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A journal devoted to the legal problems arising
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Comments

Short Accounts

ANNIVERSARY GREETING

It is a distinct honour and pleasure for me to greet the readers of the Journal of Space Law on the occasion of its 25th anniversary.

The Journal of Space Law takes pride of place among the legal periodicals dealing with the issues of law relating to the exploration and use of outer space. In fact, it is the only legal journal in the world devoted exclusively to this fascinating new legal discipline. All the major steps in the development of international, and national, space law over the last 25 years have been fully reflected in the pages of the Journal in the form of leading articles contributed by the foremost authorities in the field, or in the form of the prompt publication of current legal instruments, official statements and documents. In a sense, the volumes of the Journal may be viewed as a comprehensive history of the development of space law in the last quarter of the 20th Century. The expertise and topicality of the materials published in the Journal are widely recognized by all specialists.

Moreover, the Journal is not merely a chronicler of events. On a number of occasions it has come forward with pioneering ideas which have influenced the further development of space law. To give just one instance of such an initiative, in 1990, in a joint project with the German Zeitschrift für Luft- und Weltraumrecht and the Soviet Journal of International Law, the Journal of Space Law published a draft Convention on Manned Space Flight. As time passes, the importance of the subject-matter of the draft convention continues to grow. The realization of the idea of a global space station has brought these issues to the forefront of the current international space cooperation.

Nowadays international space law has become part and parcel of the body of international public law. Significantly, the International Court of Justice, which up till now had no space law cases on its docket, found it necessary to include space law and environmental law as major developing areas of international law for consideration at its recent Colloquium devoted to the 50th anniversary of the Court. On the other hand, with the ever-growing number of States which have enacted national space legislation, space law is becoming an integral part of domestic legal systems. Harmonization of national space laws, particularly in view of the expansion of private activities in space, is becoming a topical issue. Thus the horizon of subjects of space law awaiting illumination is ever-broadening.

I wholeheartedly wish the JOURNAL OF SPACE LAW and its indefatigable editor-in-chief, Professor Stephen Gorove, long life and many new readers all over the world.

Vladlen S. Vereshchetin
Member of the International Court of Justice
at the Hague, The Netherlands
Honorary Director of the International Institute of Space Law

THE ROLE OF THE UNITED NATIONS IN OUTER SPACE LAW DEVELOPMENT: PAST ACHIEVEMENTS AND NEW CHALLENGES

Peter Jankowitsch*

The central role and importance of the United Nations in the development of the law of Outer Space can best be understood if put into the international context of a difficult period of Post-World-War II history increasingly characterized by super-power rivalries and the chilly atmosphere of the Cold War.

Confrontation in the Cold War became increasingly dangerous as it successively left the European theater in which it had started and rapidly developed into a global contest, its sequels appearing in almost all continents and regions. Its major players were constantly in search of new areas and fields where advantage over the adversary could be gained. Military technology was the foremost area for this type of competition.

The rapid development of nuclear arms was a clear sign that in this confrontation no avenue would be left unexplored and that few limits would be respected. While thus land, air and sea had already been subjected to military uses the question remained to what extent the arms race would also move into new media: and indeed early ballistic weapons developed by Nazi Germany towards the end of the Second World War - forerunners of today's ballistic missiles - had already begun to infringe upon humanity's last frontier.

When, finally, in October 1957 a first man-made object was launched into Outer Space, it became clear that a new arena of competition between the two super powers had been opened. The question remained, however, to what extent it would be limited to the civilian field or whether it would also become a military one.

It is not easy to speculate, even today, on the intentions and motives of these two major players in regard to Outer Space. If, in the end, there was a clear turn towards more peaceful uses of Outer Space, we can assume that next to political considerations there must also have been economic

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* Past Chair (1972-1991) COPUOS.

ones, essentially the cost, even more prohibitive in those early days, of moving (and maintaining) large military structures in Outer Space.

As early as 1963 therefore, a few years before the conclusion of the Outer Space Treaty, a general understanding was reached between the USA and the USSR to ban the deployment of nuclear weapons or other weapons of mass destruction in Outer Space, originally in the form of a bilateral agreement. It was later endorsed by the General Assembly of the United Nations.

The way thus was open for entering into a wider agreement on the principles that should henceforth govern the activities of states in the exploration and uses of Outer Space. The history of the birth of the Outer Space Treaty, leading to its signing, in January 1967 in London, Moscow and Washington, has been told many times and there is no need therefore of a new version.

Much has also been said and written about its legal significance and there is general agreement that this is and remains the cornerstone of an entirely new branch of international public law, the law of Outer Space. This law is and remains of an original and innovative nature in many respects. In setting tight limits to the exercise of state sovereignty in Outer Space it creates a new ethic and spirit in relations between states rarely to be found in the traditional pages of international law much stronger marked by "realpolitik" than its pages devoted to Outer Space.

Unlike the continents newly "discovered" by Europeans from the 16th to 19th centuries, "Outer Space", including the moon and other celestial bodies, is not subject to national appropriation. And unlike the high seas, which since Salamis and Actium have been the theater of decisive military engagements, the exploration and use of space is to be "for peaceful purposes" only.

It is innovative also in the sense that, to this day, it has attempted, albeit not always successfully, to move ahead of technological developments and to try to create a secure legal environment for future scientific or economic activities. This characteristic is perhaps best exemplified by the visionary dispositions of such follow-up treaties to the Magna Carta of Outer Space as the 1979 Moon Treaty.

By designating in its Article II the Moon itself, as well as its natural resources a "common heritage of mankind" (echoing, incidentally a similar description for natural resources in the deep sea-bed) a step was certainly made towards a future, more broadly designed regime for such resources. The scope for such a regime would be even wider, as the provisions of the Moon Treaty are also applicable "to other celestial bodies within the solar system, other than the earth." Not surprisingly this Treaty, although adopted finally by the General Assembly of the UN, has to

this day found only few states willing to ratify it and thus endorse the principles it contains.

The United Nations and Space Law Development

In developing the broad principles on which space rests, the United Nations had to contend, from the outset, with opposing philosophies which its member states brought to this new subject matter. Thus, the United States and the Soviet Union which for many years governed all major space activities, were primarily motivated by national security concerns and were aiming to allow some, "conventional" military uses of Outer Space, some of which set in from the very beginning of the "Space Age". Satellites soon became indispensable for military communications, reconnaissance or military weather forecasting and it is estimated that up to 75% of all satellites launched have some military applications.

Thus even the rules of the Outer Space Treaty are guarded in restraining national military activities. Article IV, the key provision, states that "The moon and other celestial bodies shall be used exclusively for peaceful purposes." As for outer space generally, the only provision restricting military activities forbids the placing "in orbit around the Earth of any objects carrying nuclear weapons or any other kinds of weapons of mass destruction or station(ing) such weapons in outer space in any other manner." The "peaceful purposes" rubric applied to the moon and other celestial bodies is never defined in the Treaty, but presumably comprehends more than the simple prohibition of weapons of mass destruction applied to outer space generally.

The reason for the different treatment of "celestial bodies" and "outer space" generally was to accommodate nuclear ballistic missiles, which were just entering the arsenals of the US and the Soviet Union as the treaty was being negotiated. A major portion of the trajectory of such missiles is in outer space, but they do not go into orbit. The language of Article IV was carefully chosen to ensure that the general principle of "peaceful uses" would not interfere with the testing of these weapons.

The treaty also remains silent on the use of military satellites for reconnaissance, surveillance, early warning, and communications. The United States has always taken the position that such "passive" military uses are compatible with a doctrine of peaceful purposes. The Soviets, at first, seemed to take the contrary view. An early Soviet draft of the proposed treaty, drawn up at a time when the United States had a monopoly on observations satellites, contained a provision expressly forbidding their use. The United States and its allies opposed this provision. They argued that international law did not forbid observations of a state from points outside its national territory, and that there was no sound justification for making an exception in the case of outer space. The Soviet Union eventually conceded on this point, but perhaps the change of

position had as much to do with its acquisition of the relevant technology as with the force of the US legal argument.

In any case, it is clear from this history that reconnaissance and other "passive" military satellites are not prohibited by the Outer Space Treaty. This conclusion has since been confirmed by the provisions of the ABM treaty and other arms-control agreements in which the United States and the former Soviet Union endorsed the use of "national technical means of verification" to assure compliance, and agree not to interfere with them.

Although only a few provisions of the Outer Space Treaty deal specifically with military activities, and those that do leave much ground uncovered, the affirmation of the basic principles of peaceful purposes and international co-operation in exploration and use nevertheless remained important for the construction and application of more specific agreements governing outer space activities.

On the other hand, the space for military activities left open by the 1967 Treaty created numerous controversies over the years as efforts were made to complete its provisions so as to avoid what appeared, especially in the hotter years of the Cold War: a growing militarization of Outer Space.

These efforts were motivated by efforts of the early space powers, the US and the former USSR, to use space not only for purposes of information and communication but also to develop "conventional" space weapons: the first of those weapons were anti-satellite weapons whose development started in the late 1950's and which were brought to some perfection in the 1980's. An even more menacing perspective was opened by the idea, proposed by President Reagan in 1983, to build a space based system of Ballistic Missile Defense using all kinds of new and sophisticated technology and weaponry.

Had this idea been realized it would have eliminated one of the pillars of the arms control system of the Cold War era that also had its relevance for space law, namely the bilateral, Soviet-American ABM-treaty of 1972. Its basic premise was a judgment that security is enhanced and the stability of the strategic balance strengthened if both sides in the Cold War forswear defensive systems. This plan would have undermined the widely accepted doctrine of nuclear deterrence, given rise to an enormously expensive escalation of the arms race and introduced weapons into a realm which had been largely peaceful, or at least non-violent, so far.

It is not difficult to understand, therefore, that in the work of the UN Outer Space Committee militarization of Outer Space was one of the most contentious issues and the only one that threatened to seriously disrupt its work in the mid 80's. This issue also raised questions about the purposes of the Committee and the United Nations.

The United States, with some support from other Western countries, hoped to keep this question out of the Committee and confine it to the then 40-nation Conference on Disarmament, where it was less likely to attract attention in the context of a variety of other arms control questions. A majority of countries, while agreeing that the Conference on Disarmament was the appropriate body for negotiating formal agreements on the question, insisted that the militarization of Outer Space was a political issue of general concern and should therefore be discussed in a variety of relevant bodies.

This was also an example of the different attitudes of the Third World and the West towards international organizations such as the United Nations. The West considered the United Nations to be a mechanism for reaching agreement on issues where agreement was possible and could serve a useful purpose. For the developing countries, the United Nations were a unique forum in which they could let their views be known to the world and exert the pressure of their numbers, even on questions where clearly there would be no practical effect.

The fact that military and security concerns of the two initial major space powers had a strong influence on the work of the UN Outer Space Committee, not least in its legal work, also limited its membership. After the People's Republic of China had been restored to UN membership in 1971, it first refused to occupy its seat in the Committee as it felt it was too largely dominated by Soviet-American concerns. Albania, that in this period was a close ally of China, followed its example. It was only some years later and in view of the increasing importance that developing countries attached to the work of the Committee that China finally took its seat.

While it were thus the security concerns of the major space powers that put severe limitations on the development of space law, the "new majority" of the UN that became dominant in the early 60's brought a different concern to the deliberations of COPUOS; developing nations saw a need to use this new technology for the benefit of their economic and social development. There was, in particular, a fear that space benefits would remain limited to a small number of advanced countries. This view was clearly shared by U. Thant, who as Secretary General of the United Nations submitted to the 1968 Vienna Conference on the Exploration and Peaceful Uses of Outer Space a memorandum, in which he warned participants that "the space age was increasing the gap between the developed and developing areas at an alarming rate."

An effort was made, therefore, to give space law or basic principles of space law a direction that would also benefit developing countries. A case in point was negotiation of a set of principles relating to remote sensing of the Earth from space, adopted after 13 years of efforts by the

legal subcommittee of COPUOS by Resolution A/RES/41/65 of the General Assembly of the United Nations. Here the Committee had to resolve the conflict between the principle of freedom of space activities and the general interest in acquiring global environmental and resource data, on the one hand, and the rights of countries to control access to their natural resources, on the other. Consensus was reached on the principles of a general right to collect data and the right of the sensed states to have immediate access to any data collected over their territories. In the cases of both direct broadcasting and remote sensing, the conflict was intensified in the early stages by fear that the new and somewhat mysterious space technology would revolutionize television broadcasting in the first case and exploitation of natural resources in the second. As the technologies developed and as the practical limits of operational systems became apparent, it became clear that the potential impact of the technologies had been somewhat exaggerated by the agencies that had an interest in promoting them. In the case of remote sensing, the negotiating positions of the parties became more flexible and agreement was reached.

A similar conflict that remained unresolved concerned the rights of equatorial countries in relation to the geostationary orbit.

A declaration adopted by the COPUOS in 1996, whose lengthy title referred to the need to conduct the exploration and use of Outer Space "for the benefit and in the interest of all states, taking into particular account the needs of developing countries" reflects a further stage of the North-South debate on space cooperation. Whether, as some authors believe, it even marks the end of a contentious North-South debate in this area remains to be seen.

What it certainly does is to combine the freedom of the exploration and utilization of outer space with a reminder to space powers to fulfill their obligation to conduct their activities for the benefit of all countries. Space powers should foster international cooperation on an equitable and mutually acceptable basis. Developing countries interested in space activities might thus be motivated to put their energies into a well prepared strategy towards Outer Space. This could make many of them more equal partners in cooperation than the space powers might be ready to accept. Another consequence might be a strategy to pool their resources on a regional basis as even the industrialized countries of Europe had to do.

The mandate of COPUOS to promote international cooperation in the peaceful uses of outer space helps in some measure to outbalance inadequacies felt in the legal field. In this respect, it is more difficult to point to concrete results, since the Committee itself does not actually carry out space activities. Most space programmes contain some degree of cooperation between countries, the practicalities of which are worked out between the national agencies and the technical personnel of the countries involved.

In response to the desires of the developing countries to benefit from space technology, the United Nations, through the Committee, has organized so far two major world conferences on Outer Space - both in Vienna - in 1968 and in 1982. In response to the first, the United Nations established a space applications programme to provide developing countries with information on how they could use space technology. The 1982 Conference, in which 94 countries and 45 international organizations participated, was dominated by conflict between the developing and the developed countries over rights and obligations with respect to the transfer of technology. While it managed to agree that a major expansion of the Space Applications Programme was desirable, there was no agreement on funding, which continued to remain largely voluntary. Nonetheless, the existing programme does provide for a number of seminars and training courses each year in developing countries and administers a number of fellowships for long-term advanced training in space technology in developed countries. UNISPACE III to be held in Vienna in 1999 will be another attempt in this direction.

This third space conference on the peaceful uses of outer space will be held from 19 to 30 July 1999 in Vienna as a special session of the Committee on the Peaceful Uses of Outer Space open to all States members of the United Nations. Building on the Declaration on Benefits mentioned above, UNISPACE III will concentrate on the benefits space applications can provide for all mankind. Governments, national space agencies, international organizations and non-governmental organizations and for the first time representatives of industries will gather in Vienna with a view to come to an action plan for space cooperation in the 21st century. The presence of industry in this UN-Conference as a partner is a particularity of the event. It shows the growing importance of commercial industries in the area ranging from satellite communication to launch services. While in previous conferences the balance of political interests between the major blocks was predominant, the forthcoming conference has a better chance to pursue the common interest of better cooperation in space activities to further advance, *i.a.*, sustainable economic development and other objectives.

