the importance of these considerations the Committee recommended that the working group on nuclear power sources be reconvened in 1984 to consider these questions.

Delimitation of Outer Space and Examination of Geostationary Orbit

Regarding the geostationary orbit, the Committee noted that the Scientific and Technical Sub-Committee had considered that the future specialized conferences of the International Telecommunication Union (ITU) should take into account the need to develop criteria, planning methods and/or arrangements for the equitable and efficient use of the geostationary orbit and the radio frequency spectrum, based on genuine need

as identified by each country, and taking into account the specific needs of the developing countries as well as the special geographic situation of particular countries.

While some delegations were of the view that work should commence on the formulation of regulation governing the use of the geostationary orbit, since it was a limited natural resource, others said the orbit was essentially a question of the utilization of the radio frequency spectrum, already under consideration by the ITU, and preparation of regulations would, therefore, not be appropriate.

On the question of the delimitation of outer space, some delegations were of the view that a spatial definition of outer space was necessary and that the Legal Sub-Committee should establish a working group to study the question. Other delegations expressed the view that such a working group was not necessary as there was no practical need nor scientific basis for a delimitation of outer space.

In addressing the question of defining and/or delimiting outer space, the Sub-Committee considered, among other things, whether or not nations should agree on a particular altitude or degree of atmospheric density as the point at which, for legal purposes, "outer space" would be divided from "airspace" and from the already developed body of law pertaining to air and aircraft activities. Another approach would be to forego definition of outer space and instead define "space activities".

Space Transportation Systems

The Committee noted that the Scientific and Technical Sub-Committee had continued its consideration of the development of space transportation systems, and endorsed the Sub-Committee's decision to continue consideration of this item.

The Committee took note of the statements of various countries on progress being achieved in this area, including programmes that are either being planned, or are already in operation.

Military Use of Outer Space

The Committee urged all nations, in particular those with major space capabilities, to contribute actively to the goal of preventing an arms race in outer space and to refrain from any action contrary to that aim. Some delegations felt that strong efforts should be made for the early preparation of pertinent legal instruments for preventing any further militarization of outer space. Those delegations recommended that all States with the capacity for testing, deploying and stationing weapons in outer space or weapons for use in outer space, should be urged to refrain from doing so.

In addition, some delegations expressed the view that the two major space Powers should resume the arms control negotiations on anti-satellite programmes. It was noted that the Committee on Disarmament had begun consideration of the matter, but some delegations expressed the view that the Committee on the Peaceful Uses of Outer Space had a legitimate interest in the issue and its views should be taken into account by the Committee on Disarmament. These delegations also felt that the arms race in outer space should be made a priority item on the agenda of the Committee.

United Nations Programme on Space Applications

In its report the Committee took note of the United Nations Programme on Space Applications, which had been reviewed in the context of implementation of the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82). The Committee and its Scientific and Technical Sub-Committee had considered a series of activities, including those relating to the international Space Information Service proposed for 1984 and future years.

The Committee, observing that the recommendations of UNISPACE 82 were to be implemented mainly through the voluntary contributions of States in money or in kind, noted the number of offers of financial contributions, offers to host training courses on technical subjects and offers of fellowships made by member States.

Under the United Nations Space Applications Programme, short-duration training and demonstration seminars and workshops are to be financed from the regular United Nations budget; and voluntary contributions are to be made for fellowships for in-depth training, technical advisory services, the promotion of greater exchange of experience in space science and technology with specific applications, and the promotion of greater co-operation between developed and developing countries as well as among developing countries.

The Committee endorsed the recommendation that technical studies be carried out on a priority basis on the following subjects: assistance to countries in studying their remote sensing needs and assessing appropriate systems for meeting such needs, the feasibility of using direct broadcasting satellites for educational purposes and of internationally or regionally-owned space segments and the feasibility of obtaining closer spacing of satellites in the geostationary orbit and their satisfactory co-existence, including a closer examination of techno-economic implications, particularly for developing countries in order to ensure the most effective utilization of this orbit in the interest of all countries.

In order that the studies be carried out in the most efficient manner, the Committee recommended that they be conducted with the assistance of experts within the Sub-Committee to be furnished by Member States and appointed by the Secretary-General.

Future Work of Sub-Committee

During the Committee's discussion, several delegations expressed the view that it was necessary to draft a treaty concerning the use of direct television broadcast satellites and that the principles adopted by the General Assembly at its thirty-seventh session could serve as a basis for the formulation of a relevant legal convention. Some other delegations were of the opinion that the principles would not provide an acceptable basis for the drafting of an international treaty and still others expressed the view that the text should be reviewed at a future date.

The Committee also set the dates for its next session and those of its two Sub-Committees.

The next meeting of the Committee on the Peaceful Uses of Outer Space will be held from 11 to 22 June 1984, either in New York or Vienna.

The Scientific and Technical Sub-Committee will meet from 13 to 24 February 1984 in New York.

The Legal Sub-Committee will hold its next meeting from 19 March to 6 April 1984 in Geneva.

N. Jasentuliyana
Deputy Chief, Outer Space
Affairs Division, United Nations

(b) Short Accounts

2. The Conference on the History of Aviation and Space Research Devoted to the 25th Anniversary of Space Era of Mankind, Moscow, Sept. 20-23, 1982.

A conference was held in Moscow, Sept. 20-23, 1982, devoted to the 25th anniversary of space era of mankind. The Conference was one of the important events arranged in the Soviet Union in connection with the celebration of the 25th anniversary of the launching of the first artificial satellite by the USSR.

Among the organizers of the conference were the Institute of the History of Natural Sciences and Technology of the USSR Academy of Sciences, the Committee of the USSR Academy of Sciences on the Study of Scientific Heritage of the Pioneers in the Exploration and Use of Outer Space, the "Intercosmos" Council of the USSR Academy of Sciences, the Space Training Center, named after *J. Gagarin*, and the State Museum of the History of Space Research, named after *K. Tsiolkovsky*.

At the conference much attention was given to the investigation of the scientific and technical background of the creation of the first artificial Earth satellite and to the influence of the exploration and use of outer space on the development of science and technology. Other topics discussed in detail were the fundamental achievements of space research in recent years, the prospects of the further development of space research, and the problems of international cooperation in this field. About 900 people took part in the work of the conference, among them academicians *V. Avduevsky, O. Gazenko, V. Glushko, V. Kotelnikov, V. Mishin* and other scientists, veterans of space research and cosmonauts.

The conference was also attended by many prominent foreign scientists including *Ch. Draper* (USA), President of the International Academy of Astronautics; *H. Oberth* (FRG), one of the pioneers of space research; *E. Galloway* (USA), honorary director of the International Institute of Space Law (IISL); *F. Durant* (USA), chairman of the International Committee on the History of Space Science and Technology; I. Nad (Hungary), chairman of the Committee of the History of Space Research; *H. Bart* (Rumania), member of the Astronautical Committee of the Academy of Sciences of Rumania; *S. Gorove* (USA), chairman of the Editorial Board and Advisors of the Journal of Space Law and President of the Association of the U.S. Members of IISL; *V. Ratien* (FRG), one of the managers of the German Museum of Science and Technology; *V. Shulch* (FRG), one of the managers of the German Society of Aeronautics and Astronautics and others.

Cosmonauts of the USSR and other socialist states, such as Czechoslavakia, German Democratic Republic, Hungary, Mongolia, Poland, Bulgaria, Romania, Vietnam, took an active part in the work of the conference.

At the conference the following main reports were made:

—The importance of the launching of the first artificial Earth satellite for the development of space research—academician *V. Kotelnikov*;
—The main stages of the development of space research in the USSR during the last 25 years—academician *V. Avduevsky;*
—The development of space biology and medicine during the last 25 years—academician *O. Gazenko*;
—A cosmonaut-a new profession of the 20th century—doctor, pilot-cosmonaut of the USSR *A. Nikolaev*;
—International cooperation in the exploration and use of outer space—professor *V. Vereshchetin*;
—The development of space vehicles in the USSR—doctor, pilot-cosmonaut of the USSR *O. Makarov.*

Soviet scientists, foreign scientists (in particular *Ch. Draper, H. Oberth, V. Shulch*), and pilot-cosmonauts of the USSR and other socialist states, who took the floor at the conference, greatly appreciated the contributions made by Soviet science and stressed the important role of the USSR in the development of space research and expansion of international cooperation in this field.

The participants of the conference visited Leningrad, where they attended a ceremony commemorating the 25th anniversary of the space era. They also traveled to Kaluga, the Space Training Center in Star City, the Space Museum and the *S. Korolev* Museum in Moscow.

E. Kamenetskaya
Doctor of Laws,
Institute of State and Law
of the USSR Academy of Sciences

3. The Second Seminar of the Laywers of Socialist Countries under the Intercosmos Program, Prague, Oct. 25-30, 1982.

The Second Seminar of the lawyers of socialist countries under the Intercosmos program was attended by specialists in the field of space law from Czechoslovakia, Cuba, German Democratic Republic, Hungary, Poland, Bulgaria, Rumania, and the USSR.

After the first seminar was held in Poland in 1979, these seminars have become a tradition. The participants of the second seminar expressed their opinion of the importance of continuing to arrange similar seminars in the future.

The seminars are aimed at analyzing theoretical and practical problems of cooperation within the framework of the Intercosmos program, as well as, studying actual issues of international space law discussed in the United Nations. This format was used by the lawyers of socialist countries to determine the agenda and purpose of this periodical meeting at which there were made about 20 reports on the following subjects:

1. The problems of legal protection and use of scientific and technical results and achievements in the framework of the Intercosmos program;
2. The legal nature of the Intercosmos program;
3. The problems of space law discussed in the United Nations.

In the course of the discussion of the first issue, the participants of the seminar pointed out that the multilateral and bilateral agreements already existing in the Council on Mutual Economic Assistance, which are devoted to legal protection and use of joint scientific and technical results, made it possible to settle legal problems of the protection of scientific and technical achievements within the framework of the Intercosmos program. In connection with this, a recommendation was given to the leaders of the national coordinating organs of contracting parties of the Intercosmos program that would apply to different national ministries with a request to include the problems of legal protection and use of scientific and technical results within the framework of the Intercosmos program in the plans of bilateral cooperation on patent and license questions. The seminar participants found it reasonable to continue the study of the possibility of working out a common document covering the organizing aspects of this problem. This document should be based on existing intergovernmental and interdepartmental agreements and should reflect the specific features of the Intercosmos program, in particular the interdepartmental character of national organs and the fulfillment of some projects not on a bilateral but on a multilateral basis.

The reports on the second item of the agenda were devoted to the consideration of the legal nature of the Intercosmos program in connection with its representation in international organizations. The authors of the reports—*G. De Fumel* (Poland) and *E. Kamenetskaya* (USSR)—and participants in the discussion noted that the Intercosmos program in view of its specific features was not an international organization in the strict meaning of this word but a particular kind of joint activity of states. However, the mechanism created in this framework insures that the successful fulfillment of the program of cooperation in the exploration and use of outer space is quite sufficient for the representation of Intercosmos and the establishment of contacts between Intercosmos, the U.N. Committee on Outer Space and the U.N. specialized agencies as well as international space organizations.

The third item on the agenda consisted of reports on a wide range of problems. First, *A. Terekhov* and *V. Vereshchetin* (both from the USSR) and *L. Perek* (Czechoslovakia) presented reports which were devoted to the analysis of the work of the Legal Subcommittee of the U.N. Committee on Outer Space on all the problems which are under the consideration of this organ at the present time.

G. Zhukov (USSR), *Ya. Azud* and *I. Mrazek* (both from Czechoslovakia) made reports on the problems of preventing the military use of outer space. The authors expressed their serious concern about the activization of the use of outer space for military purposes. At the seminar, they also considered the existing rules of international law preventing the military use of outer space, and special attention was drawn to the necessity of working out new rules in this field. In connection with this the Soviet Draft Treaty was stressed, since it prohibited the stationing of weapons of any kind in outer space.

