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JOURNAL OF SPACE LAW

A journal devoted to the legal problems arising
out of human activities in outer space

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Announcement

The JOURNAL OF SPACE LAW is pleased to announce that Professors *He Qizhi* and *Vladimir Kopal* have become members of its Editoral Board.

He Qizhi was born in China. He received his B.A. in International Law and Diplomacy from the Central University of Political Science in Chongqing in 1942, his M.A. in International Law and International Relations from the London School of Economics in 1946 and his Ph.D. in International Economics and Law from Liverpool University in 1949.

From 1951 to 1979 *Dr. He* worked as a Research Fellow and a Senior Research Fellow in International Law, first (1951-1955), at the Chinese People's Institute of Foreign Affairs and, later (1973-79), at the Institute of International Studies in Beijing, China. During 1956-1972, he also served as the Director of the Institute of Foreign Affairs.

Dr. He was a Chinese Observer to the U.N. Committee on the Peaceful Uses of Outer Space (COPUOS) in 1980 and has been a Chinese Delegate to the same Committee and its Legal Subcommittee since 1981. He was also a member of the Chinese Delegation to the UNISPACE-82 Conference. Since 1980 *Dr. He* has held the position of Legal Adviser to the Chinese Ministry of Foreign Affairs in Beijing and is also serving as Concurrent Professor of International Law in the College of Foreign Affairs in Beijing. *Professor He* is a member of the National Committee of the Chinese People's Political Consultative Conference.

Professor He has been a visiting Professor and lecturer at many Chinese and foreign universities, including Mississippi, Cologne and McGill Universities. He is a member of the Governing Board of the Chinese Society of International Law, the Board of Directors of the International Institute of Space Law and the International Academy of Astronautics. He is the author of scores of publications on space law and a contributor to major legal periodicals, including the JOURNAL OF SPACE LAW and the ANNALS OF AIR AND SPACE LAW. He is also the Editor and Chief Revisor for the Chinese Translation of the 15-volume collection of International Treaties, 1648-1973, which was published in Beijing.

Vladimir Kopal was born in 1928 in Jaromer, Czechoslovakia, where he finished his primary and secondary schools. He was graduated in 1951 from the Faculty of Law of Charles University in Prague and received his Ph.D in 1963 in the Institute of State and Law of the Czechoslovak Academy of Sciences. He was named Professor of International Law in 1969 at Charles University and received his Doctor of Sciences degree in 1982 in the Czechoslovak Academy of Sciences.

Prior to his association with the United Nations, *Dr. Kopal* worked as a Senior Research Fellow and, during 1975-1980, as the Chief of the Department of International Law and International Organizations, in the Institute of State and Law of the Czechoslovak Academy of Sciences. He

also served as Secretary and later as Chairman of the Czech Society of International Law and as Scientific Secretary to the Czechoslovak Commission on Astronautics.

Professor Kopal has been associated with the United Nations since 1981, first, as Principal Officer and Deputy Chief of the Outer Space Affairs Division and, since 1983 through 1988, as Chief of the same division and Secretary to the UN committee on the Peaceful Uses of Outer Space (COPUOS). On January 1, 1989, he was appointed as Chief of the Chair of International Law and Politics in the Faculty of Law of Charles University in Prague, Czechoslovakia.

As a delegate of his country, *Dr. Kopal* participated in sessions of different United Nations bodies, such as COPUOS, its Subcommittees and Working Groups as well as in the first and second United Nations Conferences on the Exploration and Peaceful Uses of Outer Space, the Sea-bed Committee, the Third United Nations Conference on the Law of the Sea, and in many international conferences where he presented papers on subjects pertaining to outer space.

Since 1967, *Professor Kopal* has been a member of the Board of Directors of the International Institute of Space Law, the International Academy of Astronautics and since 1967 he has been the General Counsel of the International Astronautical Federation. He is also a member of the Board of the Czechoslovak Branch of International Law Association (ILA), the ILA Space Law Committee, the International Council of Environmental Law and a Foreign Associate Member of the French National Academy of Air and Space. Currently, he serves as the editor-in-chief of the Czechoslovak Yearbook of International Law (Studie z mezinarodniho prava).

The *Journal* welcomes these two distinguished lawyers, authors, and professors to membership on its Board.

LAND MOBILE SATELLITE COMMUNICATIONS: A FURTHER DEVELOPMENT IN INTERNATIONAL SPACE LAW (PART I)

Dr. Wolf D. von Noorden*
and
Phillip Dann**

Introduction

It is now approximately ten years since the International Maritime Satellite Organization (INMARSAT) came into existence.[1] During that period it has experienced rapid growth in its membership, its user community and its revenues. At present there are fifty-five Member States. Approximately eight thousand ships are fitted with earth stations communicating via the INMARSAT system. In 1988 the total revenues of the Organization were US $98.8 million, an increase of 34 per cent over the preceding year.

There has also been an increase in the range of services provided through the INMARSAT space segment. For example, while telephone, telex, facsimile and data services have long been offered to ships, there are now the additional possibilities of compressed video and slow-scan television. The organization is also developing navigation and radiodetermination services.

The most striking transformation, however, in the nature of the Organization is without doubt the widening of its institutional competence, which will enable it to serve entirely new user groups. The Organization was originally established "...to make provision for the space segment necessary for improving maritime communications, thereby assisting in improving distress and safety of life at sea communications, efficiency and management of ships, maritime public correspondence

* General Counsel, INMARSAT.

** Assistant General Counsel, INMARSAT.

The views expressed in this article are those of the authors and are not necessarily those of any organization with which the authors are or have been connected.

1. *See* H. H. M. Sondaal, *The Current Situation in the Field of Maritime Communications Satellites: "INMARSAT"* , 8 J. SPACE L. 9 at 34 (1980).

services and radiodetermination capabilities."[2] In 1985 the INMARSAT Assembly adopted amendments to the INMARSAT Convention and Operating Agreement which gave the Organization the additional competence to provide aeronautical satellite telecommunications. The history and nature of these amendments have already been described in the pages of this Journal.[3] It is now expected that the aeronautical amendments will come into force at some time in 1989.[4] Meanwhile, commercial trials of aeronautical satellite communications using the INMARSAT space segment are already in progress;[5] and certain operational services have been offered on an Interim basis, for example, to the Ontario air ambulance service.[6]

In January 1989, an extraordinary session of the INMARSAT Assembly adopted further amendments to the Convention and Operating Agreement. These confer on the Organization the competence to provide land mobile-satellite communications. The amendments will enable INMARSAT to respond both to existing and to predicted future demands for land mobile communications - maritime, aeronautical and land mobile - will have considerable operational and economic advantages.

In the first part of this article it is intended to describe briefly the potential applications of land mobile satellite communications, and the limited services of this type which have already been provided through the INMARSAT space segment. An explanation will be given of the institutional basis on which these limited services have been offered. We will then describe the history and origins of the recent amendments to the INMARSAT constituent instruments. This will involve consideration of the changes to the Radio Regulations which were agreed at WARC MOB-87. In the second part of this article[7], the amendments will be analyzed in detail. We shall conclude with an overview of the competitive and regulatory framework within which international land mobile-satellite services will be provided.

Applications

It is helpful to introduce at this point certain definitions. The

2. Convention on the International Maritime Satellite Organization (INMARSAT), with annex, Sept. 3, 1976, Art. 3 (1), 31 U.S.T. 1, T.I.A.S. No. 9605. This Convention will be referred to in subsequent footnotes as "CONV".
3. *See* W. D. von Noorden, *Space Communications to Aircraft: A New Development in International Space Law*, 15 J. SPACE L. 25, 147 (1987).
4. For an explanation of the amendment process, see *id.* 148-9.
5. AERONAUTICAL SATELLITE NEWS, December 1988, at 1.
6. COUNCIL/27/SR/FINAL, 13.3.4.
7. The second part of this Article will appear in a future issue of the Journal.

Radio Regulations define "land mobile earth station" as "a mobile earth station in the land mobile-satellite service capable of surface movement within the geographical limits of a country or continent."[8] They also define "mobile earth station" as "an earth station in the mobile-satellite service intended to be used while in motion or during halts at unspecified points."[9] These definitions obviously include earth stations which are fitted to vehicles, such as trucks and trains, and which may be used whether the vehicle is in motion or stationary. The definitions also include earth stations which are light and compact enough to be carried readily from place to place, but which are always stationary when in use. It may be noted that the definitions would further apply to a hand-held "global personal communicator"; but that is to anticipate future technology.[10]

The potential users of land mobile-satellite communications are very diverse, consisting for example of trucking companies, car hire firms, container shippers and railway organizations.[11] Considerable use is already made of transportable earth stations in remote regions where no alternative telecommunications facilities exist; and in areas where the existing telecommunications infrastructure has been disrupted in the aftermath of natural disasters.[12]

The land mobile market is known to be highly differentiated, encompassing both basic and sophisticated user requirements. The range of required services is currently seen to be: two-way messaging; mobile-to-land position reporting; mobile-to-land data reporting; land-to-mobile polling; paging; land-to-mobile group calls; emergency alerting; voice services; and radiodetermination.[13]

It is believed that the overall market for land mobile satellite communications will be only a small percentage - perhaps 2 to 5 percent- of the total land mobile communications marketplace, which will continue to be satisfied largely by conventional (terrestrial) land mobile radio systems, including cellular. However, in some less populous regions of the world the cost of a cellular infrastructure cannot be justified. It is acknowledged that satellites have a role to play in these circumstances.[14]

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8. Art. 1, Sec. 4.12A, as inserted by WARC MOB-87.
9. Art. 1, Sec. 4.9.
10. "Satellites and Their Role In The Mobile Revolution," a speech by Olof Lundberg to the *Financial Times* Conference on the Outlook for World Mobile Communications, London, 8 November 1988.
11. ASSEMBLY/6/2, ATTACHMENT, sec. 2.1.
12. INMARSAT ANN. REV. 1987-88, at 18.
13. *See supra* note 11.
14. *Id.*

Even in areas served by cellular systems, mobile satellite services offer a superior data communications facility.[15]

The market for land mobile-satellite communications also includes those such as the operators of long-distance trucks, whose journeys would normally cross many regional and national cellular boundaries and who would prefer therefore to fit a single piece of equipment, as would be possible with a global satellite system, in preference to multiple cellular units. Even this limited part of the overall land mobile communications market represents a potential for terminal fittings far in excess of those previously anticipated for INMARSAT in its maritime and aeronautical sectors.[16]

Existing INMARSAT Practice

Although INMARSAT had originally the express competence to provide only maritime communications, the Organization has permitted land-based earth stations to use its space segment on an exceptional basis. In particular, the Council has authorized the Director General to grant access to the INMARSAT space segment for emergency relief operations on land.[17] This has been done in the aftermath of natural disasters such as earthquakes, floods, hurricanes and volcanic eruptions, when terrestrial communications have been disrupted.[18] The Council has also authorized the Director General to grant, on special conditions, access to the space segment for more general land mobile applications.[19] Under this authority access has been granted, for example, to companies exploring for minerals in remote areas and to a mountain climbing expedition.[20]

The justification for permitting such uses may be found in particular in Article 5 (3) of the INMARSAT Convention, which requires the Organization to operate "on a sound economic and financial basis having regard to accepted commercial principles". It is a generally accepted commercial principle that an organization should derive whatever revenue it can from surplus assets. In the case of INMARSAT the surplus asset is residual space segment capacity, which may be made

15. Rober T. Gallagher, *Land-Based Satellite Services for Mobile Communications*, TELECOMMUNICATIONS 59 (Nov. 1988).
16. *See supra* note 11.
17. COUNCIL/11/SR/FINAL, 16.31.
18. "The Virtue of Impatience", an address by Olof Lundberg to the IAF/COSPAR Symposium on Space Communications for Development, New York, 18 February 1987.
19. COUNCIL/21/SR/FINAL, 12.2.8. Previously the Council had authorized such access on a case-by-case basis.
20. *See supra* note 12.

available for non-maritime communications.[21] Since this helps to meet the overall costs of the space segment, it permits the charges for maritime communications to be lower than would otherwise be the case, and therefore indirectly serves the express purposes of the Organization.

This rationale for permitting land-based communications through the INMARSAT space segment has consequences for the terms and conditions which the Council imposes in such cases. Since only residual space segment capacity may be used, land mobile communications are subject at all times to the prior and overriding requirements of INMARSAT's maritime communications services; and therefore must be subject to preemption in favour of maritime services.[22] There are also consequences for space segment planning. Whatever the demand for land-based communications, the Organization has not previously been entitled to take this into account in determining the size of its future space segments.

It should be mentioned that the INMARSAT Council has also authorized the use of the space segment for land-based fixed communications. The conditions referred to above apply equally in such cases; and it is an additional requirement that there should be no reasonable alternative telecommunications facilities available.[23] INMARSAT recognizes that fixed-satellite communications are within the express competence of the INTELSAT and certain regional satellite organizations. In the past it has not always been predictable, particularly in remote regions, to install earth stations communicating through the INTELSAT space segment. This situation is changing with the introduction of very small aperture terminals (VSATs) which may reduce the demand for fixed-satellite communications through INMARSAT.

Land-based earth stations, whether fixed or mobile, already represent a significant percentage of the total earth stations commissioned within the INMARSAT system.[24] They all, however, conform to the INMARSAT standard known as Standard-A, which was intended for maritime applications. The potential mass market for land mobile-satellite telecommunications will be addressed by INMARSAT with new technologies. It will also be addressed on a sound institutional basis, the origins of which will now be considered.

History and Origins of the Land Mobile Amendments

In its report to the Fifth Session of the INMARSAT Assembly, which was held in October 1987, the INMARSAT Council referred to land-

21. In the past this has also been a basis for authorizing the use of the space segment for aeronautical satellite communications: *e.g.*, COUNCIL/18/SR/FINAL, 16.3.4.
22. COUNCIL/21/SR/FINAL, ANNEX IX, para. (1).
23. COUNCIL/18/SR/FINAL, 12.5.4(a) and ANNEX VII, para. (g).
24. *See infra* note 25.

based non-maritime services.[25] It pointed out that, as of 31 August 1987, a total of 154 land-based ship earth stations were commissioned to utilize the space segment for non-maritime communications. INMARSAT had developed the Standard-C ship earth station as a very small, low cost ship earth station for exchanging messages and data.[26] The Standard-C system had been defined and specified for the marine environment, but was under evaluation for land mobile-satellite applications. "In this regard", the Council reported, "the Director General is assisting a group of European Signatories in the preparation of a trials programme, to investigate the technical suitability and potential market acceptance for such a land mobile-satellite services, and the fact that INMARSAT has obtained wide experience and facilities in the provision of mobile-satellite services, the Council recognized that the Assembly might wish to consider the enhancement of INMARSAT's institutional competence to this effect."[27] It should be noted, however, that the Assembly does not have the power to initiate amendments to the INMARSAT Convention and Operating Agreement.

One of the functions of the INMARSAT Assembly is to "consider and review the activities, purposes, general policy and long-term objectives of the Organization and express views and make recommendations thereon to the Council.[28] In this context the Assembly considered the report of the Council and responded with two crucial decisions:

"(a) to recommend that the council examine the commercial, technical and operational feasibility of providing land mobile-satellite services, taking into account the different interests of Parties; and

"(b) to draw the attention of Parties and Signatories to the discussions which have taken place at the Fifth Session of the Assembly on this subject and to the procedures for initiating amendments to the INMARSAT to provide land mobile-satellite services, in accordance with Article 34(1) of the Convention and Article XVIII(1) of the Operating Agreement."[29]

The reference, in the first of these decisions, to "the different interests of Parties" is partly explained by a statement by the delegations of Canada, India and the USA which was annexed to the Report of the Assembly: "The Representatives of Canada, India, and the United States of America noted that certain INMARSAT Parties are planning domestic

25. ASSEMBLY/5/1, 10.4.1.
26. *Id. at* 10.4.2.
27. *Id. at* 10.4.2. and 10.4.3.
28. CONV art. 12(1)(a).
29. ASSEMBLY/5/11, 5.9.3.

satellite systems to provide mobile services and requested that the Council recognize this in its feasibility studies.[30]

After the Fifth Session of the Assembly events moved with remarkable speed. Little more than a month later, on 30 November 1987, the Federal Republic of Germany formally initiated the procedures for amendment of the Convention and Operating Agreement by submitting proposed amendments to the Director General, together with explanatory comments. The amendments will be considered in detail in the second part of this article, but their essence may be found in two provisions. It was proposed that a paragraph should be added to the Preamble to the Convention, "Affirming that a maritime and aeronautical satellite system shall also be open for land mobile communications and communications on waters not part of the maritime environment for the benefit of all nations".[31] In addition, it was proposed that Article 3(1) of the Convention should be amended so as to read as follows:

> "The purpose of the Organization is to make provision for the space segment necessary for improving maritime communications and, as practicable, aeronautical and land mobile communications and communications on waters not part of the marine environment, thereby assisting in improving communications for distress and safety of life, communications for air traffic services, the efficiency and management of ships, aircraft and land transport, maritime, aeronautical and other mobile public correspondence services and radiodetermination capabilities."[32]

The Director General immediately circulated the proposed amendments to all INMARSAT Parties and Signatories for comment, as required by the INMARSAT constituent instruments.[33] At this time, the Twenty-Eighth Session of the Council was in progress. The Council noted the decisions of the Assembly and the initiative of the Federal Republic of Germany.[34] The Council also noted that the Director General was already carrying out a study of the commercial, technical, and operational feasibility of providing land mobile-satellite services which would address "the different approaches required for land mobile-satellite services when compared to the maritime and aeronautical services."[35]

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30. *Id. at* Annex VIII.
31. COUNCIL/29/13/REV/1, ANNEX II, page 8.
32. *Id.* at 19.
33. CONV art. 34(1); Operating Agreement on the International Maritime Satellite Organization (INMARSAT), Art XVIII(1). The Operating Agreement will be referred to in subsequent footnotes as "OA". *See also supra* note 4.
34. COUNCIL/28/SR/FINAL, 15.1.
35. *Id. at* 15.1.3.

The 1987 WARC

The Director General also reported to the Twenty-Eighth Session of Council on the results of the World Administrative Radio Conference for Mobile Services (WARC MOB-87) which was held in Geneva from 14 September to 17 October 1987.[36] INMARSAT Directorate staff members attended throughout the Conference as observers and participated in many of the Working Groups.[37] The Conference decided upon revisions to the Radio Regulations, certain of which were of great importance for the future of land mobile-satellite communications.

Prior to WARC MOB-87 there were frequency allocations for the maritime mobile-satellite service and the aeronautical mobile-satellite service, but none expressly for the land mobile-satellite service. The Conference decided to allocate 3 MHz in each direction within the existing maritime allocations for use by both land and maritime mobile-satellite services.[38] These bands were included in the specification of INMARSAT's Second Generation Satellites, which were then already under construction.[39] The remainder of the existing maritime allocation was opened up for the land mobile-satellite service, but on a secondary basis. A further 4 MHz in each direction was allocated adjacent to the aeronautical band for use by the land mobile-satellite service on a primary basis.[40]

The results of WARC MOB-87 represent a compromise between those who wanted more spectrum allocated for the land mobile-satellite services and those who wished to preserve the scarce mobile frequency spectrum for maritime and aeronautical users who, unlike land-based users, have no alternative terrestrial communications.[41] The INMARSAT Council, which deferred consideration of this matter until its Twenty-Ninth Session, noted that the outcome of WARC MOB-87 was essentially favorable to INMARSAT.[42] It was highly desirable that INMARSAT should establish an operational land mobile service in the newly-allocated bands at the earliest possible opportunity.[43] It was also noted that there exists a significant demand for integrated position determination and two-way message transfer services, which the Organization should endeavor to satisfy as soon as practicable.[44]

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36. COUNCIL/28/35.
37. *Id. at* sec. 2.
38. Final Acts of the World Administrative Radio Conference for the Mobile Services (Mob-87), Geneva, 1987: the relevant provisions are the partial revisions to article 8 of the Radio Regulations.
39. COUNCIL/28/35, sec. 6.
40. *See supra* note 38.
41. The arguments were reviewed by Olof Lundberg in *Between a Rock and a Hard Place*, TELECOMMUNICATIONS POLICY, March 1987, at 3.
42. COUNCIL/29/SR/FINAL, 19.1.1(a).
43. *Id. at* 19.1.1(b).
44. *Id. at* 19.1.1(c).

The Feasibility Study

At the same Session, in March 1988, the Council considered an initial report by the Director General on the commercial technical, operational and institutional feasibility of providing land mobile-satellite services.[45] The Director General had concluded that a significant market exists for land mobile services and that INMARSAT's future viability would be improved if some of this market could be captured.[46] It would be technically possible to provide a land mobile data service from 1989 using Standard-C.[47] The Director General also considered that a significant potential demand existed for a small, cheap, low-gain telephone terminal. The formulation of concepts for such a terminal, to be known as Standard-M, had already begun.[48]

The Director General presented a revised report to the Thirtieth Session of the Council, held in July 1988. From this the Council noted that there was a significant business opportunity for INMARSAT in the provision of land mobile-satellite services.[49] It decided to authorize the Director General to forward the revised report to the Assembly.[50]

The feasibility report considered the potential market for land mobile services: its findings are set out above.[51] It was noted that INMARSAT would face competition from domestic and regional satellite systems. However, the development of the Standard-C system meant that INMARSAT would be able to meet the needs of land mobile users for data communications and messaging before other competitive systems were in place in most countries. [52] In the future, land mobile voice services could be provided through the development of a small, low-cost voice terminal. Particular emphasis was placed on the importance of achieving worldwide common standards for user terminals.[53]

The report also considered institutional questions. It was noted the INMARSAT constituent instruments allow for considerable flexibility in the provision of communications services. There is no requirement or restriction as to the geographical basis on which INMARSAT's services may be provided: these may therefore be international, regional or domestic. There is no explicit requirement about the classes of users to whom services can be provided, so that services may be offered either to the public or to particular user groups. Furthermore, there is nothing to

45. *Id.* at 15.1.1.
46. *Id. at* 15.1.5(a).
47. *Id. at* 15.1.5(b).
48. *Id. at* 15.1.5(c).
49. COUNCIL/30/SR/FINAL, 14.2.3(a).
50. *Id. at* 14.2.4.
51. *See supra* notes 11, 13, 14 and 16.
52. ASSEMBLY/6/2, ATTACHMENT, sec. 3.3.
53. *Id. at* sec. 4.4.

prevent space segment capacity from being utilized either on a demand-assigned or on a pre-assigned basis.[54] The Convention does require, however, that the space segment shall be open to all users without discrimination on the basis of nationality.[55]

It was also noted that, subject to compliance with international treaty obligations, the use of radiocommunications in national territory is governed by the laws of the State concerned.[56] It should be understood that nothing in the INMARSAT Convention, whether in its original or amended versions, obliges a Member State to permit communications to or from its territory via the INMARSAT space segment. The implications of this are considered below.