There can be no doubt that a substantial body of international space law has been created by the UN COPUOS, particularly by the work of its legal experts in its relevant subcommittee. This body of law has underpinned a wide array of space law developed by other UN organizations, not least the ITU, and it can also be regarded as the groundwork on which regional and sub-regional organizations have drafted various instruments of space law.

On the other hand, space law development has gone, over the past years, through a series of stages that have, as was pointed outer earlier,

been influenced very clearly by geopolitical developments such as the course of the Cold War or the North-South conflict.

Another aspect of the changing environment is certainly the advent of new players in the field. States mainly through their space agencies are still the primary and the predominant actors in outer space. This is true above all for financial reasons. In addition, there are a number of intergovernmental organizations involved in satellite operations. As these organizations are run and controlled by their member states, they are also bound by international space law. But other new players are also starting to emerge. Various commercial industries have started to pick up activities in some limited areas, such as space transportation, satellite communications or remote sensing, which at an earlier stage were under state control. The Sea launch consortium may serve as one example. Private sector initiatives in the small launchers segment are serious competitors to state financed launchers. This development involves a number of questions concerning not only the possibility of accession of international organizations to the existing body of space law but also concerning issues of responsibility and liability for private operators.

The question remains why the changed environment has not resulted in a renewed blossoming of space law treaties and a new push to regulate men's conquest of outer space. The last part of this paper will therefore be devoted to discussing possible reasons why even in a new world environment, development of space law remains sluggish and slow and early enthusiasm to write or at least codify space rules seems to have completely evaporated.

And indeed there is a clear break between the first decades of space law that saw, after the entry into force of the historic Outer Space Treaty, the drafting and adoption of a few more classical legal instruments, such as the 1968 Agreement on the Rescue of Astronauts, the 1972 Convention on International Liability for Damage Caused by Space Objects, the 1976 Convention on Registration of Objects Launched into Outer Space, and the Moon Treaty, which entered into force in 1984, when Austria became the fifth country to ratify it.

Following the Moon Treaty the Committee reverted to the adoption of several sets of principles, the first of which was the "Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting" of December 1982, the last one being the 1996 principles on "Space Benefits" of which mention was made earlier. A very important set of principles also concerns remote sensing of the earth by satellites as well as the use of nuclear power sources in outer space.

While the importance of the adoption of these principles cannot be denied and while they reflect - perhaps with the exception of the principles on direct broadcasting which were the only ones adopted by

majority vote - a welcome spirit of compromise and understanding they still constitute a significant departure from previous law making efforts.

As mere principles their legal effect is certainly smaller than that of the previous conventions and while they could be important building blocks of later, more mature space law, they certainly reflect a growing resistance of some of the major players in space politics to create too stringent a body of space law. This apparent unwillingness to adopt new space regulations and complete the existing body of space law has become visible once again as first efforts to find legal solutions to the problem of space debris have failed.

One reason for this development is certainly a general public mood that first surfaced in the developed world and then became more and more global to liberalize and deregulate national markets and consequently international economic relations. Such an atmosphere was certainly not conducive to the acceptance of new regulations in space, which at the same time saw the massive entry of particularly aggressive private sector players, motivated by the expectation of rapid growth and major economic opportunity. These new players therefore resisted, as elsewhere, the introduction of a legal framework that they considered to be an artificial barrier to their activities.

Next to economic considerations, national interest also must have played its part: national space agencies, not least those operating in some of the most technologically advanced countries, apparently saw little merit in accepting new legal obligations of an international character and preferred to cast their international relations in bilateral form. While certainly accepting a responsibility to support efforts of developing countries to become users of space technology, most developed countries obviously came to prefer the bilateral approach in their assistance programmes.

At the same time however, technological progress as well as new and multiple uses of Outer Space continue, creating new problems and challenges for which legal solutions are just as important as technical ones. And while it remains debatable to what extent economic globalization can safely and successfully continue without some degree of regulation, the global nature of space cooperation certainly requires universally accepted rules to stay on course so as to avoid lawlessness and conflict in Outer Space.

These developments will certainly renew, at some stage in the future, the traditional role of the United Nations and its Outer Space Committee as indispensable instruments and fora for the further development of space law. Their universal nature is also the best guarantee that interests and concerns of all nations can be met and compromise be

reached when philosophies, policies and strategies concerning the exploration and use of Outer Space continue to be opposed.

USING EXTRATERRESTRIAL RESOURCES UNDER THE MOON AGREEMENT OF 1979

Stephen E. Doyle*

Abstract: Capabilities of space launchers, space hardware and automation inexorably progress. Opportunities for use and exploitation of extraterrestrial resources approach practicality and affordability. Individuals and organizations interested in extraterrestrial resource use and exploitation have raised questions repeatedly about the legal status of resources beyond the Earth and the consequences of contemplated international controls. This article explores the relevant existing law, notes the vacuum of existing policies in the United States and in other space faring nations, notes relevant emerging organizational activity, and proposes possible avenues of approach. The unsuccessful attempt to address some extraterrestrial resource control questions through the 1979 Moon Agreement, must eventually be addressed squarely as a problem demanding solution. The near-term solution proposed in this article requires some courage and common sense, but does not propose entanglement in lengthy, inconclusive international negotiations. Progress depends upon innovative thinking and action, not on convoluted compromises of committees and councils. In this area, as in many other historically observable areas, law should follow, not precede the facts. Existing international law does not prohibit the use of space resources.

What Law is Applicable Today?

Considering the law of outer space as it applies to resources in outer space, we begin with the first major resolution of the United Nations (UN) General Assembly (GA) to deal with the status of resources in outer space, adopted 20 December 1961 in Resolution 1721 (XVI), the initial part of which (Paragraph A) reads:

> The General Assembly,
>
> Recognizing the common interest of mankind in furthering the peaceful uses of outer space and the urgent need to strengthen international cooperation in this important field,
>
> Believing that the exploration and use of outer space should only be for the betterment of mankind and to the benefit of States irrespective of the stage of their economic or scientific development,
>
> 1. Commends to States for their guidance in the exploration and use of outer space the following principles:
>
> (a) International law, including the Charter of the United Nations, applies to outer space and celestial bodies;

* Director, International Institute of Space Law (IISL).

(b) Outer space and celestial bodies are free for exploration and use by all States in conformity with international law and are not subject to national appropriation;

2. Invites the Committee on the Peaceful Uses of Outer Space to study and report on the legal problems which may arise from the exploration and use of outer space.

In the four subsequent paragraphs of this Resolution (B through E) there are no matters dealing directly with the status or use of extraterrestrial resources. The next significant UN action is contained in the *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space,* adopted on 13 December 1963 in Resolution 1962 (XVIII), which states in its preambular provisions:

- the common interest of mankind in the progress of the exploration and use of outer space for peaceful purposes;
- the belief that the exploration and use of outer space should be carried on for the betterment of mankind and for the benefit of States;
- a desire to contribute to international cooperation in the scientific as well as in the legal aspects of the exploration and use of outer space;

and then the instrument proceeds with solemn declarations that, in the exploration and use of outer space, States should be guided by principles, including the following:

- The exploration and use of outer space should be carried on for the benefit and in the interests of all mankind.
- Outer space and celestial bodies are free for exploration and use by all States on a basis of equality and in accordance with international law.
- Outer space and celestial bodies are not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.
- In the exploration and use of outer space, States shall be guided by the principles of cooperation and mutual assistance and shall conduct all their activities in outer space with due regard for the interests of other States.
- Whenever activities of one State cause harmful interference, or may be expected to cause harmful interference with the activities of another State in the exploration and use of outer space, consultation may be requested and should be conducted between or among the States involved concerning the activity(ies) in question.

Two important points emerge from a cursory study of these provisions: (1) the use of outer space by States, or by entities within States, is repeatedly declared as anticipated and allowed; and (2) there are no provisions denying the use of outer space. The only restrictions

declared have to do with the avoidance of harmful interference with activities in or uses of outer space by other States. In such a case, it is contemplated and urged that States involved would engage in consultations. These declarations are the most broadly accepted provisions of modern space law.[1] The 1963 Declaration of Principles laid a solid foundation in 1963 for the fundamental provisions of the later Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.[2]

The 1967 Outer Space Treaty (OST)

This treaty was formulated within the UN Committee on the Peaceful Uses of Outer Space (COPUOS) and was adopted by the General Assembly (GA) of the UN and proffered to States for their signatures. In 1998 the OST had more than 100 signatures and more than 90 ratifications. All space faring States *(i.e.,* States capable of independently originating spaceflight) are ratified signatories to this treaty. Its provisions echo or amplify all the principles contained in the 1963 Declaration. As examples, the 1967 OST states in its Preamble that States Parties to the Treaty:

- Recognizing the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes,

- Believing that the exploration and use of outer space should be carried on for the benefit of all peoples,

- Desiring to contribute to broad international cooperation in the scientific as well as the legal aspects of the exploration and use of outer space for peaceful purposes, and

- Recalling resolution 1962 (XVIII), which was adopted unanimously by the UNGA on 13 December 1963, and other former UN actions, agreed to a treaty which contains, among others, the following provisions.

Article I, paragraph 1: "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[s] of economic or scientific development, and shall be the province of all mankind." The second paragraph provides that "Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies." The third paragraph reads "There shall be freedom of scientific investigation in outer space, including the moon and

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[1] Having been unanimously adopted by the UNGA on 13 December 1963 in Resolution 1962 (XVIII).

[2] 18 UST 2410; TIAS 6347; 610 UNTS 205. Frequently referred to as the 1967 Outer Space Treaty, it was adopted by the UNGA on 19 December 1966 [Resolution 222 (XXI)], it was opened for signature on 27 January 1967 in London, Moscow and Washington. It entered into force 10 October 1967.

other celestial bodies, and States shall facilitate and encourage international cooperation in such investigation."

Article I does not say that any State may not use celestial bodies; conversely, it says that all States may. Access to and use of celestial bodies shall be free and equal. This is not to say that in order for State A to use a celestial body, it must provide for equal opportunity and means for such use by all other States; or that, in using a celestial body, State A must share all benefits of its use with all other States. Such extensions of meaning are illogical, unfounded and fly in the face of right reason and equity.

Article II provides that "Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means." The fact that the use of a celestial body may not justify a declaration of national sovereignty over that body is not the same as saying "because one cannot declare sovereignty one cannot use." The OST says the opposite.

Every State is allowed to use the high seas, and no State is permitted to declare national sovereignty over the high seas. Similarly, every State has a right to use celestial bodies, but may not declare sovereignty over them. The inability to declare sovereignty is no constraint upon use.

Article III provides that "States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding." This is an unambiguous declaration of the applicability of international law, including the provisions of the Charter of the United Nations, to all that is done in outer space, including on the moon and other celestial bodies. It is also a clear exhortation to States to use outer space for peaceful purposes and, wherever practical and possible, to seek to promote international cooperation and understanding.

The promotion of cooperation and understanding with regard to commercial uses of outer space has been spectacularly successful in the application of satellite based communications, satellite navigation systems, and satellite remote sensing that now cover the world. International cooperative ventures of global and regional scope have emerged to establish means of using satellites in space applications through cooperation. There is no reason why cooperation could not be accomplished in the use of celestial bodies for activities such as propellant production, scientific exploration, establishment of settlements, or other ventures. There are no provisions of the 1967 OST, nor are there provisions in any other generally subscribed treaty relating to outer space that preclude uses of resources in outer space, including on the moon and other celestial bodies.

In Article IV, we find an explicit prohibition against placing in orbit around the Earth any object carrying nuclear weapons or any other weapons of mass destruction. Nor may such weapons be stationed in outer space in any manner, nor installed on celestial bodies. Article 4 declares

"The moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes." Article IV further declares that "The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvers on celestial bodies shall be forbidden." But, the Article also provides that: "The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the moon and other celestial bodies shall also not be prohibited." Thus the military use of outer space, including the moon and other celestial bodies, is explicitly constrained, but the uses of military personnel and equipment engaged in peaceful uses or scientific exploration are not prohibited. Again we find that the use of outer space, including the moon and other celestial bodies, is encouraged and facilitated for all peaceful purposes.

Article V, fully anticipating that different States Parties to the Treaty may be making simultaneous uses of outer space, including the moon and other celestial bodies, provides that "In carrying on activities in outer space and on celestial bodies, the astronauts of one State Party shall render all possible assistance to the astronauts of other States Parties."

Article VI clearly establishes a rule of State responsibility for the actions in outer space of the government or citizens of a State. "States Parties to the Treaty shall bear international responsibility for national activities in outer space [such as uses of outer space], including the moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and [States are responsible] for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty." Similarly, "When activities are carried on in outer space, including the moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization." Article XIII of the 1967 OST also contains provisions relating to the responsibilities of international organizations.

Article VII establishes general rules relating to liability for injury to third parties resulting from the conduct of spaceflight activities. This article is the basis for an elaborated international convention to deal with the liability issues related to damages caused by spaceflight activities. See the 1972 *Convention on International Liability for Damages Caused by Space Objects* (the 1972 Liability Convention).[3]

Article VIII clarifies and elaborates aspects of the ownership of objects launched into outer space and their status in outer space, and establishes an obligation for States Parties to the Treaty who may discover a returned object on their territory to return such object to the State of

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[3] 24 UST 2389; TIAS 7762; 961 UNTS 187. This convention was negotiated through the UNCOPUOS and was adopted by the UNGA in Resolution 2777 (XXVI) on 29 November 1971. Opened for signature on 29 March 1972 in London, Moscow and Washington; it entered into force on 1 September 1972.

origin. An elaborated agreement was established subsequently to provide for return of astronauts and space objects that return to Earth. See the 1968 *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched Into Outer Space* (1968 Rescue Agreement).[4]

In Article IX we have an elaboration of the duty of care and State responsibility for activities conducted in space, as well as a duty to communicate matters of potential harm. Article X provides for a right of reciprocal visits between sites of launch operations, subject to prior agreement between the States involved. Article XI establishes a duty to report on activities undertaken in outer space. Article XII, like Article X, provides a reciprocal right of visitation between space installations, subject to prior coordination between the States involved. Article XIII explicitly provides that the OST applies to activities of States Parties in outer space, whether they are undertaken singly or through international organizations. Articles XIV through XVII contain the housekeeping provisions relating to signature, ratification, depository, entry into force, amendment and other procedural aspects of the treaty.

In its total impression, the 1967 OST is an enabling treaty that formally establishes and declares a body of relevant law that applies to the exploration and the use of outer space, including the moon and other celestial bodies. With the exception of prohibitions related to defined military uses of outer space, the treaty is promotional and enabling, it is not restrictive. It even encourages visits between installations in space, subject to prior agreement between the parties involved (see Article 12).

It is similarly clear that the ancillary treaties that followed the 1967 OST, namely the 1968 Rescue and Return Agreement, the 1972 Liability Convention, and the 1975 Registration Convention[5] dealt with the prospects of exploration and use of outer space, and all their provisions are consistent with an expectation of such exploration and use.