In the reports on the problems of definition and delimitation of outer space made by *E. Vassilevskaya* (USSR) and *E. Konstantinov* (Bulgaria), an analysis was given of the

course of the discussion of this problem in the U.N. The authors found it reasonable to strictly establish and fix a definite height for the boundary between air and outer space.

At the seminar other reports were made covering the problems of direct television broadcast from outer space (*H. Karakashev* - Bulgaria, *O. Kunz* - Czechoslovakia), remote sensing of the Earth (*M. Hashkova* - Czechoslovakia), and a comparative analysis of air and space law (*G. Gál* - Hungary).

E. Kamenetskaya,
Doctor of Laws,
Institute of State and Law
of the USSR Academy of Sciences.

4. Conference on "Developments of Commercial Activity in Space - Economic, Legal and Insurance Aspects." Rome, March 3-4, 1983

A major international conference on commercial activities in space and their commercial, legal and insurance aspects was held in Rome on March 3-4, 1983. The conference, entitled "Developments of Commercial Activities in Space", brought together some 300 representatives of government, commercial operators, legal experts, insurance companies and brokers from all over the world.

Main speeches were made by the following:

Prof. *Luciano Guerriero:* "The Outlook for Space Activities in Italy in the Years 1982/1986"; Mr. *Chester Lee:* "Space Transportation System (Shuttle) Program: Description and Status"; Prof. *Ernesto Vallerani:* "Commercial Prospects for the Exploitation of Future Space Stations"; Mr. *Yukihiko Takenaka:* "Space Activities in Japan"; Dr. *Rene Collette:* "ESA's Space Applications Programmes"; Mr. *Roland Deschamps:* "Arianespace Commercial Prospects"; Mr. *Dennis W. Elliott:* "The R.C.A. American Satellite Program"; Ing. *Piero Masarati:* "Selenia Spazio - an Italian Approach to the Industrialization of Space Activities"; Mr. *John W. Vinter;* "Expanding Satellite Business System Services"; Mr. *Ronald Turta:* "An STS User's Perception: the Telesat Experience"; *Dr. Giorgio Salvatori:* "The Intelsat System: its Development and Prospects for the Insurance Industry"; Mr. *Vic Pino:* "Synopsis of Treaties, Agreements and Products Liability Laws as It Applies to Space Transportation"; Dr. *Maurizio Pellas:* "Space Activities and Related Liabilities for Damages Caused to Third Parties"; Prof. *Gian Piero Orsello* "Prospects and Problems of Direct Broadcasting from Satellites in Italy and in the European Economic Community"; Mr. *Henry Piekarsky:* "French Space Policy in the Current Decade"; Mr. *Hans Schimrock:* "ESA's Experience and Policy regarding Launch-In-Orbit Insurance"; Mr. *Benito Pagnanelli:* "The Insurance for Commercial Activities in Space: Economic Aspects, Technical and Underwriting Problems"; Mr. *George D. Baker:* "STS Launch Services Agreements and Insurance Requirements"; Mr. *Neil Hosenball:* "Insurance Issues and Concerns".

The proceedings were opened by Mr. *Enrico Randone,* President and Managing Director of Assicurazioni Generali, by Mr. *Eugenio Coppola,* Managing Director, and by Mr. *Camillo Giussani,* Director General, of Assicurazioni Generali, followed by the addresses of Mr. *Remo Gaspari,* Minister of Post and Telecommunications Services, and Mr. *Pierluigi Romita,* Minister of Scientific Research.

Particular emphasis has been given to the legal aspects of space utilization by private operators, to the liability imposed on the aerospace manufacturers and finally to NASA's insurance requirements for commercial activities involving the space transportation system.

It has been unanimously recognized that the service of the international insurance industry has become essential to the future development of commercial activities in space.

Dr. Benito Pagnanelli
Head of Aviation and Space Risks
Department, Assicurazione
Generali, Italy

5. Panel Discussion on "Remote Sensing," International Studies Association Meeting, Mexico City, April 8, 1983

On April 8, 1983, a panel discussion on remote sensing took place at the 24th annual meeting of the International Studies Association held in Mexico City. Entitled "Principles Relating to Remote Sensing of the Earth, its Natural Resources, and its Environment," and organized by Professor *Carl Q. Christol* of the University of Southern California, papers were written by Professor *Christol,* by *Dr. David S. Myers* of the University of West Florida, and by *Dr. Irwin M. Pikus,* Director, Planning and Policy Analysis Division, National Science Foundation. All participated in their individual capacities.

Professor *Christol's* paper, which was summarized by Professor *Peter H. Rohn* of the University of Washington, who chaired the panel in the absence of Professor *Christol,* was entitled "Mexican Contributions to the Development of Principles Relating to Remote Sensing of the Earth, its Natural Resources, and its Environment." Professor *Myers* contribution was entitled "Remote Sensing and National Sovereignty over Natural Resources: Assessment of the Mexican View." *Dr. Pikus'* paper was entitled "Principles for Remote Sensing of the Natural Resources and Environment of Earth from Space: Underlying Objectives." Serving as discussants on the panel were Professor *Rohn* and Ms. *Franke Synder,* a graduate student in the Department of Government and Politics, University of Maryland.

The papers of the panelists took account of the fact that great benefits can be derived from remote sensing, but that earth-based sensees had expressed concerns over the diminution of their privacy and the possible threat to their security. All of the papers indicated that existing international law, and in particular the 1967 Principles Treaty, imposed limitations on remote sensing.

Professor *Christol's* paper traced the interest of major Latin-American States in securing an agreed set of principles to regulate remote sensing at COPUOS. While Argentina was the first to offer a specific proposal in 1970, this led in 1974 to a joint proposal by Argentina, Brazil, Chile, Mexico, and Venezuela. In his view, by the time Mexico submitted in 1981 its set of 17 principles, the basic principle that remote sensing was permissible in international law had already been established. However, because these five States placed much emphasis on the resolutions of the UN General Assembly

calling for permanent sovereignty over natural resources, there is a need to clarify the conditions and circumstances in which the primary data and analyzed information obtained by and from sensing are to be made generally available. He analyzed the differences between the Mexican proposal and those that had been under consideration prior to 1981. He concluded that the underlying theme of the 1981 Mexican proposal was that constraints ought to be imposed on the sensing activities of States so that sensed States would not be prejudiced by the disclosure of materials obtained through the sensing process.

In his assessment of the Mexican view on remote sensing Professor *Myers* examined both legal and political perspectives. Under the first heading he concluded that remote sensing is permissible under international law, that Mexico no longer insists that a sensed State should give prior consent to a sensing State, but rather seeks acceptance of a principle calling for advance notification, and that national sovereignty constitutes a basis for asserting that a sensed State possesses the right to control dissemination of information or results and conclusions so obtained. The Mexican proposal requires the prior approval of the sensed State for such dissemination.

Professor *Myers,* in dealing with the political outlooks of Mexico, identified the basic motivations underlying the 1981 set of principles. In this portion of his paper he examined the role of Mexico in the Third World and Mexico's particular relations with the United States. Examined here were the efforts to create a New International Economic Order and the controversy surrounding the terms of the Charter of Economic Rights and Duties of States. A connection was seen between the past efforts of metropolitan States to exploit the resources of their colonies and the exploitation by the advanced States of the resources of the less developed countries. He expressed the view that "it is difficult at best to legislate new international legal rules where technology has advanced beyond the capability of states to restrict it."

Dr. Pikus introduced his paper by referring to the practical benefits derivable from sensing, to the enlarging involvement in sensing activities by advanced States, to the fears identified with purported invasions of national "privacy," and the existence of unsupported allegations of detriments flowing from sensing. He analyzed the proposition that there was a present need for the formation of a set of principles, and concluded that principles could serve three basic objectives; namely, to identify specific threats to national interests and to suggest ways to avoid them or to deal with their effects, to encourage the realizing of benefits from remote sensing, and to achieve improved international relations through cooperation in remote sensing activities.

He then examined from a policy perspective the benefits or detriments that would depend on agreement relating to (1) the mandatory or voluntary nature of the principles, (2) definitions, (3) scope, (4) rights and interests of developing countries, (5) relation to other elements of international law, and (6) public and private aspects of sensed data. On the subject of possible injuries he urged that "instead of trying to imagine specific injuries that might or might not occur, provisions should be designed to deal with injuries if and when they do occur." Dispute resolving processes were contemplated.

Carl Q. Christol
Professor of International
Law and Political Science,
University of Southern California

6. Symposium on "Air, Space and Law," Paris, April 14 and 15, 1983

A Colloquium organized by "la Societe Française de Droit Aérien et Spatial" (the French Air and Space Law Society) on the theme "Air, Space and Law" took place in Paris on 14th and 15th April 1983.

In opening the Colloquium, the President of the Society Mr. *Edmond Braure* and Honorary President *Mr. Eugène Pépin* joined in paying tribute to the recently deceased *André Garnault* one of the impressive personalities of French air law who had served as a Paris Court of Appeals barrister, Air France barrister and former President of the French Air and Space Society. Divided into three sessions, the proceedings dealt with the comparative assessment of the development of space law and air law, the rapid build-up of contract law related to space activity and the emergence of a law for private space activity.

The lively debate which revolved around statements made by the speakers enabled three major characteristics to be identified. First, space law has emerged as essentially "composite" in nature; already endowed with a firm maturity and soundly defined, despite the increasing public-private separation due to the unyielding state hold. The composite nature of space law was clearly brought out in the statements of several speakers - specific and non specific aspects of other branches of international law have merged to shape it as we know it today. The originality of space law is indisputable. The great principles of space law, such as freedom of exploration and use of outer space, or the rule of nonappropriation of space, as pointed out by Professor *Vladimir Kopal,* Deputy Director of the United Nations Space Division, were sufficient to demonstrate this point. The specificity of the international space regulations is particularly marked vis-a-vis air law. This aspect was clearly brought out by Madame *Diederiks-Verschoor,* President of the International Institute of Space Law. Legal instruments applicable to the rescue and return of astronauts seemed to have noticeably more scope than in air law, a leading role in this area having notably been given to the Secretary General of the United Nations. Divergences are particularly marked in relation to responsibility for damages in space law, where the inability of the individual to go to court and the absence of responsibility of the space transporter, are regretable. Madame *Diederiks-Verschoor* proposed the elaboration of a new international convention for this purpose, based on the Warsaw Convention model and within the purview of the principle of absolute responsibility toward space shuttle users.

Many other differences with air law were underlined by several speakers. For Professor *Du Pontavice,* Professor of the University of Paris II and Professor *Colliard,* Dean of the Law Faculty at the University of Paris I, this was a question of legal philosophy. Air law was described by the former as a law of sovereignty, Malthusianism and sterility, while space law was described by the latter as a law of freedom where physical weightlessness corresponded to legal freedom. The legal link between space law and air law was challenged whereas the link with the high sea regime is evident. Moreover, the inspiration of certain solutions in atomic energy law regarding responsibility are desirable.

Space law is also a composite on another front, insofar as it now combines rules of public international law with the new regulations of private space law. It is the second aspect which leads to observing the recently acquired but firm maturity of space law. On the technical level. Professor *Kopal* clearly underlined that today not only do we have to

survive but must live and work in space. From a negative aspect, the relative aging shows itself in the very serious difficulties which beset negotiations on subjects debated for several years within the United Nations Space Committee: international direct television, the geostationary satellite orbit, space delimitation, remote sensing, etc. After the consensual establishment of the great principles marking the early years of space exploration, there followed a difficult period characterised by "earthly" fall-out from space and aggravated by bipolar ideology (one could equally say triangular ideological confrontation: East-West-South). The cause of confrontation lies in the incompatible sharing of space exploration benefits. This point was made by Professor *Nicolas Mateesco Matte,* Director of the Institute of Air and Space Law, McGill University, Montreal.