The Amendment Process

The procedures for the amendment of the INMARSAT constituent instruments progressed in parallel with the feasibility study. Having circulated the amendments proposed by the Federal Republic of Germany, the Director General received comments from a number of Parties and Signatories, some of whom proposed additional or alternative amendments. The amendments, together with the various comments received, were submitted to the Council for consideration at its Twenty-Ninth Session, in March 1988. The Council already felt able to endorse the principle of amending the Convention and Operating Agreement to enable INMARSAT to provide land mobile-satellite services.[57] It was noted that the Director General would convene a Meeting of Experts appointed by Parties to prepare a consolidated text of the amendments to the Convention, although the Meeting would not consider the proposed amendments to the Operating Agreement. The Party of Bulgaria had issued an invitation for the meeting to be held in Varna, Bulgaria.[58] The consideration of proposed amendments by a Meeting of Experts is not part of the formal procedures for amendment of the Convention. However, such a meeting had proved extremely valuable in achieving consensus on the aeronautical amendments.[59]

The Meeting of Experts, chaired by Mr. B. Barstad of Norway, met in Varna from 20 to 24 June 1988. Thirty parties were represented, and the International Telecommunication Union was represented by an Observer. The Meeting was able to reach a remarkable degree of consensus not only on the substance but also on the text of the proposed amendments for consideration and adoption by the Assembly.[60]

54. *Id.* at sec. 5.2.
55. *Id.* at sec. 5.3.
56. *Id. at* sec. 5.4.
57. COUNCIL/29/SR/FINAL, 15.2.6.
58. *Id.* at 15.2.7(b).
59. *See supra* note 3.
60. ASSEMBLY/6/3, ATTACHMENT, ANNEX V.

The report of the Meeting of Experts was considered by the Council at its Thirtieth Session, in July 1988. The Council decided to recommend to the Assembly the adoption of amendments to the Convention to enable INMARSAT to provide land mobile-satellite services, taking into account the Report of the Meeting of Experts. It also decided to approve the related amendments to the Operating Agreement, and to recommend to the Assembly that it confirm such amendments.[61]

The next regular Session of the Assembly was due to take place in the third quarter of 1989. It was generally agreed that it would be unacceptable for there to be such a delay before the Assembly had the Opportunity to consider the amendments, bearing in mind the time taken for amendments to enter force after adoption by the Assembly. The Council therefore requested the Director General to convene an extraordinary session of the Assembly as soon as possible within the period December 1988 to February 1989 to consider the amendments. The Council also recommended that the Assembly should, as appropriate, reduce the six month interval which is normally required between action on the amendments by the Council and consideration of the amendments by the Assembly.[62]

An extraordinary session of the Assembly was duly convened from 17 to 19 January 1989. This was slightly less than six months after the recommendation of the Council; and the Assembly decided, pursuant to Article 34 of the Convention and Article XVIII of the Operating Agreement, to abridge the interval normally required.[63]

The Assembly adopted the amendments to the Convention and confirmed the amendments to the Operating Agreement with relatively little discussion or disagreement. This reflects great credit on the preparatory work done by the Meeting of Experts, whose consolidated text was adopted with scarcely any modification. On 2 February 1989 the Director General sent a verbal note to all Parties and a letter to all Signatories notifying them of the amendments and reminding them of the final stage in the amendment procedure. Under Article 34(2) of the Convention, the amendments to the Convention will enter into force one hundred and twenty days after the Depositary has received notices of acceptance from two-thirds of those States which at the time of adoption by the Assembly were Parties and represented at least two-thirds of the total investment shares. Under Article XVIII(2) of the Operating Agreement, the amendments to the Operating Agreement will enter into force one hundred and twenty days after the Depositary has received notice of their approval by two-thirds of those Signatories which at the time of confirmation by the Assembly were Signatories and then held at least two-thirds of the total investment shares.

61. COUNCIL/30/SR/FINAL, 4.3.5.

62. *Id.* The relevant periods are prescribed in CONV art. 34(1) and OA art. XVIII(1), which also give the Assembly the power to reduce these periods.

63. *See supra* note 62.

SPACE LAW AND THE GEOSTATIONARY ORBIT: THE ITU'S WARC-ORB 85-88 CONCLUDED

*Stephen E. Doyle**

Introduction

Another chapter has been written in space law. A revised set of international radio regulations has been formulated to regulate selected communication satellite uses of the geostationary satellite orbit (GSO). Because some operational communication satellite systems would not accommodate some proposed systems over a decade ago, future GSO systems were seriously threatened with unnecessary burdens. The burdens may yet be avoidable, however, with due diligence and a little common sense.

A problem that arose, in part, out of arrogance, and was aggravated by emotion, has now been resolved, but in a less than optimal way. Acting through the International Telecommunication Union (ITU) the international community has rationalized a method to overregulate selected future uses of the GSO by means agreed to in a compromise revision of the ITU Radio Regulations.

Serving in the time-honored tradition of a successful bureaucracy, the ITU has helped us muddle through another crisis of resource mismanagement, and helped us all to avoid responding to a problem with a solution that could have been more difficult to manage than the problem that was being addressed.

I. Background

The World Administrative Radio Conference (WARC) on the Geostationary-Satellite Orbit and the Planning of the Space Services Utilizing It (ORB-85-88) was a two-part conference that grew out of problems which arose in the mid-1970's. India and Indonesia were planning the establishment of their respective domestic satellite systems, which included use of fixed-satellite service (FSS) radio frequencies and desired positions on the geostationary orbit. Nations with services in that orbit and Intelsat, with satellites in service in that orbit, did not readily agree to adjust their operational systems and internationally coordinated system plans to accommodate the proposed systems of India and Indonesia[1]. Protracted negotiations ensued and the Indian and Indonesian governments decided that their positions as late-comers left them too vulnerable to the intentions and desires of developed countries. Subsequently, India and Indonesia

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1. For a general account of these events see First Report of the FCC Advisory Committee for WARC-ORB-1 (Dec. 1983) 4-24, submitted in FCC Doc. GEN-80-741; also redacted in Doyle, S.E. *"Regulating the Geostationary Orbit: ITU's WARC-ORB-85-88"* 15 J. SPACE L. 1-23, at 7-8 (1987). The Indian Government explained its frustration in IFRB Report to the First Session of WARC-ORB, ITU, Geneva, 1985 (annex); see WARC-ORB-1, Conf. Doc. No. 4E, 10 January 1985.

developed a strategy to seek from the 1979 ITU General World Administrative Radio Conference (GWARC) a decision to deal frontally with such conflicting claims as were emerging over the geostationary orbit. The issue was joined in Geneva at the GWARC-1979.[2]

The 1979 GWARC adopted a resolution declaring that a conference would be convened for the purpose of guaranteeing in practice for all nations access to the use of appropriate radio spectrum and orbital locations for communication systems on the GSO.[3] That resolution (and one other)[4] set the groundwork in place for the WARC-ORB-85-88. Details of this background have been well documented and need not be repeated here.[5]

As it developed, the conference became, particularly during its first (1985) session, a rather politicized event in an otherwise generally technical forum. Although the ITU has a record of more than a century of dealing effectively with international coordination and cooperation in the technology and the economics of communications, the issue now being brought to the ITU forum was much more political, and to some extent emotional. This issue would require a special solution because of its political and emotional content. Clearly, any significant action taken by the ITU to "guarantee" access to the GSO would involve some measure of regulation if not denials to some nations of the use of the resources. Results of this conference could affect all satellite services for many years depending upon what scope and complexity of action were to be decided upon.[6]

The ITU is the sole specialized agency of the UN dedicated to the coordination and regulation of the radio spectrum and facilities interconnected for global communication. The political aspect of the new preoccupation with the GSO is the necessity now for the ITU to enter the process of resource allocation in an environment

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2. For interpretations of these events see Rutkowski, A.M., *"Space WARC: The stake for developing countries,"* 1 SPACE POL'Y 240-243 (1985); Jasentuliyana and Chipman, *"Developing Countries, the GEO and the WARC-ORB-85 Conference,"* 1 SPACE POL'Y 244-249 (1985); Srirangan, T., *"Equity in Orbit: Planned Use of a Unique Resource"* a paper presented to the International Institute of Communications Annual Conference 1984, Berlin, Sept. 21-23, 1984; and Du Charme, Bowen and Irwin, *"The Genesis of the 1985/87 ITU WARC on the Use of the GSO and the Planning of Space Services Utilizing It,"* 7 ANNALS AIR & SPACE L. 261 (1982).

3. ITU, *Radio Regulations,* Geneva, 1982, Resolution 3, WARC '79.

4. ITU, *Radio Regulations,* Geneva, 1982, Resolution 2, WARC '79, which provides, *inter alia*, that registration of a satellite with the ITU "should not provide any permanent priority...and should not create an obstacle to the establishment of space systems by other countries."

5. See sources cited at note 2 above and sources cited in them.

6. A measure of the extent of U.S. interests in the Conference can be determined by noting the existence of U.S. Congressional advisers on the U.S. Delegation to the Conference and by the convening of special hearings to assess the results of the first session; see *World Administrative Radio Conference: Hearing before the Subcomm. on Communications and the Subcomm. on Science Technology and Space Transportation of the Senate Comm. on Commerce, Science and Transportation,* 99th Cong., 1st Sess., G.P.O., Wash., D.C. 1986.

where the demand exceeds the supply. Historically, the supply has been expanding faster than demand could consume it, but now we are reaching a cross-over where demand, at least in some regions and in some frequency bands, appears to be exceeding the available supply.[7] The perception of scarcity of resources results in:

- -- some countries wanting to protect the late entrant;
- -- some countries wanting to maintain flexibility of use; and
- -- some countries and organizations beginning to perceive, however dimly, that cooperation and accommodation in the use of the GSO are far superior solutions to a conference to establish a long-term, global, *a priori* plan.

II. WARC-ORB-85: The First Session

Details of the planning, organization and conduct of the first session of WARC-ORB have been reported in this journal[8] and in other locations. For this discussion, let us concentrate on the major decisions taken by the first session.

It was decided early and unanimously that it was not necessary to plan beyond the Broadcasting-Satellite Service (BSS) and the Fixed Satellite Services (FSS) at that time. It was agreed that within the FSS bands planning would be applied to selected bands only (6/4, 14/11-12 and 20/30 GHz bands). A series of eleven planning principles were adopted dealing with:

1. Guarantee of access and equitability
2. Sharing with other services
3. Reservation of resources
4. Technical aspects of special geographical situations
5. Consideration of existing systems
6. Provisions for multi-administration systems
7. Flexibility to accommodate unforeseen needs
8. Planning solutions adapted to circumstances
9. Efficiency in orbit and spectrum use
10. Provisions for multi-service and multi-band networks
11. Administrative costs controlled[9].

With these principles agreed, two approaches to a planning method were developed. An allotment plan was agreed that would permit each administration to satisfy requirements for national service from at least one orbital position within a predetermined arc and in predetermined bands. The allotment plan was agreed to be established in the bands:

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7. Doyle, S.E., *"Legal and Policy Implications of Treating Natural Resources as the Common Heritage of Mankind,* in PROC. 29TH COLLOQ. L. OUTER SPACE 31 (1986).

8. See Doyle, S.E., *op. cit.* note 1; see also Smith, M. L., *"Space Law/Space WARC: An Analysis of the Space Law Issues Raised at the 1985 ITU WARC-ORB,"* 8 HOUSTON J. INT'L L. 227-245 (1986).

9. These principles are elaborated at Doyle, S.E., *op. cit.* note 1.

4 500 - 4 800 MHz and 300 MHz to be selected in the band 6 425 -7 075MHz , and 10.70 - 10.95 GHz, 11.20 - 11.45 GHz and 12.75 - 13.25 GHz.

It was agreed that improved procedures would be established to satisfy requirements in addition to those appearing in the allotment plan. Improved procedures would apply in the bands:

3 700 - 4 200 MHz
5 850 - 6 425 MHz and
10.95 - 11.20 GHz
11.45 - 11.70 GHz
11.70 - 12.20 GHz in Region 2
12.50 - 12.75 GHz in Regions 1 and 3
14.00 - 14.50 GHz
18.10 - 18.30 GHz
18.30 - 20.20 GHz
27.00 - 30.00 GHz.

Both planning approaches were to comply with the eleven principles, recited above. The planning methods were to preserve the rights of other services having equal and primary status in the bands to which the methods applied. This fact creates the need for adoption of appropriate sharing criteria.

Various additional decisions and consequential actions were adopted at the first session.[10] Planning was limited to the FSS; planning would use an arc allotment approach in some bands and improved procedures in others. The arc allotment plans would guarantee access for at least one slot for every country for a total of 800 MHz of band width in a defined service area. It was understood that some countries might require more than one orbital position. When the first session ended there still remained a great deal of work to be done. There was limited time and there were limited resources at the ITU to undertake extensive intersessional studies.

A substantial amount of work was undertaken by several administrations working with the IFRB staff in the intersessional period. By the time the second session was ready to convene in August 1988, there was an almost completed set of computer programs that could greatly assist in the arc allotment planning process. The ITU issued a call for requirements to be considered at the second session and many nations provided system requirements to support the arc allotment plan.

III. WARC-ORB-88: The Second Session

The second session of WARC-ORB commenced in Geneva on 29 August 1988 and concluded there on 6 October 1988. In total, the Conference modified eleven articles of the Radio Regulations and made modifications to or added four major appendices of the Regulations. The articles and appendices involved are:

Articles 1, 8, 11, 12, 13, 14, 15A, 27, 28, 29 and 69.

10. See ITU, *Report to the Second Session,* Geneva, 1988.

Appendices 3, 4, 28, 29, 30A (ORB 88) and 30B.

The Conference also took decisions considered necessary or appropriate, including the review and revision of existing Resolutions and Recommendations associated with the Radio Regulations, and the Conference adopted various new Resolutions and Recommendations contained in the FINAL ACTS.[11]

This partial revision of the Radio Regulations (RR) shall form an integral part of the Regulations and shall enter into force on March 16, 1990.

In changes to Article 1, the Conference adopted new definitions of the Fixed-Satellite Service and of Radio Stations and Systems. Modifications were also made to definitional terms on frequency sharing. Some technical terms related to space also were modified.

The Article 8 changes involved aspects of Frequency Allocations and as one progresses deeper into the FINAL ACTS, the technical nature of the language and the changes becomes so arcane that only the most dedicated electrical engineer specializing in radio/satellite system operation could be comfortable. Consequently, rather than describe the results of the second session in terms of what was done technically, we can consider the results of the second session in terms of their impact or consequences.

Prior to convening the second session a great deal of effort was devoted to developing computer programs for use by the ITU in arc allotment planning. France, Japan, the United States and staff of the International Frequency Registration Board (IFRB) in Geneva devoted hundreds of manhours and untold machine hours to developing and proving operable computer programs. When the second session convened, early in the session, a number of technical constraints on planning systems were agreed by the Conference that had not been included in the computer programs. During the Conference, when computer runs were made, manual adjustments to program printouts were attempted, but no fully effective program could be demonstrated to the satisfaction of all delegations. Eventually a working plan was formulated and agreed. Assumptions underlying the plan are technically conservative, and relatively few new satellite systems are anticipated in the foreseeable future. Consequently, the adopted plan is expected to be serviceable and manageable for some time. It is anticipated that work will continue on computer software to improve its use in the planning function.

The improved procedures adopted essentially refine the international notification, filing and coordination systems that exist, and they provide that when appropriate and if needed, concerned nations can call for multilateral planning meetings (MPMs) to work out regional issues involving several nations simultaneously. The fact that MPMs are available as an alternative may, in fact, encourage and facilitate early bilateral settlements of coordination. It is in the coordination process that each nation must

11. FINAL ACTS, Adopted by the Second Session of the World Administrative Radio Conference on the Use of the Geostationary - Satellite Orbit and the Planning of Space Services Utilizing It (ORB-88), ITU, Geneva, 1988 (prelim.ed.), w/errata.

understand the far-reaching consequences of a failure to be reasonable, accommodating and willing to share burdens.

An arc allotment plan has been established which guarantees for every nation at least one orbital slot (more than one for some) and 800 MHz of useable band width. There appear to be no reasons now known why this plan should not enjoy an effective, long life. The nature of the plan agreed and the improved procedures also offer a degree of flexibility sufficient to accommodate multi-administration systems. John Hampton, a Deputy Director General of Intelsat reported that Intelsat believes its interests are appropriately safeguarded by the Conference results.[12]

One of the major consequences of changes to the language in Article 11 is the clarification of intent that in the process of system coordination, accommodation of the other systems is a mutual obligation that rests on systems in place, as well as on arriving systems. The new regulations also make clear the available resort to an MPM in appropriate circumstances.

One observation made by a leading personality in the U.S. Delegation, who is a prominent telecommunication policy consultant, was that the FINAL ACTS of the second session are not self-executing -- neither self-implementing nor self-enforcing. All nations involved in or with interests in space services will have to contribute effort and attention to make the WARC-ORB-88 results workable.[13] It must be recognized by all the players that the presence of rules for a game does not ensure that the game will always be well and fairly played. In the process of coordination of space networks based on the GSO all nations must show good will, a sensitivity to equity and a willingness to share the burdens created by intersystem accommodations. That need is no less critical now than it was before WARC-ORB 85-88.

The Conference adopted the needed technical standards, parameters, and criteria to manage the FSS in the bands designated by the first session. The entire body of applicable regulatory procedures was reviewed, and where necessary, revisions and additions to procedures have been made. The Conference formulated and adopted Feeder Links for the BSS in ITU Regions 1 and 3 and it made appropriate adjustments to RR Appendix 30. The Feeder Link plan now in Appendix 30A will remain in force until at least January 1, 1994 or until modified.[14] Finally, the Conference considered the matter of sound broadcasting, but was not able to take definitive action. It is expected that India will conduct some experiments in this area and that the subject will be addressed again at a future WARC, possibly in 1992.[15] A similar disposition was made of the issue of a dedicated band for high definition television (HDTV).[16]

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12. These comments were made at a seminar held to assess outcomes of the Conference by the Center for Strategic and International Studies, Washington, D.C., *"After Space WARC: What Next?"* Nov. 10, 1988. The seminar was organized and chaired by Diana Lady Dougan, Chair of the International Communication Program of the Center. Proceedings were not published.

13. These comments by D. Jansky were made at the seminar cited at note 12.

14. See FINAL ACTS, *cit.* note 11, Appendix 30, Art. 11 mods, p. 75.

15. See FINAL ACTS, *cit.* note 11, RESOLUTION COM 5/1, Resolutions pp. 13-16.

16. See FINAL ACTS, *cit.* note 11, RESOLUTION COM 5/3, Resolutions pp. 17-20.

The major work product of the WARC-ORB-88 is a new appendix in the Radio Regulations, which is designated:

Appendix 30B

Provisions and Associated Plan for the Fixed-Satellite Service in the Frequency Bands 4 500 - 4 800 MHz, 6 725 - 7 025 MHz, 10.70 - 10.95 GHz, 11.20 - 11.45 GHz and 12.75 - 13.25 GHz*.
(*see also RESOLUTION COM 4/2)

The document itself is quite technical, and the plan is a columnated symphony of numbers, 10 pages in length, with coded column headings that defy memorization.[17] In essence the new provisions present a plan in two parts: A) the national allotments, and B) networks of existing systems. Within this plan, an allotment is:

- a nominal orbit position,
- 800 MHz (up link and down link),
- a service area for national coverage,
- generalized system technical parameters, and
- a predetermined arc.

The predetermined arc's size changes over time depending upon the degree of system definition attained by a planned system. A system in the pre-design stage has an arc of plus or minus 20° east or west of the nominal position; at the design stage the arc is reduced to plus or minus 5°; and when a system becomes operational, it is assigned a specific location with 0° of arc.[18] There is an article defining the process by which an allotment in the plan is converted to an assignment;[19] and another article explains procedures to add a new allotment to the plan.[20]

The duration of the plan is stipulated as a period of at least 20 years from the date of entry into force of these provisions (*i.e.* from March 16, 1990 to March 16, 2010).[21] The technical parameters used in characterizing the FSS Plan are set forth in Annex 1 to Appendix 30B.[22] The nature and details of data to be furnished in filings of notices related to the FSS Plan are set forth in Annex 2. Other Annexes to Appendix 30B deal with:

- criteria for determining when proposed assignments are considered in conformity with the Plan (Annex 3A);

- the macrosegmentation concept (Annex 3B);

17. In the ADDENDUM to the preliminary edition of the FINAL ACTS see p. 39 *et. seq.*
18. FINAL ACTS, Addendum p. 42.
19. Article "L" in the FINAL ACTS, Addendum at pp. 44-52.
20. Article "K" in the FINAL ACTS, Addendum at p. 52.
21. FINAL ACTS, Addendum at p. 71.
22. *Id.* at 72-78.

- limits for determining whether an allotment or an assignment made in accordance with the provisions of Appendix 30B is considered to be affected (Annex 4);
- application of the predetermined arc (PDA) concept (Annex 5); and
- technical means which may be used to avoid incompatibilities between Fixed-Satellite Service Systems at their implementation stage (Annex 6).[23]

One RESOLUTION contained in the FINAL ACTS reviews all of the resolutions passed by various conferences since 1979 concerning WARC-ORB-85-88 and, where appropriate, identifies modified resolutions, as well as identifying those resolutions which are no longer useful or relevant, and they are cancelled.[24] There are a few additional technical matters contained in the FINAL ACTS and as a final page, there is a list of errata.