The 1979 Moon Agreement

In contrast to the foregoing discussion and provisions of the aforementioned treaties and agreements, the 1979 Moon Agreement[6] is fundamentally different in nature. Because it is regarded by critics as

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[4] 19 UST 7570; TIAS 6599; 672 UNTS 119. This agreement was negotiated through the UNCOPUOS and was adopted by the UNGA in Resolution 2345 (XXII) on 19 December 1967. The agreement was opened for signature on 22 April 1968 in London, Moscow and Washington, and entered into force on 3 December 1968.

[5] *Convention on Registration of Objects Launched into Outer Space* (Registration Convention) 28 UST 695; TIAS 8480; 1023 UNTS 15. The convention was negotiated through the UNCOPUOS and was adopted by the UNGA on 12 November 1974 in Resolution 3235 (XXIX). The convention was opened for signature in New York on 14 January 1975 and entered into force on 15 September 1976.

[6] *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies* (Moon Agreement) 18 INT'L LEGAL MAT'LS. 1434; 1363 UNTS 3. This treaty was negotiated through the UNCOPUOS and was adopted by the UNGA on 5

restrictive, the agreement has languished for want of signatures and ratifications. It is the least accepted agreement of the treaties negotiated through the UNCOPUOS. The 1979 Moon Agreement has fewer than twenty signatories and fewer than 10 ratifications. Major space faring nations, with the exception of France, are not signatories and are not likely to become signatories. The crux of the problem with the Moon Agreement is embodied in its Article 11. We examine Article 11 in some detail below, but let us first consider the earlier elements of the treaty. The agreement is flawed, not only in its concept and design, but also in that it proposes to establish new international law inconsistent with existing and widely accepted principles of law.

In its Preamble, the 1979 Moon Agreement provides that the Parties Signatory:

"- Noting the achievements of States in the exploration and use of the moon and other celestial bodies, [there having been by this time successful landings of men on the moon and return of material specimens to Earth from manned and automated flights to the moon;]

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

"- Determined to promote on the basis of equality the further development of cooperation among States in the exploration and use of the moon and other celestial bodies, [noting again that "use" is explicitly contemplated]

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

"- Bearing in mind the benefits which may be derived from the exploitation of the natural resources of the moon and other celestial bodies," [now explicitly extending the notion of "use" to embrace "exploitation"]

"- [then] recalling the 1967 Outer Space Treaty, the 1968 Rescue and Return Agreement, the 1972 Liability Convention, and the 1975 Registration Convention, and

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

"Have agreed on the following:"

The Preamble clearly indicates the drafters' intention to define and develop the previously agreed space treaties in relation to the moon and other celestial bodies. It is the case that substantial portions of the Moon Agreement restate many of the provisions of earlier agreements with little or no definition or amplification. In the following excerpts we con-

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December 1979 in Resolution 34/68. The Moon Agreement was opened for signature on 18 December 1979 in New York and entered into force on 11 July 1984.

centrate on those provisions of the Moon Agreement that contain new materials, agreements or definitions, not already found in the former agreements. We do not quote or dwell on obvious declarations and repetitive provisions. In two material elements, the 1979 Moon Agreement proposes to change existing, well established principles of international law.

Article 1 provides definitionally that the Moon Agreement applies to the celestial bodies within the solar system, other than the Earth, except in so far as specific legal norms enter into force with respect to any of these [solar system] celestial bodies. This is a declaration limiting applicability of the agreement to the bodies of the solar system, other than the Earth. For purposes of this Agreement, reference to the moon includes orbits around or other trajectories to or around the moon. Also, the Moon Agreement declares that it does not apply to extraterrestrial materials which reach the surface of the Earth naturally.

Article 2, in its entirety, is one of the provisions which might well have been excluded as totally redundant and superfluous. Article 2 neither adds nor states anything new.

Article 3 is totally redundant in the first paragraph. The second paragraph is a restatement of the provisions of the UN Charter concerning the threat or use of force, which was already applicable to the moon and other celestial bodies by virtue of Article III of the 1967 OST. The third and fourth paragraphs are an unnecessary restatement of the consequences of Article IV of the 1967 OST. Thus, Article 3 of the Moon Agreement neither adds nor states anything new.

Article 4, paragraph 1, reads: "1. The exploration and use of the moon shall be the province of all mankind and shall be carried out for the benefit and in the interests of all countries, irrespective of their degree[s] of economic or scientific development. Due regard shall be paid to the interests of present and future generations as well as to the need to promote higher standards of living and conditions of economic and social progress and development in accordance with the Charter of the United Nations." This paragraph is, in part, a restatement of the 1963 Declaration of Principles and the first paragraph of Article I of the 1967 OST, and, in part [the second sentence] so general and vague as to be irrelevant. This is a provision reflecting the interests of States that believe they are not sufficiently represented among the space faring nations of the world, fearing that they may be left out or ignored in the process of possible future exploitation of lunar resources.

A far more reliable guarantee of participation by such countries would be obtained by their development of national competence in selected or specialized space technology areas, such as we see being done in India, Brazil and selected other developing countries, and the involvement of their citizens or institutions in international cooperative ventures to visit and use the resources of the moon and other celestial bodies.

The models of global participation in and use of satellite communication, navigation, remote sensing and meteorological services come to mind. States cannot enjoy the benefits of satellite communications

or other space application services unless they equip themselves with resources to do so. The same observation can be made about use and exploitation of lunar resources. States interested in participating should equip themselves with the resources to do so.

Article 4, paragraph 2, reads: "2. States Parties shall be guided by the principle of cooperation and mutual assistance in all their activities concerning the exploration and use of the moon. International cooperation in pursuance of this Agreement should be as wide as possible and may take place on a multilateral basis, on a bilateral basis or through international intergovernmental organizations." A statement of the obvious. This paragraph of Article 4 is a similarly ineffective attempt to "protect" States' perceived rights, which would be better accomplished through direct, sustained and equitable participation in the actual missions to be undertaken. When and how shall the peoples of the world know that the "international cooperation pursuant to this Agreement ...[is] as wide as possible..."? Who shall make such a determination?

Article 5 is an attempt to require any State undertaking a moon mission of any kind to fully disclose every operational aspect and every significant discovery or result of such a mission. Updates on information "shall be given periodically" at prescribed intervals. This is a new and unprecedented requirement of "full disclosure." The notification provisions of Article 5, paragraph 2, are totally redundant to good sense and protection of self-interest. Article 5, paragraphs 1, 2 and 3, are elaborations of detail of the obligations already imposed by provisions of Article IX of the 1967 OST. While they extend the detail of implications, these paragraphs create no new obligations.

Article 6, paragraph 1, is fully redundant to provisions of the 1967 treaty: "1. There shall be freedom of scientific investigation on the moon by all States Parties without discrimination of any kind, on the basis of equality and in accordance with international law." One is tempted to ask, "Is discrimination against non-signatory States allowed?" Paragraph 2 provides that "In carrying out scientific investigations and in furtherance of the provisions of this Agreement, the States Parties shall have the right to collect on and remove from the moon samples of its mineral and other substances." This had already been done during the 1970's by the United States and the then USSR.

The second paragraph continues "Such samples shall remain at the disposal of those States Parties which caused them to be collected and may be used by them for scientific purposes. States Parties shall have regard to the desirability of making a portion of such samples available to other interested States Parties and the international scientific community for scientific investigation. *States Parties may in the course of scientific investigations also use minerals and other substances of the moon in quantities appropriate for the support of their missions.*" (Italics added.) Thus, there is explicit authority in the 1979 Moon Agreement to "use mineral and other substances of the moon in quantities appropriate for the support of ... missions." The extent of the use of materials "in support of a

mission" is then determinable by the mission definition or mission profile, defining its purposes and objectives.

Paragraph 3 of Article 6 of the Moon Agreement provides that "States Parties agree on the desirability of exchanging scientific and other personnel on expeditions to or installations on the moon to the greatest extent feasible and practicable." Again, it is obviously contemplated that there will be missions to the moon and installations established there, with personnel who should be exchanged between installations and missions "to the greatest extent feasible and practicable."

Article 7 is devoted to the preservation of the environment on the moon. States Parties "shall take measures to prevent the disruption of the existing balance of the environment" and they shall "avoid harmfully affecting the environment of the [E]arth through the introduction of extraterrestrial matter or otherwise." Paragraph 2 requires prior notice to the UN Secretary-General of any intention to introduce nuclear materials on the moon. In paragraph 3, the Agreement requires notice to the UN Secretary-General of the need for any special scientific preserves for which protective arrangements should be agreed.

Article 8 permits landing on and launching space objects from the surface of the moon; placement of personnel, space vehicles, equipment, facilities, stations, and installations anywhere on or below the surface of the moon; and all these people and materials may move or be moved freely over or below the surface of the moon, subject to the avoidance of any harmful interference with personnel or property of another State Party present on the moon. If such harmful interference is possible, there is a duty to consult between or among the involved or interested States. The agreement is silent with regard to States relations with settlements that are independent of States Parties and thus have an existence outside the agreements among States Parties.[7]

Article 9 permits the establishment of manned or unmanned stations on the moon. The establishing State(s) "shall only use that area which is required for the needs of the station and shall immediately inform the Secretary-General of the United Nations of the location and purposes of that station", as well as providing an annual update on the use and purposes of the station.

Article 10 of the Moon Agreement says that Article V of the 1967 OST shall apply to persons on the moon and that the 1975 Rescue and Return Agreement shall be relevant. Article V of the 1967 treaty, as well as the 1975 Agreement, would apply to persons on the moon regardless of the content of Article 10. This is another article fully redundant to prior agreements. So much of what is in the Moon Agreement is repetitive of what is in the earlier, much more broadly subscribed agreements. It is clear that the main problem that creates the general unacceptability of the Moon Agreement lies in Article 11.

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[7] See discussion of "autonomy" in Sterns, Stine and Tennen, source at note 8, at 59-60.

In Article 11, paragraph 1, reads: "1. The moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement, in particular in paragraph 5 of this article." Gobbledygook! The declaration that "the moon and its natural resources are the common heritage of mankind," is a phrase burdened with a history of inconsistent interpretations about the meaning of the term "common heritage of mankind," and what that term connotes with regard to the exploitation or use of lunar resources.

Article 11, paragraph 2, reads: "2. The moon is not subject to national appropriation by any claim of sovereignty, by means or use or occupation, or by any other means." This is a painfully obvious restatement of the content of Article II of the 1967 OST and, like many other parts of the Moon Agreement, is a paragraph that is totally redundant and unnecessary.

Article 11, paragraph 3, reads:

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

This provision appears to declare a moratorium on extending property rights to materials "in place" on the moon, pending the establishment of a regime of resource management by means described in paragraph 5 of Article 11. The intention was to withhold property rights over materials in place on the moon, but not to constrain use of lunar materials.[8] While materials are "in place," they are *res communes*, the property of everyone. Once material is reduced to use, this point is moot. To argue that there is a moratorium contained in the Moon Agreement on

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[8] See the diverse discussions of the legal nature and history of this matter in Fasan, E. *Dominium Lunae, Proprietas Lunae;* Cocca A. A., *Property Rights on the Moon and Other Celestial Bodies;* Almond, H. H., *The Legal Status of Property on the Moon and Other Celestial Bodies;* Mani, V. S., *The Common Heritage of Mankind: Implications for the Legal Status of Property Rights on the Moon and Other Celestial Bodies;* van Traa-Engelman, H. L., *Clearness Regarding Property Rights on the Moon and Other Celestial Bodies*; Gál, G., *Acquisition of Property in the Legal Regime of Celestial Bodies;* and Sterns, P. M., G. H. Stine, and L. I. Tennen, *Preliminary Jurisdictional Observations Concerning Property Rights on the Moon and Other Celestial Bodies in the Commercial Space Age,* 39 PROC. COLLOQ. L. OUTER SPACE 1-60 (1997).

use of lunar material, one must ignore the explicit provisions of Article 6, paragraph 2, which states that: "States parties may... use mineral and other substances of the moon in quantities appropriate for the support of their missions."

Consider the air you breathe. You do not own the air. It is *res communes*. But you breathe it. When you breathe it, you extract oxygen and add carbon dioxide and then exhale it. Once exhaled, the air is again *res communes*, until inspired again. You don't own the air, but you certainly make extensive use of it. The same may be said of sunlight. No one owns the sunlight, but many people use it. Some use it to produce energy for power applications, both in space and on the Earth. Farmers use sunlight to grow crops. Some use the sun to heat water, or their homes, but no one owns sunlight. What are the consequences to the users of not being allowed to own the sunlight? The consequences are of no effect. One could argue that the provisions of Article 11, paragraph 3, of the Moon Agreement have about the same force, which is to say, no force at all, with regard to use of lunar materials.

Paragraph 4 of Article 11 reads: "States Parties have the right to exploration and use of the moon without discrimination of any kind, on the basis of equality and in accordance with international law and the terms of this Agreement." The most constructive aspect of this largely redundant provision is that it makes clear that Article 11 of the Moon Agreement was not at the time of its drafting, and is not now a part of international law, except as to relationships between the Parties to the Agreement. This rewrite of the second paragraph of Article I of the 1967 OST does not create any new international law.

Paragraph 5 of Article 11 reads: "States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible. This provision shall be implemented in accordance with Article 18 of this Agreement."

Thus the States Parties to the Agreement have declared an undertaking, but as to States non-Parties to the Agreement, there is no such undertaking nor are they bound by what the States Parties choose to do, especially in the case where the States Parties comprise fewer than ten percent of the world's nations.

Among the most offensive and inconsistent provisions of the Moon Agreement are those embodied in the seventh paragraph of Article 11, which reads:

> The main purposes of the international regime to be established shall include:
> (a) The orderly and safe development of the natural resources of the moon;
> (b) The rational management of those resources;
> (c) The expansion of opportunities in the use of those resources;
> [and]

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

Paragraphs 11 (a) through 11 (c) are unobjectionable statements based in common sense. Paragraph 11 (d) however, contradicts paragraph 11 (b) and contradicts Article 4, paragraph 1 of the Moon Agreement, Article I, paragraph 1, of the 1967 OST, and provisions of early UN Resolutions on principles adopted by the UNGA.

Why and how are the interests and needs of developing countries to be given special consideration with regard to the sharing of benefits derived from the use or exploitation of lunar resources? The language of Article 11, paragraph 7 (d) is in direct contradiction of the language of Article I, paragraph 1, of the 1967 OST and of Article 4, paragraph 1, of the Moon Agreement. Either we should carry out activities in outer space, including the moon and other celestial bodies, "in the interests of all countries irrespective of their degree[s] of economic and scientific development," or we will share the benefits derived from lunar resources giving special consideration to "the interests and needs of the developing countries" and those which have contributed to the effort. We can do one or the other, but we cannot do both at the same time. Because Article 11, paragraph 7 (d) is only a hortatory declaration of future intent, it must fail, to the extent it conflicts with the language of earlier UN Resolutions, the language of the 1967 OST, and the language of Article 4 of the Moon Agreement. Paragraph 7 (d) is just bad policy, whether current or future, inconsistent with established law, and ought to be ignored rather than implemented.