The most striking sign, however, of this phenomena of accelerated maturity, is the appearance of an actual Private Space Law brought about by the progressive appearance of private bodies during the development of space exploitation facilities. Mr. *Gilbert Guillaume,* Director of Legal Affairs at the University of External Relations summed up this tendency very well by describing the transition from an interstate law to a private law. One of the important merits of this Colloquium is to have brought together under the Presidency of Mr. *Legrez,* Court Barrister, several space lawyers who revealed the legal richness of space contracts, whether industrial, launching (statement from Dr. *Iserland,* Deputy Managing Director of ARIANESPACE), or insurance (Mr. *Clerc,* Director of "La Reunion Aérienne"). The lawyers also discussed the important progress in intellectual property rights, the real motivator of private investments in space (statement from Mr. *Mossinghoff* presented by Dr. *Quigg,* U.S. Patent Office, Department of Commerce). These statements have shown an ambiguity, as underlined by Dean *Colliard,* related to the phenomena and the concept itself of privatised space activities. As Professor *Nicolas Mateesco Matte* also indicated, one cannot separate public law from private law in space. The privatisation of space activities is not a conflict between the state and free enterprise but on the contrary, is subject to close and necessary collaboration between the two entities.

This unyielding state hold constitutes the third salient impression of these two days. The State, even within a privatisation process, appears like the *ultima ratio* for reasons which are at one and the same time historical, economic, legal and political. Mr. *Roy Gibson,* former Director General of the European Space Agency, recalled that in the United States as well as in the Soviet Union and in Europe, space activities started through state initiative. Today, rather than a separation, very close collaboration exists between state and private bodies. The appearance of private firms is often, as in Europe, only a mask for the public body which, through affiliation or financial participation is able to control the private activity. In view of this hypothesis it is more justified to speak of activities of an industrial or commercial nature than to use the term Private activities. On the financial level, the State, often remains the necessary refuge faced with the massiveness of research and development costs as with the risks that space insurance does not seem to be able to assume completely. On the purely legal plane, private space law remains conditioned by public law for the fundamental reason that the launching state retains control of all national space activities whether they are undertaken by public or private bodies. Finally, on the political plane it is quite apparent that private enterprise can only make progress in directions previously recognised and defined by the state. Today state appetites are sufficiently whetted to open up great prospects for companies.

It is not surprising that one of the safest prospects for a company is to participate in the enormous effort expended by the United States and the Soviet Union in the field of the military utilization of space. As noted by Monsieur *Alexandre Carnelutti,* Counselor to the Ministry of External Relations, the military space budgets represent 60 to 70% of the overall American and Soviet Space budgets. It is a domain which remains under exclusive State control.

At the end of this very complete tour of the horizon Monsieur *Michel Bourély,* Vice-President of the French Air and Space Law Society, closed the symposium. Three quite contradictory phenomena were observed. The first is the strong affirmation of the 1967 Space Treaty regulations, The regulations can be considered as an essential standard of the international law of *jus cogens,* applicable to all States including those who were not party to the 1967 Treaty. The second phenomenon is the delay of space law codification processes in a degraded international climate, the conflicting claims of the players in the international space community and the increasing concern about the acceleration of the space armaments race. Finally, there is the growing wealth of solutions which private space law has to produce. Of course the legal solutions will not be completely new. Undoubtedly this law will have to be "a law originating on earth and returning there" in the same way as the activities which it controls. Nevertheless private space law like public space law will not be a simple extension of its earthly metropolis. It is hoped that in the future its constructional ingenuity will not only satisfy its authors but also the humanism which animated the 1967 Treaty writers and which is put to a severe test. It is hoped also that it will permit the inspiration of inventive legal solutions which are still critically lacking on our planet.

*Olivier de Saint-Lager**
Centre National D'Etudes Spatiales
Paris, France

*Unedited translation provided by M.E. Leniston.

7. Session on "Space Telecommunications—Issues and Policies," American Society of International Law Washington, D.C., April 15, 1983.

"Space Telecommunications—Issues and Policies" was the theme of a panel discussion during the annual meeting of the American Society of International Law in Washington, D.C. on April 15, 1983. The event was cosponsored by the Association of the U.S. Members of the International Institute of Space Law (IISL) and the American Branch of the International Law Association. It was organized and chaired by Professor *Stephen Gorove* of the University of Mississippi Law Center. Among the panelists were *N. Jasentuiliyana,* Deputy Chief of the Outer Space Affairs Division of the United Nations Secretariat, *Samuel Probst,* of the Systematics General Corporation and *Ronald F. Stowe,* Director of Government and International Affairs for Satellite Business Systems. Commentators included *Bert Cowlan,* consultant in telecommunications, *Eilene Galloway,* Honorary Director of IISL and *David H. Small,* Assistant Legal Adviser for Economic and Business Affairs in the Department of State. *Nancy Kellner* of Washington, D.C. served as rapporteur.

In his introduction Professor Gorove noted the revolutionary advances in telecommunications technology and reviewed briefly some of the recent legal developments in space telecommunications, including actions taken by the U.N. regarding direct television broadcasting by satellites and measures taken by the 1982 International Telecommunication Union Plenipotentiary Conference in Nairobi. Following this general setting Mr. *Jasentuliyana* dwelt at length on "The United Nations and Space Telecommunication", whereas Mr. Probst focused on the "Implications of the Nairobi ITU Plenipotentiary Conference", while Mr. Stowe addressed the topic "WARC '85 - Implications for the Use of the Geostationary Orbit" (read in absentia).

Lively discussion and questions followed the presentations not only on the part of the commentators but of the audience as well. A brief business meeting of the Association of the U.S. Members of the IISL was held immediately after the session.

The Session on "Space Telecommunications—Issues and Policies" was recorded and the tapes may be ordered through the American Society of International Law, 2223 Massachusetts Ave. N.W. Washington, D.C. 20008. The session presentations and discussions are also expected to be published in the annual Proceedings of the American Society of International Law.

Stephen Gorove
Session Chairman,
American Society of International
Law 1983 Annual Meeting

8. Conference on "Space Manufacturing", Princeton University, May 9-19, 1983.

The Sixth Princeton University Conference on "Space Manufacturing" was held on May 9-19, 1983, under the general chairmanship of Professor Gerard K. O'Neill. It was cosponsored by the Space Studies Institute of Princeton University and the American Astronautical Society.

The presentations and subsequent discussions dealt with developments relating to "Biomedical and Social Sciences", "Space Stations and Habitats", "Manufacturing", "International Legal Considerations", "Materials Resources and Processing", "Accelerators and Asteroids" and "Economics". The conclusions in each of the subject areas were summerized during the last day of the conference.

The session on "International Legal Considerations" was chaired by *Irwin Pikus* of the National Science Foundation. Presentations were made by *S. Neil Hosenball,* General Counsel of NASA, on "Space Law: Current Status and Issues": Prof. *Stephen Gorove,* University of Mississippi Law Center, on "Major Concerns of Private Enterprise Regarding Recent Developments in Space Law"; *Kenneth Pedersen,* NASA International Affairs Division, on "International Cooperation: Government Perspectives" (read by *James Morrison*); *Diana H. Josephson,* American Scientific and Technical Corporation, on "International Cooperation: Private Sector Opportunities and Needs", *Gordon Law,* Office of Technology Assessment, on "UNISPACE 82: The International Context"; *Martin Rothblatt,* Associate, Schnader, Harrison, Segal and Lewis, on "A Legal Charter for Nongovernmental Space Industrialization"; and *Guy*

Pignolet, Centre National D'Etudes Spatiales, on "Making the High Frontier Highly Visible with a Solar Sale Race to the Moon".

The three-day conference provided a unique opportunity for scientists, engineers, lawyers and other social scientists as well as government experts to exchange views and learn about progress and problems in areas related to, but different from, their fields of interests.

The conference proceedings are expected to be published in a forthcoming volume of the American Astronautical Society.

Stephen Gorove
President, Association of the
U.S. Members of IISL

9. Session on "Commercial Activity in Space", Second National Institute in Litigation in Aviation and Space Law Washington, D.C., May 26-28.

A session on "Commercial Activity in Space" was held on May 27, 1983 during the Second National Institute on Litigation in Aviation and Space Law of the American Bar Association in Washington, D.C. The Institute was sponsored by the Torts and Insurance Practice Section and the Committee on Aviation and Space Law of the American Bar Association and the Program Planning Committee consisted of *George N. Tompkins, Jr.,* Chairman, of New York City, *John J. Kennelly,* of Chicago and *Cecile S. Hatfield,* of Washington, D.C.

The Session on "Commercial Activity in Space" was chaired by Cecile S. Hatfield and the speakers included *S. Neil Hosenball,* General Counsel of NASA, on "The Law Applicable to the Use of Space For Commercial Activities and Progress for the Future," Prof. *Stephen Gorove,* of the University of Mississippi Law Center, on "Liabilities Arising From the Commercial Uses of Space," *Ronald F. Stowe,* of Satellite Business Systems, on "Contractual Arrangements," and *A. H. Bolton,* of the Aviation Division of C.T. Bowring & Co. Ltd., London, on "Insuring Commercial Space Activities."

The program was very well received and attended by about 300 practicing attorneys.

Stephen Gorove
President, Ass'n of the
U.S. Members of the IISL

10. Program on "International Manned Space Flight", U.N. Dag Hammarskjold Auditorium, June 21, 1983.

The Association of the United States Members of the International Institute of Space Law in cooperation with the International Astronautical Federation (IAF) sponsored an informal program on "International Manned Space Flight on June 21, 1983 during the UNCOPUOS session." The program was organized and moderated by the President of the Association, Professor *Stephen Gorove* of the University of Mississippi Law Center.

Among the speakers were: *Jerry Grey,* Vice-president of IAF: *Kenneth Pedersen,* Director of International Affairs of NASA: *Y.S. Rajan,* Head of the Indian Delegation to UNCOPUOS; and *V.S. Vereshchetin,* Vice-Chairman of Intercosmos and Deputy-Director of the Institute of State and Law, USSR Academy of Sciences.

The presentations included two films on the U.S. and Soviet space programs, addressed the nature and meaning of international manned space flight and touched upon issues of potential interest to UNCOPUOS.

The program was well received by UNCOPUOS delegates and evoked many interesting questions and answers both by the speakers and those in attendance.

Stephen Gorove
President, Association of the
U.S. Members of IISL

11. Activities of the Legal Implications Subcommittee of the FCC Space WARC Advisory Committee, Washington, D.C.

At the 1979 General World Administrative Radio Conference the ITU membership passed Resolution 3 (BP), which states "that a world administrative radio conference shall be convened not later than 1984 to guarantee in practice for all countries equitable access to the geostationary-satellite orbit and the frequency bands allocated to the space services." This conference was subsequently rescheduled for July 1985. In an unclassified joint Department of State, National Telecommunications and Information Administration and Federal Communications Commission memorandum of January, 1982, this conference, informally called the Space WARC, was declared to be "by far the most important and comprehensive conference ever to affect space telecommunications." Accordingly, a National Preparatory Program was established to assure the United States would be well prepared for the many complex issues the Space WARC raises.

The National Preparatory Program recognizes the importance of the legal aspects of the Space WARC. In particular, the National Preparatory Program includes an FCC Space WARC Advisory Committee to provide the government with nongovernmental input as to the legal, and other, implications of guaranteeing in practice for all countries equitable access to the geostationary orbit and associated space service frequency bands. Within the FCC Space WARC Advisory Committee, which is chaired by Mr. *Steven Doyle* of Aerojet Liquid Rocket Company, analysis of legal issues is the responsibility of a Working Group on Legal, Institutional and Political Interests. This Working Group is chaired by Mr. *Ronald Stowe* of Satellite Business Systems. A Legal Implications Subcommittee was established within Mr. Stowe's Working Group.