It should be borne in mind that the preliminary edition of the FINAL ACTS used to prepare this article will be superseded by a published book edition which may have other designations on article numbers, and on resolution and recommendation numbers, than those that appear herein. The titles, however, will be common and the substance of the provisions will not change.

IV. Concluding Observations

WARC-ORB-85-88 was a conference that might never had been held. The time, energy, stress and care devoted to it were required because, more than a decade ago, certain governments and organization officials were preoccupied with the letter of the law in the ITU regulations and they totally lost the spirit of the law. Much of what is now ITU RR Appendix 30B is an exercise in education and accommodation. It is an example of what happens when "national" positions are hardened, based on "sovereign interests." We all have to live together on this globe. The sooner we accept that simple fact, the sooner we will acknowledge that it is better to live in harmony than in conflict.

When the nations of the world begin to devote as much of their time, energy and resources to achieving and maintaining harmony, as we now devote to avoiding or preparing for conflict, we will be putting our energy and resources to better use. The century of global organization is entering its final decade, yet more than half of the world's nations are preoccupied with national prerogatives and maintenance of national sovereignty.

A famous American educator wrote:

> To develop international law and to teach governments and peoples how they can conduct international relations in accord with the prescriptions of that

23. *Id.* at 79-88.
24. RESOLUTION 92 (ORB-88), *id.* at 88-91.

> law is the greatest task which jurists can undertake. What processes or adjustments can the nations rely upon? What principles of justice can they accept? Until we can answer these questions, we cannot expect the nations, in the apt phrase of the Chief Justice, to abandon the law of force and abide by the force of law.[25]
>
> International law cannot be an extrapolation of our own faith or law, or of the faith or law of any nation. It must apply to the world as it is with its conflicts, it complexities, its changes and its dangers. To do this its principles must be universal, progressive, pragmatic and relative to changing conditions. We cannot expect law to descend upon the world through a stroke of genius or a grand design. Its progress depends upon the diligent work of many minds in many lands.[26]

In the view of this author, the "diligent work" of those engaged in international political and economic intercourse must be guided by the spirit of cooperation and accommodation to succeed. Unless we learn this soon, and move away from slavish adherence to the polarizing concept of absolute national sovereignty, our progress will be slow, if at all measurable.

The WARC that wasn't needed is now history. The strengthening of rules to try to legislate good sense is done in this area, for a while at least. Those who consider the GSO and related spectrum as "limited natural resources" are more secure. We tried to solve a political problem through law. But we will still have to apply some common sense.[27]

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25. Chief Justice Earl Warren, address at Urbana, Illinois, April 14, 1956.

26. Wright, Q., *"The Prospects of International Law,"* PROCEEDINGS OF THE AMERICAN SOCIETY OF INTERNATIONAL LAW 2, 11, Fiftieth Annual Meeting, Wash., D.C., April 25-28, 1956.

27. Doyle, S. E. *"Equitable Aspects of Access to and Use of the Geostationary Satellite Orbit."* 17:6 ACTA ASTRONAUTICA 637-646 (1988).

THE INTERGOVERNMENTAL SPACE STATION AGREEMENT AND INTELLECTUAL PROPERTY RIGHTS

R. Oosterlinck*

Introduction

This presentation deals with the provisions concerning Intellectual Property Rights foreseen under the Intergovernmental Agreement concluded on September 29, 1988, among the Government of the United States, Governments of Member States of the European Space Agency,[1] the Government of Japan and the Government of Canada on the cooperation in the detailed design, development, operation and utilization of the permanently manned civil Space Station.

Before going to the Intellectual Property Rights provisions it might be useful to recall briefly the legal construction and instruments governing this cooperation and its goal. The object of the cooperation is to establish a long term international cooperative framework for the

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The views expressed herein are those of the author and do not necessarily reflect the views of the European Space Agency.

1. The European Space Agency (ESA) was formed by a Convention which was opened for signature on 30 October 1980. The organization was established for exclusively peaceful purposes to provide for and to promote, cooperation among European States in Space research and technology and their applications. The Agency has 13 Member States; the Federal Republic of Germany, Belgium, Denmark, Spain, France, Ireland, Italy, Norway, The Netherlands, The United Kingdom, Sweden, Switzerland, and Austria. The contribution of ESA in the Space Station is carried out through the Columbus programme, undertaken as an optional program in which Member States participate, except Austria, Ireland, Sweden, and Switzerland.

detailed design, development, operation and utilization of a permanently manned civil Space Station.[2]

The Space Station will be a multi-use facility in low earth orbit comprised of a permanently manned base, a man tended free flying laboratory, two unmanned platforms in near polar orbit and Space Station unique ground elements.[3]

Legal framework

For the purposes of the present study, it will be sufficient to describe in general terms the legal framework governing the above cooperative agreement. The legal framework comprises three different legal instruments: first of all, the Intergovernmental Agreement (IGA) itself which is signed by States and is thus a multilateral agreement among States (12 Signatories but four Partners, USA, European States, Canada, Japan); Secondly, three bilateral Memoranda of Understanding (MOU) concluded between "cooperating agencies"; and, thirdly, Implementing Arrangements which complement them,

The respective cooperating agencies foreseen in the IGA (Art. 4) are NASA for the USA, ESA for the European Governments, and the Ministry of State for Science and Technology (MOSST) for the Government.

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2. For a more detailed survey of the legal considerations, see Lafferranderie, *La Station Spaciale* in DROIT DE L'ESPACE 157--196 (Pedone ed. 1988).

3. Agreement Among the Government of the United States of America, Governments of Member States of the European Space Agency, the Governmant of Japan and the Government of Canada in cooperation in the Permanently Manned Civil Space Station, signed Sept. 29, 1988, with Annex (hereinafter "Treaty").

1) The Government of the United States, through NASA, shall provide: Space Station infrastructure elements, including a habitation module; as user elements, a laboratory module for the manned base (including basic functional outfitting), attached payload accommodation equipment for the manned base, a polar platform; and Space Station-unique ground elements.

2) The European Governments, through ESA, shall provide:
as user elements, the Attached Pressurized Module for the manned base (including basic functional outfitting), a Man-tended Free Flyer which will be serviced at the manned base, a polar platform; and Space Station-unique ground elements.

3) The Government of Japan shall provide:
as a user element, the Japanese Experiment Module for the manned base (including basic functional outfitting, as well as the Exposed Facility and the Experiment Logistics Modules), and Space Station-unique ground elements.

4) The Government of Canada, through MOSST, shall provide:
as Space Station infrastructure elements, the Mobile Servicing Center (MSC), the MSC Maintenance Depot, the Special Purpose Dexterous Manipulator and Space Station-unique ground elements.

of Canada. The Government of Japan shall sign itself the MOU with NASA and will designate by that time its cooperating Agency.

The object of the MOU's concerns the detailed design, development operation and utilization of the Space Station. The Implementing Arrangements are to be concluded for the execution of the respective MOU's.[4, 5, 6] The legal framework is thus a three layer construction with the Intergovernmental Agreement (IGA) on top followed by the Memoranda of Understanding (MOU) subject to the IGA and finally implementing arrangements subject to the MOU's. The complexity of the legal structure is fully justified by the fact that the cooperative agreement will govern a multi-billion dollar project to be spread out over more than 20 years.

Intellectual Property Rights

Confusion frequently exists in the minds of jurists when discussing "intellectual property matters". Depending on the country from which they come, jurists will use this term for designating copyright and related issues, and will use the term "industrial property" when speaking on inventions and patents. Strictly speaking, however, "intellectual property" is a generic term comprising mainly but not exclusively patents, copyrights, trademarks, trade secrets and unfair competition.

During the negotiations of the IGA, several definitions have been proposed so as to define unambiguously "intellectual property rights". The definition given in Article 2 of the Convention establishing the World Intellectual Property Organization (WIPO) has been retained. In order to avoid possible change of this definition by further amendments of the

4. Treaty, *supra* note 3, at art. XXV. The entry into force of the IGA is not expected to take place before mid-1989.

5. Treaty, *supra* note 3, at art. I. In order to be in a position of signing the MOU's foreseen under art. IV of the IGA, US, Europe and Canada also signed an arrangement pending entry into force of the IGA.

6. Treaty, *supra* note 3, at art. IV. ESA/NASA MOU entered into force on 14 November 1988.

WIPO Convention, it has been agreed that Article 2 of the Stockholm Convention of July 1967 is the only one to be taken into consideration.[7]

As far as intellectual property and the space station is concerned, the main issue to be considered will undoubtedly be related to patent rights although the other components, in particular copyrights, should not be neglected.[8, 9]

A patent is an agreement between a State and an inventor. In return for a full public disclosure of the invention, the inventor is granted the right for a fixed period of time to exclude others from making, using or selling the invention on the territory of that State. The primary purpose is to encourage a public disclosure of the invented subject matter. The violation of the patent rights of an inventor is called infringement. The infringement results from an unauthorized making, using, selling and in some countries, importing the patented invention.

A basic principle of patent law is that the rights granted are limited in scope, time and space. In particular, the fact that an invention is only protected in the territory of those countries in which a patent has been granted is in the context of the Space Station, the most important element, *e.g.*, an invention made in Belgium but only patented in the USA means that in all countries (including Belgium), except in the USA the invention may be used freely. The process for obtaining a patent is very costly; therefore, inventions are normally protected only in those countries where either manufacturing or extensive use is expected to take place.

Since according to the "Outer Space Treaty" of 1967 (referred to in Art. 2 of the IGA) outer space is not subject to national appropriation by claim of sovereignty, by means of use or occupation or by any other means, the question arises which law should be applied in the absence of a territory in outer space for governing intellectual property matters? As

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7. Treaty, *supra* note 3, at art. XXI. The Convention Establishing the World Intellectual Property Organization (WIPO), concluded in Stockholm on July 14, 1967, by providing that "Intellectual Property shall include rights relating to:

[1] literary, artistic, and scientific works;
[2] performances of performing artists, phonograms, and broadcasts;
[3] inventions in all fields of human endeavor;
[4] scientific discoveries;
[5] industrial designs;
[6] trademarks, service marks, and commercial names and designations;
[7] protection against unfair competition;

and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields."(Art. II(viii)).

8. Oosterlinck, *Intellectual Property and Space Activities*, PROC. 26TH COLLOQ. L. OUTER SPACE 161-64 (1983).

9. Oosterlinck, *Legal Protection of Remote Sensing Data*, PROC. 27TH COLLOQ. L. OUTER SPACE 112-28 (1984)).

yet, no specific intellectual property law applicable in outer space is available. The only solution is the transposition of national law to outer space. In order to guarantee legal security, it will be necessary that commercial entities be able to determine in advance the law applicable to patents.[10] One possible solution is to use connecting factors similar to the ones used in the case of private international law.

Nationality

One potential connecting factor is "nationality". One could either consider the nationality of the inventor or the nationality of the person or entity who financed the experiments from which the invention resulted.

The problem with the nationality of the inventor is that in some countries that are part of the IGA, no difference is made between nationality and domicile. In fact, in the UK the notion of nationality in private international law is less important than domicile which in most cases will be the connecting factor.

Another problem with which we are faced when considering the inventors' nationality as a connecting factor is what happens if the invention is made by a team composed of members of different nationalities. The only possible solution would be that prior to the launch, agreements amongst the crew would be set up to deal with this matter. One can, however, easily understand that such an approach would be very cumbersome, and in many cases would lead to legal uncertainty. A second possibility would be to consider the nationality of the person or entity who financed the experiment. *e.g.*, if a French company finances an experiment from which an invention results, French patent law would be applicable to this invention.

However, the nationality of commercial firms is difficult to establish. In some countries, the nationality is not the most important factor, *e.g.*, under English law, the residence is generally the connecting factor between a corporation and the governing legal system. Moreover, although the nationality approach could eventually solve problems linked to the applicable law for the securing of patent rights, it is entirely inappropriate for dealing with infringement issues. Under this legal construction the place where the infringement takes place is irrelevant for sueing an infringer; only the nationality of the latter will be the

10. Hoover, *Law and Security from the Viewpoint of Private Industry*, 11 J. SPACE L. 115 (1983).

The intellectual prxoperty of private industry is vital to its existence. To the extent that the right to retain and protect technology is diluted or lost, the industry will be weakend or destroyed. Thus a vital issue of security to private industry in its outer space activities is its ability to maintain its proprietary position. *Id.* at 122.

determining factor. This approach is totally contrary to the fundamentals of patent law itself.

As mentioned above, patents are generally taken out in those countries where one could expect production or exploitation to take place. For high-tech issues the choice is normally straightforward and will be limited to some industrialized countries. For inventions made in outer space which can only be used or made in outer space, the situation is totally different.

Consider the following example: an invention made in outer space has been patented in France, Germany, Belgium, and Italy. If the nationality is the determining factor, this would mean that the same act taking place at the same location will be qualified an infringement if it is a French astronaut who uses the invention but not if it is a Norwegian astronaut! It is evident that industry could thus select its astronaut on nationality so as to avoid infringments! This selection process could also apply to the nationality of a firm. If a specific task is to be performed in outer space a firm could be set up having the nationality of a country in which no legal protection has been secured for the invention.

Territory

A second approach is the territorial approach. Under this system the Space Station activities with regard to intellectual property are deemed to take place in a certain territory on earth.

The most simple way would be if only one law were applicable to the Space Station. Since the U.S. is the biggest financial contributor to this venture, one could logically conclude that U.S law schould apply.This solution envisaged by some U.S. jurists is unacceptable to the other partners for reasons linked to obtainment of patent rights as well as to possible infringement issues.

The securing of patent rights in the U.S. differs considerably from all other countries in that the first to invent principle is applied whereas in the other countries the first to file principle applies. Under the "first to file" system the patent will be granted, provided that all other requirements are fulfilled, to the one who first filed a patent application for the invention. Whereas, under the "first to invent" system the patent will be granted to the first and true inventor. In practice, the date of filing a U.S. patent applicaton is considered the date of invention. If necessary, however, the inventor may swear back to an earlier date which must be proved by convincing evidence, *i.e.*, lab notebooks, records, etc.

The "first to invent" principle is in itself not an unfair system. The only difficulty lies in proving that an inventor is the first inventor. However, the fact that U.S. patent law requires that an invention made abroad establish the effective date of invention is unacceptable in the context of the space station since this would automatically put an inventor

who made the first steps towards his invention in the U.S. in a better position.[11]

A supplementary problem resides in the fact that the U.S. Invention Secrecy Act provides that if an invention is made in the U.S. a person may not file an application for a patent in a foreign country unless he has either filed a patent application in the U.S. and waited six months or obtained a license to file abroad from the Commissioner of Patents and Trademarks. This provision is not to be condemned since limitations of the freedom to file in any other country immediately after having filed an original patent application also exists in other countries; *e.g.*, in France where Art. 77 of the Penal Code provides that whoever discloses to a foreign state information concerning an invention without prior approval is subject to imprisonment for 10 to 20 years.[12,13]

Notwithstanding the fact that similar provisions exist in most countries, the application of a unique patent law would mean that the officials of that country could, for reasons peculiar to their security policy, classify patent applications irrespective of the fact that the invention was not conceived nor reduced in practice in that country, nor was the invention or the one who financed the invention a resident in that country. It is easy to understand that the above consequences made the application of a unique national law impossible.

An even more important consideration that is counter to a single national patent law is evidenced in litigation procedure in infringement cases. If only one law applies, it would be sufficient to file one patent application only in that specific country; *e.g.* if U.S. patent law were selected as the patent law, all conflicts would be dealt with in the United States which would undoubtedly lead to higher expenditures for foreign entities, and the possibility of jury trial foreseen under U.S. law applicable to patent issues could lead to unexpected amounts to be paid to the patent owner.

The final solution retained by the IGA is a multi-territorial approach slightly adapted to avoid problems based on nationality for

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11. 35 U.S.C.A. para. 104: "In proceedings in the Patent and Trade Mark Office and in the Courts, an applicant for a patent, or a patentee, may not establish a date of invention by reference to knowledge or use thereof, or other activity with respect thereto, in a foreign country,..."

12. Art. 77 of the Code Penal:

"Sera punit de la détention criminelle à temps de dix à vingt ans tout Francais ou étranger qui sans autorisation préalable de l'autorité compétente, livrera ou communiquera à une personne agissant pour le compte d'une puissance ou d'une entreprise étrangère soit une invention intéressant la defense nationale, soit des renseignements, études ou procèdes de fabrication se rapportant à une invention de ce genre ou à une application industrielle intéressant la défense nationale."

13. Provisions to bar an invention from filing a foreign patent application because the disclosure is considered detrimental to national security exist in almost all countries. For instance, articles 24 to 27 of the French Patent Law provide for means to safeguard the interest of national security.

obtaining patent rights and to avoid changing the current regulations in force (in particular in the U.S. where the IGA will be an Executive Agreement). In application of Art. 21 an activity (as far as intellectual property is concerned) ocurring in or on a Space Station element, excluding Extra-Vehicular Activities (EVAs), shall be deemed to have occurred only in the territory of the Partner State of that element's registry, except that for ESA-registered elements, any European Partner State may deem the activity to have occurred within its territory.[14,15]

This fiction is also considered under U.S. domestic law where in application of the Patents in Space Act the application of the U.S. patent law will be extended to activities occurring on U.S. aeronautical and space vehicles.[16] This fiction has also been applied or mentioned in patent litigations (Appeal Board). Several of these suits have dealt with the question of whether an invention was conceived or actually reduced to practice within the United States. In a case concerning a process for obtaining oxygen from extraterrestrial materials containing iron-bearing oxides on the moon, the Appeal Board stated that the process to be carried out on the moon by personnel subject to its jurisdiction, is not inimical and at variance with the indicated section of statute.[17] In order to avoid the limitations imposed by national security, the third paragraph of Art. 21 provides that in respect of an invention made in or on any Space Station flight element by a person who is not its national or resident, a

14. Treaty, *supra* note 3, at art. 21 para. 2.

Subject to the provisions of this Article, for purposes of intellectual property law, an activity occuring in or on a Space Station flight element shall be deemed to have occured only in the territory of the Partner State of that element's registry, except that for ESA-registered elements any European Partner State may deem the activity to have occurred within its territory. For avoidance of doubt, participation by a Partner State, its Cooperating Agency, or its related entities in an activity occuring in or on other Partner's Space Station Flight Elements shall not in and of itself alter or affect the jurisdiction over such activity provided for in the previous sentence.

15. *Id.* For the time being there is no European patent law. This may change with the introduction of an EEC patent which would be a unique title enforceable in all EEC Member States. There remains however, the problem that not all ESA Member States are EEC Member States.

16. H.R. 1510, Cong. Rec., Oct. 5, 1988, p. H9669. "Patents in Space Act", Chapter 10, title 35 provides under para. 105 that "any invention made, used or sold in outer space on an aeronautical and space vehicle as defined in section 103(2) of the NASAct under the jurisdiction or control of the United States shall be considered to be made, used or sold within the United States for purposes of this title with respect to any space vehicle or component thereof that is specifically identified and otherwise provided for by an international agreement to which the United States is a party."

17. *See* 200 U.S.P.Q. 324-327.

Partner State shall not apply its law concerning secrecy of invention so as to prevent the filing of a patent application.

Since the solution reached under section 2, Art. 21, para. 2 results in the fact that any act is deemed to take place simultaneously in all European Partner States, some limitations should be introduced for infringement cases. One could, for example, imagine that in the previous example an invention is protected by a patent in France, Germany, Belgium, and Italy. If infringement of this patent takes place in ESA's element, the infringer could be sued in all the countries for the one unlawful act. In order to circumvent this, para. 4 provides that if intellectual property is protected in more than one European Partner State, the Patentee may not recover in more than one such State for the same act of infringement. In other words, it is up to the patent right owner to determine in which country he wishes to start an infringement procedure.

In many cases, however, patent rights in different countries for one invention do not belong to the same person or entity. It could well be that in the above example the patentee has retained his rights in France but licensed them to three different licensees in the other countries. In this case the infringer could only be sued once the question of who is entitled to recover damage resulting from infringement is settled. The solution retained in the IGA is essentially a first come first-serve system.

Where the same act of infringement in or on an ESA-registered element gives rise to actions by different intellectual property owners, a court may grant a temporary stay of proceedings in a later filed action pending the outcome of an earlier filed action. And if satisfaction of a judgment is rendered for damages in any of the actions, this shall bar further recovery of damages in any pending or future action for infringement based upon the same act of infringement (Art. 21, para. 4 second sentence).

The above wording (*i.e.* "may") leaves the granting of a temporary stay to the judge's discretion. In other words, it will not necessarily be the one who first sued who, in the end, will be compensated for damage or loss suffered. In order to avoid uncertainty, it will be mandatory to introduce adequate provisions of Member States into the national legislation of ESA. In particular, it would be unacceptable to let different patent right owners file multiple infringement actions when the one for which a national judge will render a final decision will be compensated.

A special provision concerning licenses is given in para. 5. No European Partner State shall refuse to recognize a license if that license is enforceable under the laws of any European State, and compliance with the provisions of such license shall also bar recovery for infringement in any European Partner State. This provision prohibits litigation between patents right owners in different States for the same invention.

At first sight, these provisions may appear to result in an unsatisfactory settlement; *e.g.*, take the above case where three licenses

have been granted for the same invention, yet only one of the licensees will recover damages from infringement and, thereby, will automatically exclude the others from recovery. If one considers, however, that infringement takes place in outer space and that only the ficton of the infringement taking place on earth has made it possible to sue the infringer, one can only conclude that the patent rights which, in the first place, have been granted for activities within the boundaries of the respective State where patent rights have been secured are still totally valid and that the only difference is that the one who has sued successfully has gained something up and above his original rights!

Also as far as patentability is concerned, the provisions under Art. 21 have practical consequences. If use, sale, or knowledge of an invention occur strictly on a US flight element this would bar patentability in the US; however, if the same activity occurs on a non-US element, the patentability would not necessarily be affected. The important legal consequence of this territorial approach as far as patentability is concerned is that it applies regardless of nationality. Thus, a US citizen on a ESA flight element would be subject to the same legal interpretations as a non-US citizen, and these would be based on the theory that the relevant activities occured outside the United States.