Article 11 concludes with paragraph 8, which reads: "All the activities with respect to the natural resources of the moon shall be carried out in a manner compatible with the purposes specified in paragraph 7 of this article and the provisions of article 6, paragraph 2, of this Agreement." Compliance with paragraph 7 (d) would be action in violation of broadly accepted, well established international law.

Article 12, paragraph 1, is a redundant restatement of provisions contained in Article VIII of the 1967 OST. Article 12 Paragraph 2, is an unnecessary declaration that the 1975 Agreement on Rescue and Return of astronauts and space objects applies on the moon. Article 12, paragraph 3 states that "In the event of an emergency involving a threat to human life, States Parties may use the equipment, vehicles, installations, facilities or supplies of other States Parties on the moon. Prompt notification of such use shall be made to the Secretary-General of the United Nations or the State Party concerned." This provision, being devoid of constraints of reasonableness and prior notice, has potential for possibly life-threatening interference, with potential counter productive expansion of the emergency to involve others. The provision has many implications which appear not to have been thought through very well. By eliminating

the requirement of prior notice, as required by Article XII of the 1967 OST for reasons stated there, this provision in Article 12, paragraph 3, of the Moon Agreement is a potentially dangerous and an undesirable provision that ought not to survive any international review of the Moon Agreement. As it stands, Article 12, paragraph 3 of the 1979 Moon Agreement, invalidates the notice requirements of Article XII of the 1967 OST.

Article 13 would appear to be another logical extension of the obligations of Article VIII of the 1967 OST.

Article 14, paragraph 1, is a wholly redundant restatement of provisions found in Article VI of the 1967 OST. The second paragraph of Article 14 is another masterful restatement of the obvious.

Article 15 is a provision establishing a right on the part of any State Party to the Agreement to visit the space vehicles, equipment, facilities, stations, and installations of any other State Party on the moon. It is a sort of "general warrant" that permits anyone who gets to the Moon to gain access to whatever it is that anyone else on the Moon is doing there. This provision creates a people's police force by permitting unlimited inspection after the giving of reasonable notice of a planned visit. The bulk of this longest article in the agreement concerns itself with methods and procedures for the resolution of differences and disputes that may arise between or among States Parties to the Agreement. It is an Article calculated to give rise to many disagreements and disputes.

Article 16 extends general application of the terms of the Agreement to the activities of consenting international intergovernmental organizations, if a majority of the members of the organizations are also signatories to the Moon Agreement and the 1967 OST.

Articles 17 through 21 deal with the procedural aspects of the Agreement. Provisions in Article 18 provide for a review of the Agreement after 10 years,[9] which took place and resulted in no change. Article 18 also permits the UN Secretary-General to convene a review conference at the request of one third of the States Parties to the Agreement, with the concurrence of a majority of the States Parties. No such conference has been requested or convened.

Other Applicable Law

Beyond the treaties formulated in the UNCOPUOS relating to activities of States in the exploration and use of outer space, there is no presently identifiable law relating to the use or exploitation of resources on the moon, or for that matter, on any other celestial body, including asteroids.

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[9] According to E. Fasan, on 9 December 1994 the UNGA decided not to take action regarding revision of the Moon Agreement, although the ten year period since its entry into force had elapsed. Fasan, E., *Dominium Lunae, Proprietas Lunae*, 39 PROC. COLLOQ. L. OUTER SPACE 1 (1997). *See* UNGA Resolution 49/34 dated 9 December 1994.

Although there have been several national bodies of space law established, none of them to date has dealt explicitly with the legal status of or regulations relating to resources in outer space. There is no identifiable, relevant law or policy in the United States today, beyond the generally applicable provisions of the 1967 OST. At this writing the author is unaware of any national law relating to the status, use or exploitation of extraterrestrial resources.

Alternative Approaches Emerging

There is a program being developed by the recently formed United Societies in Space, Inc., in Denver, Colorado.[10] This group is formulating plans for a Lunar Economic Development Authority.[11] The proposed authority would be organized through international cooperation and operated as a licensing body to plan, coordinate, facilitate and encourage commercial exploitation of the resources of the Moon. The concept is not intended to apply only to the Moon, because other, wider ranging ventures may be undertaken in the future. At this time, however, the organizers believe that the Moon is the most likely early site of the actual use of extraterrestrial resources. The initial focus is on creating a Lunar Economic Development Authority. When technology and economics permit a wider range of activities off the Earth, the concept would be flexible enough to accommodate broadening the scope of activities or creating an alternative entity to oversee activities other than those related to the Moon.

Aldo Armando Cocca argues that a new international agency is the best potential means for accomplishing the harmonization of the interests of mankind as a whole with the interests of States or entities arriving on and seeking to exploit the resources of the Moon.[12] Harry Almond argues that substantial studies, analyses and discussions are required to understand what it is in outer space that is intended to be regulated and how it is intended to regulate or control activities. His analysis is influenced by perceptions of power and use of power to establish and protect rights in property. Almond believes that there is a great deal of ambiguity and uncertainty related to the expectations of States with regard to activities, including exploitation of resources, in outer space. He offers a list of proposed courses of action to reduce the ambiguities and uncertainties.[13]

V. S. Mani suggests that there is a need for an International Space Resource Management Authority with close linkage to the United Nations,

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[10] For information, contact Mr. Declan O'Donnell, United Societies for Space, Inc., 3300 East Fourteenth Avenue, Denver, CO 80206 USA.

[11] O'Donnell, D. J., *Benefit Sharing: The Municipal Model,* 39 PROC. COLLOQ. L. OUTER SPACE 151-161 (1997).

[12] Cocca A. A., *Property Rights on the Moon and Other Celestial Bodies,* 39 PROC. COLLOQ. L. OUTER SPACE 9-19 (1997)

[13] Almond, H. H., *The Legal Status of Property on the Moon and Other Celestial Bodies,* 39 PROC. COLLOQ. L. OUTER SPACE 20-30 (1997).

associated with numerous other activities deemed necessary for proper progress to be achieved. Mani argues that the concept of the "common heritage of mankind" is governing in this matter and concludes a presentation of his highly biased views with this question:

"Will the Space Powers rise above their short term, narrow, Shylockian view of profits, and meet the challenge of the next millennium with magnanimity, compassion and camaraderie to the whole international community?"[14]

One may hope. One may hope that the Space Powers will go right on exploiting the world by promoting, creating and supporting things like: a United Nations Organization; global attacks on diseases like smallpox, poliomyelitis, cancer and other scourges; and dozens of peace-keeping teams deployed over the Earth. One may hope that they will continue providing technologies for real-time communication capability for every person on Earth; and global real-time and reliable navigation; global weather monitoring and services such as the Internet. When the critics of personal freedom and competition can view reality with objectivity, greater progress will be made. Discord, name-calling and unrestrained covetousness do not foster progress, they hamper it.

H.L. van Traa-Engelman approaches this entire subject area in a similarly unrealistic manner to that of Mani. Treating the Agreement on the Moon as if it represents the global community's accepted approach, and is thus the prevailing international law, will not result in the acceptance of the proposed approach. The major difficulty in the approach of van Traa-Engelman and others is analogous to trying to mix oil with water. Consider this suggestion:

"As soon as the international regime will be established in accordance with Art. 11 of the Moon Treaty, States Parties will have to make provisions to honour specific property rights on natural resources of the moon etc. acquired through national legislation, but to be accommodated within the constraints and requirements of such an international regime."[15]

This declaration ignores the apparent and declared intent of the proposed international regime, which was and is to negate individual property rights in the Moon's resources and to establish the rights of mankind in equality, equity and with special consideration to the interests and the needs of developing countries and those contributing to the exploration of the Moon. Gyula Gál clearly states the problem with this approach:

"Unfortunately mankind is not a subject of international law. It can not act as a legal person, can not launch a process, can not claim anything in its own name. ... Coming generations have not a single 'ombudsman'

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[14] Mani, V. S., *The Common Heritage of Mankind: Implications for the Legal Status of Property Rights on the Moon and Other Celestial Bodies*, 39 PROC. COLLOQ. L. OUTER SPACE 31, at 36 (1997).

[15] van Traa-Engelman, H. L., *Clearness Regarding Property Rights on the Moon and Other Celestial Bodies*, 39 PROC. COLLOQ. L. OUTER SPACE 43 (1997).

among us to represent their interests, which we cannot understand in many respects. For our subject [Acquisition of Property in the Legal Regime of Heavenly Bodies]: it would be science fiction to speak about property rights on heavenly bodies which some time in the future will be acquired by mankind itself."[16]

It may be that Mani's "overwhelming majority of the contemporary international community" desires such an outcome. It is difficult to see how the resources necessary to permit exploitation of lunar resources would ever be amassed, organized and brought to bear on the problem, if exploitation is to be under an international administration, on behalf of "mankind," the first premise of which is "there are no property rights."

Conclusion

The 1979 Moon Agreement is an imperfect, largely redundant, partisan instrument, attempted to be imposed upon the space faring States by others. The ultimate defense against such imposition is by States declining to become signatories. The 1979 Moon Agreement was badly conceived and poorly drafted. It is self defeating in content. It is internally inconsistent. Upon reflection, its lack of acceptability to States in general, and its unacceptability to space faring States in particular, should be no surprise to anyone. It has not been and will not be signed and ratified by a substantial number of States. It is, and will remain, of no relevance to the States non-Parties to the Agreement. Thus, it is unlikely ever to have any significance for the use or exploitation of lunar resources. Although some commentators refer to its provisions as if they were equivalent international law to that found in the more generally accepted space agreements formulated through the UNCOPUOS, the 1979 Moon Agreement has never attained such status and it will not in its present form.

In existing international law there are no constraints upon uses of resources beyond the Earth. Signatories to the 1979 Moon Agreement may be bound to intentions that are potentially violating of established international law, but the vast majority of States have declined to adopt that approach. An instructive tour of many existing and anticipatable features of international law related to use of extraterrestrial resources can be found in Sterns, Stine and Tennen's paper dealing with future management of property rights on the moon and other celestial bodies, presented in Beijing, China in October 1996.[17]

Waiting for clarification of international legal rules relating to use of resources beyond the Earth may be self-defeating. The prevailing legal

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[16] Gál, G., *Acquisition of Property in the Legal Regime of Celestial Bodies,* 39 PROC. COLLOQ. L. OUTER SPACE 48 (1997).

[17] P. M. Sterns, G. H. Stine, and L. I. Tennen, *Preliminary Jurisdictional Observations Concerning Property Rights on the Moon and Other Celestial Bodies in the Commercial Space Age,* 39 PROC. COLLOQ. L. OUTER SPACE 50-60 (1997).

regime is permissive and clearly influencable by future action. The longer one waits, the more likely it is that constraints will emerge. The sooner action is taken to demonstrate what can be used and how it can be used, the sooner the international community is likely to move forward to establish appropriate rules to regulate the use and exploitation of extraterrestrial resources.

ON THE MOON

Francis Lyall*

I. Introduction

The news that potentially exploitable water may have been found in the deeper sunless craters of the north and south poles of the Moon brings closer the possibility of a return to our nearest neighbour. We will undoubtedly return to the Moon, but this detection, if confirmed, means we may well go back sooner than many of us had thought.

Water is necessary for the sustenance of life as we know it. In addition water can be split into hydrogen (fuel) and oxygen (life and fuel). If we can supply the water requirements of astronauts and other space-farers without having to lift it from the bottom of earth's gravity well, the exploration of the Moon (and beyond) will be so much easier. The return to the Moon, therefore, becomes the obvious venture to be undertaken next after the Space Station. Indeed, the possibility emerges that some states may choose to proceed with Moon projects without waiting for the Space Station to be completed. The news therefore raises once more the question of a fuller legal regime to deal with the many problems which the exploration and exploitation of the Moon may produce.

The Moon is romantic. It has always fascinated mankind.[1] Hanging in our sky as the deep cream of the full Harvest Moon or the faint silver crescent with its intimations of fullness to come or imminent decline, it is not to be wondered that tale-smiths sought it out. Stories of various 'Voyages to the Moon' start in the Seventeenth Century.[2] In our own century science fiction has used the Moon magnificently.[3] Now we have to deal with the reality.

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* Professor of Public Law, Faculty of Law, University of Aberdeen, Scotland, U.K.

1 *Cf.* M. Lachs, *Some Reflections on the State of the Law of Outer Space* 9 J. SPACE L. 3-12, at 3 (1981).

2 M.H. NICOLSON, VOYAGES TO THE MOON, (New York: Macmillan, 1948, 1960): P.B. GOVE, THE IMAGINARY VOYAGE IN PROSE FICTION, (New York: Columbia U.P., 1941; London: The Holland Press, 1961); L.T. SARGENT, BRITISH AND AMERICAN UTOPIAN LITERATURE, 1516-1875 (Boston: G.K. Hall, 1979).

3 B.W. ALDISS WITH D. WINGROVE, TRILLION YEAR SPREE: THE HISTORY OF SCIENCE FICTION, (London: Gollancz, 1986); *cf.* B.W. ALDISS, BILLION YEAR SPREE: THE HISTORY OF SCIENCE FICTION (London: Weidenfeld and Nicolson, 1973; Corgi, 1975). J. GUNN, THE ROAD TO SCIENCE FICTION, vol.1, *From Gilgamesh to Wells*, (New York: New American Library, Mentor Books, 1977). *See also* in J. CLUTE AND P. NICHOLS (Eds.), THE ENCYCLOPEDIA OF SCIENCE FICTION (London and New York: Orbit, 1993): *Critical and Historical Works about SF* (pp. 277-81) and *History of SF* (pp. 567-72).

Of course, the legal like the literary field is neither unknown, nor unploughed. Previous decades, and particularly the controversy surrounding the Moon Agreement of 1979, produced a considerable volume of discussion.[4] But the potential of imminent return to the Moon, and of developments thereon even short of full-scale exploitation, require that once more lawyers turn to the legal problems which the Moon may produce, and to their potential solutions. Too often the law has lagged behind the entrepreneur and the scientist.

For this, the twenty-fifth anniversary volume of the leading journal devoted to Space Law, I select only certain elements as we once more consider the question of the Moon, but in doing so draw attention to the fact that this Journal, even in its early years, was usefully concerned with such matters.[5]

II. International Law

One has, of course, to start with the fact that the legal arena is not unoccupied. The full title of the 1967 Outer Space Treaty indicates that its substance consists of 'Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies.'[6] Fundamentally, Art. III of the Treaty articulates the proposition that International Law applies in Outer Space. But most would go beyond that as a statement of treaty-law and assert that the proposition that International Law applies in Outer Space has passed into customary international law. This is important. If true, it means that a state, not being a member of the 1967 Treaty, must also recognise the role of International Law in space exploration, and the content of International Law for this purpose is not restricted to the generalities of the Outer Space Treaty.