The Legal Implications Subcommittee is charged with identifying all domestic and international law relevant to the Space WARC, assessing the relationship between this body of law and various methods of meeting the mandate of Resolution 3 (BP), and, as appropriate, making recommendations for new legislation. The work of the Legal Implications Subcommittee is available to the public in the FCC's General Docket File No. 80-741.

The Legal Implications Subcommittee has generated 32 documents between March 1982 and May 1983. These documents have identified a wide body of international and domestic law and policy relevant to the Space WARC and have also comparatively assessed the legal implications of twelve different methods of coordinating access to the orbit/spectrum resource. The documents have been submitted by leading academicians and private industry experts on satellite communications law and policy. The work of the Legal Implications Subcommittee has particularly benefited from the participation of several experts with considerable experience in geostationary orbit matters, including *Dr. Carl Christol,* Mrs. *Eilene Galloway,* Dr. *Stephen Gorove, Mr. Neil Hosenball, Gen. Martin Menter* and *Mr. Samuel Probst.* The work of the Legal Implications Subcommittee has also been significantly facilitated by the liaison efforts of *Mr. Thomas Tycz* and *Mr. A. M. Rutkowski,* both of the FCC's Office of Science and Technology.

The Legal Implications Subcommittee is presently (May 1983) analyzing in detail the impact of various forms of *a prior* and *posteriori* orbit/spectrum management methods on the fundamental U.S. satellite communications policy known as "open entry." Included in this assessment are the relative legal implications of managing access on global, regional and sub-regional bases. The Legal Implications Subcommittee is also devoting careful attention to the impact of the new International Telecommunication Convention (Nairobi, 1982) upon the body of law governing equitable access to space communications.

Final conclusions on the legal implications of the Space WARC, from the perspective of non-governmental entities, will be reached towards the end of 1983. At that time the FCC will issue a formal Notice of Inquiry requesting public comment on these and other conclusions of the Space WARC Advisory Committee. The entire process of analyzing the legal implications of the Space WARC may be fairly characterized as comprehensive and public. This process certainly inures to the benefit of the United States since it permits all points of view to be addressed and thereby facilitiates optimum preparation for negotiating the future status of the orbit/spectrum resource.

Martin A. Rothblatt
Chairman, Legal Implications Subcommittee,
FCC Space WARC Advisory Committee

12. IISL Program on "Space Legal Problems at the Turn of the Century," U.N. Dag Hammarskjold Auditorium, March 24, 1983.

The International Institute of Space Law (IISL) sponsored a program on "Space Legal Problems at the Turn of the Century," March 24, 1983, in the U.N. Dag Hammarskjold Auditorium. The program was organized by Dr. *Martin Menter,* Vice President of IISL and opened by Prof. Dr. *Diederiks-Verschoor,* President of IISL. The speakers included *Dr. George E. Mueller,* President of the International Academy of Astronautics (IAF) and President of System Development Corporation (USA); *Prof. Dr. Karl-Heinz Böckstiegel,* Director of the Institute of Air and Space Law, Cologne University (Federal Republic of Germany); and *Prof. Dr. Bozidar Bakotic,* of the Faculty of Law, University of Zagreb (Jugoslavia.)

The program was very successful and well attended by delegates to the UNCOPUOS Legal Subcommittee session and many IISL members. The presentations made by the speakers are expected to be published in the Proceedings of the next IISL Coloquium.

Martin Menter
Vice President, IISL

13. Other Events

The 29th Anniversary of the American Astronautical Society took place in Houston, Texas, on October 25-27, 1982. Its theme was "Developing the Space Frontier".

A Symposium on "Private and Public Models for the Development of Outer Space" was held at Wake Forest Law School on April 8, 1983. The panelists were Marvin Robinson, George S. Robinson and Arthur Dula, and the moderator was Prof. Hamilton DeSaussure.

The Third Bienniel Communications Law Symposium on "International Satellite Television was presented by the International Bar Association and the University of California (L.A.) in Los Angeles, March 4-5, 1983.

14. Brief News

Sally Ride is the first American woman astronaut. . . 1,000 delegates from 147 countries attended the Plenipotentiary Conference of the International Telecommunications Union in Nairobi, Kenya, in the fall of 1982, which resulted in the signing of a new International Telecommunication Convention. . . The Regional Administrative Radio Conference meeting June 13 - July 15, 1983 in Geneva is to plan the broadcasting-satellite service for Region 2. . . The first session of the World Administrative Radio Conference on the use of the Geostationary-Satellite Orbit and the planning of the space services utilizing it is scheduled for June-August, 1985. . . In December 1985 ARIANE is expected to launch the first domestic direct-broadcast TV satellite owned by Satellite Television Corporation, a COMSAT subsidiary. . . The first domestic communication satellite system in Latin America connecting Brazilian cities and villages will become operational in 1985. . . ESA has awarded a contract to British Aerospace Space and Communication Division for a deep-space probe which is expected to pass within 500 kilometers of Haley's Comet in March, 1986. . .A new daylight savings time proposed by NASA scientists involves sixteen mirrors orbiting Earth to reflect sunlight to illuminate cities at night to conserve energy. . . In August, 1988, the Galileo Probe will pass through the atmosphere of Jupiter to transmit information about the planet.

B. Forthcoming Events

As reported in the previous issue of the Journal, the 1983 IISL Colloquium will be held in Budapest, Hungary, Oct. 9-15 during the IAF Congress. The theme will be "International Cooperation in Space" and the subjects to be discussed will be: Telecommunication and the Geostationary Orbit; Interrelationships Between Air and Space Law; Responsibility for Space Activities; and Legal Aspects of International Cooperation in Space.

The International Show of Techniques and Energies of the Future (SITEF) is expected to hold Colloquia on "Telecommunications" and "Space in the Service of Man" on Oct. 19-21, 1983, in Toulouse, France.

Televent USA expects to sponsor its second International Telecommunications Conference in Montreaux, Switzerland, Oct. 23-25, 1983.

The Modern International Law of Outer Space by Carl Q. Christol, Pergamon Press, Inc., 1982, pp. 932.

This comprehensive volume on the international law developed for outer space activities during the 25 years since the first satellite was orbited, is definitive and timely for both the legal and political science professions. Sufficient time had elapsed to afford the author a perspective on the process and substance whereby space law was formulated into a new branch of international law. The rapid development of space science and technology, and its beneficial application to functions required by society, ensured continuous attention to legal issues which the author has analyzed in terms of pending and emerging questions.

The book is presented in 15 chapters beginning with an introduction which emphasizes the requirement of factual knowledge concerning space science and technology as a basis for formulating principles, rules and regulations for space activities designed to foster peaceful uses. There are chapters on each of the five space treaties formulated by the UN Committee on the Peaceful Uses of Outer Space and its Legal Subcommittee, all with conclusions analyzing accomplishments and posing questions for further expansion of legal principles to govern space activities for peaceful purposes. The concluding analyses enable the reader to make a quick review of what has been accomplished, what remains to be undertaken, and raises questions likely to elicit group discussions.

The major subjects now comprising an agenda for developing international outer space law are set forth in succeeding chapters on a legal regime for natural resources, the definition/delimitation of outer space and use of the geostationary orbit, the International Telecommunication Union and the orbit/spectrum resource, direct broadcast satellites, remote sensing, use of nuclear power sources, and space transportation systems.

In his concluding chapter, the author points out that "The modern international law of outer space is serving the interests, values, wants, and needs of the world community at this moment in history. It is alive to the important issues of the time. Its capacity for growth has been well demonstrated. . .The existing law is by no means the final law for the space environment."

Students of this subject will find particularly useful the appendices: the texts of the space treaties, the Bogota declaration, White House policy statements, nations that ratified the space treaties and ITU Conventions. There is a detailed subject index. In addition to its usefulness to political decision makers, this volume fills the need for a textbook for seminars in international law and foreign relations.

Professor Christol's scholarly volume is a testament to his analytical study of the formulation of international law for outer space and provides the foundation for its future development.

Eilene Galloway
Honorary Director, IISL

The International Telecommunication Union in a Changing World, by George A. Codding, Jr. and Anthony M. Rutkowski (Dedham, MA. Artech House, Inc. 1982) pp. 414. $38.00.

This book thoroughly analyzes the ITU in terms of its efforts to meet the challenges of changing technology, the changing demands of nations, and the changing international political climate. In the first section the authors trace the history of the ITU and detail the evolution of its organization, aims, and methods as telecommunications technology advanced from the telegraph to the space satellite.

The second section examines the decision-making processes of the ITU, covering the roles of conferences, the two consultative committees, the Interational Frequency Registration Board, the Administrative Council, and the Secretariat. The important problem of finances is also discussed.

In the third section a critical analysis is made of the tasks performed by the ITU for its membership including basic arrangements, telecommunications regulations and standards, frequency management, development assistance, and the information function. The needs of both the older developed nation minority and the new, less developed majority are reviewed.

The final section evaluates the performance of the ITU in light of the manpower and financial support that it utilizes to fulfill its functions. The future developments of telecommunications technology are explored as well as the corresponding services that the ITU might be expected to render. The authors also include suggestions for improving the structure and methods of operation of the ITU. Detailed annexes give a diagram of the ITU's organizational structure, list of members, and participation in working groups.

Outer Space In International Law, Andrzej Gorbiel, (Acta Universitatis Lodziensis, Politologia 8, Uniwersytet Lodzki, 1981), pp. 175.

The work consists of what the author describes as a monographical presentation and analysis of those areas and aspects of activities in space which the author believes to be most essential in the application of international law to space exploration. The book is organized into six chapters, each dealing with a separate area of inquiry and analysis. The author has provided a 35 page bibliography of what he considers the most important works dealing with international law as applied to outer space. Included as an appendix, the author has prepared a resume of the substance of each chapter.

The first chapter presents an historical development of the basis for the regulation of outer space through international law. Early attempts to define and regulate outer space through such civil law concepts, as *res nullius,* are seen as inadequate to explain or regulate the legal status of outer space. The adherent of civil law concepts failed to appreciate the basic differences in "relations occurring between the subjects of the private law and the relations occurring between the sovereign states as subjects of the law of nations". As outer space and the celestial bodies are unique, their legal status must be *sui generis.* The author suggests that this legal status is established by the Outer Space Treaty of 1967 (and its expansion by subsequent agreements) and the "universally recognized norms of the customary laws of nations". The guiding principles of this

international legal status are the freedom of access and exploration and the nonappropriation of outer space.

In the second chapter, the author explores the rights of sovereignty over terrestrial objects launched into space. While the established principle of nonappropriation of outer space suggests a preclusion of a state's extension of its sovereignty over space (or celestial bodies), it does not preclude the exercise of certain sovereignty in space. The exercise of sovereignty over objects in space is indispensable to the practical realization of the freedom of access and exploration of outer space. Thus, some sovereignty must be retained over launched objects (whether these space objects are vehicles, astronauts, or space stations) subject to the least infringement upon the rights of others in space.

The scope of admissible exploration and use of outer space is discussed in the third chapter. Specifically, the author discusses remote sensing of the earth, direct t.v. broadcasting, and the use of nuclear power sources in space. The author takes the position that the "common benefit and interests" provision of article I of the '67 Outer Space Treaty manifests more than an intent to realize "universally tangible" benefits. Rather, it is a binding legal norm governing the conduct of signatory states. Remote sensing of the earth and direct t.v. broadcasting are two areas where the application of the article I provision is immediately relevant. The conflicting views and interpretations of article I's application to these areas is unresolved and in need of further clarification. As for the use of nuclear power sources, the author takes the position that there use is in compliance with the prohibition against the use of nuclear weapons contained in the Outer Space Treaty. Moreover, practical necessity makes their use indispensable to the exploration of space. Regarding nuclear power sources, the only present need is to delineate and elaborate legal provisions concerning the assistance to be provided by a launching state to those states to be affected by the re-entry damage caused by such power sources. Any more would deny priority to more pressing concerns such as the "legal implication" of remote sensing, direct t.v. broadcasting, and delimitation of outer space.