Two main contraints imposed by the different Partners are:

(i) the IGA should not result in a change in laws presently in force, and
(ii) the jurisdiction and control principle should be applied.

This construction foreseen under the IGA, is the best construction under positive law. However, it is still far from satisfactory. In particular, problems will arise when an invention can only be used in outer space. For those cases it should be clear from the outset that acts of infringement will be limited to use or making and that selling is for the moment excluded.[18] One could however envisage other cases where patented products can only be manufactured in space, but will be used on earth where they will be put on the market. In such cases this selling will be ruled by normal national patent law to which the fiction would not apply.

Take the following example: a pharmaceutical product which can only be manufactured in outer space has been invented. The question which will arise is which patent policy should be applied by the inventor (firm).

At first sight, one could conclude from Art. 21 that it would be sufficient to file a patent application in only one European Partner State, such as, for instance, France. Then a German firm wants to use the invention regardless of the fact that this firm has never had any activity

18. Treaty, *supra* note 3, at art. IX, para. VII. Notwithstanding the fact that a Partner has the right to barter or sell any portion of their respective allocation.

in France nor intend to have any in the future. The fact that the invention is used on the ESA registered element will automatically result in an infringement in France and the German firm could be sued in France. For manufacturing in outer space, one patent could thus be sufficient.

The problem, however, is that once the product has been manufactured it will be sold on earth, and legal protection at present will now only be available in those countries where the product has been patented. It is paradoxical that although the processing of the pharmaceutical product took place fictionally in all European Partner States, the French patent prohibits any firm from other ESA States to manufacture the product. Note that actual selling of the product will only be an act of infringement through importation if the product is patented in the different States. Therefore, it is important to file a patent application in those countries where one expects to do business to insure proper protection.

The whole fiction of Art. 21 is based on the registration of space objects in application of Art. VIII of the Outer Space Treaty. Many definitions of the term "space object" have been proposed, though there is still no official definition. Until recently the U.S. interpretation was that an object launched in space only qualifies for a space object if it is capable of free flying. A Spacelab, for example, which was an integrated part of the shuttle was not considered by the U.S. as being a space object, and could therefore not be registered separately.[19, 20]

Some authors give an attributive character to the registration, thereby admitting that through registration of a space object by a State, laws of that State could be applicable on that space object.[21] A similar approach has been used for ships and aircraft whereby the registration determines to some extent the applicable law. The rationale behind this approach is that since ships and aircraft are moving from one State to another, the legal status would change continuously. This approach, however, is debatable for objects launched into outer space since contrary to what is the case for ships and aircraft, an object in outer space does not cross any frontiers. But, according to others, the registration is only declaratory in that the legal status on the space object or personnel thereof is not altered by the launching into outer space of this object.

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19. Bourély, *Legal Regime of International Space Flight: legal issues relating to flights or the SpaceLab* in THE SPACE SHUTTLE AND THE LAW 73-76 (Stephen Gorove ed., Monograph Ser. No. 3. Univ. Mississippi Law Center, 1980).

20. Sloup, *Legal Regime of International Space Flights: Criminal Jurisdiction and command authority aboard the Space Shuttle/SpaceLab* in THE SPACE SHUTTLE AND THE LAW 72-92 (Stephen Gorove ed., Monograph Ser. No.3. Univ. Mississippi Law Center,1980).

21. R. OOSTERLINCK, REGISTRATION AND LAW APPLICABLE TO ACTIVITIES CARRIED OUT IN OUTER SPACE, (to be published in 1989).

The provisions of section 2, Article 5 of the IGA "Registration Jurisdiction and Control"[22] is a major step forward in resolving problems linked to registration. It first establishes that elements, whether free flying or not, are capable of being registered, provided they are identified beforehand. Furthermore, jurisdiction and control of a Partner is not limited to the elements has registered, but it extends over personnel who are its nationals irrespective of whether they are on an element which has been registered by another Partner. This approach leans towards the declaratory action of Art. VIII of the Outer Space Treaty in some respects.[23]

The last paragraph of Article 21 concerns the temporary presence doctrine. This doctrine provides for certain limitations on exclusive rights in cases where ships, aircraft or land vehicles temporarily visit foreign countries. Such temporary presence is not considered an infringement of the rights of a patentee. This doctrine is based on Article

22. Treaty, *supra* note 3, at art. V, para. 2:

"Pursuant to Article VIII of the Outer Space Treaty and Article II of the Registration Convention, of 1974 each Partner shall retain jurisdiction and control over the elements it registers in accordance with paragraph 1 above and over personnel in or on the Space Station who are its nationals. The exercise of such jurisdiction and control shall be subject to any relevant provisions of this Agreement, the MOUs, and implementing arrangements, including relevant procedural mechanisms established therein."

23. Article VIII of the Outer Space Treaty of 1967 provides:

"A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof while in outer space or on a celestial body..."

In application of Article VIII the State on whose registry the object is carried has jurisdiction over all persons on the object irrespective of their nationality.

5 of the Paris Convention to which all Partner States are a party.[24] In fact, section 6 of Art. 21 of the IGA rephrases the wording of Article 5 by explicitly including space objects as "aircraft or land vehicles".[25]

A last provision concerning intellectual property rights is found under Article 16 which deals with cross-waiver of liability. The objective of this Article is to establish a cross-waiver of liability by the Partner States and related entities in the interest of encouraging participation in the exploration, and use of outer space through the Space Station. This cross-waiver of liability is, however, explicitly excluded for intellectual property claims (Art.16.3.d.4).[26] The provisions of this article emphasize the importance of defining the applicable law concerning intellectual property for space activities and for infringement cases, in particular.

One final remark can be made on the absence of an authorization and content clause. In the past such a clause has been used in cooperative agreements. The advantage of it being that if such a clause is foreseen

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24. *See* art. 5 ter of the Paris Convention for the protection of industrial property.

"In any country of the Union the following shall not be considered as infringements of the rights of a patentee....:

[2] the use of devices forming the subject of the patent in the construction or operation of aircraft or land vehicles of other countries of the Union, of accessories of such aircraft or land vehicles, when those aircraft or land vehicles temporarily or accidentally enter the said country."

See also the US Patent Law under which the application of the temporary presence doctrine is explicitly foreseen. USC 35 Patents; Pub. L. 96-517, para. 272, Temporary presence in the United States: "The use of any invention in any vessel, aircraft or vehicle of any country which affords similar privileges to vessels, aircraft or vehicles of the United States, entering temporarily or accidentally, shall not constitute infringement of any patent, if the invention is used exclusively for the needs of the vessel, aircraft or vehicle and is not sold in or used for the manufacture of anything to be sold in or exported from the United States." See also NASA Authorization Act 1982, Pub. L. 97-96 Dec. 21 1981, sec.7, adding a new subsection to the National Aeronautics and Space Act of 1958, Section 305: "(k) Any object intended for launch, launched or assembled in outer space shall be considered a vehicle for the purpose of section 272 of title 35 United States Code."

25. Art. 21, para. 6: The Temporary presence in the territory of a Partner State of any articles, including the components of a flight element, in transit between any place on Earth and any flight element of the Space Station registered by another Partner State or ESA shall not in itself form the basis for any proceedings in the first Partner State for patent infringement.

26. *See also* 53 Fed. Reg. 45095-45096 (to be codified at 48 CFR. pts. 1828 & 1852):

"Since the obligation of the United States Government under the International agreement is effective now, it is an urgent and compelling matter to place the cross waiver liability clause to appropriate NASA contracts and subcontracts. Therefore this rule is issued as an interim rule to require its immediate use."

under US law,[27] any suit for infringement of a patent based on the manufacture or use of a patented invention for the Government by a contractor or by a subcontractor (including lower tier subcontractors) can be maintained only against the Government and not against the contractor. The liability of the Government for damages in any suit against it may, however, ultimately be borne by the contractors. The patentee's remedy against the Government shall, however, be limited to reasonable compensation.

Conclusion

Since outer space is not subject to national appropriation, it is difficult to accept that national laws can be applicable to activities carried out in outer space. To reconcile this the fiction that these activities are taking place on earth has been introduced. For the time being this approach will be sufficient but when activities in outer space increase it will be necessary to look for other solutions. One solution would be to draft a Convention on "Intellectual Property - Space Law". Under this Convention, outer space would be considered as one territory for which patents would exist and whose effect would be limited to outer space. This territorial approach could of course only be developed if all nations recognized an intergovernmental organization, such as the World Intellectual Property Organization (WIPO).

27. *See,e.g.,* 28 USC 1498.

Since 1981, the authorization and consent should be given explicitly and beforehand. See NASA Authorization Act 1982, Pub. L. 97-96, Dec. 21, 1981, sec. 7, adding a new subsection to the National Aeronautics and Space Act of 1958, Section 305:

"(1) The use or manufacture of any patented invention incorporated in a space vehicle launched by the United States Government for a person other than the United States shall not be considered to be a use or manufacture by or for the United States within the meaning of section 1498(a) of title 28, United States Code, unless the Administration gives an express authorization or consent for such use or manufacture."

EVENTS OF INTEREST

A. PAST EVENTS

Reports

Review of the Work of the United Nations Scientific and Technical Sub-Committee on Outer Space in February - March 1989

The Scientific and Technical Sub-Committee of the United Nations Committee on the Peaceful Uses of Outer Space held its twenty-sixth session in New York at its Headquarters from 21 February to 3 March 1989. The report of the Sub-Committee and its two Working Groups are to be found in U. N. document A/AC. 105/429. The important discussions and recommendations are summarized below.

(A) Implementation of the recommendations of UNISPACE 82

The Sub-Committee considered this agenda item through the Working Group of the Whole to Evaluate the Implementation of the Recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82). As in past years, the Working Group worked on the basis of a draft text of recommendations prepared by the Group of 77. The Working Group recognized that many of the recommendations of UNISPACE 82 have still not been fully implemented.

As a result, the Working Group recommended that the United Nations Programme on Space Applications should maintain its emphasis on long-term project-oriented on-the-job training in specific application areas of space technology, particularly new developments in satellite systems software for remote sensing and use of digital processing systems and training for management of ground stations.

In the light of the on-going development of space activities, the Working Group recommended that all States, in particular those with major space or space-related capabilities, and international organizations be requested to inform the Secretary-General annually on those space activities that are or could be the subject of greater international co-operation.

With a view to promoting better access to space-related disciplines, the United Nations should arrange for consultancy of experts to be provided to States in their preparation of an integrated national plan of action for initiating, strengthening or reorienting an appropriate programme.

The United Nations should encourage intensive participation of international and regional financial and development institutions in co-operative programmes and projects which States formulate.

States with relevant capabilities should be encouraged to provide developing countries with technical and financial aid for developing low-cost community receivers for communication satellites.

With regard to paragraph 8(b) of General Assembly resolution 43/56 of 6 December 1988, in which the Assembly considered it urgent to implement the recommendations that data banks should be strengthened at the national and regional levels and an international space information service be established at the Outer Space Affairs Division of the Secretariat, the Working Group asked the Division to convene a meeting of experts representing developed and developing countries with a view to consider ways and means for the implementation of this recommendation.

The Working Group also recommended that the Outer Space Affairs Division report to the Scientific and Technical Sub-Committee in the 1990 session which of the UNISPACE 82 recommendations, addressed to the United Nations, had not yet been implemented.

(B) Use of Nuclear Power Sources in Outer Space

The Sub-Committee considered this agenda item through the Working Group on the Use of Nuclear Power Sources in Outer Space. While the Legal Sub-Committee considers draft principles on this question, the Scientific and Technical Sub-Committee considers its technical aspects, in particular its safety aspects. In the 1988 session, a question was raised on whether dispersal of nuclear fuel, considered as one of the safety measures in case of uncontrolled re-entry of a space object with a nuclear reactor on board into the Earth's atmosphere, can be complete, and also on the possibility of collision of nuclear power source with space debris. As a result, the Sub-Committee had stated that further information and investigation was required on the question of complete dispersal, and also encouraged national studies on the question of collision. In this year's session, the Working Group received views and working papers from Chile, the Federal Republic of Germany, Indonesia, Iraq, Saudi Arabia, the Soviet Union, the United Kingdom (A/AC.105/C.1/L.21 and Corr. 1 and 2, Add.1-7 and Add.5/Corr.1, A/AC.105/C.1/WG.5/1989/WP.1).

The consideration of the question of the completeness of dispersal ended up in a technical disagreement between the Federal Republic of Germany and the Soviet Union: the former expressed doubts about it and the latter maintained that the concept of complete dispersal was applicable to virtually any kind of fuel.

On the question of possible collision, there were technical discussions, and the Working Group considered it essential to continue the study of the problem, and again called for national research, the

results of which should be submitted to the Scientific and Technical Sub-Committee.

On the question of the "nuclear-safe orbit" or "parking orbit", the Working Group recommended that nuclear reactors used in Earth orbit should be stored, after their mission, in a "parking orbit" until radioactivity has decayed to an acceptable minimum level before re-entering the Earth's atmosphere. The altitude of the parking orbit should take into consideration that, in case of possible destruction of the reactor due to a collision with space debris or object, the reactor parts should also attain the required decay time before they re-enter the Earth's atmosphere.

On the question of a back-up system, the Working Group recommended that, in view of possible failures in the systems of nuclear power sources or satellites during operations in orbit (including operation for transfer into the parking orbit), there should be a highly reliable operational system to ensure a reliable and controllable disposal of the reactor. Such measures could, for example, be a back-up system to reach the parking orbit, a controlled and intact re-entry or other methods to be developed in the future.

The Working Group also recommended that in the case of radio-isotope generators (RTG), the containment for the radionuclide materials should be such that the probability of the release or radio-isotope should be minimum.

(C) Remote Sensing

In the course of the debate, Member countries reviewed their national and international co-operative programmes in remote sensing of the Earth from outer space, The Sub-Committee recommended that information and data from remote sensing should be disseminated at a reasonable cost and in a timely manner to meet the needs of developing countries. Free access to data from meteorological satellites should also be ensured.

(D) Space Technology for Environmental problems

As decided upon at the last session, the theme for special attention at this year's session was "Space technology as an instrument for combating environmental problems, particularly those of developing countries," and a symposium on this theme was organized by the Committee on Space Research (COSPAR) and the International Astronautical Federation (IAF) in two sessions, with the participation of the Scientific Committee on Problems of the Environment (SCOPE).

The Sub-Committee heard that the Soviet Union is offering the use of a specialized remote sensing and ecology module PRIRODA (meaning

"Nature"), a part of the Mir orbital station, to the international scientific community.

It also noted that the United States continues to provide free international direct-data-readout services from its environmental spacecraft. The applications of the data included vegetation inventory, agricultural assessment, fisheries and watershed and range management.

In India, remote sensing from space was used for detection, forecasting and prevention of deforestation, floods, drought and land degradation, and also for locating underground water sources.

In Egypt, Landsat images were used for surveying current land use patterns and potential land capability and providing land use maps for most of Egypt. They were also used for getting information on crop, fungus infestations, soil moisture distribution, salinity, alkalinity, water logging and degradation of agricultural land and urban encroachment on agricultural land.

The Sub-Committee heard warnings that the rate of deforestation in the world, particularly in the Brazilian Amazon, was growing rapidly, contributing to the increase in carbon dioxide in the Earth's atmosphere. A co-ordinated programme of satellite imagery acquistion and analysis could effectively be used to monitor the rate of deforestation, relying upon Landsat, SPOT, AVHRR (Advanced Very High Resolution Radiometer satellite - NOAA) data. No new satellite systems, innovation in technology or improvement in existing data collection system would be required.

(E) Other matters

The General Assembly and the Committee on the Peaceful Uses of Outer Space (COPUOS) last year had debated without reaching consensus the question of whether the Assembly should declare 1992 as international space year. The General Assembly last year in its resolution 43/56 had endorsed the request of COPUOS that the Scientific and Technical Sub-Committee consider recommendations regarding possible activities which might be undertaken during an international space year.

The Sub-Committee at this year's session considered two working papers by the Soviet Union (A/AC.105/C.1/L.161) and the United States (A/AC.105/C.1/L.160) on such possible activities, but did not reach consensus on possible specific activities. The Sub-Committee considered that COPUOS should address the question of whether it was advisable for the General Assembly to declare 1992 as international space year.

This year's session of the Sub-Committee had again a substantial scientific content. In addition to the above mentioned symposium organized by COSPAR and IAF, fourteen scientific and technical presentations were made by Member States and international non-governmental organizations. The Sub-Committee decided as the theme for

special attention of the 1990 session: "The use of space technology in terrestrial search and rescue and in disaster relief activities".

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*The 28th Session of the Legal Sub-Committee of the UN Committee on the Peaceful Uses of Outer Space, 20 March - 7 April 1989**

The 28th session of the Legal Sub-Committee of the UN Committee on the Peaceful Uses of Outer Space (COPUOS) took place in New York from 20 March to 7 April 1989. The Sub-Committee appeared to pick up its pace, though principally only on one of its agenda items: the use of nuclear power sources in outer space; no visible advances were made on the other substantive or procedural items, except that a program of work was adopted for the long-awaited new item.

Nuclear Power Sources

This subject has now been under consideration for a decade, during the early part of which only very slow progress was made. As reported last year,[1] at the 27th session the previous rather constricted set of draft principles was somewhat expanded and rounded out, in particular as reflected in a paper that the Canadians submitted at the end of that session.[2] Though this time they did not submit a yet more advanced comprehensive draft reflecting inter-sessional consultations, the just-mentioned closing paper at the 1988 session served as the main framework of the discussion this year. In addition, perhaps stimulated by a report on this subject from the recent 26th session of the Scientific and Technical Sub-Committee[3] and by various developments since the last session (such as the alarm about the possible crash of another Soviet satellite, "Cosmos-1400", with a nuclear power source on board, and the increasing recognition that the radiation emitted by even a normally operating reactor in space can disturb scientific measurements being carried out from other satellites), several delegations introduced drafts relating to one of the key principles: No. 3, "Guidelines and criteria for

* The views expressed herein are those of the author and do not necessarily reflect those of the United Nations.

1. *See* Szasz, *The 27th Session of the Legal Sub-Committee of the UN Committee on the Peaceful Uses of Outer Space, 14-31 March 1988.* 16 J. SPACE L. 57-63 (1988).
2. U.N. Doc. A/AC.105/C.2/L.154/Rev.4, reproduced in Annex III.A.4 of the Report of the Legal Sub-Committee (of COPUOS) on the Work of its Twenty-seventh Session (A/AC.105/411) (hereinafter referred to as the 1988 Report).
3. U.N. Doc. A/AC.105/429, Annex III.

safe use",[4] and a substantial portion of the debates on this item centered on this question. However, almost all the other principles also received a going-over, and at the end of the session the Canadians were able to present another complete draft reflecting the work done during the past weeks.[5]

Following is a brief account of the evolution this year of each of the eleven principles now under consideration:

1. *Applicability of international law*: The text of this principle had been agreed to at the 27th session[6] and was not re-examined at the 28th.

2. *Notification of the presence on board a space object of a nuclear power source*: After extensive debate,[7] centering mostly on the question of timing (i.e., should the notification be made before the launch, immediately thereafter or only as soon as possible thereafter) and on the relation of this obligation to that under article IV of the Convention on Registration of Objects Launched into Outer Space,[8] the principle was tentatively changed in the Canadian draft by merely deleting the prior reference to that earlier instrument.

3. *Guidelines and criteria for safe use*: As indicated, at the current session attention focused on this principle.[9] Early in the session, the British, the Canadian and the French delegations separately submitted complete redrafts of the previous text.[10] After consultations among these delegations and some others, a western five-power draft[11] (albeit one containing several bracketed passages marking limited disagreements among the co-sponsors) was in effect substituted for the individual efforts, and at the end of the session the Canadians inserted it (brackets and all) into their new comprehensive text.[12]

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4. U.N. Docs. A/AC.105/C.2/L.168 by United Kingdom, /L.169 by Canada and /L.170 by France. These documents are, somewhat unusually, not reproduced in the 1989 Report, presumably because their sponsors all joined in a later draft that is so reproduced (*see* note 11 *infra*); *see also* note 22 *infra*.

5. U.N. Doc. A/AC.105/C.2/L.154/Rev.5, reproduced in Annex III.A.3 of the Report of the Legal Sub-Committee (of COPUOS) on the Work of its Twenty-eighth Session (A/AC.105/430) (herein referred to as the 1989 Report).

6. 1988 Report, Annex I, para. 8, reproduced in 1989 Report, Annex III.A.4, part II.

7. 1989 Report, Annex I, paras. 7-10.

8. Convention on Registration of Objects Launched into Outer Space, 14 January 1975, 26 U. S. T. 695, T. I. A. S. 8480, 1023 U. N. T. S. 15 (entered into force: 15 September 1976). Set out in *The United Nations Treaties on Outer Space* (U.N. Publication Sales No.E 84. I. 10, New York, 1984) (The Space Treaties Booklet).

9. 1989 Report, Annex I, paras. 11-35.

10. *Supra*, note 4.

11. U.N. Doc. A/AC.105/C.2/L.173, reproduced in Annex III.A.2 of the 1989 Report.

12. *Supra*, note 5.

4. *Safety assessment*: After some debate[13] centering on which state (the launching one, or another that may have constructed the satellite) is responsible for the safety assessment, and whether the latter need be made public, the Canadians included bracketed clauses reflecting these disagreements into their closing comprehensive text.

5. *Notification of re-entry*: This principle, on which consensus had already been achieved at the 25th session,[14] was only briefly re-examined this time.

6. *Consultations*: After some deliberations, a consensus was recorded on the text[15] as it had appeared in the Canadian draft submitted at the close of the previous session.

7. *Assistance to States*: As in respect of principle 5, this already accepted principle[16] was only briefly re-examined this time.

8. *Responsibility of States*: After some debate[17] relating mostly to verbal issues, the Canadians submitted a new draft of this principle,[18] and then inserted that, with certain editorial changes, into their new comprehensive draft.

9. *Compensation*: After some debate[19] on three of the four paragraphs of this principle, only a minor drafting change was made in the first of these paragraphs in the closing Canadian draft.

10. *Settlement of disputes*: After a short debate, a consensus was recorded on a brief and basically insubstantial text.[20]

11. *Relation with international treaties*: As a result of an inconclusive debate,[21] the Canadians made some changes in this brief text, as it appears in their new comprehensive draft.