Some areas may still hover on the cusp between treaty and custom, and therefore may or may not be binding. Other areas would seem to have a surer basis as law. Of them, of fundamental importance for this article is the principle that the Moon is not subject to national appropriation by claim of sovereignty, by use, occupation or any other means (Art. II, Outer Space Treaty). Fortunately the currently space-competent states are bound by their ratification of the 1967 Treaty. But I would hope that, were such a state to make use of the provision of Art. XVI as to withdrawal from the Treaty, it would continue to consider itself, and be held by appropriate

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4 *See,* for example, Bin Cheng, *The Moon Treaty: Agreement Governing the Activities of States on the Moon and other Celestial Bodies within the Solar System other than the Earth* 33 CURRENT LEGAL PROBS. 213-37 (1980), reprinted in his STUDIES IN INTERNATIONAL SPACE LAW 356-380 (Oxford: Clarendon Press, 1997); C.Q. Christol, *The 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies,* ch.7 of his THE MODERN INTERNATIONAL LAW OF OUTER SPACE 246-341 (New York: Pergamon Press, 1982).

5 *Cf.* S. Gorove, *Property Rights in Outer Space: Focus on the Proposed Moon Treaty,* 2 J. SPACE L. 27-30 1(974).

6 610 UNTS 205;(1968) UKTS 10,Cmnd.3519; 18 UST 2410, TIAS 6347.

process, to be bound as a matter of customary law by the rule otherwise articulated in Art. II.

Another approach to that question would be to call in aid the 1963 Declaration of Legal Principles Governing the Activities of States in the Exploration and use of Outer Space (GA Res. 1962 (XVIII)). Although there is debate as to the precise weight to be given to a UN Resolution in general as well as in particular instances,[7] the various Space Resolutions followed by compliant practice come closest to full legal competence, arguably being formative of customary International Law, albeit that the usual chronology of the creation process is inverted.[8] On this view Principle 3 of the 1963 Declaration, which anticipates the terms of the 1967 Treaty in setting aside outer space and celestial bodies from national appropriation, would continue to bind a state withdrawing from the 1967 Treaty. Such reasoning would apply also to the rule that activities in space and on the Moon have to be licensed and supervised by states (Art. VI, Outer Space Treaty; Principle 5, 1963 Declaration).[9]

Other questions, however, clearly remain treaty-based. Thus, that the Moon shall be used for peaceful purposes only, and that military bases are forbidden (Art. IV, para 2 Outer Space Treaty) are not matters of customary law, for military activities are not yet generally unlawful, and this proposition does not repeat within the UN Resolutions.

III. The Moon Agreement or another solution?

Few states have bound themselves to the terms of the one treaty whose major focus is the Moon, the Moon Agreement of 1979.[10] Arguments for and against the Moon Agreement are fairly stated in a report of the

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7 B. Sloane, *General Assembly Resolutions Revisited (Forty Years Later)*, 58 BRIT.Y.B. INT'L L. 39-130 (1987); *cf.* M. Lachs, *The International Law of Outer Space* 3 R.C.A.D.I. 1-114, at 95-99 (1964); A.D. Terekhov, *UN General Assembly Resolutions and Outer Space Law*, 40 PROC. COLLOQ. L. OUTER SPACE 97-107 (1997)

8 I accept, of course, the Direct Broadcast Principles, 1982 G.A. Res. 37/92, as they were adopted by the vote of a majority which did not contain the major space-competent states.

9 There is room for further work on the duty and responsibilities of a state with regard to the activities of its nationals in this sphere: I think of the analogy of the legal status of privateers and of pirates. The one cannot be sanctioned; the other cannot be allowed to exist in space, *Moonraker* notwithstanding.

10 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, G.A. Res. 34/68, 18 INT'L LEGAL MAT'S. 1434 (1979). As at March 1998, the nine ratifying states were Australia, Austria, Chile, Mexico, Morocco, The Netherlands, Pakistan, The Philippines, and Uruguay. There are another five signatory states - France, Guatemala, India, Peru, Romania. As yet none in either category is independently space competent.

Congressional Research Service to a US Senate Committee in 1980.[11] The arguments there outlined would, of course, have different impacts in different countries, but it is useful to have them laid out in short compass.

The Moon Agreement was a well-intentioned effort to take the generalities of the 1967 Treaty further, and to spell out in more detail various matters with the Moon specifically in view.[12] It remains to be seen whether attempts will be made to resuscitate it, although at least one distinguished commentator considers this unlikely in the near future.[13] But whatever happens to the Moon Agreement, the fact is that it does identify several fundamentals. Its main problem is the 'common heritage' principle, with the implication of some 'Authority' as a hidden reef.

The 'Common Heritage' Principle

The 'common heritage' principle is, of course, a major reason why the Moon Agreement has not received more support. The statement that the Moon and its natural resources are the common heritage of mankind is baldly made in art. 11.1 of the Agreement. That paragraph goes on to say that the concept of 'common heritage' finds its expression in the rest of art. 11, and in particular in art. 11.5, which talks of an international regime and appropriate procedures.

The status and indeed content of the concept of 'common heritage' has been a matter of controversy.[14] But despite argument, the concept has come into use, and in particular has been sanctified by its application to The Area under the terms of art. 136 of the 1982 UN Convention on the Law

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11 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Committee on Commerce, Science, and Transportation, U.S. Senate, 96th Cong., 2d Sess., Part 4, at 463-7. The whole Committee Report is valuable. Parts 1 and 2 were published in May, Part 3 in August and Part 4 in November 1980.

12 See n. 5 above.

13 C.Q. Christol, *The Moon Treaty and the Allocation of Resources*, 22(2) ANNALS AIR & SPACE L. 31-47, at 46-7 (1997).

14 S. Gorove, *The Concept of the "Common Heritage of Mankind"*, Ch. 5 of his STUDIES IN SPACE LAW 65-78 (Leiden: Sijthoff, 1977); (*cf. The Concept of the "Common Heritage of Mankind": A Political, Moral or Legal Innovation?* 9 SAN DIEGO L. REV. 390 (1972). G. M. Danilenko, *The Concept of the "Common Heritage of Mankind" in International Law*, 13 ANNALS AIR & SPACE L. 247-63 (1988); H. S. Rana, *The "Common Heritage of Mankind" and the Final Frontier*, 26 RUTGERS L. J. 225 (1994).

of the Sea.[15] While it is true that the concept is not yet a general rule of International Law, in the Law of the Sea it has found a working role.

Be that as it may, it is coming to be accepted that, in any manifestation of it, the 'common heritage' concept has particular elements: that certain regions should not be subject to national appropriation in any way, that there will be a management system for such an area, that the managers, be they state or international organisation, will act as representative of mankind, that any benefits from such areas will be shared internationally, and that the area will be used for peaceful purposes only.[16] Correlatively, scientific research in the area is encouraged. Ideally this would apply to the Moon.

Although the idea of 'common heritage' first emerged in relation to Outer Space, its main development has been in the Law of the Sea. While it is true that there have been statements separating the notion as it is found in the Law of the Sea and in Space, as time goes on it is not likely that separation can usefully be maintained. In the meantime, however, the history of the concept in the Law of the Sea shows clearly the difficulties that some states have in accepting it. In brief, states which have the technology to undertake activities which may be hindered or restricted by a 'common heritage' regime, were reluctant to sign up to such a system. Indeed, the modification of Part XI of the 1982 Convention has yet to be proved to work satisfactorily, although that modification has been sufficient to induce the US and the UK to move towards ratification. The same pattern might prove to be true of the Moon Agreement. Space-competent states have been reluctant to sign, let alone ratify, the Moon Agreement because of art. 11. However, in time, things may change.

One element of debate is that the 'common heritage' idea conflates law and morality, and this is said to be unacceptable. Curiously the argument seems to be put most strongly by those anxious to defend limited commercial interests.

Morality and Law

To put the matter contentiously: the 'common heritage' principle can be attacked on the ground that it is an attempt by states unable themselves to exploit resources because of technical or other incompetence, to compel space competent states to invest time, trouble and finance in a project, and then divert to non-participants and non-investors some of the rewards of these entrepreneurial activities. On this view the 'have-not' nations are free-loading. There may be some force in this argument. Certainly it will be interesting to see whether in the Law of the Sea manifestation of the concept, the benefits of that 'common heritage' do in fact make their way

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15 The Law of the Sea Convention, Montego Bay, Jamaica, 1982, 21 INT'L LEGAL MAT'S 1261-1354 (1982); 1983 UKTS Misc. No. 11, Cmnd. 8941; G.A. Res. 48/263 amending Part XI of the Convention is printed at 33 INT'L LEGAL MAT'S 1309 (1994) and President Clinton's Letter to the US Senate of Transmittal of the Convention with recommendation of approval is at 34 INT'L LEGAL MAT'S 1393-447 (1995).

16 *Cf.* C.C. Joyner, *Legal Implications of the Concept of the Common Heritage of Mankind*, 35 INT'L & COMP. L. Q. 190-99 (1986); Christol, n. 13 above.

down to the welfare of the peoples of the less-developed world and does not simply augment the extra-territorially held coffers of their rulers.

But, although there is opportunity for abuse, that is not a sufficient reason to reject the concept of 'common heritage'. The separation of morality and law which often underlies the arguments of those who reject the concept, is pernicious. It is corrosive of the integrity of a legal system. Legal systems do not continue long to work when those whom they affect concentrate on the letter and ignore the spirit, when legal propositions are construed as mere formal requirements, when the law is seen as part of the game to be used to defend advantage and impede the efforts of the other side, or when men seek to adapt or amend agreements for their own selfish advantage. Unfortunately we have seen examples of this in Space Law, particularly within the deliberations of the International Telecommunication Union, but it is also evident in the debates of the international trade organisations.[17]

The fact is that Space Law does already contain statements as to the 'benefit' of mankind.[18] 'Common heritage' is another of these concepts, and it is grievous error simply to shoot it down in flames. Its core does represent a moral imperative, which should be preserved and fostered.[19] If it is not, it is not too much to say that barbarity beckons only a few decades hence. 'Have' and 'have-not' are too intertwined nowadays for the one to neglect the interests of the other. As Clausewitz pointed out, war is the continuation of policy by other means - and modern war need not be clinical if the combatants are desperate or irrationally inflamed.

Another Agreement?

Some form of general agreement on Moon matters is highly desirable. Ideally this should be agreement on a global scale, with a general acceptance similar to that of the Outer Space Treaty. An obvious model is the 1982 Law of the Sea Convention, which, in its Part XI, as amended, sets up the International Sea-Bed Authority to supervise and regulate developments in the Area beyond national jurisdiction, the 'common heritage of mankind' designated by art. 136 of the Convention.

Whether a new Moon Agreement should set up a 'lunar authority' to supervise, and perhaps to license and draw a revenue from exploitative activities is a neat question. Utopians would prefer the model of the International Sea-Bed Authority, together with the concept of 'common

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17 I hope to write more generally on this point elsewhere.

18 Cf. Art. I of the Outer Space Treaty, and the Declaration of International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries, G.A. Res. 51/122 (1996).

19 *Cf.* C.Q. Christol, *Outer Space and Exploitability: International law and developing nations,* 11 SPACE POL'Y 146-60 (1990).

heritage' to ensure that benefits are spread widely. Such, however, seems unlikely.[20]

More practically perhaps, an agreement between the states active in space exploration, could suffice.[21] The 'common heritage' wording could be avoided within such an agreement should it remain unduly awkward for major participants. This points to a model which has worked pretty well for the last almost four decades.

At present the more flexible, non-authoritarian Antarctic system seems to me the model that should be adopted. Based on the Antarctic Treaty,[22] the system developed by the Parties to the Treaty has the merit of having been developed slowly and in response to practical needs, for precisely the sort of scientific enterprise that is likely at first at least to be seen on the Moon. If there is indeed recoverable water resources frozen in the bottom of deep craters near the Moon's poles, there may be rush to set up bases there. The Antarctic model would allow for that. Later, if significant resources are discovered in some other particular and restricted areas of the Moon, something legally stronger and more structured will be required.[23] Such a development would logically at least require some sort of regime to regulate competition, and give a good 'title' to those involved.[24] The history of the Antarctic regime provides such a model.[25] Of course, in the further future one might hope for its replacement by a fuller structure on the Sea-Bed Authority model, but we need not hurry to that: a basic agreement is better than nothing.

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20 *Cf.* Christol, n. 19.

21 This could be eased if Moon exploration and exploitation were a joint effort. The European Space Agency, for example, is already a consortium.

22 The Antarctic Treaty, 1959; 402 UNTS 71; (1961) UKTS 97, Cmnd. 1535; 12 UST 794, TIAS No. 4780.

23 See D.H. Overholt, *Environmental Protection in the Antarctic: Past, Present and Future*, 28 CAN. Y. B. INT'L L. 227-62 (1990); C. Redgewell, *Current Developments: International Law, III Antarctica*, 39 INT'L & COMP. L. Q. 474-81 (1990).

24 Note that the word 'title' is here in inverted commas. The most that is likely is a lease or license for a limited time and area: cf. art. 137.2 of the Law of the Sea Convention, 1982 which restricts the nature of legal titles involved in the Area and to minerals and other resources extracted. Although by art. 11 3 of the Moon Agreement property rights on the Moon are excluded, by art. 6.2 states members of that Agreement have a right to use appropriate quantities of mineral and other substances found on the Moon for the support of their missions, as well as to collect and remove samples.

25 *Cf.* C.G. Joyner, *The Antarctic Treaty System and the Law of the Sea - Competing Regimes in the Southern Ocean?*, 10 J. MARINE & COASTAL L. 301-311 (1995). *See also: Antarctic Treaty Consultative Parties: Measures relating to the Furtherance of the Principles and Objectives of the Antarctic Treaty [Meetings I-XIX]*, 35 INT'L LEGAL MAT'S 1165-77 (1996); and, *Idem:, Recommendation XVIII-1 on Tourism and Non-governmental Activities*, 35 INT'L LEGAL MAT'S 1178-86 (1996).

IV. SAHA: a Moon Crater as a Science Preserve

Whatever the outcome of discussions (or inertia) as to the formal legal position affecting the generality of the Moon, there is one matter that needs to be dealt with urgently. Certain areas of the Moon should be set aside for scientific study and endeavour. In broad, no-one would quarrel with such a proposal, and art. 9 of the Moon Agreement might be used to provide a legal base for it. But, whatever happens, one particular scheme deserves special consideration, care and protection, whether we have a whole-lunar agreement, or a less formal arrangement. This is the proposal to set aside one or more deep craters on the lunar far-side for the activities of radio-astronomers, including those who listen in the hope of detecting evidence of extra-terrestrial intelligence.[26]

Radio-astronomy makes a passive use of the radio-spectrum. The radio signals radio-astronomy deals with are not generated by the instrumentation used. Radio emissions from far into space are detected, recorded and analysed, and many important scientific discoveries have been made. Radio-astronomy is therefore an important human activity.

However, the protection given to radio-astronomy within the Radio Regulations of the International Telecommunication Union, is not satisfactory. Freedom of interference from man-made radio emissions in those sections of the radio spectrum which are most useful for the science is not adequately guaranteed. Not all important wave-lengths within the usable spectrum are set aside for passive use. Allocations within the Radio Regulations are now extending into bands previously unused, and sections of the spectrum relevant for radio-astronomy are now being subjected to encroachment, particularly by the new satellite telephony systems. And all this is entirely apart from the problems which can be caused by radio emitters which are not efficiently tuned, properly screened, damped or otherwise neutralised.[27]

Many of the problems of radio astronomy in general, and of SETI in particular, would be alleviated were radio-telescopes to be fully shielded from man-made radio interference. The proposal therefore has been made that an appropriate site would be within a crater on the far-side of the

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26 The Search for Extra-Terrestrial Intelligence (SETI), is a curious, but potentially very important sub-set of the use of radio-telescopes.