Chapter four continues the problem explored in three, focusing on the scope of allowable exploration and use of celestial bodies. The author accepts the broad view of celestial bodies as "all astronomical objects or forms of matter existing in space, the exploitation of which by any single state would make their use by other states impossible". In conjunction with the discussion of celestial bodies, the author examines the controversy surrounding the Moon Treaty's article 11 "common heritage" provision. The author accepts the critical approach, labeling the provision "inexact" and "lacking legal sense", arguing that the provision applies a civil law concept of private relationships to a public international relationship. The concept, as incorporated in the Moon Treaty remains, and can be expected to prevent many states from signing the treaty or else to force them to ratify the treaty with reservations as to the "normative essence of the article. As for space stations situated on celestial bodies, the author takes the position that practicalities require the retention of some sovereignty over such facilities. This practical approach is essential to the realization of the freedom of access to outer space and its celestial bodies.

If there exists the freedom of access to outer space, it becomes essential to determine where the air space of an individual state ends and outer space begins. Chapter five deals with the delimitation of outer space. The various attempts to define the boundaries of space are examined. While most proposed formulas take into account

only one criterion in making the determination, it is argued that all essential factors must be considered. Following this approach, the author suggests that 100 kilometers above sea level should mark the edge of space.

The subject of the geostationary orbit is important for two reasons. First, it is generally the most preferred for satellite communications. Second, the number of satellites that can be placed in the geostationary orbit without mutual interference is severely limited. Because of these factors, there are claims being made by certain equatorial states to ownership of positions of the geostationary orbit. These theories of ownership are examined in chapter six. However, as the orbit is clearly within outer space the freedom of access to space precludes such claims from being recognized.

High Frontier: A New National Strategy, by Lt. Gen. Daniel O. Graham, U.S.A.F. (Ret.) (Washington: High Frontier, 1982),pp. 175, $15.00.

In this book a team of scientists, space engineers, strategists and economists makes recommendations for a new strategy for the United States. High Frontier is a privately funded organization of the Heritage Foundation, a group which seeks to use U.S. space and surface technology to solve problems presently confronting the United States.

The author, in response to the envisioned Soviet challenge, recommends a move away from the policy of Mutual Assured Destruction (MAD) and a move toward a strategy of assured survival. The information in this work not only includes military strategy, spaceborne defenses, and survivability but delves into risks, non-military dimensions, space industrialization and the ever-present cost factor.

Present technology would assure an effective defense of the United States through a "layered" system of spaceborne weapons. These missiles would assure survivability by effectively intercepting the bulk of only hostile missiles launched against the U.S. Other weapons-systems would be directed against unfriendly objects in near-earth orbits. These systems can be missiles as well as laser oriented defense beams. The last of these projects would be fiscally unobjectionable, says this study, because it would be a mere transferral of the same funds which would normally be used to build up present surface systems.

The study calls for re-examination of the present anti-ballistic missile (ABM) Treaty and an eventual withdrawal from it. This, it is said, can be accomplished by invoking one of the clauses to the agreement. The High Frontier does encourage cooperation and cost sharing between the United States and other Free World countries and the reader is assured that strict regulation of the technology would prevent its transferral to the Soviet Union. High Frontier is, however, quick to criticize any proposed international space legal systems; these are viewed as detrimental to U.S. economic interests.

This work provides stimulating information for those interested in just how far our technology can reach in protecting us. Although it may be seen as premature, there is no doubt that these issues will have to be resolved eventually.

Outer Space - A New Dimension of the Arms Race, edited by Bhupendra Jasani (Stockholm International Peace Research Institute, 1982), pp. 423.

This book was edited by Bhupendra Jasani, a research fellow at the Stockholm International Peace Research Institute. It contains the papers presented at the Symposium which took place in Stockholm in November of 1981 and focuses on the arms race and its extension into outer space. Preceding the papers is an introductory section by Mr. Jasani which provides an overview of the issues covered by the symposium papers. This section includes such topics as basic orbital concepts, space transportation vehicles, reconnaissance satellites, communications satellites, navigation satellites, meteorological satellites, geodetic satellites, military use of manned spaceflights, anti-satellite systems, nuclear war doctrines, satellites for crisis monitoring, international verification of disarmament agreements, and an ASAT Treaty.

The second part of the book contains 15 papers which deal with such topics as identification of military components within the Soviet space programme, system aspects in military satellite communications, image analysis and sensor technology for satellite monitoring, the prospects for beam weapons, the usefulness of an ASAT treaty, and the feasibility of banning military use of outer space.

The authors of one paper suggest the creation of an international satellite-monitoring agency for the purpose of verifying compliance with arms control and disarmament agreements, as well as for the monitoring of crisis areas. There is not a provision in international law that prohibits the creation of an international governmental agency for satellite monitoring, as long as the agency would not interfere in the internal affairs of states and would follow the operational rules established by the international community.

It is submitted by one symposium contributor that the establishment of a special forum composed of representatives of the bodies concerned with stopping the militarization of outer space is needed. This forum would be created within the framework of the United Nations.

The appendices include compilations of photographic and electronic reconnaissance satellites launched between 1977 and 1981 as well as other types of satellites launched during this period of time. Also included is an appendix of six treaties which contain provisions aimed at some form of arms control in space. This book is informative and useful to the reader interested in space disarmament.

Space In The 1980's and Beyond: 17th European Space Symposium, edited by Peter M. Bainum (American Astronautical Society, Science and Technology Series, Vol. 53, San Diego: Univelt, Inc. 1981), pp. 292.

This work is compiled from papers presented at the 17th European Space Symposium held in London, England, in June, 1980. It includes topics on a Long-term Space Program for Europe; Space Communications; Space Transportation; Space Applications; Space Technology; and Lunar and Planetary exploration.

Papers devoted to a Long-Term Space Program for Europe present realistic goals for the next half-century. The European Space Agency proposes, among other things, in-space surveillance of the Comet Encke, the establishment of a large radio-astronomy

antenna, and a mission to the planet Mars—most likely in cooperation with the United States. These projects may be hindered by economic and political considerations and one author questions whether European solidarity will continue to exist so that these projects can be realized. Other questions presented include the age old cost-benefit analysis where possible investment return is balanced with the more austere pure science research. The European Space Agency, one author states, is also presented with competition in the form of the American Space Shuttle.

While these economic and political questions are presented, the bulk of this work is devoted to the purely scientific endeavor. Such programs as oxygen extraction from the terrain and atmosphere of Mars are extensively surveyed.

This book is written for the technically minded but an interested layman would encounter little difficulty in understanding most of this information. Numerous illustrations also add to this volume's usefulness.

Global Talk, by J. N. Pelton (Alphen aan den Rijn: Sijthoff & Noordhoff International Publishers, B.V., 1981) pp. 344. Paper Dfl. $13.00; Cloth Dfl. $25.50.

The author states that the theme of this book "is to examine what communication and information technology, coupled with space and energy research, will mean for the future."

After a brief sketch of the past, the author focuses with much speculation on future developments such as space station future telecommunication, new energy technologies, humanized telecities for the 21st Century and a global electronic village. Additionally, some electronic and technical profile of the United States, the U.S.S.R., the United Kingdom, France and the Federal Republic of Germany are included, along with some speculation as to the prospects of developing countries.

The author touches upon the role of the World Administrative Radio Conference (WARC), the International Telecommunication Satellite Organization (INTELSAT) and the International Telecommunication Union (ITU). It should be noted that the publication of this work was prior to the 1982 Nairobi Plenipotentiary Conference.

The book is not scholarly nor is it well documented or footnoted. However, the appendices on Satellite and Cable Systems of the World and Trends in International Satellite Communication are informative.

Alternative Space Futures and the Human Condition, edited by Kiran Karnik (Unispace 82 International Round Table, Pergamon Press, 1982), pp. 175.

This volume is the work of the International Round Table on Alternative Space Futures and the Human Condition which was held in New York in March, 1982. The Round Table is one of the organizations created in conjunction with the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (Unispace 82). The objective of the Round Table is to bring together a group of people who have a wide knowledge of space activities and a vision of possibilities of human development in regard to all aspects of space technology.

The discussions in this book are not technical in nature but are focused on overall policies, future scenarios and other key issues. The participants in these discussions are

drawn from such diverse backgrounds as academia, government, business, research institutions and international agencies. Included among them are Dr. Peter Jankowitsch, Chairman of the Committee on the Peaceful Uses of Outer Space; Professor Yash Pal, Secretary-General of Unispace 82; and Dr. Jerry Grey, Deputy Secretary-General, Unispace 82. The members act in their individual capacities and not as representatives of a particular interest or country.

Topics in this work are numerous; included among them are Space Futures and Choices; Space Activities and the Human Condition; Space and Education; Cooperation in Space: Possibilities and Prospects; Space as an Intellectual Adventure of Man; and Space as a Source of New Social and Personal Ethnic. These frank discussions delve into such matters as the prohibition of military satellites and the need for sharing space technology among all nations., Indeed, it is suggested that space technology can be harmful to certain developing countries. It is hoped that these ideas and recommendations will positively influence the direction of all possible space programs.

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Determination of Applicable Law to Living and Working in Outer Space

Legal Aspects of Direct Broadcast Satellites

Addendum

Roundtable Discussion

Energy from Outer Space—Problems of Technological Feasibility and International Cooperation

Appendix

Excerpts from the Report of the Legal Sub-Committee on the Work of its Twenty-Second Session (21 March - 8 April 1983).+

APPENDIX

Section A

TEXTS OF DRAFT PRINCIPLES AS CONTAINED IN THE REPORT OF THE LEGAL SUB-COMMITTEE ON THE WORK OF ITS TWENTIETH SESSION (A/AC.105/288, ANNEX I, APPENDIX), WITH CHANGES MADE AT THE PRESENT SESSION

Principle I 1/

For the purpose of these principles with respect to remote sensing of the natural rsources of the earth and its environment: 2/

(a) The term "remote sensing of the earth" means "remote sensing of the natural resources of the earth and its environment"; 3/

(b) The term "primary data" means those primary data which are acquired by satellite-borne remote sensors and transmitted from a satellite either by telemetry in the form of electromagnetic signals or physically in any form such as photographic film or magnetic tape, as well as preprocessed products derived from those data which may be used for later analysis;

(c) The term "analysed information"* means the end-product resulting from the analytical process performed on the primary data as defined in paragraph (b) above combined with data and/or knowledge obtained from sources other than satellite-borne remote sensors.

Principle II

Remote sensing of the earth from outer space and international co-operation in that field [shall] [should] be carried out for the benefit and in the interests of

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* The content, definition and necessity of the term "analysed information" is still to be clarified.

1/ The question of the application of these principles to international intergovernmental organizations will be considered later.

2/ The formulation "with respect to remote sensing of the natural resources of the earth and its environment" will be reviewed in light of the title to be given to the principles.

3/ This term is still subject to further discussion. In the view of some delegations, it would be necessary in the future work to further define the meaning of the words "remote sensing of the earth and its environment".

+Taken from U.N. Doc. A/AC.105/320, pp.16-36 (1983).

all countries, irrespective of their degree of economic or scientific development, and taking into consideration, in international co-operation, the particular needs of the developing countries.

Principle III

Remote sensing of the earth from outer space [shall] [should] be conducted in accordance with international law, including the Charter of the United Nations and 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 relevant instruments of ITU.

Principle IV

1. States carrying out programmes for remote sensing of the earth from outer space [should] [shall] promote international co-operation in these programmes. To this end, sensing States [should] [shall] make available to other States opportunities for participation in these programmes. Such participation should be based in each case on equitable and mutually acceptable terms due regard being paid to principles ...