Definition of Outer Space

Once again, as during all but four of the last 22 years, the "Matters relating to the definition and delimitation of outer space", which again were coupled with consideration of the geostationary orbit (see below), were considered fruitlessly in a Working Group. No new documents were introduced, and the only ones referred to were two that the Soviet Union (the principal sponsor of this item) had introduced in

13. 1989 Report, Annex I, paras. 36-41.
14. U.N. Doc. A/AC.105/370 and /Corr.1, Annex II, paras. 5.1-5.3, reproduced in Annex III.A.4, part I, of the 1989 Report
15. 1989 Report, Annex I, para. 42, reproduced in Annex III.A.4, part II, of the 1989 Report.
16. *Supra*, note 14, paras. 5.4-5.5.
17. 1989 Report, Annex I, paras. 43-48.
18. U.N. Doc. A/AC.105/C.2/L.172.
19. 1989 Report, Annex I, paras. 49-52.
20. *Id.*, para. 53 and Annex III.A.4, part III.
21. *Id.*, para. 54.

1983 and 1987.[22] Nor were there any new arguments, on either side, except possibly a suggestion by the proponents of delimitation, to the effect that it might be time to confirm an alleged norm of customary law that all artificial satellites placed in Earth orbit are in outer space.[23]

Geostationary Orbit

The other half of the above-mentioned twin agenda item: "Matters relating to... the character and utilization of the geostationary orbit, including consideration of ways and means to ensure the rational and equitable use of the geostationary orbit without prejudice to the role of the International Telecommunication Union", has by now been considered for over a decade, with little visible progress, in an organ that requires consensus -- most unlikely on the substance of this subject -- for any advance.

The principal relevant development since the last session of the Sub-Committee was of course the second and closing session of ITU's World Administrative Radio Conference on the Use of the Geostationary-Satellite Orbit and the Planning of the Space Services Utilizing It (WARC-ORB-88), which gave some satisfaction to the claims of the developing countries in general, though not of the equatorial countries in particular, by adopting an Allotment Plan for certain frequency bands, which assigns to every state at least one slot on the geostationary orbit, even though that state may have no technical capability to launch a satellite to the orbit at present or in the foreseeable future.[24] However, in the considerations of the Working Group, the results of the Conference were only casually referred to.

The framework for the discussion this year was a "working non-paper"[25] prepared by a group of developing ("Group of 77") countries, and semi-endorsed by that Group. That paper presented five tentative principles, each constituting a complex and therefore potentially controversial statement which cumulatively would have the effect of giving substance to the claim of the equatorial countries for some special rights in respect of the geostationary orbit. These principles asserted respectively that: (i) The GSO is a limited natural resource that should

22. U.N. Docs. A/AC.105/C.2/L.139 and A/AC.105/L.168, reproduced in Annex III.B.2 and 7 of the 1988 Report. These two documents were not again reproduced in the 1989 Report, even though they had been reproduced in several previous reports, because of a procedural decision taken this year by the Sub-Committee that normally documents would be reproduced, if at all, only in the report of the session in which they were first submitted (see 1989 Report, para. 15 (e)).

23. 1989 Report, Annex II, para. 7.

24. See ITU Doc. Final Acts: Adopted by the Second Session of the World Administrative Radio Conference on the Use of the Geostationary-Satellite Orbit and the Planning of Space Services Utilizing It (ORB-88) (Geneva, 1988), Appendix 30B.

25. 1989 Report, Annex II, para. 20.

be utilized rationally and equitably; (ii) The development of science and technology relating to the GSO is important; (iii) The GSO should be used exclusively for peaceful purposes; (iv) As the GSO lies in the plane of the equator, it has a special geographical relationship to the equatorial region; and (v) All countries should in practice be guaranteed equitable access to the GSO, and account should be taken of the special needs of the developing countries and in particular of the special situation of the equatorial ones. After a lengthy debate during which almost every significant aspect of each of these principles was challenged by at least some participants,[26] the Working Group Chairman expressed the hope that the exchange of ideas would constitute a positive platform for future debates.[27]

Benefits of the Exploitation of Outer Space

This was the first year in which substantive consideration was given to this new agenda item, which the General Assembly had approved for the Sub-Committee's agenda on the basis of an agreement reached at its previous session,[28] namely the "Consideration of the legal aspects related to the application of the principle that the exploration and utilization of outer space should be carried out for the benefit and in the interests of all States, taking into particular account the needs of developing countries". In a sense the first order of business was a decision on whether a working group should be established for this item, a point that the General Assembly had particularly requested to have resolved.[29] However, in the event, this point was only settled as part of a general compromise concerning the program of work on this item.

The Sub-Committee had before it a set of 12 written comments from member states.[30] Throughout its discussions,[31] there was considerable sparring about the purpose and scope of the item, evidently constituting a test of the compromises that had gone into the formulation of its rather tortured title. Aside from generalities, the following specific subjects were mentioned as candidates for consideration under this item: space debris;[32] the compatibility and complementariness of satellite ground and space segment systems; the cost of remote sensing and digital image processing systems; space medical and biological sciences and spin-offs for developing countries; the development of a core of indigenous

26. *Id.*, paras. 21-27.
27. *Id.*, para. 28.
28. 1988 Report, para. 48.
29. General Assembly resolution 43/56 of 6 December 1988, para. 5.
30. U.N. Docs. A/AC.105/C.2/15 and /Add.1-6.
31. 1989 Report, paras. 43-52.
32. U.N. Doc. A/AC.105/C.2/L.171, which is not reproduced in the 1989 Report.

capability in space sciences in developing countries; and the fostering of co-operation among developing countries.

Once more, the Austrians came to the rescue by proposing a four-point work program[33] which was adopted by the Working Group[34] after it heard six explanatory comments.[35] In essence, this program provides for the:

> (a) Consideration of the national legal provisions relating to the application of the principle embodied in Article 1 of the 1967 Outer Space Treaty;[36]
> (b) Consideration of all types of international agreements member states have entered into with respect to that principle;
> (c) Establishment of a working group no later than 1991 to consider the information obtained under the above two headings;
> (d) Continuation of the consideration of this item in the working group until the Sub-Committee concludes that a satisfactory outcome has been achieved.

Enhancing the Work of the Sub-Committee

At various stages during the Sub-Committee's deliberations essentially procedural questions were again raised about its methods of work.[37] For the most part these reflected the efforts of certain western countries, under the leadership of the United States, to cut back on what they consider to be the rather self-indulgent schedule of work that the Sub-Committee has by tradition enjoyed. In particular, the following questions came up: should the "general exchange of views" (*i. e.* general statements to the Sub-Committee made by representatives on any legal aspects of the peaceful uses of outer space), which has for many years taken place systematically though informally, be formally recognized as an agenda item and concentrated during a few specific meetings; and may questions about the methods of work of the Sub-Committee (for which there was no separate agenda item) be raised under the heading of the new agenda item.

During the course of these discussions, eight western delegations presented a proposal[38] that related principally to the scheduling of the work of the Sub-Committee at future sessions. This proposal foresaw the reduction of the length of the sessions from three to two-and-a-half weeks, of which almost half would be set aside for the currently potentially most productive item, that on nuclear power sources, with two

33. *Id.*, para. 53.
34. *Id.*, para. 60.
35. *Id.*, paras. 54-59.
37. *Id.*, paras. 15, 18-20.
38. U. N. Doc. A/AC.105/C.2/L.174, reproduced in Annex III B of the 1989 Report.

days for the definitions/GSO item and three for the new space benefits item. Unsurprisingly, no agreement was reached on this proposal. Thus, unless the General Assembly, on the recommendation of COPUOS itself, decides on a reduction in the length of the Sub-Committee's sessions, and on a radical restructuring of its work, the Sub-Committee will, at least at its coming 29th session, continue to follow a pattern of meetings similar to that of the current session.

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Developments in the International Law of Telecommunications

Recent developments in the international law of telecommunications was the subject of a panel discussion during the Annual Meeting of the American Society of International Law on April 7, 1989, in Chicago. The meeting was organized by *Professor Stephen Gorove* of the University of Mississippi Law Center who co-chaired the part dealing with space telecommunications. *Mr. Robert R. Bruce,* a partner in the Washington law firm of Debevoise and Plimpton, co-chaired the part of the panel addressing terrrestrial communications. Panelists included: *Major Milton "Skip" Smith* (USAF), a member of the U.S. delegation and *Dr. Ram S. Jakhu* of McGill University, a member of the Canadian delegation, to WARC-ORB-88. Another panelist was *Mr. Thomas Ramsey,* a partner in the Washington law firm of Squire, Sanders and Dempsey. *Professor Siegfried Wiessner* of St. Thomas University Law School served as commentator.

In his introduction, *Professor Stephen Gorove* recalled an earlier meeting of the Society dealing with telecommunications where issues of direct television broadcast were discussed. He summarized the International Telecommunciation Union's involvement with the limited orbit-spectrum resource by tracing the development of the equal rights. and equitable access principles. He noted that the 1977 and 1979 WARCs saw continued efforts on the part of developing nations to alter the "first come, first served" rule and substitute an a priori plan under which orbital positions and frequencies would be allotted to nations and reserved for their use. He pointed out the changes in Article 33 of the International Telecommunications Convention brought about by the Nairobi Conference and noted how the 1979 WARC led up to the holding of the 1985 and 1988 conferences to guarantee in practice for all countries equitable access to the geostationary satellite orbit (GSO) and the frequency bands allocated to space services. He challanged the panelists to show what has become of the allotment plan and multilateral planning meeting (MPM) method contemplated by the 1985 WARC.

Following *Professor Gorove's* introduction, the first panelist *Major Smith* began by summarizing in more detail the key orbital results of the 1985 Conference: (i) guaranteed equitable access by planning certain frequency bands of the Fixed Satellite Service (FSS) using a dual method; (ii) allotment planning in "expansion bands" (those bands that were allocated to the FSS in 1979 but are not yet in use); (iii) improved regulatory procedures in "conventional bands" (bands used by most of the telecommunications satellites today), with MPMs to be the usual mode of access; (iv) simplified regulatory procedures for all other bands and services; and (v) plans for the Broadcast Satellite Service (BSS).

Smith then spoke of the 1988 WARC results, primarily focusing on the allotment plan which, although limited to expansion bands, allows for national allotments within a predetermined arc, subregional systems, and existing systems. He also briefly discussed other results of the 1988 Conference, including: the new network coordination and notification procedures (using the standard of a typical earth station within the service area of the satellite for coordination and notice purposes); increase in service windows from 6 1/2 years to nine years (lengthening the number of years from publication of the system to putting that satellite in service); a Delta-T change from 4% to 6% (*i.e.*, technical coordination will be needed in fewer instances); the resolution of several issues pertaining to steerable satellite antenna beams; and the finalization of plans for Region 1 and 3 Feeder Link Plan for the BSS.

Also at the 1988 WARC, the concept of MPMs was changed, so that the MPMs will only take place in exceptional cases where major difficulties exist in coordinating specified FSS Bands. The results of an MPM are not prejudicial to non-assenting Administrations. *Major Smith* noted that unresolved issues for a future conference include: (i) sound BSS issues (where one would receive broadcasting signals for the reception of very inexpensive radio receivers even car receivers) and (ii) High Definitional Television issues.

In addition, *Major Smith* discussed the technical workings of the allotment plan, as well as the history of the allotment plan's goal of guaranteeing equitable access, explaining that many of the plan's procedures were drafted in the last stages of the Conference. He then elaborated more on the workings of the MPMs.

Mr. Ram Jakhu also spoke of the 1988 SPACE WARC, highlighting that March 16, 1990, when the Final Acts go into effect, will be a historic day, primarily because the Acts will formally establish a new order in international regulation of space telecommunications, sought for over a quarter of the century by the developing countries. He pointed out that these countries believe that the traditional international legal system does not serve their interest as they did not participate in its formulation. Although *Mr. Jakhu* believes that "[t]elecommunications are essential to economic development in the third world," he noted that there telecommunication facilities are often in a pathetic state, because a

major portion of the usual radio frequencies which are essential tools for telecommunications has been historically monopolized by developed countries. *Mr. Jakhu* blaimed this result on the practice of "first come, first served" that has been applied to radio frequencies, as well as to access to satellite radio positions. *Jakhu* stressed that although developing countries have been relatively successful in the democratization and improvement of the functioning of the ITU, their efforts to establish an international regulatory regime for equitable sharing of the radio frequencies and orbital positions have been confronted more vigorously by the developed countries.

Mr Jakhu summarized by stating that the Final Acts of the 1988 WARC looked "very good" but cautioned that "a careful scrutiny would show that it fell short of what the developing countries had hoped to achieve" for the following reasons: (i) the plan adopted in 1988 is limited to only one service out of seventeen space services and the planned portion covers less than one percent of the total spectrum allocated to the space services; (ii) the allotment plan specifies only a nominal position in the predetermined arc, which means that since the arc is plus/minus ten degrees wide and orbital position of a country can be moved within that arc without its consent, serious difficulties may be created for the latecomer countries because the rule of "first come, first served" applies in the actual occupation of the orbital positions within that arc; (iii) the relationship between national allotments and existing systems is not well defined, so that the latecomer countries that want to use their national allotments could face very serious difficulties from the existing systems; (iv) the weakening of the MPM process which means that newcomers are still at the mercy of individual states for gaining access to the international resource; and (v) the fact that the SPACE WARC decided not to allot orbital positions and radio frequencies in the allotment plan meant that the subregional systems could not live up to their full potential because they could be implemented only through MPMs and could not affect the allotments and assignments of other countries.

Mr. Jakhu also commented on some of the reasons that he saw for the developing countries' failure to attain their goals at the 1988 WARC: (i) lack of technology and economic resources necessary for effective participation in ITU conferences; and (ii) the fact that no clear leaders of the Third World emerged at the conference, because the space policies of China, India, Mexico and Brazil no longer coincide with those of the other Third World nations. *Mr. Jakhu* concluded with his personal view that the latest revisions to the radio regulations allow the developing countries to use an appropriate technology and formally create a clear precedent which will be followed in the future for the equitable sharing of this international resource.

The second co-chairman, *Mr. Robert Bruce,* introduced the portion of the panel dealing with terrestrial telecommunications issues. He discussed the recent changes in international telecommunications,

noting that the world is now being girded by networks of fiber optic cables. He stressed that the developments in technology, although leading to new services are straining the traditional concepts upon which national regulation has been based, resulting in an extraordinary spade of developments in developed, as well as developing countries. After elaborating on some of the many changes in the ways that countries are arranging for the provision of telecommunications services, *Bruce* stated that the key question now is the manner in which new arrangements for the provision of telecommunication services will be handled, *i.e.*, the implications of the the Regulations of the World Administrative Telegraph and Telephone Conference (WATTC), He highlighted that a troublesome issue is whether the new telecommunications service providers, such as banks and companies like General Motors, are going to be subject to the same kinds of requirements that have applied to traditional telecommunications carriers, such as AT&T and British Telecom.

Bruce pointed out that a problem common to both space and terrestrial teleommunications is the tension between the interests of industrialized and developing countries. In the terrestrial area, there is a sensitivity that the major industrialized countries will work out arrangements effectively siphoning traffic away from the traditional public services that many of the developing countries feel are essential for the development of their own infrastructure. He concluded stating that the key question for policy makers is whether the thrust of our energies will be shifted into bilateral discussions among trading blocks leaving international institutions isolated and ineffectual.

Following *Mr. Bruce's* introduction, *Mr. Tom Ramsey* spoke of the recent transformation in the telecommunications marketplace. He speculated on (i) the likelihood that there will no longer be a national telecommunications equipment corporation for each country which will affect relationships and boundaries between countries and result in increased participation by third world countries, several of which represent a significant market for network equipment and (ii) the growth of the local area networking phenomena, which will concentrate the traffic of systems of computers resulting in "mammoth bandwith requirements."

Ramsey pointed out that this latter change will require a shift from a megabyte world to a gigabyte one, posing the fundamental question of whether satellite systems that are really aimed at a megabyte world will function in a gigabyte environment. He expressed his belief that the "spectrum allocations of the future will be a different agenda" and that "access to fiber optic systems will be much more important perhaps to third world [countries] in some ways in ten years than satellite."

Mr. Ramsey then addressed issues pertaining to the regulatory boundary between basic communications services (such as telephone service) and enhanced or value-added services and WATTC's treatment of these issues. He remarked that these regulations were the first

recognition, that he knew of, that acknowledged that bilateral arrangements were available to countries for handling telecommunications matters. He opined that the reasons for the rapid global changes in the regulation of telecommunications resulted from "an acknowledgement by decision makers at the national level that the new technologies allow for competition."

Mr. Wiessner, the panel's commentator, began his remarks noting that the panel had focused on the legal regulations of access to means of communications worldwide rather than on the laws and policies regarding the content of the communications. He distinguished between three approaches to access to telecommunications that the panelists had mentioned: (i) the US "free market" approach, increasingly shared by the European Common Market; (ii) the Common Market approach striving for global interconnection or technical interconnection; and (iii) the developing countries' equity approach. *Wiessner* stated that "accommodation in some sectors at least seems to be inevitable [and that] to reach the promised land of the global village maybe we must tear down some walls protecting perceived national interests." He then attempted to put the three approaches to telecom access into some kind of global common interest perspective, discussing the benefits and potential failures of the free market approach: on one hand, the WATTC Regulations encouraging Member Nations to provide access by the public to at least one basic telecom service [usually the phone], and on the other hand, realizing that in a totally unregulated private environment, provision of telephone service to rural places might never occur. *Wiessner* pointed out that, even in the U.S., there has been a recognition that the market should not always govern. For example, the U.S. Departmentr of Defense has recommended that the U.S. not become dependent upon foreign firms to provide vital telecom equipment or services.

After briefly discussing the merits of prescribing standards for interoperability of services and equipment versus the potential for stifling key technological innovation because of an overabundance of standards, *Wiessner* elaborated on the advantages of joint telecommunications ventures. In summing up the lessons to be learned from the history of the developments in communications, *Wiessner* highlighted that appeals to unity, equity, and fairness, especially in the context of global redistribution of wealth and technology have often proven fruitless. Although acknowledging success with GSO, he opined that the Moon Treaty was a dismal failure, but that equitable access to the GSO was granted by universal consensus and implemented, while be it in a limited fashion, by WARC-ORB. He explained that this success was due to the special nature of the GSO, in that the First World was forced to deal with the Third World to avoid interference. In concluding, *Wiessner* stated that it might be hoped though not expected that the upcoming conference of the ITU might help to insure that while harnessing the

powerful forces of the market, the benefits of telecom development trigger down to some extent to the more modest inhabitants of the global village.

Carl Q. Christol, Professor Emeritus of International Law at the University of Southern California, asked the first question of the panelists. He expressed his disagreement with remarks made by *Mr. Smith* and *Mr. Jakhu* with respect to their characterization of the a priori plan favored by the developing countries and the a posteriori allotment plan touted by the developed countries. He defined the a priori plan as allowing for the granting of opportunities for exploitation even though the beneficiary of the grant is not immediately capable of using the resource and the a posteriori plan as calling for the utilization of the resource at such time as a nation is able to and does make effective use of the resource. *Professor Christol* disagreed with those who said that that the existing regime was based upon "the first come, first served" concept with the implication that this produced exclusive rights for the benefit of those who had gotten their first. *Christol* argued that there was never an exclusive rights situation but rather an opportunity to use dependent upon a country being their first and not exclusive in any sovereign sense whatsoever. Consequently, *Professor Christol* believes that the great gain of the SPACE WARC was the allotment plan, because the plan basically permits each country to satisfy its requirements for national services from at least one orbital position within a predetermined arc and bands, essentially allowing for the a priori approach to use. As a result, *Christol,* unlike the earlier panelists, believes that the notion of "first come, first served" has died in the Fixed Satellite Service, because of the very fact of granting to the developing countries the opportunity to have access to the allotment. In fact, *Christol* stressed that the concept is more of a slogan than a principle.

Skip Smith responded to *Professor Christol's* comments, explaining that "the first come, first served" regulatory regime for the FSS does grant exclusive rights for a satellite in a certain position along with those associated frequencies, to the extent that no one else can cause interference. He explained that these rights are potentially perpetual in that one has the right to replace a dead satellite with a satellite of basically the same characteristics. But he cautioned that in practice that right is not really perpetual, because of advances in technology which give the new satellite very different characteristics from the one that is being replaced. With a radically differing replacement satellite, one must reenter the regulatory regime as a first-comer. Nevertheless, *Mr. Smith* noted that although he hoped that the "first come first served" notion was a slogan and not a principle, he stressed that the concept does still have a very legitimate rights vesting mechanism for a particular satellite slot. If a satellite system had no assurance of the right to operate from a certain position without interference, financing would be unavailable for the system. *Dr. Jakhu* followed up *Skip Smith's* remarks,

highlighting that "first come, first served" is neither a slogan, nor a principle, but a rule.

Charles Okolie of Oxford University argued that if the predetermined allocation in the orbital arc creates ownership of a particular spot, that allotment violates the law of outer space. To him, the rules of ORB '85 contradict the rules of ORB '88. His position is that under the allotment plan, a country does not have possession. Rather, a country only acquires a specific frequency within a predetermined orbital arc and a narrow band of radio frequency spectrum for up to twenty years. He explained that although a country can continue for more than twenty years, the fact that there is a general limit on the number of years is important, because as an article by *Professor Stephen Gorove* had once noted, one of the elements of appreciation is an intent to possess permanently. In addition, he does not think one would have possession because anyone else could put a satellite ten meters from anothers as long as the satellite operated on different frequencies. He was sympathetic with the position that this system of predetermined positions is not necessarily good for developing countries, because he believes that 90% of the developing countries are never going to establish a position. *Mr. Okolie* suggested that developing countries should focus on using subregional systems as opposed to acquiring rights to establish spots that 90% of them are never going to utilize

Major Smith, responding to *Professor Okolie's* comments, stressed that the conclusion as to the type of right granted depends on whether one acquires one's orbital position through "first come, first served" or through a priori planning. Through a priori planning, countries understand that they have the right to use, but not own, an orbital position, although others cannot use that position without permission for twenty years. *Smith* pointed out that, in contrast, the "first come, first served" orbital positions have no time limitation. As a result, the position can be bartered or sold to other countries.