27 For example, a badly screened micro-wave oven can produce a radio signal which could interfere with or mask a spectrum band being used by a radio-telescope.

Moon, the crater Saha being particularly identified as suitable the main proponent of the idea having outlined his questions in 1994.[28]

By Art. I of the Outer Space Treaty, outer space including the Moon and celestial bodies is free for exploration and use by all, and this use specifically includes scientific investigation. As indicated above, by Art. VI of the Outer Space Treaty what is done in space or on the Moon is required to be subject to the supervision of the appropriate national state having jurisdiction over those conducting the relevant activity. Other general aspects of International Law indicated above, including the question of 'nuisance', would also have relevance. In this discharge of their duty of supervision, states ought to ensure that the activities of nationals do not impede the activities of others.[29]

But that is obviously insufficient protection for the radio-astronomers' projects. What is required is a proper formal setting aside of a specific site, and its protection for radio astronomic purposes, which we expect would include SETI. This should be done before any further steps are taken in Moon exploration.

The limited terms of the Moon Agreement as it stands at present do not provide sufficient protection for a far-side site on the Moon for radio-astronomy purposes. While its terms make lawful landing and the placing of facilities, stations and installations anywhere on the Moon (art. 8.1-2 and 9), art. 8.3 merely requires that activities of states parties to the Agreement shall not interfere the activities of other states parties on the Moon. This is quite vague and imprecise. This 'interference' is not a reference to 'radio interference' though arguably the term could encompass it. But the argument is not strong: any competent lawyer could blow holes in it, deny the duty in a particular instance, or justify an alleged breach by his state. Article 8.3 of the Moon Agreement is therefore insufficient for the protection of a Saha project.

On the other hand, were the Moon Agreement to be revived and gain a general membership particularly among the space-faring nations, its terms could be used. Once exploitation is about to become feasible, parties to that treaty are to agree on a regime for the exploitation and use of the Moon (art. 11.5). Setting aside a Saha site could be accomplished within that regime, whether the regime comprises a formal structure on the lines

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28 J. Heidmann, *Saha Crater: A Candidate for a SETI Lunar Base*, 32 ACTA ASTRONAUTICA 471-2 (1994); *What legal questions are raised by the establishment of a dedicated lunar farside specific crater for high sensitivity radioastronomy?*, 37 PROC. COLLOQ. L. OUTER SPACE 255 (1994), (*cf.* S. Doyle's comments on Dr Heidmann's proposal, summarised 37 PROC. COLLOQ. L. OUTER SPACE 302 (1994); *Recent progress on the Lunar Farside Crater Saha Proposal*, a paper presented to the 48th International Astronautical Congress, Turin, Italy, 1997: IAA-97-IAA.9.1.05; *Cf.* A.A. Cocca, *Reservation of a Lunar Zone for SETI Purposes*, 38 PROC. COLLOQ. L. OUTER SPACE 270-3 (1995).

29 This could cover both the technical question of 'interference' as that word in known within the ITU system, and also its broader meaning within International Law: cf. the line of thought stemming from the Trail Smelter Arbitration (1938-41), 3 R.I.A.A. 1905.

of the International Sea-Bed Authority, or the less bureaucratic regime that applies in the Antarctic.

But, irrespective of which of these alternatives comes to be, some sort of regime will be required to provide ground rules at least between participants in the exploration and exploitation of the Moon. However such matters are arranged, care should be taken to ensure that the fullest protection is given to the requirements of a far-side lunar radio observatory under any Moon regime. Thereafter, once the legal basis has been established for the site, the ordinary procedures of assignment and notification would be gone through for the site's use of telecommunications services. Its protection from interference would, however, be dependent on the enforcement of the appropriate provisions of the Radio Regulations.

V. Conclusion

Twenty-five years on from the first issues of this Journal, the problem of the Moon has been brought once more to the attention of lawyers. The prospect is that the Moon may soon be revisited, on a more permanent basis than hitherto. It would be easy to await developments, and let 'things work themselves out'. It would be more prudent deliberately to choose the route of future developments. An 'Antarctic solution' may be easier to agree on than a 'lunar authority' drawn up on the model of the Law of the Sea. But whichever avenue is taken, steps should be taken now to secure the interests of radio-astronomers.

SPACE DEBRIS AND INTERNATIONAL LAW

*N. Jasentuliyana**

While the issue of space debris has been the subject of scientific study and discussion for some time now, it has yet to be fully addressed within the context of an international legal framework.[1] During the earlier stages of the space age, which began in the late 1950s, the focus of international lawmakers and diplomats was the establishment of basic rules which sought to define the legal nature of outer space and set out the parameters for space activities. The nature and scope of activities carried out in outer space were quite limited, both with respect to the actors engaged in such activities and to the quantity and impact of the missions making up these activities. Consequently, environmental issues and the risks that might arise from the generation of space debris did not receive priority attention within the context of the development international space law.

In recent years, however, the world has seen dramatic advances in technology and increases in the type and number of space-related activities which are being carried out. In addition, the number of actors in this field has exploded from two highly developed States to a vast array of different States, intergovernmental and non-governmental organizations, including private industry. Therefore, the number of artificial objects in the near-Earth space is continually increasing. At the beginning of the space era, this region was considered empty and free for unlimited use, but now it becomes more and more populated by functioning objects and, unfortunately, by "space garbage" which is known as space debris. Spacecrafts often collide with natural objects, like meteoroids, but now they also collide with objects created by human activities. The vast majority of these particles are very small and can cause little damage. However, due to large velocities of orbiting objects, the kinetic energy of a 0.1 mm diameter particle is sufficient to cause damage or surface degradation of a typical spacecraft and a collision with larger particles can

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* Deputy to the Director-General, United Nations Office at Vienna; Director, Office for Outer Space Affairs; and President, International Institute of Space Law. The author is grateful to Ms. Jayne Hall, Mr. Petr Lála, and Mr. Philip R. McDougall for their assistance and contributions in completing this article.

1 To date, the matter has been addressed only at a non-governmental level by the International Law Association, which has developed a strategy dealing with the legal issues relating to space debris. *See* Prof. Dr. Karl-Heinz Böckstiegel, *The Draft of the International Law Association for a Convention on Space Debris,* 38 PROC. COLLOQ. L. OUTER SPACE 73-77 (Oct. 1996, AIAA).

significantly disturb or even disrupt a satellite's operation. The chance of collision increases with the size of the satellite and its orbital lifetime. This is why space debris are very dangerous for complex scientific satellites like the Hubble Space Telescope and particularly for the manned International Space Station, the largest spacecraft ever built.

This article seeks to discuss the status of international law as it relates to space debris and indicate a course of action which might be taken by the international community to develop a legal framework which can adequately cope with the complexity of issues that have recently been recognized as being associated with the proliferation of space debris. Section I discusses the current status of international space law, and the extent to which some of the issues raised by space debris are accounted for within the existing United Nations multilateral treaties. Section II discusses the scope and nature of space debris issues as they emerged from the recent multi-year study carried out by the Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space ("COPUOS") as a prelude to the matters that will require the attention of international lawmakers in the future. Finally, Section III analyzes the difficulties inherent in the future regulation and control of space debris and the activities contributing to its proliferation, and indicates a possible course of action which could well provide, at the least, a partial solution to this complex challenge.

I. Space Debris And Current International Space Law

Space debris and the problems that are associated therewith, are to some extent accounted for, albeit indirectly, within the provisions of the current treaties relating to activities in outer space. Article IX of the Outer Space Treaty[2] provides that States "shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty." Article IX continues that studies and exploration of outer space, the Moon, and other celestial bodies by States shall be conducted "so as to avoid their harmful contamination" and binds States Parties to "where necessary, ... adopt appropriate measures for this purpose." Article IX establishes consultation procedures where an activity or experiment planned by a State or its nationals would cause potentially harmful interference with the activities of another State in the peaceful exploration and use of outer space, the Moon, or other celestial bodies.

Article IX, therefore, considers the contamination or pollution of outer space, and the possibility that such pollution might interfere with the activities of other States. This is of course a growing concern related to the proliferation of space debris, especially in high-use orbits around the earth, *e.g.*, the Geostationary Orbit. However, the provisions of Article IX, like many other parts of the Outer Space Treaty, are by their nature not

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2 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, *opened for signature Jan. 27, 1967, came into force Oct. 10, 1967,* 18 UST 2410, TIAS 6347, 610 UNTS 205.

precise. As the first treaty relating to activities in outer space, the Outer Space Treaty was meant to provide the foundation upon which later, more specific agreements could be based. To some extent, the vague terminology demonstrated in Article IX is reflective of the lack of technological knowledge and ability to foresee the problems that we are now facing in space activities. Consequently, the Outer Space Treaty does not define what is meant by "harmful contamination", nor what is meant by requiring States to "where necessary, ... adopt appropriate measures". In addition, the provisions of Article IX do not give any guidance as to what is meant by "potential harmful interference", nor indicate whether any limits should exist to the nature of activity or experiment which might fall within the provisions of this article.

Article VII of the Outer Space Treaty[3] establishes that each "State Party to the Treaty that launches or procures the launching of an object into outer space, including the moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space, including the moon and other celestial bodies." Furthermore, Article VI of the Outer Space Treaty[4] also extends State responsibility to activities of its nationals in outer space, the moon and other celestial bodies.

Therefore, once again, provisions of the Outer Space Treaty, while not specifically addressing the issue of space debris, do provide guidance as to the manner by which the generation of space debris and the liability for damage caused by such debris might be regulated. Unfortunately, there is no definition of what comprises an "object or its component parts", thus it is uncertain whether all space debris would fall within the ambit of this provision. Furthermore, it is unclear as to how "objects" (and by implication space debris) would be identified as being associated with the appropriate responsible State. Additionally, activities carried out by private industry and other non-governmental entities which have space debris implications are not adequately dealt with by the vague, general provisions of Article VI.

The Outer Space Treaty has been rightly recognized as the Magna Carta of space law, but its provisions are just not definite enough to handle the complex issue of space debris and the advancements in technology. Even though the Outer Space Treaty seems applicable to the issue of space debris, it fails to authorize the establishment of the specific regulatory regime necessary to establish detailed standards of conduct, which are needed.

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3 *Id.*

4 *Id.*

The Liability Convention[5] is aimed at the establishment of more specific provisions for concepts that are set out in general terms in the Outer Space Treaty. The particular focus of the Liability Convention is the establishment of rules and procedures in cases where activities in outer space of Member States result in "loss of life, personal injury or other impairment of health, or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations."[6] As such, this Convention is of particular importance to one of the important issues associated with space debris, that of reparation for damages caused by such debris. To the extent that space debris can be included within the ambit of the provisions of this Convention, a set of rules and procedures is established to deal with issues of damage caused by the same debris.

Unfortunately, whether or not all, or any space debris does indeed fall within the provisions of the Liability Convention is far from being settled. The term "space object" is defined in the Liability Convention as including the space object, the launch vehicle and the component parts of both.[7] This definition is generally regarded as an expansion of the scope of the terms used in the Outer Space Treaty, mentioned above. However, what constitutes component parts is not defined. The issue of whether fragmentation debris and micro-particulate matter are component parts has also not been decided. Such fragmentation debris from satellite breakups caused by explosions and collisions currently poses the greatest risk to active space objects.[8]

Assuming that space debris falls within the ambit of space objects then there are still other issues to be resolved. First, the application of the Liability Convention to *areas* in space is not absolute when there is still no consensus on what constitutes airspace and what constitutes outer space. A proposed definition, the functional approach, would set the upper limits of airspace, which would of course be the lower limits of outer space, at about 100 km above the surface of the Earth.[9] The functional approach is premised on the lowest possible orbiting altitude for satellites, at the

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5 Convention on International Liability for Damage Caused by Space Objects, *opened for signature Mar. 29, 1972, entered into force Sept. 1, 1972*, 24 U.S.T. 2389, TIAS 7762, 961 UNTS 187.

6 *Id.* at Article I(a).

7 *Id.* at Article I(d).

8 HOWARD A. BAKER, SPACE DEBRIS: LEGAL AND POLICY IMPLICATIONS 65 (1989), and *see generally,* Lawrence D. Roberts, *Addressing the Problem of Orbital Space Debris: Combining In ternational Regulatory and Liability Regimes*, B. C. INT'L & COMP. L. REV. 55 (1992).

9 *See* proposal made at the Legal Subcommittee of COPUOS by the Soviet Union, UN Docs. A/AC.105/C.2/L.121, L.139 and A/AC.105/C.2/SR.392 on 7 April 1983. There are many scientific studies that support 100 km as the legal ceiling on airspace, see Marietta Benkö, Kai-Uwe Schrogl, *International Space Law In The Making*, F. AIR & SPACE L. 129 (1993). *See also* 1998 IISL/ECSL Symposium, *Review of the Status of the Outer Space Treaties,* 37th Session of the Legal Subcommittee of the United Nations COPOUS, A/AC.105/C.2/1998/CRP.4 (to be also published in 41 PROC. COLLOQ. L. OUTER SPACE, Sept. 1998, AIAA).

point where the aerodynamic lift used by aircraft ceased to be effective. However, this definition has yet to be generally accepted.

Secondly, there is an enormous influx of private actors commercializing activities in outer space, and the application of the existing space treaties to these actors is unclear, although member States are liable for activities in space carried out by their nationals or procured from within their national borders.[10] Private industry has a substantial monetary stake and no definite legal guidelines that must be adhered to in order to prevent liability for themselves or to prevent further debris problems - especially with the influx of satellite deployment into the LEO (lower Earth Orbit).[11] As national legislation increasingly opens telecommunication markets, a greater number of nations, private industries, and trade organizations will become involved with space activities.

Thirdly, the Liability Convention does not deal completely with the issue of fault for outer space accidents. Even though the Liability Convention speaks of absolute liability for space objects damaging another state or its nationals or organizations, negligence or fault must be established for outer space "injuries". However, there is no definition of fault set forth in the Convention itself, nor is a standard of care set forth or guidelines for establishing negligence.[12]

In addition, the Liability Convention does not provide any specific mechanism for establishing the identity of space objects launched into outer space, or the associated debris that might accompany such launchings. It operates on the assumption that the "launching State" which is determined to be the State liable for damages caused in terms of the Convention's provisions, would be readily ascertainable for any given space object. This is quite clearly not the case.

Finally, the Liability Convention speaks only of damage to persons or property, but not for damage to the outer space environment, or other common spaces.[13] There is nothing in the Convention that requires States to avoid generating space debris. There is simply a system of rules and procedures that might have an adverse impact on States whose "space objects" cause damage. The Liability Convention, therefore, constitutes only a limited deterrent to States' generation of space debris.

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10 *See* the Outer Space Treaty, Article VII and the Convention on International Liability for Damage Caused by Space Objects at notes 3 and 6, respectively.

11 Michael B. Gerrad, *Environmental Law: Regulation of Orbital Space Debris*, N.Y.L.J. (Sept. 25, 1998).

12 HOWARD A. BAKER, SPACE DEBRIS: LEGAL AND POLICY IMPLICATIONS 79 (1989), and *see* the Convention on International Liability for Damage Caused by Space Objects, at note 6.