2. In order to maximize the availability of benefits from such remote sensing data, States are encouraged to consider agreements for the establishment of shared regional facilities.

Principle V

Remote sensing of the earth from outer space [should] [shall] promote the protection of the natural environment of the earth. To this end States participating in remote sensing [should] [shall] identify and make available information useful for the prevention of phenomena detrimental to the natural environment of the earth.

Principle VI

States participating in remote sensing of the earth from outer space [should] [shall] make available technical assistance to other interested States on mutually agreed terms.

Principle VII

1. The United Nations and the relevant agencies within the United Nations system should promote international co-operation, including technical assistance, and play a role of co-ordination in the area of remote sensing of the earth.

2. States conducting activities in the field remote sensing of the earth [shall] [should] notify the Secretary-General thereof, in compliance with article XI 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.

Principle VIII

Remote sensing of the earth from outer space should promote the protection of mankind from natural disaster.*** To this end, States which have identified primary data from remote sensing of the earth and/or analysed information in their possession which would be useful in helping to alert States to impending natural disasters, or in assisting States to deal with natural disasters should as promptly as possible, notify those States affected or likely to be affected of the existence and availability of such data and/or information. Such data and/or information should, upon request, be disseminated as promptly as possible.

Principle IX 1/

Taking into account the principles II and III above, remote sensing data or information derived therefrom [shall] [should] be used by States in a manner compatible with the legitimate rights and interests of other States.* **

Principle X

States participating in remote sensing of the earth either directly or through relevant international organization [shall] [should] be prepared to make available to the United Nations and other interested States, particularly the developing countries, upon their request, any relevant technical information involving possible operational systems which they are free to disclose.

Principle XI

[States [shall] [should] bear international responsibility for [national] activities of remote sensing of the earth [irrespective of whether] [where] such activities are carried out by governmental [or non-governmental] entities, and [shall] [should] [guarantee that such activities will] comply with the provisions of these principles.]

Principle XII

A sensed State [shall] [should] have timely and non-discriminating access to primary data obtained by remote sensing of the earth from outer space, concerning its territory, on [agreed] reasonable terms and [no later than] [before] access is

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* Some delegations were of the view that, for the sake of consistency it was necessary to consider this principle in the light of draft principle II and III.

** A delegation reserved its position on removing the square brackets around the words "in a manner compatible with" and on the deletion of the words "not" and "to the detriment of".

*** The meaning of this term is subject to further discussion.

1/ Should be considered in connection with the formulation of a principle on dissemination of data or information and subject to later discussion of the terms "information" and "data".

granted to any third State. 1/ 2/ [[To the greatest extent feasible and practicable,] this principle shall also apply to analysed information.]

Principle XIII

[A State intending to conduct or conducting * activities and/or programmes for remote sensing of the earth from outer space shall notify promptly the Secretary-General of the United Nations of the nature, estimated duration of the programme, and the geographic area covered as well as any major modification of the programme. The Secretary-General shall immediately disseminate the information thus received to the States concerned and shall publish it accordingly. A State conducting activities and/or programmes for remote sensing of the earth from outer space should also furnish such information to the extent practicable directly to any State which so requests.]

Principle XIV

[A State carrying out remote sensing of the earth [shall] [should] without delay consult with a State whose territory is sensed upon request of the latter in regard to such activity, [in particular dissemination of data and information,] in order to promote international co-operation, friendly relations among States and to enhance the mutual benefits to be derived from this activity.]

Principle XV

[States carrying out remote sensing of the earth shall not, without the approval of the States whose territories are affected by these activities, disseminate or dispose of any data or information on the natural resources of these States to third States, international organizations, public or private entities.]

Principle XVI

[Without prejudice to the principle of the freedom of exploration and use of outer space, as set forth in 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, remote sensing of the earth [should] [shall] be conducted with respect for the principle of full and permanent sovereignty of all States and peoples over their own wealth and natural resources [with due regard to the rights and interests of other States and their natural and juridical persons in accordance with international law] [as well as their inalienable right to dispose of their natural resources] [and of information concerning those resources].]

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* With respect to the words "or conducting", reference should be made to paragraph 21 of the Working Group Chairman's report at the twenty-second (1983) session of the Sub-Committee.

1/ The question of from which States access to and provision of data should be obtained, needs further consideration.

2/ Subject to review in the light of the discussion on access by third States.

Principle XVII

[Any dispute that may arise with respect to the application of [Activities covered by] these principles [shall] [should] be resolved by prompt consultations among the parties to the dispute. Where a mutually acceptable solution cannot be found by such consultations it [shall] [should] be sought through other [established] [existing] procedures for the peaceful means of settlement of disputes mutually agreed upon by the parties concerned.]*

Section B

WORKING PAPERS SUBMITTED TO THE WORKING GROUP AT THE TWENTY-SECOND SESSION OF THE SUB-COMMITTEE

Greece: working paper

(WG/RS(1983)/WP.1 of 24 March 1983)

Principle XIII

A State intending to conduct remote sensing activities of the earth from outer space shall notify promptly the Secretary-General of the United Nations of the nature and duration of the programme as well as of the geographic area covered. The Secretary-General shall immediately disseminate the information thus received to the States concerned and shall publish it accordingly.

Greece: working paper

(WG/RS(1983)/WP.1/Rev.1 of 28 March 1983)

Principle XIII

A State intending to conduct or conducting activities and/or programmes for remote sensing of the earth from outer space shall notify promptly the Secretary-General of the United Nations of the nature, estimated duration of the programme and the geographic area covered as well as any major modification of the programme. The Secretary-General shall immediately disseminate the information thus received to the States concerned and shall publish it accordingly. A State conducting activities and/or programmes for remote sensing of the earth from outer space should also furnish such information to the extent practicable directly to any State which so requests.

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* Subject to review in the light of the full set of agreed principles and a decision on the legal nature of the principles.

Annex II

DRAFT REPORT OF THE CHAIRMAN OF THE WORKING GROUP ON AGENDA ITEM 5

(Consideration of the possibility of supplementing the norms of international law relevant to the use of nuclear power sources in outer space)

1. The Sub-Committee, on 22 March 1983, re-established its Working Group on agenda item 5 (Consideration of the possibility of supplementing the norms of international law relevant to the use of nuclear power sources in outer space).

2. The Working Group had before it the report of the Legal Sub-Committee on its twenty-first session in 1982 (A/AC.105/305); the report of the Scientific and Technical Sub-Committee on its eighteenth session in 1981 which contained in annex II the report of its Working Group on the Use of Nuclear Power Sources in Outer Space (A/AC.105/287); and the report of the Scientific and Technical Sub-Committee on its twentieth session in 1983 (A/AC.105/318).

3. The following working papers were submitted at the present session of the Sub-Committee: a working paper submitted by the delegation of Canada (A/AC.105/C.2/L.137); and two working papers submitted by the delegation of the Federal Republic of Germany (A/AC.105/C.2/L.138) and (WG/NPS(1983)/WP.1). The working papers A/AC.105/C.2/L.137 and A/AC.105/C.2/L.138 are attached to the report of the Sub-Committee. Working paper WG/NPS(1983)/WP.1 is attached to the present report.

4. The Working Group examined the question of notification in a case where a space object with nuclear power sources on board is malfunctioning with a risk of re-entry of radioactive materials to the earth; and addressed itself to the matters of format, content and procedure of such notification.

5. Following a suggestion of its Chairman, the Working Group decided to separate the two questions, namely, (a) the format and procedure of notification; and (b) its contents. The latter, having already been agreed upon would be left aside, bearing in mind the conclusions and recommendations reached by the Scientific and Technical Sub-Committee's Working Group on the use of nuclear power sources in outer space at the eighteenth session of the Scientific and Technical Sub-Committee (A/AC.105/287, annex II). Discussions would therefore concentrate on format and procedure of notification.

6. The Working Group, following discussions and a number of informal consultations, agreed that

"Any State launching a space object with nuclear power sources on board should timely inform States concerned in the event this space object is malfunctioning with a risk of re-entry of radioactive materials to the earth. The information should be in accordance with the following format:

1. System parameters

1.1 Name of launching State or States including the address of the authority which may be contacted for additional information or assistance in case of accident

1.2 International designation

1.3 Date and territory or location of launch

1.4 Information required for best prediction of orbit lifetime, trajectory and impact region

1.5 General function of spacecraft

2. Information on the radiological risk of nuclear power source(s)

2.1 Type of NPS: radio-isotopic/reactor

2.2 The probable physical form, amount and general radiological characteristics of the fuel and contaminated and/or activated components likely to reach the ground. The term 'fuel' refers to the nuclear material used as the source of heat or power.

This information should also be transmitted to the Secretary-General of the United Nations."

7. Thereafter some delegations expressed the view that the title of this item on the agenda of the Legal Sub-Committee should be changed to "Consideration of supplementing the norms of international law relevant to the use of nuclear power sources in outer space with the view to elaborating additional rules through its working group".

8. Other delegations were of the opinion that such a change was not necessary.

9. The Working Group held its final meeting on 7 April 1983 when it considered and approved the present report.

Appendix

WORKING PAPERS SUBMITTED TO THE WORKING GROUP OF THE TWENTY-SECOND SESSION OF THE SUB-COMMITTEE

Federal Republic of Germany: working paper

(WG/NPS(1983)/WP.1 of 31 March 1983)

We recommend that the sentence underlined below should be added to the paragraph preceding the notification format, irrespective of the exact wording of the remainder of that paragraph. According to discussions on 30 March 1983, the paragraph should read as follows:

"In the event that a space object with a nuclear power source on board is malfunctioning with a risk of re-entry and dispersion of radioactive material in the environment including the upper atmosphere, the launching State should notify the States concerned and the Secretary-General of the United Nations of the anticipated re-entry immediately after the malfunction, and provide information adequate to enable Member States to assess the likelihood and consequences of this particular re-entry and to carry out preparations for search and recovery of the nuclear power source and the protection of their population. The information contained in item 1.4 below should be updated regularly, with daily updatings during the last days before the re-entry. The notification should be in accordance with the following format:"

Annex III

DOCUMENTS SUBMITTED TO THE LEGAL SUB-COMMITTEE AT ITS TWENTY-SECOND SESSION

A

CONSIDERATION OF THE POSSIBILITY OF SUPPLEMENTING THE NORMS OF INTERNATIONAL LAW RELEVANT TO THE USE OF NUCLEAR POWER SOURCES IN OUTER SPACE

Canada: working paper

(A/AC.105/C.2/L.137 of 28 March 1983)

Use of nuclear power sources in outer space

The present working paper represents a consolidation of the previous Canadian working papers as contained in documents A/AC.105/C.2/L.129, A/AC.105/C.2/L.134 and A/AC.105/C.2/L.135. It contains ideas that are put forward for the purpose of structuring and facilitating further our deliberations on promoting the developments of principles relevant to the use of nuclear power sources (NPS) in outer space.

A. Information concerning the use of nuclear power sources

1. Each launching State should furnish to the Secretary-General of the United Nations, at least one month prior to launching, the planned date and time of launching of a space object containing a nuclear power source. All changes in the planned date of launching should be communicated to the Secretary-General as soon as practicable.

2. Each launching State should provide the Secretary-General of the United Nations, at least one month prior to launching, with information relating to generic design, safety tests conducted, basic orbital parameters, and primary and back-up devices, systems and procedures. Each launching State should also provide a safety evaluation statement, including an analysis of accident probability, sufficiently comprehensive to assure the international community that the nuclear power source can be utilized safely.

3. The Secretary-General should transmit this information to all Members of the United Nations as early as possible prior to launching.

4. Each launching State should also provide this information for those space objects containing nuclear power sources which have already been launched into and remain in earth orbit.