In his response, *Profesor Gorove* noted that the question raised by *Dr. Okolie* was in the uppermost of several scholars' mind in connection with the interpretation of Article II of the Outer Space Treaty which prohibits national appropriation. The question is, what constitutes national appropriation of outer space or any part of outer space and whether a particular allocation of orbital position would be in fact a violation of Article II. Apart from exclusive control and possession, the meaning of appropriation in the legal sense of the term also includes a sense of permanence. Also, one should not lose sight of the fact that satellites in the geostationary orbit are technically not occupying exactly the same position even relative to the Earth, inasmuch as they are moving within a fairly wide corridor. So, there is a problem with that too when one speaks of a possible violation of Article II.

The panel discussion was concluded with brief statements by the Co-chairmen.

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Comments

"Threat or Use of Force" - Observations to Article 2 of the U.N. Charter and Article III of the Outer Space Treaty

At the beginning of this century, mankind took its first steps towards the domination of airspace. With the appearance of the dirigible and airplanes, the fear arose that such technical achievements in the hands of the military would become another means by which war would extend to the civilian population.

A remarkable historical document of the early struggle against the militarization of air was the work of H. G. Wells, "War in the Air," written in 1908. The author depicted the horrors of aerial warfare. In the year 1912, he, with C. Doyle and two hundred other personalities of the arts and literature, signed a declaration. "This civilized world expresses its desire for peace and good will demands the limitation of the exorbitant arms race," they declared.[1] Their protest should not remain a hopeless hypocrisy. They were not willing to accept that such a magnificent achievement of human genius as the conquest of the air should be utilized as a tool of destruction. This declaration was signed after the first aerial bombing in history which took place on November 1, 1911, during the Italian-Turkish war in North Africa. The development of military aviation since that time is well known. Military forces developed such methods of warfare as "indiscriminate bombing" which was used regardless of civilian populations living in the target areas.[2] Most recently, the deployment of nuclear bombs abolishes any differentiation between combatants and non-combatants and has opened a new age of militarization of airspace and aviation.

Today we must choose between peaceful or militarized outer space. The arguments pro and con have existed since the era of H. G. Wells. The

1. O. GROEHLER, GESCHICHTE DES LUFTKRIEGS 1910 bis 1970, 11 (Hungarian trans. 1980).

2. *Id.* at 251. "Target area bombing" was formulated in a Memorandum of Sir Charles Webster, 1938. N. FRANKLAND and SIR CHARLES WEBSTER, THE STRATEGIC AIR OFFENSIVE AGAINST GERMANY 118 (vol. 1, 1961). *See* J. M. SPAIGHT, AIR POWER AND WAR RIGHTS (1947). *See also* SIR ARTHUR HARRIS, BOMBER OFFENSIVE (1947).

concept of "Starwars" is not a new one, but it is clear the path to follow was embodied in the 1912 Declaration. There are proponents of space armament. They attribute peacekeeping efforts (deterrents) to militarization of outer space. A similar argument was offered before World War II to the effect that military uses of aircraft would make war in the future practically impossible. Others - and I, myself, - are of the opinion that an arms race in outer space does not mitigate, but instead augments the risk of a devastating war and that this war will not be restricted to outer space.

Recent discussions have focused on the possibility of an arms race in outer space and possible preventive measures. The prevention of militarization can and should be supported by legal means. To evaluate their effectiveness, we must analyze space law together with general international law. For a realistic interpretation of the legal restrictions of space activity, we must consider three connected, though clearly separable, elements of the Space Treaty:

A. Treaty restrictions on military activities in the orbit of and on the moon or other celestial bodies;[3]

B. Program-like postulates concerning the general aims and charater of space activities;[4]

C. The obligation to carry out space activities in accordance with international law, including the Charter of the United Nations.[5]

The first two elements constitute a *jus speciale* shaped to the demands of exploration and uses of outer space and should be harmonized with general international law, both being applicable to and binding on space activity.

I. Jus Speciale - Obligations and Postulates

Looking over the pages of my early writings, I regretfully must admit that my onetime views concerning exclusively peaceful uses were too optimistic.[6] I had developed, during the pre-treaty era of space law, a thesis, namely, that this maxim extends to the whole universe, *i.e.*, to all space activities, and peaceful uses are equal to non-military activities.

3. 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, art. IV, 18 U.S.T. 2410, T.I.A.S. 6347, 610 U.N.T.S 20 (hereinafter referred to as "Outer Space Treaty," "Space Treaty" or "Treaty").

4. *Id.* at Preamble, para. 1.

5. *Id.* at art. III.

6. G. GÁL, VILÁGÜRJOG 197-204 (1964).

No doubt, I sustained it even after the space treaty differentiated in the treaty stipulation between the demilitarized status of the moon and other celestial bodies.[7] At today's level of technical development, military space activity constitutes a fact which space lawyers interpreting policy with respect to treaty law may not ignore. Realities cannot be influenced even by the dispute as to whether "peaceful uses" encompass military uses of a non-aggressive character.

The prohibitions formulated in Article IV of the Space Treaty, the Test Ban and ENMOD treaties and the Moon Treaty[8] concerning nuclear weapons and other weapons of mass destruction are, despite certain ambiguities with respect to their clear-cut obligatory character, no doubt on a level equal to principles confirmed by General Assembly resolutions declared in the Space Treaty itself. Consider these basic principles:

> A. Outer space should be used for peaceful purposes only. The General Assembly wishes to avoid the extension of national rivalry into this new field;[9]
> B. The States Parties to the Space Treaty recognize the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes;
> C. The exploration and use of outer space, including the moon and other celestial bodies, 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.[10]

The legal nature of these principles may depend upon the document in which they appear. Declared in General Assembly resolutions, they are to be viewed as recommendations. In the Space Treaty itself, they may be looked at as prohibiting concrete forms of military uses according to their content, while in preambles they may be relevant to guide interpretation of the instrument.

Certain conclusions may be drawn from the last twenty years of interstate treaty application. First, tacit approval and acceptance of the

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7. G. Gál, Space Law 164-172 (1964).

8. Treaty Banning Nuclear Weapons Tests in Atmosphere, in Outer Space and Under Water, August 5, 1963, art. I, 14 U.S.T. 1313, T.I.A.S. No. 5433, 480 U.N.T.S. 43 (herein referred to as "Test Ban" Treaty). Convention on the Prohibition of Military or any other Mobile Use of Environmental Modification Techniques, May 18, 1977, art. I. 31 U.S.T. 333, T.I.A.S. 9614 (herein referred to as the "ENMOD" Treaty). Agreement Governing the Activities of States on the Moon and other Celestial bodies, December 18, 1979, art 3. (herein referred to as "Moon Treaty" or "Moon Agreement"). *See* THE UNITED NATIONS TREATIES ON OUTER SPACE 27-37 (1984).

9. G.A. RES. 36/97C. *See* Menter, *Peaceful Uses of Outer Space and National Security*, PROC. 25TH COLLOQ. L. OUTER SPACE 135 (1982).

10. Outer Space Treaty, *supra* note 3, at Preamble, para. 2 and art. 1, para. 1.

uses of dual capacity satellites for telecommunications, meteorology, geodesy, *etc.* is of significance to the doctrine of peaceful uses of outer space, because reconnaissance satellites operate in the same sphere. This silent consent should be viewed as holding much significance. The authors of the recently published Soviet manual of international space law have drawn from these factors the following conclusion:

> The 1967 Space Treaty, together with a number of international agreements, establishes a regime of total neutralization and demilitarization of celestial bodies and partial demilitarization of outer space....Thus only some of the channels for the military uses of outer space were closed. In particular, any types of weapons which are not covered by the definition of weapons of mass destruction are outside the ban.[11]

Further, they are of the opinion that the principles enumerated above, in the context of space law sources, express tasks for law-making and application of positive law: "In the present absence of such agreement, international documents refer to the exploration and use of outer space for peaceful purposes exclusively merely as a goal to be pursued.[12] Peaceful use of outer space is a postulate indeed. A lawyer is somebody who *"ex vinculis sermocinatur"* - that is, he is bound by rules which are to be interpreted without the intermixing of his wishes into the work of legal analysis, no matter how noble they may be. As a consequence of the partial demilitarization of outer space, aside from celestial bodies, we have to admit that military space activity beyond the ban on mass destruction weapons is not undisputably forbidden. At the same time, my opinion remains that militarization of outer space is contrary to the principles defining the lawful aims of space activity and that these principles, by virtue of the Space Treaty, are to be considered the legal basis of efforts toward the general demilitarization of outer space.

II. Jus Generale - International Law, including the Charter

The view that international law or, at least its general principles, govern international relations arising from space activities goes back to the theory of the pre-satellite age. This is in full harmony with the general legal opinion in General Assembly Resolution 1721/XVI which declared: "international law, including the Charter of the United Nations, applies to outer space and celestial bodies."[13]

The Space Treaty, with its choice of words, creates a close contact between this principle and the central concept of modern international law - the obligation of maintaining international peace and security:

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11. G. ZHUKOV AND Y. KOLOSOV, INTERNATIONAL SPACE LAW 55 (1984).
12. *Id.* at 57.
13. G.A. Res. 1721/XVI, at para. A 1 (a). *See* G. GÁL, SPACE LAW 130 (1964).

> States Parties to the treaty shall carry on activities in the exploration and uses of outer space...in accordance with international law, including the Charter of the United Nations in the interests of maintaining international peace and security and promoting international cooperation and understanding.[14]

The Moon Agreement adds that all activities on the moon shall be carried out by "taking into account the Declaration on Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations, adopted by the General Assembly on 24 October 1970...[15]

Briefly, I must emphasize the declarative character of these statements. They confirm but do not constitute obligations under international law. From the Charter the following principles with respect to space activities can be derived:

A. States should abstain from the threat or use of force against another's territorial integrity or political independence;[16]

B. Against a state violating this duty and using its space activity for aggression, every state is entitled to the right of individual or collective self-defense;[17]

C. In the domain of space activities, states are not allowed to interfere in affairs belonging to the internal jurisdiction of another state;[18]

D. States should comply with the duties and obligations arising from the Space Treaty and all other sources of space law and should do so in good faith;[19]

E. States are required to solve their disputes arising from space activities by peaceful means and in a manner not endangering international peace and security.[20]

There exists a wide-spread view as to the application of international law to space activity. This view required initial application of generally accepted principles. As formulated in the space law manual of G. Zhukov and Y. Kolosov:

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14. Outer Space Treaty, *supra* note 3, at art. III.
15. Moon Agreement, *supra* note 8, at art. 2.
16. U.N. Charter, art. 2, para. 4.
17. *Id.* at art. 51.
18. *Id.* at art. 2, para. 7.
19. *Id.* at art. 2, para. 2.
20. *Id.* at art. 2, para. 3.

> The Space Treaty refers to the general principles of international law which States have to be guided by, irrespective of where or in what connection they enter into relations with one another, which include the relations that arise between them in exploring and using outer space.[21]

To this correct statement we should add that each of the principles embodied in Article II of the Charter may be interpreted as a fundamental principle of general international law.

Is it possible now to draw conclusions from the principles to be used in the legal relations of space activities, and are these conclusions applicable to the actual level and imminent prospect of military space activities?

In a more concrete formulation the question is, does general international law expand special space law regulations so as to be an effective legal means for banning militarization of outer space?

"Threat or use of force"

The most important feature of the development of international law in our century is the deletion of *"jus ad bellum"* from the essential elements of sovereignty. War is no longer a legal means of settlement of international disputes. Armed conflicts in the United Nations Charter appear as "threats to the peace," "breaches of the peace," and "acts of aggression."[22]

According to Article 39 of the U.N. Charter, the Security Council shall determine the existence of such situations and shall make recommendations as to what measures should be taken to maintain or restore international peace and security. The Security Council in a given case should act without having a legally binding or generally accepted definition of the concept "aggression". The Special Committee on the Question of Defining Aggression set up by the General Assembly in 1967 adopted a definition by consensus in 1974. The General Assembly approved it and called the attention of the Security Council to this definition as guidance in determining the existence of an act of aggression for the purpose of Article 39 of the Charter. According to Article 1 of this definition, aggression is: "the use of armed force by a state against the sovereignty, territorial integrity or political independence of another state, or in any other manner inconsistent with the Charter of the United Nations as set out in this definition."

Under Article 2, the "first use" of armed force by a state in contravention of the Charter constitutes *prima facie* evidence of an act of

21. G. ZHUKOV & Y. KOLOSOV, INTERNATIONAL SPACE LAW 50 (1984).
22. J. G. STARKE, INTRODUCTION TO INTERNATIONAL LAW 565-566 (8th ed. 1977).

aggression. However, the Security Council may conclude otherwise in light of the gravity of the conduct of that state.

Acts of aggression may include:

1. Invasion or attack by the armed forces of a state on the territory of another state;
2. Bombardment of or the use of weapons against the territory of another state;
3. The attack by the armed forces of a state on land, sea or air against the land forces, sea or air fleets of another state.

Applying single elements of this definition to military space activity, an act of "space aggression" in all three respects would be technically possible. Such act may be simply an attack on the territory of another state, an attack on armed forces of another state from outer space, or a *par excellence* space-attack, *i.e.*, destroying a space object of another state by its own space object or ground or air-based ASAT weapon would also be an "act of space aggression."

The incorporation of the Charter into the body of space law by Article III of the Space Treaty makes it clear that an attack carried out by new-type weapons could also qualify as an act of aggression. No doubt, the intentional destruction of a satellite by ASAT devices or deliberately caused collision should be qualified under the elements enumerated above. It would be open, however, to the Security Council "to conclude otherwise" in the light of the gravity or the consequences of such conduct. Fortunately at present, we have no such precedent.

The positive space law on the level of *jus speciale* adopts this rule with respect to the Moon and other celestial bodies. According to the Moon Agreement, Article 3:

> Any threat or use of force or any hostile act or threat of hostile act on the Moon is prohibited. It is likewise prohibited to use the Moon in order to commit any such act or to engage in any such threat in relation to the Earth, the Moon, spacecraft or man-made space objects.

Peace in outer space could be strengthened by similar positive statements of generally accepted principles of the non-use of force to the special relations of space activity. Such a project *de lege ferenda* is the Soviet Draft Treaty on the "Prohibition of the Use of Force in Outer Space and from Space against the Earth" submitted to the United Nations in 1983. [23]

The proposed Treaty would stipulate, among other prohibitions of aggressive military uses, that:

23. U.N. DOC. A/38/194 (1983).

A. It is prohibited to utilize space objects in orbit around the Earth, on celestial bodies or stationed in space in any manner for the purpose of the use or threat of force in outer space, the atmosphere, and on the Earth.

B. It is further prohibited to resort to the use or threat of force against space objects themselves which are in orbit around the Earth, on celestial bodies or stationed in outer space.

In a practical sense, the treaty would confirm the prohibition against the uses of space-based weapons for the destruction of objects on the Earth, in the atmosphere or in outer space. (Art. 2, para. 1). Moreover, the obligation not to destroy, damage, or disturb the normal functioning or change the flight trajectory of space objects of other states would be made clear.

No doubt, such a treaty would be a decisive step towards a demilitarized, peaceful outer space. At the same time, it should be emphasized that today under valid general international law - referred to in Article III of the Space Treaty - threat or use of force is an illegal act and a breach of basic rules of the international legal order even when it is carried out or, more correctly, committed, by space activity.

Conclusion

Nations would be relieved of the nightmare of a war started from or through outer space if space activity was kept from following the example of aviation, and the fateful parallel we mentioned in our introductory remarks could be interrupted in good time. The fate of aircraft need not be the fate of space activity.

In my opinion, experts of space law from East and West would be glad to go to work on law-making based on a balance of confidence, instead of interpreting half-measures dictated by a balance of fear. They would get a "green light" on the level of political decisions! Meanwhile, we must emphasize that peaceful use of outer space as a postulate constitutes an essential part of the positive law of today's outer space activities.

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The Advent of Commercial Space: Comments on a Joint Venture Agreement

January 1, 1989 marks the beginning of a historic relationship. It was then that GLAVCOSMOS, the Soviet civil space agency began a joint venture with an American company, The Space Commerce Corporation

(SCC). This Agreement enables commercial entities world-wide to take advantage of the gamut of space goods and services available through the robust space program of the U. S. S. R.

The Agreement addresses the foremost problem in the development of outer space. There is now the opportunity for private firms and entrepreneurs to take part in the commercial space arena. Up to now, the businessman has been stifled in his attempts to make the space market profitable due to government dominance of the field. The opportunity now presents itself for the entrepreneur to forge out into space limited only by the constraints of the Outer Space Treaty of 1967.

Under the the Joint Venture Agreement SCC shall market all Soviet space goods and services, including but not limited to:

A. Marketing launch and associated services for commercial and scientific spacecraft including communications satellites;

B. Marketing experimental and associated services in the space environment, including man tended services on Soviet space stations and the use of automatic systems;

C. Marketing Soviet space hardware and component parts of launch vehicles and spacecraft;

D. Production of technical literature describing Soviet space goods and services;

E. Production of advertising materials for marketing Soviet space goods and services;

F. Marketing Soviet space goods and services through trade shows, conferences, and scientific meetings;

G. Obtaining the technical information and governmental approvals required to market Soviet space goods and services;

H. Marketing the services of Soviet communications, remote sensing and navigation satellites;

I. Marketing and conducting technical training and educational activities including visits to Soviet space facilities;

J. Providing engineering and technical services including the design and construction of space apparatus, spacecraft and facilities;

K. Conducting public relations activities.

Additionally, innovative entrepreneurs may suggest new ways to turn a profit from the resources of the Soviet space program.

What makes this opportunity truly unique is that prior to now, every space program in the world has been instigated, managed and controlled by a government. The restrictions and labyrinth of procedures necessary to obtain space services have had a chilling effect on the businessman. Therefore, it is truly remarkable that it is through a socialist society that the free enterprise businessman will have the first legitimate opportunity to utilize space.

Soviet Space Capabilities. Few people in the world outside of military circles appreciate the full capability of the Soviet space programs. Soviet space activities in recent years leave no doubt of the

vitality and commitment of the most prolific space program in the world. Less than four weeks after the celebration of the 30th anniversary of the space age, the launch of Sputnik I on October 4, 1957, the Soviet Union achieved its 2,000th space mission, compared with less than 1,000 for the rest of the world combined. In all, the Soviets reached Earth orbit 95 times in 1987 with 116 separate payloads while the United States, China, Japan, and the European Space Agency together could only muster 15 space flights.

Major milestones accomplished by the Soviets in 1987 were many and impressive: the establishment of permanent manned presence in space, the setting of a new endurance record for man in space, the introduction of a new heavy-lift launch vehicle five times more capable than previous Soviet boosters, the testing of a large shuttle spacecraft during powered approach and landing tests, the debut of a new generation of heavy, multi-discipline remote sensing spacecraft, and the planning of an extensive and ambitious scientific assault on the solar system, to name but a few.

The high annual launch rate of Soviet satellites is a direct consequence of their relatively short (by Western standards) operational lifetimes. By the end of 1987 almost half (47%) of the year's missions had been terminated. A second factor of equal importance is the dependence of the Soviet Union on the proliferation of modest, cheaper satellites in lieu of a smaller number of more capable, expensive spacecraft. Today the United States is reevaluating its own spacecraft philosophies and may adopt a more balanced space fleet.

Attributes of the Soviet system are many. When several identical satellites are contributing to a single mission, the loss of one due to natural causes or even hostile activity is not catastrophic. Soviet space networks are specifically designed to degrade gracefully through attrition. Furthermore, the high annual launch rates dictate that new spacecraft boosters are readily available for launch with short notice. Soviet replacement rates following unexpected spacecraft failures *(e.g.*, launch failures, major satellite malfunctions) are phenomenal when compared to Western replenishment timeliness. For example, two Soviet space programs which suffered the complete loss of a newly launched satellite in 1987 were both active again within two months.

Two of the most impressive features of the Soviet space program are its ability to conduct routine launches regardless of weather conditions and to carry out launches in rapid succession. During the harsh winter months of 1987, the Soviets successfully launched 23 space flights, almost one-fourth of the year's total. In fact, while Moscow streets were covered with ice and abandoned cars in January, launch crews at all three cosmosdromes conducted 10 launches involving variants from four of the five operational launch vehicle families. On 15 occasions two launches were conducted within 24 hours, including one pair launched only 10 minutes apart. Similarly, launch crews at the Plesetsk

Cosmodrome, the world's busiest spaceport, normally conduct a space launching every six days. Such activity greatly enhances the efficiency of costly launch facilities

General Business Approach. If this is the character and the capability of the Soviet space program, how does The Space Commerce Corporation propose to go about making the goods and services available to the world?

In order to market these Soviet space products most effectively, SCC has structured its marketing activities into the following cost centers: A. Remote Sensing; B. Communication; C. Materials Processing; D. Launch Services; E. Space Qualified Hardware and Technical Services; F. Travel to Soviet Space Facilities; G. Advertising and Memorabilia.

Marketing activities will be conducted by a small, very mobile sales cadre, assisted by a central operations and support facility. All production, and related overhead costs, are carried by GLAVCOSMOS.

SCC intends to begin by selling low-market-risk goods and services such as trips to Soviet Space facilities, remote sensing data licenses, and memorabilia of the Soviet space program. The revenue from these sales will allow the company time to enter the much larger and more lucrative voice and data communications market using Soviet satellites and ground stations. This market is highly regulated, but it is facing a serious shortage of capacity. The SCC will also, through the capability available through GLAVCOSMOS, fly scientific experiments in space.

The Company's Markets. Let us now turn to the various market segments that exist today.

Remote Sensing. Through steady growth in the 1980's the Soviets have deployed and now operate the most comprehensive and capable remote sensing satellite network in the world.

There are currently 17 non-U.S. Landsat and/or French Spot Image remote sensing satellite systems. Three additional stations are under construction.

The Landsat system is not currently considered to be a dependable source of this data. It is expected that all of these stations and their customers may soon have to rely exclusively on foreign sources for current data for several years.