13 *Id.*

The Registration Convention[14] represents a move to resolve the issue of identifying objects in outer space originating from humankind's activities. It has implications for the problem of identifying the origin of space debris discussed in the context of the Outer Space Treaty and Liability Convention above. Not only does the Registration Convention confirm the definition of "space object" set out in the Liability Convention,[15] and thereby includes within the ambit of its provisions the component parts of a space object as well as its launch vehicle and parts thereof, the Convention also binds launching States to register such objects, when they are launched, within a registry maintained by the United Nations Secretary-General.[16] Unfortunately, because of the limited information that is required to be supplied by States in so registering, and the fact that such information is required by the terms of the Convention to be supplied "as soon as practicable"[17], the Registration Convention has not proved very useful a tool in keeping track of space debris.

Furthermore, it is not clear from this Convention's language whether only active satellites are required to be registered, or whether additional information on such things as inactive satellites, failed missions, and space object breakup might also be required, all of which could increase the amount of debris in outer space. The Convention's contents focus primarily upon satellites at fixed orbital parameters which could exclude satellites with varying orbits. In addition, launches of sub-orbital sounding rockets or ballistic missile test vehicles, types of fuel or exhausts, chemical or radioactive payloads are not required information for registration.[18] Some States do list this type of information, but not everyone, nor is it required under current outer space law.

The Moon Agreement[19] is currently somewhat limited in its value compared to the earlier treaties because even though it, too, represents an expansion on the provisions of the Outer Space Treaty, it has not been

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14 Convention on Registration of Objects Launched into Outer Space, *opened for signature Jan. 14, 1975, entered into force Sept. 15, 1976*, 28 UST 695, TIAS 8480, 1023 UNTS 15.

15 *Id.* at Article I.

16 *Id.* at Article II.

17 Article IV(1) of the Registration Convention states: "Each State of registry shall furnish to the Secretary-General of the United Nations, as soon as practicable, the following information concerning each space object carried on its registry: (a) name of launching State or States; (b) an appropriate designator of the space object or its registration number; (c) date and territory or location of launch; (d) basic orbital parameters, including: (i) nodal period, (ii) inclination, (iii) apogee, (iv) perigee; (e) general function of the space object.

18 HOWARD A. BAKER, SPACE DEBRIS: LEGAL AND POLICY IMPLICATIONS 77 (1989), and *see* the Convention on Registration of Objects Launched into Outer Space, *opened for signature Jan. 14, 1975, entered into force Sept. 15, 1976*, 28 UST 695, TIAS 8480, 1023 UNTS 15.

19 Agreement Governing the Activities of States on the Moon and Celestial Bodies, *opened for signature Dec. 18, 1979, entered into force July 11, 1984*, 18 ILM 1434, 1363 UNTS 3.

signed or ratified by most of the space-faring nations.[20] This failure of most major space-faring States to bind themselves to the provisions of the Moon Agreement results from the fact that the Moon Agreement has *inter alia* raised the issue of the moon its orbits or trajectories and other celestrial bodies as being the "common heritage of mankind",[21] which has proved far less accepted a principle than that embodied in the Outer Space Treaty's language of "for the benefit and interest of all countries" and "the province of all mankind".[22] Nonetheless, certain provisions of this Agreement bear consideration in this discussion to the extent that they provide an existing mechanism to regulate some matters related to space debris, should States choose to utilize it.

The Moon Agreement, like the other treaties, does not deal directly with the issue of space debris. However, some of its provisions might well be extended to cover this problem. The Moon Agreement expands Article IX of the Outer Space Treaty by creating a duty to prevent the harmful contamination of the environment of the Moon or "the orbits around or other trajectories to or around it."[23] In addition, Article 7 of the Moon Agreement states that States Parties "shall take measures to avoid harmfully affecting the environment of the earth through the introduction of extra-terrestrial matter or otherwise." Unfortunately, this wording is somewhat unclear and the key concept of "extra-terrestrial matter" is not defined.[24]

As has been illustrated in the discussion above, the multilateral treaties that form the core of international space law do, to some extent, provide rules, procedures, and legal mechanisms which could in the future be utilized to deal with some of the issues raised by the proliferation of space debris. However, the texts of these treaties are more characterized by what they lack in terms of adequate provisions for the regulation of space debris than by their value to such endeavors. This is hardly surprising in view of the fact, stated at the start of this discussion, that at the time the texts of the treaties were developed and negotiated within COPUOS, very little was known about the nature of either space debris or the practical difficulties and legal implications which would arise from its proliferation as humankind became more active in outer space.

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20 Despite the fact that the text of the Moon Agreement was established by consensus in COPUOS, it has only been ratified by nine States and signed by an additional five States.

21 *See* Agreement Governing the Activities of States on the Moon and Celestial Bodies, Articles 1 and 11, *opened for signature Dec. 18, 1979, entered into force July 11, 1984,* 18 ILM 1434, 1363 UNTS 3.

22 GEORGE T. HACKETT, SPACE DEBRIS AND THE CORPUS IURIS SPATIALIS, vol. 2, 75-79 (1994).

23 *Id.* at Articles 1 and 7, and *see generally*, Lawrence D. Roberts, *Addressing the Problem of Orbital Space Debris: Combining International Regulatory and Liability Regimes*, B. C. INT'L & COMP. L. REV. 62 (1992) .

24 Article 1(3) of the Moon Agreement merely states that "(t)his agreement does not apply to extraterrestrial materials which reach the surface of the earth by natural means."

II. Recent developments in the study and analysis of Space Debris issues by the United Nations

1. Initiation of a multi-year plan of study

The item on space debris was included on the agenda of the Scientific and Technical Subcommittee of COPUOS at its February 1994 session,[25] at which time it was agreed that consideration of space debris was important and that international cooperation was needed to evolve appropriate and affordable strategies to minimize the potential impact of space debris on future space missions. At its 32nd session, in February 1995, the Subcommittee continued its consideration of this agenda item, this time on a priority basis.[26]

In order to have a common understanding of the term "space debris", the following explanation was proposed: Space debris are all man-made objects, including their fragments and parts, whether their owners can be identified or not, in Earth orbit or re-entering the dense layers of the atmosphere that are non-functional with no reasonable expectation of their being able to assume or resume their intended functions or any other functions for which they are or can be authorized.[27] However, this explanation still has not been agreed upon as a consensus definition.

The Subcommittee agreed that it was important to have a firm scientific and technical basis for future action on the complex attributes of space debris and that it should, *inter alia*, focus on understanding aspects of research related to space debris, including debris measurement techniques; mathematical modelling of the debris environment, characterizing the space debris environment; and measures to mitigate the risks of space debris, including spacecraft design measures to protect against space debris. In order to advance in its consideration of space debris, the following work plan was adopted by the Subcommittee in 1995:[28]

> 1996: Measurements of space debris, understanding of data and effects of this environment on space systems
>
> Measurements of space debris comprise all processes by which information on the near-Earth particulate environment is gained through ground and space-based sensors. The effect (impact of particles and resulting damage) of this environment on space systems should be described.

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25 Report of the Scientific and Technical Subcommittee on the Work of its Thirty-first Session, UN Doc. A/AC.105/571, United Nations 10 March 1994.

26 Report of the Scientific and Technical Subcommittee on the Work of its Thirty-second Session, UN Doc. A/AC.105/605, United Nations 24 February 1995.

27 Report of the Scientific and Technical Subcommittee on the Work of its Thirty-fourth Session, UN Doc. A/AC.105/672, United Nations 10 March 1997.

28 Report of the Scientific and Technical Subcommittee on the Work of its Thirty-second Session, UN Doc. A/AC.105/605, United Nations 24 February 1995.

1997: Modelling of space debris environment and risk assessment
A space debris model is a mathematical description of the current and future distribution in space of debris as a function of its size and other physical parameters. Aspects to be addressed are an analysis of fragmentation models; short- and long-term evolution of the space debris population and comparison of models. The various methods for collision risk assessment should be critically reviewed.

1998: Space debris mitigation measures
Mitigation comprises reduction of the space debris population growth and protection against particulate impact. Measures for the reduction of space debris growth include methods for debris prevention and removal. Protection against space debris includes physical protection with shielding and protection through collision avoidance.

Each session would review the current operational debris mitigation practices and consider future mitigation methods with regard to cost efficiency.

The Subcommittee noted that a certain amount of research on space debris had already been undertaken in some countries, which had allowed for a better understanding of the sources of debris, the areas in near-Earth orbit that were reaching high levels of space debris density, the probabilities and effects of collisions and the necessity to minimize the creation of space debris.[29] The Subcommittee went on to encourage Member States and relevant international organizations to provide information on practices that they had adopted and that had proven effective in minimizing the creation of space debris. This information was synthetised by the Office for Outer Space Affairs (OOSA) and published as United Nations documents[30] in order to make this invaluable experience widely available. Furthermore, at each session of the Subcommittee, several detailed working papers[31] were introduced and scientific and technical

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29 Report of the Scientific and Technical Subcommittee on the Work of its Thirty-third Session, UN Doc. A/AC.105/637, United Nations 4 March 1996.

30 *Steps Taken by Space Agencies for Reducing the Growth or Damage Potential of Space Debris*, UN Doc. A/AC.105/620, United Nations 21 November 1995; *Steps Taken by Space Agencies for Reducing the Growth or Damage Potential of Space Debris*, UN Doc. A/AC.105/663, United Nations 13 December 1996; and *Steps Taken by Space Agencies for Reducing the Growth or Damage Potential of Space Debris*, UN Doc. A/AC.105/681, United Nations 17 December 1997.

31 *Use of Nuclear Power Sources in Outer Space: Space Debris. Working document submitted by the Russian Federation*, UN Doc. A/AC.105/C.1/L.193, 21 February 1994; *Space Debris. Report of the International Astronautical Federation*. UN Doc. A/AC.105/570, United Nations 25 February 1994; *Collisions between Nuclear Power Sources and Space Debris. Working paper submitted by the Russian Federation*. UN Doc. A/AC.105/C.1/L.204, United Nations 13 February 1996; *Brief Review of the Work done by Russian Scientists on the Problem of the Technogenic Pollution of Near Space. Working paper submitted by the Russian Federation*, UN Doc. A/AC.105/C.1/L.205, United Nations 13 February 1996; Space Debris. Working

presentations on space debris by experts from different Member States and observer organizations presented.[32]

At its 33rd session in 1996, the Subcommittee initiated the development of its technical report on space debris in order to establish a common understanding that could serve as the basis for further deliberations of the Committee on that important matter. The technical report was structured according to the specific topics addressed by the work plan during the period 1996-1998. As an initiative of the Chairman of the Subcommittee, Prof. D. Rex of Germany - eminent expert on scientific and technical problems of space debris himself - the text[33] was drafted during the sessions by an unofficial group of experts with substantial participation of IAA, Inter-Agency Space Debris Coordination Committee (IADC), ESA and other international and national space-related organizations. The report has been carried forward and updated each year,[34] leading to an accumulation of advice and guidance and should be adopted by the Subcommittee at its 36th session in February 1999. Some of the most interesting information about the space debris issue is summarized below.

2. Measurements of Space Debris

Objects moving in the near-Earth space are tracked and catalogued by the United States Space Command Space Surveillance System (sometimes

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paper submitted by the International Academy of Astronautics, UN Doc. A/AC.105/C.1/L.217, United Nations 12 January 1998; and *Space Debris. Working paper submitted by the Russian Federation*, UN Doc. A/AC.105/C.1/L.219, United Nations 10 February 1998.

32 Scientific and Technical Presentations to the Scientific and Technical Subcommittee at its Thirty-first Session, UN Doc. A/AC.105/574, United Nations 12 May 1994; Scientific and Technical Presentations to the Scientific and Technical Subcommittee at its Thirty-second Session, UN Doc. A/AC.105/606, United Nations 27 April 1995; Scientific and Technical Presentations to the Scientific and Technical Subcommittee at its Thirty-third Session, UN Doc. A/AC.105/638, United Nations 7 May 1996; Scientific and Technical Presentations to the Scientific and Technical Subcommittee at its Thirty-fourth Session, UN Doc. A/AC.105/673, United Nations 7 May 1997; and Scientific and Technical Presentations to the Scientific and Technical Subcommittee at its Thirty-fifth Session, UN Doc. A/AC.105/699, United Nations 20 April 1998.

33 Appears progressively in the Report of the Scientific and Technical Subcommittee on the Work of its Thirty-third Session, UN Doc. A/AC.105/637, United Nations 4 March 1996; the Report of the Scientific and Technical Subcommittee on the Work of its Thirty-fourth Session, UN Doc. A/AC.105/672, United Nations 10 March 1997; and the Report of the Scientific and Technical Subcommittee on the Work of its Thirty-fifth Session, UN Doc. A/AC.105/697, United Nations 25 February 1998.

34 *Revisions to the Technical Report on Space Debris of the Scientific and Technical Subcommittee*, UN Doc. A/AC.105/C.1/L.214, United Nations 26 February 1997 and *Revisions to the Technical Report on Space Debris of the Scientific and Technical Subcommittee*, UN Doc. A/AC.105/C.1/L.224, United Nations 19 February 1998.

called SPACECOM) with some contributions also by other countries. This system operates more then two dozen radar and optical facilities to monitor near-Earth space and maintains a catalogue of orbital elements of all tracked objects. Recently, these unique facilities have been offered also for monitoring and cataloguing of Near Earth Objects (NEO). The minimum diameter of "trackable" objects is about 10 cm for Low Earth Orbits (LEO) and 1 m for Geostationary Orbits (GSO). The SPACECOM catalogue, characterizing the orbits of all trackable objects, constitutes the main data source for research work in the field of space debris.

The number of catalogued objects orbiting the Earth exceeds 8000, of which only about 500 objects can be considered operational spacecraft. Approximately another 1000 are being tracked but have not been catalogued. A statistical sample of the environment has determined that a much larger number of objects of 1 cm size or larger are in orbit as well. Collision of any of these objects with an operational spacecraft may lead to damage or even functional loss because of the large amount of kinetic energy involved. The catalogued population is an important observable parameter for the prediction of the future state of the orbital environment.

Since Sputnik 1 was launched in 1957, about 25 000 Earth-orbiting objects have been catalogued. About 16,000 have entered Earth's atmosphere and most have disintegrated or vaporized, with very little remaining to impact Earth. In some cases solid fragments from spacecraft or rocket stages have reached the Earth's surface (Cosmos 954, Skylab, Salyut-7/Cosmos-1686) and have been observed. Certainly, much higher numbers of debris have reached the ground, but went mostly unreported.

The fragmentation of satellites and rocket upper stages (due to explosions) is a major source of catalogued objects (42 percent). Therefore, a major mitigation technique consists of minimizing the rate of future explosions. As many as 82 percent of all upper stage breakups could have been prevented by executing proper passivation techniques. During the period between 1990-96 a total of 28 upper stages -- an average of four per year -- associated with 10 different vehicle types broke-up in Earth orbit. Although some of these events originated with old upper stages already in orbit for a long time, the vast majority of these vehicles were launched in 1988 or later, after widespread attention had been given to the issue of upper stage passivation.