B. Safety measures regarding radiological protection

1. States should ensure that their use of space objects containing nuclear power sources meets generally accepted international guidelines for radiological protection; inter alia, the radiological risks involved should conform to the recommendations of the International Commission on Radiological Protection. In particular, the intended benefits to those people incurring radiological risks must adequately compensate for such risks.

2. In any case, States using NPS in outer space should ensure that the radiological risks involved do not exceed (...).

3. States should endeavour to ensure that radiation exposure in all phases of a space mission involving use of NPS, including accident situations, does not exceed 0.5 rem per year for members of the general public.

4. Where the type of nuclear power source utilized makes it unfeasible to prevent the release of nuclear radiation under re-entry conditions, earth orbits should be used which are sufficiently high to allow radioactive materials to decay before re-entry to a level that would meet the conditions set out in paragraph 1. Reactors should not be activated until the space vehicle has reached a safe operating altitude.

5. If a launching State considers it necessary to use NPS in outer space in a way inconsistent with generally accepted international guidelines for radiological protection, it should announce that it is doing so for reasons of national security.

6. The launching State should not use more than (X) nuclear reactor(s) in low-earth orbit at the same time and should not launch more than (X) nuclear reactor(s) a year intended for low-earth orbit.

7. Space objects in low earth orbit containing nuclear reactors should be equipped with at least two back-up systems to boost the object into higher orbit in cases where the object is not to be returned to earth in a controlled re-entry. Where the space object is to return to earth at the completion of its mission, the level of control should at least meet the standards for manned spacecraft.

8. The amount of radioactive fuel contained in space objects should not exceed (...).

C. Notification prior to re-entry

1. Whenever it becomes possible to predict with reasonable certainty that a space object containing a nuclear power source will imminently re-enter the earth's atmosphere, the launching State should notify the Secretary-General of the anticipated re-entry and provide him with information adequate to enable Member States to assess the likelihood and consequences of a particular re-entry and to carry out preparations for search and recovery of the nuclear power source and protection of their population. That notification should be in accordance with the following format:

1. System parameters

*1.1 Name of launching State or States including the address of the authority which may be contacted for additional information or assistance in case of accident

*1.2 International designation

*1.3 Date and territory or location of launch

1.4 Information required for best prediction of orbit lifetime trajectory and impact region

*1.5 General function of spacecraft

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* Denotes the requirements in the Convention on Registration of Objects Launched into Outer Space (art. IV).

2. Information on the radiological risk of nuclear power source(s)

2.1 Type of NPS: radio-isotopic/reactor

2.2 The probable physical form, amount and general radiological characteristics of the fuel and contaminated and/or activated components likely to reach the ground. The term "fuel" refers to the nuclear material used as the source of heat or power.

2. The Secretary-General should transmit this information to all Members of the United Nations as early as possible.

3. In situations where the timely transmission of this information via the Secretary-General is not possible, the launching State should communicate the information direct to those States likely to be affected. States at most risk should be informed first.

D. Assistance to States

1. The State launching a space object containing a nuclear power source that is about to re-enter the earth's atmosphere in an uncontrolled manner, should co-operate to the greatest extent feasible with States along the orbital path of the object in monitoring the object. In doing so, the launching State should bear in mind the need for prompt notification with sufficient information so as to allow those States likely to be affected to assess the situation, in particular in order to take necessary precautionary measures. States other than the launching State possessing space monitoring and tracking facilities should co-operate for the same purpose with States along the orbital path of the object.

2. The State launching a space object containing a nuclear power source that is about to re-enter the earth's atmosphere in an uncontrolled manner should offer to provide all necessary assistance to States likely to be affected by the re-entry or impact of the space object or its component parts. When an uncontrolled re-entry has occurred, the launching State, in accordance with the provisions contained in article 5, paragraph 4, of the 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, should promptly provide necessary assistance to eliminate possible danger of harm if requested to do so by States over whose territory or areas of jurisdiction the space object disintegrated or on whose territory or areas of jurisdiction debris has landed.

3. Other States or international organizations with relevant technical capabilities should, to the extent feasible, be prepared to provide necessary assistance if requested to do so by the affected States. In this connection, States and international organizations should consider co-operating to establish an international registry that would list those countries and international organizations with expertise available in this field, the type of expertise available and those agencies or branches in which it is available. States, particularly launching States of space objects containing nuclear power sources, should also co-operate to establish appropriate training programmes to assist States to prepare for and deal with re-entering space objects containing nuclear power sources. The special needs of developing countries for assistance in developing their capacity to take precautionary measures and to remedy the effects of an uncontrolled re-entry or impact of a space object containing a nuclear power source should be borne in mind.

E. State responsibility

1. The State launching a space object containing a nuclear power source should bear international responsibility in accordance with international law, including the relevant outer space conventions.

2. Such responsibility should include the obligation of the launching State to offer to provide all necessary assistance to States likely to be affected by the re-entry or impact of its space object containing a nuclear power source; promptly to provide the necessary assistance to eliminate possible danger of harm if requested to do so by the affected States; and, in accordance with the 1972 Convention on International Liability for Damage Caused by Space Objects, to pay compensation for all damage caused by the nuclear power source, including all reasonable expenses for search and clean-up, and damages related to measures taken to prevent and limit radiation exposure and related to the number of people exposed and the degree of exposure.

3. Nothing in these principles shall have the effect of reducing the responsibility of States under international law, including the relevant outer space conventions.

4. States launching nuclear power sources into outer space should consider establishing an independent internationally administered fund for the purpose of satisfying claims for compensation.

5. If damage is caused to other States by the return to earth of a space object containing NPS, punitive (treble) damages should be paid.

Federal Republic of Germany: working paper

(A/AC.105/C.2/L.138 of 28 March 1983)

I. RECOMMENDATIONS FOR THE NOTIFICATION PRIOR TO RE-ENTRY OF A NUCLEAR-POWERED SATELLITE

The issue of notification prior to re-entry of a nuclear-powered satellite has been treated in the report of the Working Group on nuclear power sources of the Scientific and Technical Sub-Committee (A/AC.105/C.1/L.126, February 1981). In view of the experience obtained during the recent years, it seems advisable to improve the notification procedure so as to distribute more detailed and timely information. Therefore, it is recommended that the following requirements be included in the notification procedure.

The launching State should inform the Secretary-General of the United Nations as soon as the re-entry of a nuclear power source (NPS) is foreseeable, following some malfunction onboard a satellite. This information should be given immediately after that malfunction - this can be weeks or months in advance to the expected re-entry - so that there is enough time for thorough preparation and information. The information provided by the launching State should include all items contained in the format for notification of the reference given above. In addition to that, there should be information on the planned or predicted sequence of re-entry. It should be made clear whether intact re-entry or complete burn-up is planned. Technical information should be provided on the containment concept or the burn-up procedure especially as to the materials used in the construction and to the sizes of the components. During the time from the first notification until the final re-entry, the launching State should distribute regular bulletins on the state of the object and on the updated predictions for the re-entry date and hour. The launching State should assist international exchange of the orbital data and the aerodynamic properties of the re-entering object.

Such additional information will demonstrate that a reliable safety concept has been applied and will contribute to create an atmosphere of confidence within the international community. Only if such confidence can be created will the Governments be able to reduce their precautionary measures.

These suggestions are based on the practical experience obtained during the re-entry of the COSMOS-1402 satellite, which can be considered as an example for events of this type. Therefore the history of this event, as experienced in the Federal Republic of Germany, is reported in the following section.

II. EXPERIENCE FROM THE RE-ENTRY OF A NUCLEAR-POWERED SATELLITE

The typical situation of any country before and during the re-entry of a satellite with NPS can be illustrated by the history of the COSMOS-1402 event and the precautionary measures taken in the Federal Republic of Germany. Some important conclusions can be drawn from this event with respect to the necessity of early notification and full information as well as to the benefits of international co-operation.

In January/February of this year, the satellite COSMOS-1402 bearing a nuclear reactor re-entered into the earth's atmosphere. It had been separated into the three objects A, B and C. The dates of their re-entry were as follows:

Object A on 23 January 1983

Object B on 30 December 1982

Object C on 7 February 1983

Start-up of operations

During the first days of January 1983, authorities in the Federal Republic of Germany became aware of the fact that, following some malfunction on board COSMOS-1402, there was the risk of its re-entry into the earth's atmosphere together with its nuclear reactor. Bearing in mind the consequences of such an event experienced in Canada in 1978, where some hundred mostly radioactive pieces of debris were spread over a 600-km length of the subsatellite track, the authorities in the Federal Republic of Germany decided to go ahead with pre-planned precautionary measures in order to be prepared for protecting the population should this become necessary. At that time, there was no information on how that specific case would develop, especially as there was no evidence that it would be different from the COSMOS-954 accident in Canada. Under those circumstances the precautionary measures taken by the Federal Republic of Germany were justified.

On 12 January 1983, several German scientific institutions with considerable manpower and facilities started tracking the two objects A and C - while object B had decayed already - and calculating their further orbital decay. In addition, orbital elements of the two objects were received from the National Aeronautics and Space Administration (NASA), enhancing the reliability of the orbital predictions. The results of these predictions, especially the predicted groundtracks flown over by the satellite over Europe and estimates of the re-entry date, were collected by the German Ministry of the Interior and distributed by telex bulletins not only to all federal authorities involved in the Federal Republic of Germany but also to the authorities of most neighbouring countries in Europe.

In distributing its results and in replying to inquiries from other countries the Federal Republic of Germany followed the recommendations discussed so far in the bodies of the United Nations with respect to NPS accidents.

Tracking of object A

Of the two objects A and C, the object C was considered initially only as a minor fraction without importance, since its size was between 10 and 100 times smaller than object A. Also, it was not known at that time that the satellite had been separated into the fragments intentionally and not by accident. Therefore the

main tracking and calculating activities were concentrated on object A. But by 18 January it became evident from the orbital data, that object C was a very compact part (i.e. small but very heavy), which well could represent the core of the nuclear reactor or a part of it. Two days later, on 20 January, the Union of Soviet Socialist Republics confirmed by notification to the Secretary-General of the United Nations that object C was the reactor core. So the question arose whether all the prediction activities for object A had been in vain. On the other hand, there was no information on how much of the structure material of object A had been activated by neutron radiation from the reactor core. While it was clear that the radioactivity produced in object A by activation would be much less than the activity in the reactor core, there was still considerable uncertainty about this due to lack of information. So it had to be decided to track also object A until its final descent on 23 January at 2220 hours universal time (equal to Greenwich mean time). If the satellite had stayed in its orbit only 1 hour and 10 minutes longer, it would then have crossed the Federal Republic of Germany, posing a risk to this territory, at least with respect to the level of information then available.

By timely information, probably most of the tracking and prediction activities spent on object A could have been saved.

Tracking of object C

After the decay of object A the activities were concentrated on object C. The question whether it would totally burn up during re-entry was still open since there was no information on the materials and the physical sizes of the object (containment or single parts, etc.). For another two weeks the institutions involved in tracking and orbital predictions had to be assigned to that task and all the data transmission and international distribution of the results were continued as described before. Until 4 February the final re-entry of object C was predicted for the night hours between 7 February and 8 February, in conformity with predictions in other countries. Then an unforeseeable eruption on the sun (solar flare) occurred, which produced an increase of atmospheric density of the earth. From then on the final re-entry of object C was predicted for times centring around noon on 7 February (universal time). But the time period of uncertainty was considerable.

The consequences of this uncertainty and the resulting nearly world-wide threat can best be discussed together with figures 1 and 2 attached to this paper. Figure 1 shows the subsatellite tracks flown over by object C during the last three hours before its final re-entry (and also the tracks which it would have passed within three hours after its re-entry if it had not re-entered at that time). Figure 2 shows the tracks over Europe within the same time period in an enlarged scale, some instants of passage being indicated in universal time (UT = GMT).