The company believes that at least half of these stations will purchase a license to receive and use Soviet data, because its cost is less than their current Landsat license. For support of those sales, the Soviet government will guarantee a continuous supply of data until the year 2000.

Eventually, SCC plans to launch and operate commercial remote sensing satellites and ground facilities to provide commercial information to customers

Communications. This market consists of communications transponders, communications satellites, ground stations and specialized turnkey communications and navigation systems.

Due to the age of current satellites, virtually every C and KU band transponder now in use will be out of service by 1996. The largest transponder increase is expected to come in private networks, which will grow from 94 today to 315 by the middle of the next decade.

The major segment of this market for SCC is the developing nations who do not need, and cannot afford, expensive Western systems. These countries also need assistance, which SCC will provide, in working with international regulatory authorities.

The company will lease transponders, and will launch and sell a commercial communications satellite. SCC hopes to sell private networks based on the 12 Gorizont communication satellites now in orbit. Further, the company also expects to sell a few earth stations each year.

In the long term, the company plans to build and launch communications satellite systems and to provide turnkey communications systems to end users, primarily in developing nations.

Materials Processing and Scientific Research in Space. SCC will market Soviet sub-orbital scientific experiment flights, unmanned space experiment flights, man tended experiments on the Soviet MIR space station and flights of research specialists to the MIR.

Several private companies in the U.S. and Europe have contracted to fly unmanned experiments on the Soviet MIR space station. SCC expects to sell one additional unmanned experiment every year beginning in 1990. The company also anticipates that it will sell one man tended experiment on the MIR space station each year and will fly one commercial researcher to the MIR for experiments each year beginning in 1990. The company expects to sell these services primarily in Europe, Japan, Korea, and Taiwan.

Launch Services. SCC will sell launches on all Soviet launch vehicles, including the Shuttle ("Buran"), Energia, Proton, Soyuz, Vostok, and the small Tsiklon (Cyclone).

The Proton is an ideal vehicle to launch commercial communications satellites because it can place even the heaviest of them directly into final orbital position. The trend in the industry is toward very heavy 8,000 to 11,000 pound satellites. The satellite must use its own fuel or an attached rocket engine to move to its final orbit. This fact is important because, if a satellite retains all its fuel, it can operate for several years longer.

In September 1988, the U.S. granted export licenses for the launch of three Hughes communications satellites from the People's Republic of China. Encouraged by this, SCC has signed a Memorandum of Understanding with a corporation to launch a Hughes 393 communications satellite on the Proton. The corporation has already obtained the U.S. government license it required to build and operate this satellite, and it has agreed to be SCC's test case for a change in the U.S. policy prohibiting export of communications satellites to the Soviet Union. SCC plans to

apply for the required export permits in behalf of the corporation in the second quarter of 1989.

Soviet Space Tours. GLAVCOSMOS controls access to all space launch and flight control facilities in the Soviet Union. Except for distinguished visitors, no tours have been conducted in spite of considerable demand.

SCC tours are planned for 100 people each. The groups will travel from New York/Washington, D.C. to Moscow, and will tour facilities at Moscow, Leningrad, and the Baikonur Cosmodrome.

Members of the tour will visit space vehicle processing facilities, white rooms, cosmonaut training facilities, space rockets and launch pads, in addition to Star City, Intercosmos Headquarters, Space Research Institute, Soviet Mission Control, and Russia's National Space Museum, plus space memorials and monuments in greater Moscow and Leningrad.

Memorabilia. SCC intends to give a producer-marketer an exclusive license to advertise and sell pins, patches, pictures, slides, video tapes, posters, and clothing items from the Soviet space program.

Advertising, SCC will provide unique advertising opportunities to commercial entities. Corporate names, for example, may be placed on the sides of Soviet Rocket launchers. Cosmonauts are also available to promote Soviet space products, world-wide.

The above discussed joint venture entered into by The Space Commerce Corporation is a bold undertaking. Only time will tell the nature and extent of the changes in commercial space that will occur because of this commercial opportunity.

William B. Wirin
Executive Vice President,
The Space Commerce Corporation

Short Accounts

Space Commercialization: Roles of Developing Countries

Space commercialization issues with emphasis on the roles and interests of developing countries was the subject matter of a conference organized by the University of Tennessee Space Institute and co-sponsored by the United Nations, the American Institute of Aeronautics and Astronautics, and the International Academy of Astronautics on March 5-10, 1989, in Nashville, Tennessee.

The discussion of the legal issues was chaired by *Professor Stephen Gorove* of the University of Mississippi Law Center, and participants included *Stephen E. Doyle,* Manager of Contract Administration of Aerojet TechSystems in Sacremento, *Carl Q. Christol,* Emeritus Professor at the University of Southern California and *Christine Specter* of Florida International University.

In his introduction, the chairman noted that few people would have thought at the beginning of the Space Age that three decades later, there will be an international gathering to address legal issues of space commercialization with both governmental and private involvement and with an emphasis on the developing nations. He noted that benefits to society, including both developed and developing nations, arising out of space activities was the topic at a special Symposium of the International Academy of Astronautics in Bangalore, India in the Fall of 1988. Glancing at the general title of the discussion, he illustrated briefly how each of the terms "Commercialization", "Outer Space," and "Developing Countries" may carry different meaning to different people. Thus it was the lawyer's task to clarify them if possible.

The first speaker, *Mr. Doyle,* stressed that access to space was universal so long as a country was willing and able to pay the cost of launch services. He noted that at present there are five countries which can provide commercially reimbursable space launch services. They include the U. S., France, the USSR, China and, for small scientific payloads of the Scout class, Italy in cooperation with the US and Kenya from the San Marco platform. He anticipated that to these countries may well be added Japan, India, Brazil and other countries during the 1990's. In the United States a developing country may choose NASA for services requiring the Shuttle, Martin Marietta for the Titan launch vehicle, General Dynamics for the Atlas launch vehicle, McDonnell Douglas for the Delta launch vehicle, and LTV for the Scout launch vehicle. Selection of the country which is to provide launch services is important because with each choice there is "a choice of applicable law that will be made". *Mr. Doyle* also cautioned that the status of treaty adherence by nations had legal consequences.

There were many issues associated with the launch services contract, including price, payment schedule, launch schedule, costs of delay, liability issues, support services, contingency clauses, payload control issues, radio regulatory issues, aeronautical and maritime notices (coordinated with ICAO and also IMO), registration functions under national registry and UN procedures. *Mr. Doyle* noted the importance of a thorough acquaintance of both the procurer and provider of the launch service with national and international laws governing such service. The procurement of insurance to cover the payload, risk of loss, risk of third party damage and risk of revenue loss were all negotiable cost items.

Professor Christol reviewed the applicable provisions of international space law pertaining to international responsibility. He elaborated in detail on Article VI of the Outer Space Treaty which provides that the States Parties shall bear international responsibility for national activities in outer space irrespective of whether such activities are carried on by governmental agencies or nongovernmental entities. He noted that one of the Principles of Remote Sensing (Principle 14) adopted by the United Nations General Assembly declared that the "international

responsibility principle" was without prejudice to the applicability of the norms of international law on state responsibility for remote sensing activities. This language imposed a task on legal technicians to differentiate "international responsibility" from "state responsibility" for remote sensing activities.

In *Professor Christol's* view, there were factual situations in which each of the expressions, possessed relevance. One could apply the state responsibility doctrine to the conduct of nongovernmental entities in international remote sensing activities and "international responsibility" for the State's conduct in carrying out international remote sensing activities. However, in the final analysis they had substantially the same meaning.

In her presentation which was based on a paper co-authored by *Mr. Robert Amann, Dr Specter* reviewed existing obstacles to space commercialization in the developing world with particular attention to the lessons learned from Landsat. *Dr. Specter's* presentation was based on a survey which reflected responses received to a questionnaire comprised of 49 items, each representing a potential obstacle to remote sensing technology transfer that had been identified through literature review. Responses were received from 222 experts. The 7 factors identified in the relevant literature were classified most critical. They included the lack of computer hardware and software for digital analysis, lack of experienced personnel, environmental issues related to economics, role of decision-making in developing countries, the uncertain future of Earth-observing satellite systems and the lack of cooperation among relevant organizations in developing countries. It was hoped that the factors identified would be of assistance to policy makers in finding ways to increase the flow of remote sensing technology to developing country systems.

Stephen Gorove
Chair, Symposium on Space Commercialization:
Roles of Developing Countries

Environmental Implications and Responsibility in the Use of Outer Space

The International Institute of Space Law (IISL) sponsored a program entitled "Environmental Implications and Responsibility in the Use of Outer Space" on March 30, 1989 before the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space in its Conference Room during the Subcommittee's 1989 Session in New York City.

The program's two principal speakers were *Nicholas L. Johnson,* Advisory Scientist of Teledyne Brown Engineering, Colorado Springs, who addressed the technical aspects of the subject, and *Nicolas M Matte,* Director of the Institute and Centre of Air and Space Law, McGill

University, Montreal, Canada, who addressed the legal aspects. *Stephen E. Doyle,* of Aerojet TechSystems, Sacramento, California, served as Moderator and *Martin Menter* as Program Chairman.

Mr. Johnson narrated the categories of concern as to the effect of man made debris and derelicts in outer space on future space activities and on the biosphere. By view-graphs, he illustrated the potential for catastrophic collisions, in future space operations, with not only the tracked space debris population but also with the far greater very small debris. He related that as the size of the spacecraft grows, the probability of collisions increases proportionately. Of the fragmentation debris now in orbit 42% originated from payloads and 58% from rocket bodies. These debris primarily populate the region of near-earth space below 2,000 km where many application satellites reside and where all manned operations take place.

Mr. Johnson further observed that the Earth satellite population is primarily influenced by satellite launch rate, satellite fragmentation and solar activity. Due to the approaching solar maximum, which is expected to peak in the next decade, the growth rate of the cataloged population has been negative and this trend should contine for the next few years. He pointed out that the hazards of artificial space debris in the existing environment can be reduced by both passive and active means. Shielding against small space debris can be taken. However, if the debris is greater than 1 cm in diameter, shielding is normally undesirable due to weight penalties and potential interference with mission objectives and in light of currently estimated spatial densities. Nonetheless, active collision avoidance capabilities may be instituted, such as an on-board detection system. A space-based space surveillance system could enhance the prospects for a reliable collision avoidance system. Action, initially, that should be taken is to curb creation of unnecessary orbital debris, whether from planned debris generated to meet scientific or security objectives, or from operational launch activity. Actions also are possible to accelerate decay by redesign of rocket bodies and new launch procedures and by having propellant restart capability to lower perigee. *Mr. Johnson* concluded that if the space debris population remains unchecked, all space activities - manned and unmanned - would suffer, including satellites we now daily rely upon for weather, remote sensing, telephone, television and navigational aids.

Professor Nicolas M. Matte, in addressing the legal aspects of the program subject, examined the provisions of the space law and other treaties affecting activities in outer space and observed that their lack of specificity results in their being "not adequate to deal with the menace at hand." Remedially, he observed four basic issues to be addressed: the identification of the harmful effects emanating from space activity; the selection of preventative measures by imposing a total ban or technical standards to regulate the harmful activity; the identification of remedial

measures once harm has occurred; and the establishment of an appropriate liability regime for wrongdoers.

Professor Matte proposes a series of steps to be taken to an ultimate international community formulation of a convention dedicated to environmental protection. As an interim first, he recommends the establishment of a standing group of qualified scientists, technicians, jurists and economists. Its task would be to: gather comprehensive information on present forseeable environmental dangers resulting from space activities; prepare a list of preventable measures to reduce the likelihood of occurrence of environmental harm; develop a body of recommended standards and practices to ensure safety of activities in the aerospace environment to be supplemented by easily amendable technical appendices similar to the ITU Radio Regulations or the Annexes to the Chicago Convention on International Civil Aviation.

Dr. Matte envisages that, concomitant with the establishment of the group of experts, States would continue to pursue unilateral, regional or multinational initiatives to prevent damage and pollution of the aerospace medium. He believes that the international convention sought should provide for: a uniform regime of environmental protection that does not take into account the artificial separation of airspace and outer space; a mandatory consultation procedure and an effective dispute settlement procedure, including provision for presentation of claims, assignment of liability and awarding of specific penalties; recovery by non-launching States of threatening non-functional orbiting spacecraft; prohibition of intentional fragmentation of orbiting space objects; and definitions of terms or expressions used in the convention.

Professor Matte concludes: "The time to move decisively toward an adequate international regime has come. Humanity, concerned with its survival, cannot afford to wait for a major catastrophe before it takes the initiative. .... The alternative is everlasting silence."

Martin Menter
Honorary Director, IISL

Space Debris Update

The United States Congress Office of Technology Assessment and The United States Space Foundation co-sponsored a workshop on Space Debris and Its Policy Implications on April 4, 1989 in Colorado Springs.

During the morning session, panelists presented their views on the technical factors, policy implications, and legal concerns. In the afternoon, *Dr. Ray A. Williamson* (OTA), workshop co-chairman, moderated a round-table discussion seeking policy and technological solutions for the issues raised during the morning session.

The purpose of the workshop was: to review the current developments in our understanding of the debris problem; to study the February,

1989 Report on Orbital Debris by the Interagency Group (Space) submitted to the National Security Council; and formulate positions to be reported to the U. S. Congress.

Drs. Joseph P. Loftus, Jr. (NASA), and *Darren S. McKnight* (U. S. Air Force Academy), provided an update on the technical factors. It was recently discovered that the historic data on the debris population gives an inaccurate trend because the technical capability of observing debris is increasing. Accordingly, the debris counted in 1988 included debris which was present in earlier years but not recorded. The good news is that debris is not increasing as rapidly as year to year reports would indicate. The bad news is we still do not know how much more debris there is.

Dr. Loftus pointed out that we cannot logically assume if you know the population of a certain size of debris you can extrapolate and determine the quantity of smaller debris. The Administration report calls for a greater study of space debris so the true extent of it can be accurately ascertained.

From a technical standpoint the greatest concern is with regard to low earth orbit space debris because of the total mass located there. From a strategic and economic perspective there is growing concern about the extent of space debris in the geosynchronous arc.

Michael A. G. Michaud (Department of State), *Elaine O. David* (DOT), *John E. Shepard* (Major, Army, NASA) and *F. Kenneth Schwetje* (Lt. Col., USAF, JCS), provided insight into the history of the U. S. space debris policy and the current concerns of the various agencies. It was noted that space debris has been a concern at the Federal level for a number of years and several studies have been conducted.

The primary concern by the various agencies is that we may be rushing to formulate a policy which may be unwise after we better understand the technical aspects of space debris. For instance, there have been proposals and some operators are beginning to boost satellites to a position 150km above geosynchronous orbit. Recent studies indicate in order to be effective a boost up to 500km may be necessary. Placing them in a 150km "disposal orbit" may be worse than leaving the satellites where they were. Moreover, the cost of moving a satellite may be as much as 10% of its stationkeeping fuel which will significantly reduce its on-orbit life. A compounding factor is that the remaining stationkeeping fuel is difficult to calculate exactly. Therefore, to allow for an error factor, even more of the satellite's life would have to be used to assure such disposal if a disposal orbit policy were to be established.

An allied concern of the agencies is the cost of implementing a space debris abatement policy which might place United States entrepreneurs at a significant disadvantage in the international marketplace.

In summary, the U. S. position is to study the matter further and evaluate the viability of proposed technical solutions to space debris.

Economic consequences must be taken into consideration prior to formulating a policy. In contrast, the European Space Agency report on space debris, released late in 1988, took the position that while much needs to be learned about space debris, we know enough to take affirmative action and start finding solutions.

Closing the morning session, a potpourri of legal experts provided insight into various aspects of the problem. *Professor Stephen Gorove* (University of Mississippi) pointed out that space debris is an environmental problem and that while none of the space treaties spell out specific provisions dealing with space debris, the philosophy and sense of the treaties requires space faring nations to ameliorate the problem in order to assure unfettered access to space. He proposed as a solution that rather than trying to negotiate a treaty at this point it would be better to study the practice of nations. What nations do becomes international law by custom. If we find a commonality of approach to the space debris problem by the various nations, the first provisions of a treaty should be easily written.

Bruce S. Marks, Esq., drew the group's attention to the way in which the U.S. has dealt with environmental pollution in other arenas and suggested that some analogies could be drawn. He proposed that space debris be stockpiled in space so that at a later time it would provide a useful pantry for space development and exploration.

Howard A. Baker (McGill University, Canada) commented that a definition of debris was essential. He felt that the need for the development of a policy on space debris was critical because the situation had the potential to get out of hand. He called for the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) to propose a treaty resolving the debris issues.

Bruce D. Kraselsky, Esq., discussed the concerns of the insurance community. He indicated that at this time debris was not a major issue but that if nothing is done, it will have an adverse impact on the risk of space activity and insurance companies will begin charging for the risk they are taking. He urged that constructive solutions be sought so that space development would not be curtailed.

Ambassador Edward E. Finch, Jr., reported on the recent meeting at the United Nations which discussed nuclear power sources and the threat which they pose to a safe environment. *Professor Nicolas Matte* (McGill University, Canada) strongly urged at the U. N. meeting that treaty provisions be drafted because of the increasing threat that space debris was posing to the beneficial development of space.

William Wirin
Workshop Co-Chairman,
Professor, University of Colorado at Colorado Springs
and Webster University

The Aerospace Plane: A Challenge to Air and Space Law

On April 6, 1989, an Open Forum discussion was held on the legal and policy issues arising out of the development and use of the aerospace plane. The discussion took place during the Annual Meeting of the American Society of International Law in Chicago. It was attended by members of the Society's Space Law Interest Group and chaired by *Professor Stephen Gorove* of the University of Mississippi Law Center.

In his introduction, the *Chair* recalled that in recent years research efforts have been under way in the United States, the Soviet Union and other countries to develop a new versatile vehicle which may well revolutionize intercontinental transportation and travel by substantially shortening the time presently required to reach far-away destinations. He noted that when developed, the aerospace plane would be capable of taking off horizontally and providing on-demand access to near space from many different bases on earth. He raised a number of issues requiring careful consideration of possible alternatives: they related to the legal nature and use of the aerospace plane, the delimitation of air space and outer space, the status of astronauts, and problems of liability, responsibility, registration and jurisdiction.

In the ensuing discussion *Professor John Reifenberg* of Detroit College and *Dr. Wulf von Kries*, Adminstrative Director of the German Space Agency (DVFLR) noted some of the physical attributes of the plane and stressed differences in approaches to its use in different countries.

With respect to delimitation issues, *Professors Peter Haanappel* and *Ivan Vlasic* of McGill University expressed the view that the activities of the aerospace plane as a space traversing device used for point-to-point earth transportation could be governed by air law. If so, a possible requirement could call for bilateral agreements between states prior to an international flight by the aerospace plane.

As to the issue of whether personnel or passengers of an aerospace plane would be regarded as "astronauts", *Professor Carl Christol* of the University of Southern California, commented that while that the status of astronauts as "envoys of mankind" has never been clarified, there has been a Soviet draft proposal dealing with their privileges and necessities.

In discussing the issue of registration *Dr. von Kries* felt that since the plane was not a space object its registration under the registration Convention was not necessary. At the same time, *Professor Christol* thought that the notification of other countries upon take-off of an aerospace plane on an international flight was essential.

As to issues of liability the view was expressed that it may be necessary to apply a dual system (air law and space law) to the aerospace plane depending on the circumstances of each case. The Chair concluded

the discussion by reemphasizing this observation.

Stephen Gorove
Chair, Open Forum
ASIL 1989 Annual Meeting

New Opportunities in Space: Legal Issues for the 21st Century

The Aerospace Law Committee of the American Bar Association presented a panel discussion on "New Opportunities in Space: Legal Issues for the 21st Century" at the Annual Meeting of the A.B.A. International Law Section in Washington on April 28, 1989. The program moderator was the Committee's chairman: *F. Kenneth Schwetje*. The panel was comprised of NASA General Counsel, *Edward Frankle, John Graykowski* of the Senate Subcommittee on Science and Technology, and *William Wirin* of Space Commerce Corporation (SCC). The theme of the discussion addressed the changing nature of the commercial launch industry in the United States.

The emerging domestic commercial space launch industry is a product of a few well known events. In 1984, Congress passed the Commercial Space Launch Act. Most domestic launch providers found themselves in competition with NASA which provided launch for commercial satellites on the Shuttle. In January 1986, the Challenger disaster resulted in a backlog for commercial satellite activity. The President decided that the Shuttle would no longer be used for routine commercial launches. This change was reflected in the 1988 Space Policy statement of the United States. In October 1988, the Congress amended the Commercial Space Launch Act to facilitate the growth of the domestic industry.

Mr. Graykowski opened the program with an explanation of how these amendments were intended to correct portions of the original Act that the commercial sector found inhibiting. The primary area addressed involved the issue of indemnification. *Mr. Frankle* described some of the latest opportunities NASA offered the business commmunity, highlighting microgravity and materials processing programs. The third speaker, *Mr. Wirin* detailed the efforts of SCC to market the services of the Soviet Union's space program in the West. He outlined the legal and policy problems involved in getting permission from the U.S. Government to launch U.S. technology on Soviet boosters.

Following the formal presentations, there was a great deal of interaction between and among the panel members and the audience over a number of the issues raised by the panelists. The program ended with a reminder from *Ken Schwetje* that the committee would be presenting a related series of lectures at the ABA Convention in Honolulu this coming August called: "Hawaii: Spaceport of the Future."

Kenneth Schwetje
Chairman, ABA Aerospace Law Committee

Other Events

Asia Telecom '89, organized under the auspices of the Telecommunications Authority of Singapore in cooperation with the International Telecommunication Union met in Singapore during the week of February 20-25, 1989.

A conference providing detailed information on the new NOAA System of Geostationary Operational Environmental Satellite (GOES), which is anticipated to enter service in 1990 was held April 3-6, 1989, in Crystal City, Virginia.

The annual meeting of the AIAA Technical Committee on Legal Aspects of Aeronautics and Astronautics took place May 4, 1989, in Crystal City, Virginia. Topics on the agenda included commercial implications of the Government-to-Government Long March Agreement, Space WARC-88, liability aspects of P.L. 100-657, current COPUOS issues, implementation of international standards for space debris, patent law and other issues.