The actual re-entry occurred over the southern Atlantic Ocean at about 11.00 hours UT. Only about 25 minutes later the satellite would have passed the border area between Austria and the Federal Republic of Germany. So the German precautionary measures had to be maintained until the very end.

In the early morning of the re-entry day, 7 February, the uncertainty of the predicted re-entry time was still $\pm$ three hours, corresponding to the groundtracks shown in figures 1 and 2. At that time all the countries underneath those tracks were subject to the risk of being afflicted by the re-entry.

In the evening before the re-entry, the uncertainty of the predicted re-entry time was even $\pm$ eight hours, which corresponds to more than five orbits before and after the actual re-entry. So, then, nearly every country of the world was under one of the ground tracks. This uncertainty was to some extent enhanced by the preceding solar flare and would be less than half as wide under normal circumstances.

Conclusions

It can be seen from this example that every re-entry of a satellite with NPS raises world-wide concern, justified by the geometry of the ground tracks flown over by the re-entering object within the predicted uncertainty period of the final re-entry.

Timely notification and comprehensive information given by the launching State about all circumstances influencing the expected further history of the event would help to reduce this concern.

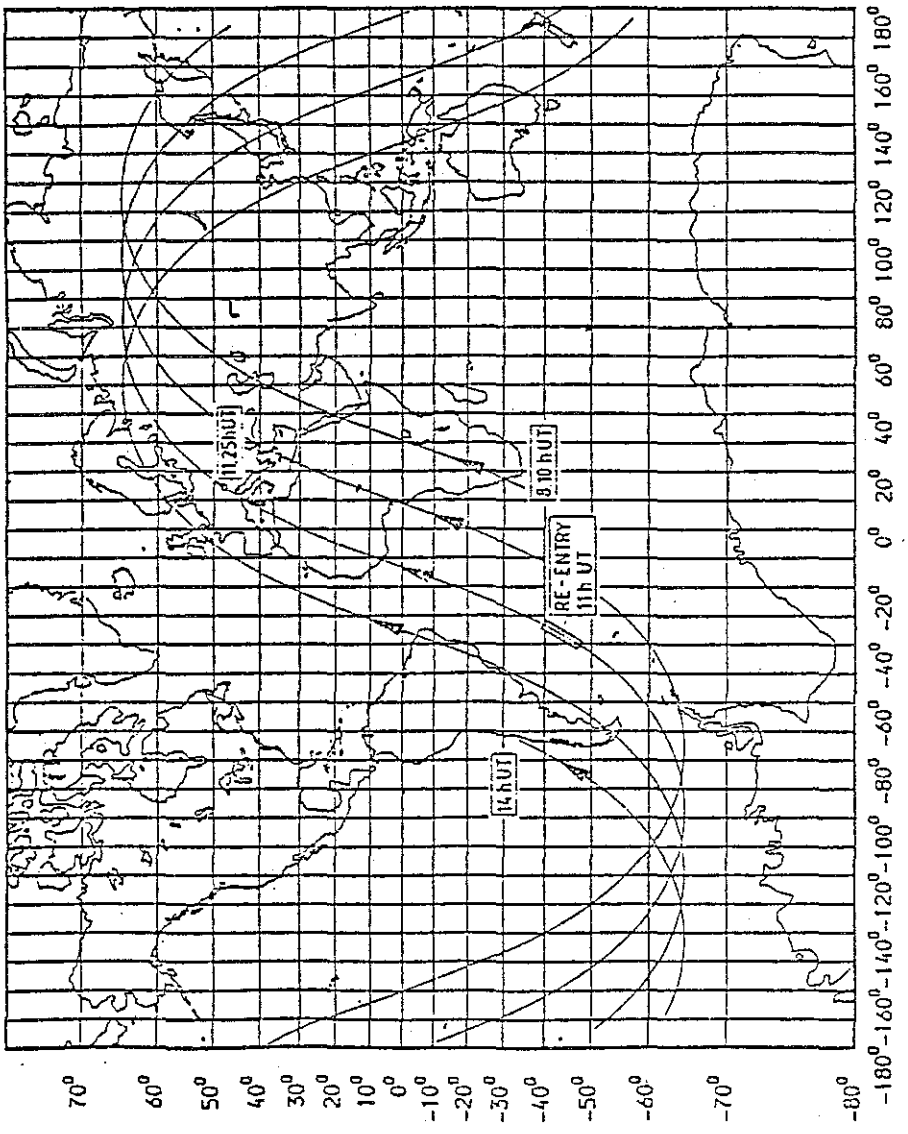

Fig. 1. GROUNDTRACKS OF COSMOS 1402 (OBJECT C) ON FEB 7TH 1983. TWO REVOLUTIONS BEFORE AND AFTER ACTUAL DECAY

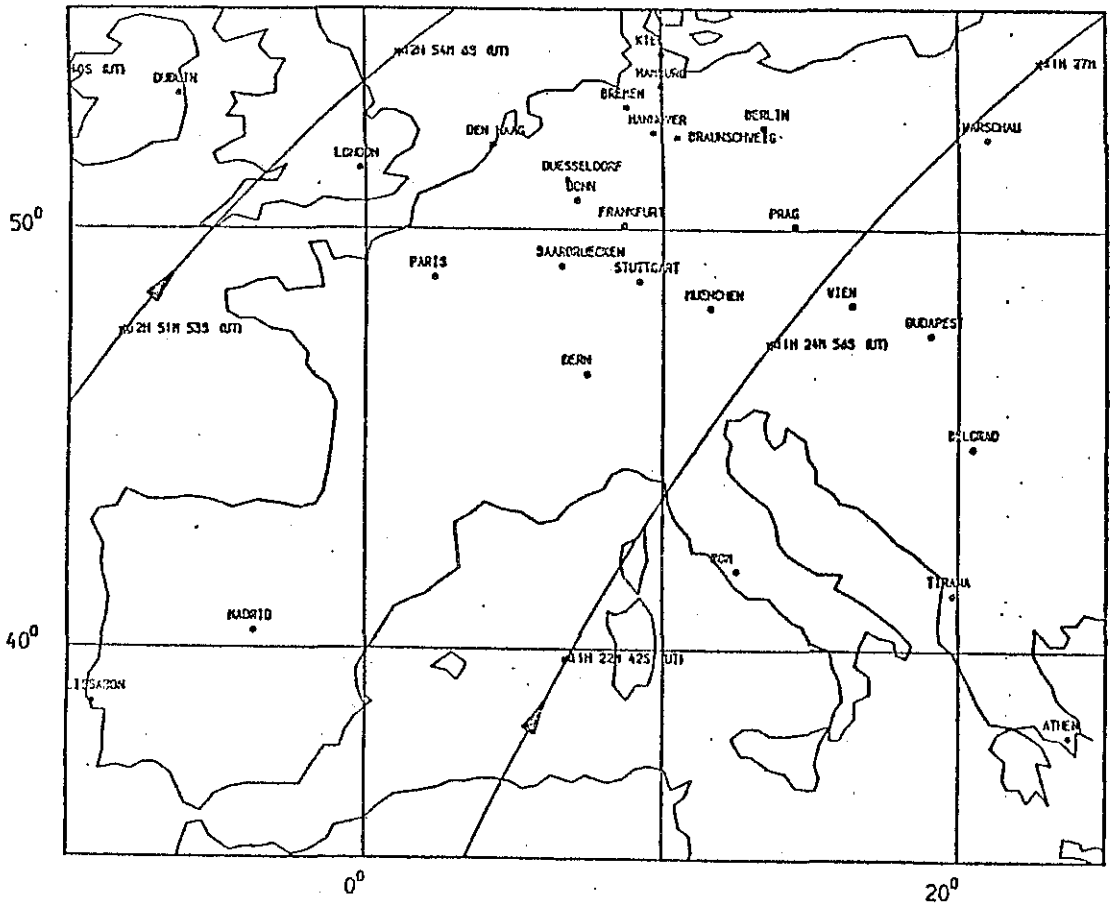

Fig. 2. GROUNDTRACKS OF COSMOS 1402 (OBJECT C) ON FEB 7TH 1983.
TWO TRACKS FOLLOWING THE ACTUAL DECAY TUBS-IFRR

B

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

Union of Soviet Socialist Republics: working paper

(A/AC.105/C.2/L.139 of 4 April 1983)

Approach to the delimitation of air space and outer space

1. The boundary between outer space and air space shall be established by agreement among States at an altitude not exceeding 110 km above sea level, and shall be legally confirmed by the conclusion of an international legal instrument of a binding character.

2. This instrument shall also specify that a space object of any State shall retain the right of innocent (peaceful) passage over the territory of other States at altitudes lower than the agreed boundary for the purpose of reaching orbit or returning to earth.

C

Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Uruguay and Venezuela: working paper

(A/AC.105/C.2/L.142 of 6 April 1983)

DECLARATION BY THE LATIN AMERICAN COUNTRIES MEMBERS OF THE LEGAL SUB-COMMITTEE OF THE COMMITTEE ON THE PEACEFUL USES OF OUTER SPACE

The Group of Latin American countries, members of COPUOS, wish to place on record their views on some points relating to the utilization, exploration and exploitation of outer space, which should be based on the following basic principles:

(a) It should be regulated in accordance with the principles of the Charter of the United Nations, resolution 2625 on friendship and co-operation among peoples, the 1967 Space Treaty and other relevant international instruments, taking into account that space law must be based on international co-operation.

(b) The legal context referred to above is clearly indicative of the obligation incumbent on all States to explore, exploit and utilize outer space, the Moon and other celestial bodies exclusively for peaceful purposes. We consider it essential to avoid the continuation, in actual deeds or in planning, of an increasing militarization and use for military purposes of outer space in flagrant violation of the spirit of the 1967 Treaty, of agreed principles and of existing positive law. We advocate the early elaboration of an appropriate instrument additional to the 1967 Space Treaty.

With respect to the items on the agenda of this session of the Legal Sub-Committee, the Latin American countries wish to state the following:

1. Remote sensing of the earth by satellites

Any set of principles should include, inter alia, those concerning the sovereign and permanent right of States over their natural resources, as recognized by the relevant resolutions of the General Assembly; priority access for the sensed State to data concerning its territory; and the establishment of a régime of international liability in the event of the dissemination of data and information by the sensing State or its governmental and non-governmental organizations to the detriment of the countries sensed.

2. Use of nuclear power sources in outer space

Such a system should embody specific safety rules covering, inter alia, prior notice of the launching of nuclear-powered space objects, effective rules for radiological protection and specific regulation of international liability arising from an accident originating from any such space object.

3. Matters relating to the definition and/or delimitation of outer space and of the geostationary orbit

The Latin American countries, members of COPUOS, formally requested the establishment of a working group to consider these matters on a priority basis, including the elaboration of general principles to govern the rational and equitable use of geostationary orbit and, to that end, request Member States to submit draft principles; in so doing, account will have to be taken of the different legal régimes governing air space and outer space respectively and the need for technical planning and legal regulation of the use of the geostationary orbit.

The Latin American countries, members of COPUOS, hope that the parallel approaches they have outlined in this document, in connection with the items on the agenda, will at the coming sessions be transformed into legal norms.

The Latin American countries, members of COPUOS, wish to place on record their concern at the very real possibility that meteorological satellites may be transferred to private industry. This would endanger international co-operation since it would impede the efficient and fair pursuit of the traditional system of providing data and exchanging information free of charge.

Finally, the Latin American Group of the Committee on the Peaceful Uses of Outer Space expresses its intention of continuing to urge regional co-operation machinery to strengthen their political action and technical possibilities.

CORRIGENDUM

The name of the editor of the book on Outer Space and Law reviewed by I. Kotlyrov on page 223 of the Fall 1982 issue of the Journal of Space Law should be: Prof. *Juri M. Kolosov.*

INDEX TO VOLUME 11