The Third International Conference on Tethers in Space, sponsored by AIAA, NASA, ASI, and ESA, was held in San Francisco, California on May 17-19, 1989.

Brief News

A new era of planetary exploration started on May 3, 1989, with the successful deployment by the space shuttle Atlantis of the Magellan spacecraft which is expected to reach Venus in August 1990 to provide data on the red planet. The craft will have the capability to distinguish objects of the size of a football field...Each satellite deployed by Discovery in September and March can transmit 37 million characters - the rough equivalent of about ten sets of encyclopedias - every second...A bill to ban the use of nuclear satellites in earth orbit was introduced in Congress...Discovery STS-29 carried America's first official space art piece, a sculpture, named Boundless Aperture, into orbit...A Nevstar Global Positioning System (GPS) satellite was launched February 14, 1989 to provide accurate position and velocity information in three dimensions...A mockup model of an unmanned, cargo-carrying shuttle was displayed by NASA...Waste water discharged by Discovery turned into ice crystals over Hawaii...The U.S. Transportation Dept. has set an $800 million insurance minimum for each commercial launch of the Titan and Delta vehicles...NASA has invited the Soviet Union to place biological experiments on the Space Shuttle on a June 1990 mission...The Science, Technology and Space Subcommittee of the U.S. Senate held hearings on May 8, 1989 on the greenhouse effect and possible climate surprises...The U. S. Galileo probe to Jupiter is scheduled for October 12, 1989...In 1990, Discovery is to place the Hubble space telescope into orbit to study deep

space...NASA plans to increase its launch rate from 6 in 1989 to 14 by 1993. It will conduct a study on a multi-mission Crew Rescue Emergency Vehicle (CREV) which could return astronauts from the space station.

The first Soviet unmanned space shuttle, Buran (Snowstorm), was successfully launched on November 15, 1988. It is expected to be displayed at the Paris Air Show, June 8-18, 1989. The two Soviet endurance-record setting astronauts suffered fewer physical problems than expected from their 366-day stay in space...A new all-weather space borne camera under development by the Soviet Union would provide two-meter-resolution for commercial customers...The Soviet Union reached an agreement with the Tokyo Broadcasting System allowing a Japanese to visit the Mir space station before the end of 1991...The Soviet Phobos 2 spacecraft gathers data on Mars...The Soviet Union intends to expand its foreign marketing of commercial manned and unmanned space flights in order to generate revenues for its space program...The first Russian manned space flight to Mars has been tentatively scheduled between the years 2005-2010.

The French National Space Agency's budget was increased by 20% for 1989...Ariane 2 put a communications satellite in orbit to serve Sweden, Finland, and Norway...The European Space Agency expects to launch 4 Japanese satellites during this year. It plans a joint international mission with NASA to Saturn and its largest moon Titan...INMARSAT is to operate a minimum of three spot-beam satellites for use in the 1990's.

Astrotech Space Operations is planning to launch seven more satellites this year after its launch of the INSAT Indian Communications satellite...China agrees with the U. S. to launch no more than nine international communications satellites through 1994...Japan is developing radar powered satellites and nuclear power sources which can be used on space stations and lunar bases...Both China and Japan are now developing new heavy boosters for a manned space program in the 21st century.

B. Forthcoming Events

The American Institute of Aeronautics and Astronautics (AIAA) and NASA are jointly sponsoring the International Space Station Technical Symposium to be held June 20-22, 1989, in Vienna, Virginia.

The International Space University (ISU) will hold its Summer Session June 30-August 31, 1989. The ISU-s program fee per student is $10,000 which includes tuition, housing and meals but does not include a personal stipend or travel expenses.

Issues of the national aerospace plane will be discussed at an International Symposium on the Future of Air Transportation August 8-10, 1989 in Vancouver, Canada.

The Federal Bar Association's Space Law Committee and Transportation Law Section will cosponsor a major commercial space law program, "The First Annual Symposium on the Law and Outer Space" at Georgetown Law School on September 8, 1989. The next day a special panel of world famous space law experts will accept the presentation of student papers on any space law topic. Following this student paper program, professors teaching space law will be invited to a working luncheon to compare and discuss national and international space law courses. For further information contact the program moderator, *F. Kenneth Schwetje,* 15397 Autumn Ln., Dumfries, VA 22026.

The International Academy of Astronautics (IAA) will conduct a symposium on "Humans in Earth Orbit and Planetary Exploration Missions" in Tushkent, Uzbekistan, USSR, on Sept. 29-Oct. 3, 1989.

The Third Space Enterprise Conference, entitled "Lunar Commerce Conference - Building the Earth-Moon Bridge," is scheduled for October 1-3, 1989, in San Francisco.

As reported in our previous issue, the 32nd International Colloquium on the Law of Outer Space will take place in Beijing, China, October 7-13, 1989, during the IAF Congress. Topics to be discussed are: 1. Legal aspects of protection of the outer space environments; 2. Legal implications of the principle according to which the exploration and use of outer space shall be carried out for the benefit and in the interests of all States taking into account the needs of developing countries; 3. The legal status of the geostationary orbit in light of the recent activities of ITU; 4. Other issues of space law.

SPACE COMMERCE '90 will be held March 26-29, 1990 in Montreux, Switzerland.

The 33rd International Colloquium on the Law of Outer Space will take place in Dresden, German Democratic Republic, in October 1990. Proposed topics for discussion include: (1) Legal aspects of the protection of the global environment; (2) The present legal status and the future of space commercialization; (3) Recent developments in national and international space law; (4) Other legal subjects. (This last category may include papers on such subjects as developments in customary international space law, principles governing manned space flight, improvement in registration of space objects, or on any other legal subject relevant to outer space).

BOOK REVIEWS/NOTICES

Reviews

Droit de l'Espace, by Jacqueline Dutheil de la Rochère and others (Editions Pedone, 1988).

This challenging book dealing with recent aspects of the law of outer space has been born under the able direction of *Jacqueline Dutheil de la Rochere* in cooperation with a number of other distinguished authorities who also contributed to it. The introductory note explains that the book is neither a manual nor a treatise since the various aspects of space law are not treated systematically or exhaustively. Thus certain themes may be repeatedly touched upon but in a different perspective.

The book is divided into four major parts dealing with space law, space applications, space as the common heritage of mankind, and the question of militarization of space, respectively.

The first part focuses on the sources of the law *(Dutheil de la Rochère)*; the legal regime applicable to different types of space activity *(Michel Bourély)*; international cooperation and space law as exemplified by the European Space Agency *(Michel Bourély)*; and the Outer Space Treaty of 1967 in the light of its permanence and current relevance *(Claude Albert Colliard)*.

The second part acquaints the reader with space transportation systems *(Jean Chappez)*, the space station *(Gabriel Lafferranderie)*, the commercial systems of telecommunications by satellite *(Simone Courteix)*; legal aspects of remote sensing *(Olivier de Saint Lager)*, direct television broadcasting by satellite *(Brigitte Cherreau)* and the protection of data and inventions in space *(Marie-France Murphy* and *René Osterlinck)*

The section on space as the common heritage of mankind focuses on two topics: the law pertaining to the protection of the space environment *(Michel Bourély)*, and the developing nations' interest in the establishment of a new international order governing outer space activities *(Olivier de Saint Lager)*, while the last part of the book discusses space in the era of nuclear dissuasion *(Thierry Garcin)*, and the S.D.I. in light of the ABM Treaty *(Hubert Thierry)*.

The book on the whole provides the reader with an excellent perspective on the birth and development of space law, its international and national sources, the fundamental principles upon which it rests, some of its organizational settings, and some of its problems and their possible solutions. The individual treatments by different authors elaborate on such legal issues as those arising from the privatization of space activities, the use of the Space Shuttle, the setting up of private trans-oceanic systems distinct from Intelsat, the interpretative declara-

tions of states regarding principles of remote sensing and the fluctuating nature of U.S. policy with respect to the interpretation of the ABM Treaty.

While the book contains no appendix of documents or index, this reviewer found it particularly innovative and useful to have a set of interpretative declarations accompany the discussion of the U.N. Principles of Remote Sensing.

Stephen Gorove
Director of Space Law and Policy Studies
and Professor of Law
University of Mississippi Law Center

The Telecom Mosaic, by Robert R. Bruce, Jeffrey P. Cunard, and Mark D. Director (Butterworth Scientific, 1988), pp. 447.

The Telecom Mosaic is the second phase of the work on the Study of Telecommunications Structures (STS) sponsored by the International Institute of Communications. The first phase of STS was completed in August 1985 entitled *From Telecommunications to Electronic Services. The Telecom Mosaic* is divided into five separate reports, each treating individual yet interrelated issues in the field of telecommunications - primarily terrestrial, but also some satellite communications.

In the first section, "Boundary Lines," attention is given to the evolution of the lines of demarcation between "basic" and "enhanced" or value-added telecommunication services, basic being defined as telephone services and "enhanced" as those services offered on top of the "basic" service. This section examines the approaches of the U.S., the United Kingdom, Japan, France, the Netherlands, Finland, Canada, Italy, Spain, Germany, and Australia to the appropriate regulatory boundary between the different service offerings, the problems with their respective approaches, and the prospects for changes in their policies in the near future.

The next section, "Telecommunications and Transactional Services," treats the structural and regulatory issues surrounding the relatively recent ability to offer international electronic financial and transactional services, focusing in particular on the problems of regulating or treating such services within established international institutional roles.

The third paper entitled "The Future of European Communications Policy" examines a variety of terrestrial telecommunications issues, but also addresses issues resulting from the emergence of a new facilities infrastructure for satellite services and the extent and structure of cooperation and competition in the emergence of satellites. The essay notes that "the implementation of new satellite facilities in Europe is a bit of a technological 'wild card'," because it "will change the mix of pressures that are forcing the [Bureaus of Posts, Telephone and Telegraph] PTTs and governments to reexamine telecommunications policy." The

work draws attention to the fact that critical to any European satellite plan, such as EUTELSAT, are the investment plans and marketing strategies of the national PTTs, as well as the plans of the European Commission in the Integrated Service Digital Network (ISDN) area, and that changes in the regulatory environment may create significant incentives for the PTTs to explore new uses of satellite-based services. The work reviews briefly various European satellite projects and then discusses their implications for developing a European satellite policy. The article points out that several of the institutions with interests in satellites have conflicting views, including the European Space Agency and the Coordination Committeee for Satellite Telecommunications (CCTS) of the Conference Europeenne des Postes et Telecommunications (CEPT). The essay points out that a 1986 CCTS Report, Report of the CCTS on its Review of the European Space Agency's Future Telecommunications Programme, Doc. T/CCTS(86) 11, that has been the subject of active discussion, will be of considerable assistance in coordinating CEPT telecommunications planning and ESA programs.

Titled in part "The Changing Environment for Planning International Facilities," the fourth report puts into perspective the direct relationship between various national and international policies and their effect upon the success or failure of international telecommunications facilities. The work discusses the growth of international transmission capacity, the strains in current facilities planning activities, including the INTELSAT coordination procedures and the development of regional and national satellite systems. Also dealt with are existing international planning policies that the author suggests may be in need of alteration, due to new problems and pressures. This section pays considerable attention to possibilities for enhancing INTELSAT's contributions to planning activities.

The fifth and last report "Telecommunications Structures in the World," addresses the impact which the telecommunications industry has had upon developing nations, using India, Malaysia, and Indonesia as case studies. The work focuses on the problems of financing and planning telecommunications infrastructures, the obstacles encountered in doing so, some of the reactions of each these countries, and offers ideas as to possible solutions or strategies. In conclusion, the report distinguishes the needs of developing countries and calls for an exchange of views on the subject in an international forum.

The United States and the Direct Broadcast Satellite, by Sara F. Luther (Oxford University Press, 1988), pp. 266.

This book discusses the possibilities of Direct Global Broadcast by Satellite and points out the economic, cultural, social, and political ramifications of such an international broadcast. Even though technology has rapidly advanced in this area, federal regulations have posed

significant barriers to its international usage. Likewise, international legal issues surrounding the Direct Broadcast Satellite remain unanswered. Once these national and international restraints are removed the telecommunications satellite industry will be meshed with the rapidly advancing computer technology which will result in numerous innovative applications of the Direct Broadcast Satellite.

Sattellite Communications and Outer Space: Regulatory Aspects, by G.N. Sharma (Academic Book Centre, 1988), pp. 160.

In a brief and easilty read format, this book examines and analyzea the regulations of the International Telecommunication Union (I.T.U.) as they apply to the various form of electronic communication. The author first examines the I.T.U. Regulations in relation to satellite communications and explores the legal problems raised by the growing number of satellites as well as the shrinking number of available frequencies and geostationary orbit positions. He points out the legal distinction between a sovereign state's airspace and international outer space and examines how I.T.U. Regulations apply to the rapidly expanding area of land mobile communications, including car calling systems. *Mr. Sharma* also examines the legal problems associated with interference and secrecy. In the final chapter of the book, the author focuses on an analysis of the geostationary orbit. He elaborates on various international treaties and draws an analogy between the geostationary orbit and the high seas.

The appendices in the book include several important treaties, I.T.U. regulations, dates in telecommunication history and dates of and information about satellite launchings up to 1984. The appendices also include lists of terms, definitions, I.T.U. members, radio frequency bands, and useful constants.

Handbook of Satellite Telecommunications and Broadcasting, by L. Ya. Kantor (Artech House Publishing Co., 1987), pp. 498.

This book starts off by explaining the basic characteristics of satellite communications systems and their advantages. T.V. programs, one-way messages, and telephone messages are all products of efficient satellite systems. From an international perspective, satellites also play an important role in day to day communications. Many satellite stations are located in different countries which allow global communications; such systems include Intersputnik, Intelsat, and Eutelsat. Thre are also national satellite systems located within the boundaries of countries which permit commercial and governmental organizations to communicate through intra-continental systems.

Satellite maintenance is also discussed in this book. First of all, many companies will put a satellite into orbit as soon as the previous one fails or is exhausted. However, sometimes a standby satellite is put in orbit with the main satellite ready to replace the worn-out satellite when needed. To sum up, today's satellite technology is aimed at making satellite systems more efficient. To do so, we need to extend the active life of satellites, perfect the equipment of earth stations and shorten satellite downtime due to operating mistakes by personnel.

World Wide Space Law Bibliography, Vol. II, by Kuo Lee Li (De Daro Publishing, 1987), pp. 441.

This comprehensive reference book is the second volume in a series. It contains bibliographic entries of materials published from 1977-1986, although it must be noted that some publications in 1986 may not have been available for inclusion at press time. This volume includes materials which touch upon space law from the legal community itself as well as from the scientific and economic fields.

The book is organized according to subject with many subtopics which are further subdivided. There are twenty broad subject areas ranging from "Space Exploration" to "Sources of Space Law" to "Meteorological Satellites." Also, the subjects of liability, damages, telecommunications, and causation are included among many others. There is an expansive list of abbreviations included for additional reference. Also, the book contains indices by name and subject. It should be noted, however, that the volume does not include documents issued by the United Nations.

Notices

Commercial Opportunities in Space, edited by C.C. Chao, K.E. Horwell, and Shahrokhi (American Institute of Aeronautics and Astronautics, Inc., 1987), pp 540.

This work is a combination of about three dozen contributions by different authors containing technical discussions of space platforms, material processing and fluid mechanics in microgravity, satellite communication, remote sensing, propulsion in space, and lunar activities, The book was written to persuade third world countries that they have a future in space. The authors note that the cost of space equipment is not as expensive as most third world countries believe and due to advances in technology, the cost should decrease in the future..

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A. Books

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LEGAL ASPECTS OF MAINTAINING OUTER SPACE FOR PEACEFUL PURPOSES

SPACE LAW AND THE PROBLEMS OF DEVELOPING COUNTRIES

NATIONAL SPACE LAWS AND BILATERAL AND REGIONAL SPACE AGREEMENTS

GENERAL ISSUES OF SPACE LAW

CURRENT DOCUMENT

PRESENT STATUS OF OUTER SPACE TREATIES
MARCH 1989*

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)

Adoption by the UN General Assembly:	19 December 1966
Opening for signature:	27 January 1967
Entry into force:	10 October 1967
Depositary:	U.K., U.S.A., U.S.S.R.

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

Adoption by the UN General Assembly:	19 December 1967
Opening for signature:	22 April 1968
Entry into force:	3 December 1968
Depositary:	U.K., U.S.A., U.S.S.R.

3. Convention on International Liability for Damage Caused by Space Objects (Liability Convention)

Adoption by the UN General Assembly:	29 November 1971
Opening for signature:	29 March 1972
Entry into force:	1 September 1972
Depositary:	U.K., U.S.A., U.S.S.R.

4. Convention on Registration of Objects Launched into Outer Space (Registration Convention)

Adoption by the UN General Assembly:	12 November 1974
Opening for signature:	14 January 1975
Entry into force:	15 September 1976
Depositary:	UN Secretary-General

5. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement)

Adoption by the UN General Assembly:	5 December 1979
Opening for signature:	18 December 1979
Entry into force:	11 July 1984
Depositary:	UN Secretary-General

* Taken from unnumbered UN document.

State	(1) Outer Space Treaty	(2) Rescue Agreement	(3) Liability Convention	(4) Registration Convention	(5) Moon Agreement
Afghanistan	R				
Algeria			S		
Antigua and Barbuda	R	R	R	R	
Argentina	R	R	R	S	
Australia	R	R	R	R	R
Austria	R	R	R	R	R
Bahamas	R	R			
Bangladesh	R				
Barbados	R	R			
Belgium	R	R	R	R	
Benin	R		R		
Bolivia	S	S			
Botswana	S	R	R		
Brazil	R	R	R		
Bulgaria	R	R	R	R	
Burkina Faso	R				
Burma	R	S			
Burundi	S		S	S	
Byelorussian SSR	R	R	R	R	
Cameroon, United Republic of	S	R			
Canada	R	R	R	R	
Central African Republic	S		S		
Chile	R	R	R	R	R
China	R	R	R	R	
Colombia	S	S	S		
Costa Rica		S	S		
Cuba	R	R	R	R	
Cyprus	R	R	R	R	
Czechoslovakia	R	R	R	R	
Democratic Kampuchea			S		
Democratic Yemen	R				
Denmark	R	R	R	R	
Dominican Rep.	R	S	R		
Ecuador	R	R	R		
Egypt	R	R	S		
El Salvador	R	R	S		
Equatorial Guinea	R				
Ethiopia	S				
Fiji	R	R	R		
Finland	R	R	R		
France	R	R	R	R	S

State	(1) Outer Space Treaty	(2) Rescue Agreement	(3) Liability Convention	(4) Registration Convention	(5) Moon Agreement
Gabon		R	R		
Gambia	S	R	S		
German Democratic Rep.	R	R	R	R	
Germany, Federal Rep. of	R	R	R	R	
Ghana	S	S	S		
Greece	R	R	R		
Guatemala			S		S
Guinea-Bissau	R	R			
Guyana	S	R			
Haiti	S	S	S		
Holy See	S				
Honduras	S		S		
Hungary	R	R	R	R	
Iceland	R	R	S		
India	R	R	R	R	S
Indonesia	S				
Iran	S	R	R	S	
Iraq	R	R	R		
Ireland	R	R	R		
Israel	R	R	R		
Italy	R	R	R		
Jamaica	R	S			
Japan	R	R	R	R	
Jordan	S	S	S		
Kenya	R		R		
Korea, Rep. of	R	R	R	R	
Kuwait	R	R	R		
Laos	R	R	R		
Lebanon	R	R	S		
Lesotho	S	S			
Libyan Arab Jamahiriya	R				
Liechtenstein			R		
Luxembourg	S	S	R		
Madagascar	R	R			
Malaysia	S	S			
Maldives		R			
Mali	R		R		
Malta			R		
Mauritius	R	R			
Mexico	R	R	R	R	
Mongolia	R	R	R	R	

State	(1) Outer Space Treaty	(2) Rescue Agreement	(3) Liability Convention	(4) Registration Convention	(5) Moon Agreement
Morocco	R	R	R		S
Nepal	R	R	S		
Netherlands	R	R	R	R	R
New Zealand	R	R	R		
Nicaragua	S	S	S	S	
Niger	R	R	R	R	
Nigeria	R	R			
Norway	R	R	S		
Oman			S		
Pakistan	R	R	R	R	R
Panama	S		R		
Papua New Guinea	R	R	R		
Peru	R	R	S	R	S
Philippines	S	S	S		R
Poland	R	R	R	R	
Portugal		R			
Qatar			R		
Romania	R	R	R		S
Rwanda	S	S	S		
San Marino	R	R			
Saudi Arabia	R		R		
Senegal			R		
Seychelles	R	R	R	R	
Sierra Leone	R	S	S		
Singapore	R	R	R	S	
Somalia	S	S			
South Africa	R	R	S		
Spain	R		R	R	
Sri Lanka	R		R		
Swaziland		R			
Sweden	R	R	R	R	
Switzerland	R	R	R	R	
Syrian Arab Rep.	R	R	R		
Thailand	R	R			
Togo	S		R		
Tonga	R	R			
Trinidad and Tobago	S		R		
Tunisia	R	R	R		
Turkey	R	S			
Uganda	R				

State	(1) Outer Space Treaty	(2) Rescue Agreement	(3) Liability Convention	(4) Registration Convention	(5) Moon Agreement
Ukrainian SSR	R	R	R	R	
U.S.S.R	R	R	R	R	
United Kingdom	R	R	R	R	
United Rep. of Tanzania			S		
U.S.A.	R	R	R	R	
Uruguay	R	R	R	R	R
Venezuela	R	S	R		
Vietnam	R				
Yemen Arab Rep.		S			
Yugoslavia	S	R	R	R	
Zaire	S	S	S		
Zambia	R	R	R		
	S-28	S-21	S-27	S-5	S-6
	R-91	R-81	R-74	R-37	R-7
Organization					
European Space Agency (ESA)		D	D	D	
European Telecommunications Satellite Organization (EUTELSAT)			D		
		D-1	D-2	D-1	D-0

Notes:

S - Signature only
R - Ratification, accession or succession
D - Declaration of acceptance of rights and obligations

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STEPHEN GOROVE

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