The most significant contribution to the expansion of knowledge of small-size particles is made in Europe and the United States with investigations of the ESA's European Retrievable Carrier (EURECA), the returned solar array panel of the Hubble Space Telescope (HST) and other spacecraft. The spacecraft surfaces are covered with a large number of impacts of micrometeoroids and debris. The size of individual impact craters and holes range from 20 microns to several millimetres. A preliminary analysis of EURECA shows that the number of large impacts was greater than expected. The largest impact crater diameter is 6.4 mm, resulting from an object of 0.5 to 1 mm diameter. With 3.6 years on orbit at the time of the repair mission, the HST had about four times the space exposure time of EURECA. First visual inspection of the retrieved panel

revealed a large number of impacts, with the largest hole diameter of 2-3 mm. Results from the EURECA and HST panel impact analyses are used to validate current reference flux models for small size meteoroids and space debris.

3. Modelling of Space Debris Environment and Risk Assessment

Because only a limited part of the total population of space debris can be directly observed or measured, significant gaps in spatial and temporal distribution can be filled only by mathematical modelling. Modelling is also the only way to predict future development of the space debris environment. The predictions are complicated by the possibilities of increased launch rates by a growing number of space users, especially in light of new smallsat technology and the advent of constellations of communications satellites. The uncertainty in the future environment is also increased by the uncertainty in the frequency of future explosions and collisions. A collision between two objects may result in the creation of numerous fragments whose number and size depend on several factors, such as mass of colliding bodies and collision velocity.

Assessing the present and future risk to all space objects by the Space Debris Environment requires the use of models. The ESA MASTER Model (Meteoroids And Space Debris Terrestrial Reference Model)[35] has been developed by the Institute for Flight Mechanics and Spaceflight Technology of the Technical University of Braunschweig, Germany (IFR/TUBS) under an ESA contract. The scope of the model covers man-made and natural objects larger than 0.1 mm in altitudes below 2,000 km. Analytical break-up models are used for the individual generation of the untrackable debris population for the known on-orbit fragmentations. The observable part of the population is considered by the implementation of ground-based radar measurements.

There are several other models, such as CHAIN, EVOLVE and ORDEM96 developed by NASA, IDES by DARA and Nazarenko (Russian Federation) that can be used to characterize the present and future space debris environment. Their initial conditions, structure and applicability are currently subjected to thorough international scrutiny in order to arrive at most reliable modelling methods.

Some studies suggest that, in the crowded orbital regimes of LEO, the number of collision partners will reach the critical level required to sustain collisional cascading within the next 10 to 15 years. This is the process whereby the breakup of one large object can produce many hundreds of fragments, each capable of colliding with, and damaging other objects. These secondary events may then produce more fragments, the process can be repeated and the orbital regime can soon become a particulate equivalent of the Van Allen radiation belts, a hostile and inaccessible environment for normal operations. Some studies conclude that it is the larger objects which play the critical role in the cascade

35 PROCEEDINGS OF THE FIRST EUROPEAN CONFERENCE ON SPACE DEBRIS, European Space Agency, Report SD-01, ESOC Darmstadt (Germany), 5-7 April 1993.

phenomenon. If the number of these objects in orbit can be reduced or minimized, the onset of the cascading will be avoided and fragmentation events will remain localized.

The average relative velocity between any particular spacecraft orbiting near-Earth space and orbital debris objects ranges from about 10 km/s for low inclination spacecraft orbits, to about 13 km/sec for near polar orbits. Due to their great kinetic energy, particles larger than 0.1 mm may cause damage or degradation of a spacecraft and 1 cm fragment has sufficient energy to disturb significantly any satellite's operation; and debris in the 1 - 10 cm size range (too small to be sensed by ground systems), are large enough to cause catastrophic damage to many satellites.

The first confirmed collision of two catalogued objects in orbit occurred on 24 July 1996. At that time, the French satellite CERISE (international designation 1995-033B) and a fragment of the Ariane 1 upper stage from another launch (1986-019RF) had collided and the broken satellite gravity stabilization boom was registered as a new piece of debris (1995-033E). Only through the efforts of ground control personnel has the satellite recovered almost completely from this accident. Although the collision had not been directly observed, sufficient evidence had been obtained from the orbit and attitude behaviour of the two objects involved to indicate such an event occurred.

Based on existing meteoroid and debris models, the flux of particles near a space vehicle can be modelled. ESA analyses[36] show that the current population of debris does not represent an immediate and excessive danger. For example, during a five-year period, the chance of the ERS satellite colliding with a 1 cm particle or larger was 1 to 2 percent. However, the risk of collision with debris is steadily growing. Of most concern is the long-term prospect in low Earth and geostationary orbits, the two most heavily used and endangered regions in space. Theoretical models of debris generation caused by the disintegration of objects or by collision between objects are also performed in other countries, *e.g.*, in India. These studies are aimed at better understanding of the untracked debris environment and predicting collision probability for operational spacecraft. In spite of different initial assumptions, their conclusions are in general agreement.

In connection with the introduction of large commercial satellite constellations in LEO, the impact of such a huge number of satellites on the space and space debris environment has been studied at different institutions, *e.g.*, at the Defence Evaluation Research Agency (DERA) of the United Kingdom and at the German IFR/TUBS. Interest has been mainly focussed on the internal collision risk in case of a fragmentation within the constellation on the one hand and its contribution to the global debris evolution on the other.

Studies performed at IFR/TUBS indicate that the first of these two problems seems to be negligible, given that the members of a constellation

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36 PROCEEDINGS OF THE FIRST EUROPEAN CONFERENCE ON SPACE DEBRIS, European Space Agency, Report SD-01, ESOC Darmstadt (Germany), 5-7 April 1993.

operate at the same altitude band, often in multiple, nearly polar-orbit planes that are phased in right ascension and intersect at high latitudes. Nevertheless, a collision of constellation members among each other is seen as extremely unlikely due to active satellite controlling by the ground stations during the operational lifetimes and intended de-orbiting strategies afterwards. Even in the event of fragmentation of one member as a result of a collision with an object of the background debris population, the additional flux imposed by this fragmentation cloud to the remaining satellites of the constellation is several orders of magnitude below the background.

The second problem, the impact of constellations on the overall debris evolution, is much more severe. The constellations planned for the future comprise up to several hundred satellites and consequently will contribute significantly to the accumulated in-orbit area within their altitude regime. In addition, most of these constellations will operate at an altitude between 700-1400 km, which is currently the area of highest object density. Hence, the risk of a collision followed by complete disintegration of the target is increased to a comparatively high level. Most of the companies projecting such LEO constellations have agreed to include an end-of-life de-orbiting procedure into their system concept. But even in the ideal case that every satellite launched can be removed after its operational life, the collision risk is enlarged significantly due to the steady large number of operational satellites added to the background population.

4. Space Debris Mitigation Measures

The United States of America has the longest space debris mitigation experience. Its current policy was established by Presidential Decision Directive NSC-48/NSTC-8, National Space Policy of 14 September 1996. In August 1995, NASA's Office of Safety and Mission Assurance issued NASA Safety Standard (NSS) 170.14, Guidelines and Assessment Procedures for Limiting Orbital Debris. The Department of Defence (DOD) policies are defined in DOD Space Policy of February 1987 and in the United States Space Command Satellite Disposal Procedures of November 1997, and policies of the commercial sector in the Commercial Space Launch Activities act issued in 1994.

The United States space debris mitigation priorities are to make the spacecraft safe by eliminating all stored energy (propellants, pressurants and batteries), at the end-of-life; relocate the spacecraft to a disposal orbit (decrease the perigee of the low Earth orbit to limit orbital lifetime to less than 25 years, and raise the perigee not less than 300 kilometres above geostationary orbit for GSO objects); and, when feasible, do the relocation before "safing" the spacecraft. Examples of recent operational procedures to minimize debris creation during the launching phase include the Delta launcher second stages executing depletion burns after executing the payload contact avoidance manoeuver; pressurants being vented and batteries left on open circuit; Centaur upper stages being vented at the end of mission and batteries left on open circuit; and, Pegasus XL launchers having been modified to provide for a depletion burn after payload deployment. All newly launched United States upper stages and spacecraft

are modified to eliminate operational debris; retain captive separation devices; keep captive deployment and restraint devices; and disable pyrotechnic devices.

The Japanese Society for Aeronautical and Space Sciences (JSASS) committee on space debris prevention design standards published the final report for the Japanese National Space Development Agency (NASDA) standards and design criteria in March 1996. Based on this report, NASDA established the NASDA-STD-18 "Space Debris Mitigation Standard" on 28 March 1996. The NASDA Standard includes the following mitigation measures: passivation of the spacecraft and the upper stages at the end of the mission; re-orbiting the spacecraft and upper stages at the end of the mission; disposal of objects in geostationary transfer orbit in order not to pose a risk to the geostationary orbit; minimizing the debris released during normal operations; and post-mission disposal of spacecraft from low Earth orbit.

NASDA has already implemented the draining of residual propellants and helium gas from the H-I/H-II second stage. The release of mechanical devices at satellite separation and solar paddle deployment has been avoided except in some particular missions, such as the separation of spent apogee motors for the geostationary meteorological satellites. In order to prevent unintended destruction of H-II second stages in space, the command destruct system is disabled immediately after injection into orbit and its pyrotechnics are thermally insulated to prevent spontaneous initiation. The measures adopted for NASDA programmes seem to be relatively inexpensive and have been proven to be very effective.

Strict mitigation measures are applied to all French space agency CNES launches. The basic requirement is to leave no more than one piece of passivated debris in orbit per payload. This means the upper stage of the launcher in the case of a single launch, and the upper stage with link structure in the case of a dual launch. The separation of the payload from the last stage of the Ariane 4 launcher should not generate any other debris (pyrotechnic separation should be "clean" and remains of pyro bolts should be trapped). The normal use of the upper stage should not generate other debris; therefore solid propulsion in orbit is avoided and the end-of-life of the batteries and cells should not lead to explosions. To passivate the upper stage, pyrotechnic valves to empty the tanks and decrease the internal pressures are added.

The third stage of the Ariane 4 launch vehicle was modified following the explosion in orbit of this stage during the launch of Spot 1 in 1986 (V16), which occurred nine months after the launch. Introduced in October 1993, this design modification has so far permitted 30 flights to take place without any anomaly, thus demonstrating the total effectiveness of the measures taken. During the development of a new Ariane 5 launcher, passivation requirements were taken into account in the early design phase. It was decided to provide for a direct controlled reentry of the main cryogenic stage, even though it meant the loss of 500 kilograms of deliverable payload to the geostationary transfer orbit. The Ariane 5

orbiter will also be rendered passive at the end of its mission through the opening of two pyrotechnic valves fitted on the pressurization circuit.

Specific programmes and techniques are being developed in the Russian Federation to avoid upper rocket stages from entering into orbit around the Earth. The spacecraft itself is inserted into its working orbit by means of an additional smaller booster module or apogee stage. Such techniques will be used operationally on the newly developed Zenit and Angara launchers. Passivation of spent rocket stages and space objects remaining in orbit, *i.e.*, the release from tanks and gas bottles of propellants and pressurants that could cause their explosion even after a considerable period of time are envisaged for preventing explosions. It is proposed to fit the upper module of the Proton and second stages of Zenit launchers with appropriate equipment. Modifications of the on-board power-supply circuits of the Ekran and similar communication satellites should improve their structural integrity and prevent accidental creation of debris due to electric faults.

The ESA Space Debris Mitigation Handbook is to be published shortly. Its purpose is to provide technical information on the space debris situation and guidance on how to avoid space debris in further spacecraft design and mission planning. This handbook is intended to be used for these purposes within ESA and in the European industry as well as in space research planning. The Handbook has no regulatory character. However, if regulations were to be introduced in Europe by other documents, reference could be made to suitable paragraphs of the Handbook. An approach of this kind has already begun, with the drafting of the European Cooperation for Space Standardisation (ECSS), where initial paragraphs on space debris are contained and later can include reference to the Handbook.

One of the most important of the NASA guidelines is the planned disposal of spacecraft and upper stages at the end of their useful life. Following this guideline reduces the growth of mass in the most frequently used regions of space and reduces the potential for having on-orbit collisions become a significant source of debris. However, since planned disposal is a new concept in most cases, it is perceived as a significant added cost burden on new programs. In general, the post-mission disposal options are:

- direct retrieval and deorbit,

- manoeuvre to an orbit for which atmospheric drag or gravitational perturbations will remove the object from orbit within 25 years, and

- manoeuvre to one of a set of disposal regions in which the objects will not interfere with future space operations.

Retrieval means to return to the Earth without damage the spacecraft or other space hardware by a space vehicle capable of atmospheric entry, *e.g.*, the United Space Shuttle or Russian Federation Soyuz reentry modules.

Examples of retrieved space hardware are the European EURECA satellite, Japanese SFU, United States LDEF, Palapa-A, Westar-B and a solar array from the Hubble Space Telescope. Due to the limited capacity of the Shuttle and the relatively high costs involved, this method of debris mitigation is used only rarely.

Deorbit is an efficient method for removing objects from space. This includes propulsive manoeuvrers to force an immediate destructive entry into the atmosphere and also reduction of the orbital lifetime under certain limit (*e.g.*, 25 years) by lowering the orbit using propulsive manoeuvrers or other methods, such as increasing the area vulnerable to atmospheric drag. A controlled deorbiting over deserted regions of the Pacific ocean is regularly performed by the Russian Space Agency (RSA) after their cargo craft of the Progress type fulfil a mission to the Mir orbital station. This method was used even during servicing of previous orbital stations of the former Soviet Union, starting with Salyut 6 in 1978. All Salyut orbital stations have been deorbited over the Pacific ocean with the exception of Salyut 2 and Salyut 7, which malfunctioned. Controlled reentry is also planned for the Mir station in 1999. NASDA does not have any experience with controlled reentry of spacecraft from high altitude, but the Tropical Rainfall Measuring Mission (TRMM) is supposed to re-enter into the ocean from a 380 km altitude to provide this kind of data.

An alternative to natural atmospheric re-entry and controlled disposal over the ocean is relocation to a disposal orbit. In low Earth orbit, this is not an advantageous strategy because it generally requires a two-burn manoeuvre that is more costly in terms of fuel than the single burn that is required for entry. During the 1980s and early 1990s, the former Soviet Union used near-circular orbits at 900 to 1000 kilometres altitude to dispose of 31 of their nuclear power sources. The NASA guidelines recommend manoeuvring to disposal orbit with perigee above 2500 kilometres and apogee altitude below 35,288 kilometres (500 kilometres below geostationary altitude).

There is an ever-increasing number of satellites in geostationary orbit. Since atmospheric friction is no longer a factor at this altitude, objects abandoned in this orbit do not move out of this region, thus presenting a hazard to other satellites, both in the possibility of collision with operational satellites and also that of an accidental explosion which would result in the creation of an extremely large number of fragments. The use of disposal orbits is presently the only technically feasible strategy for clearing the GSO region. However, it requires planning and reserving the necessary propellant resources to effect the manoeuvre. Preliminary studies indicate that the orbit needs to be raised on the order of 300 km to serve the intended purpose, not the 40 to 70 km that has been used by some operators. To re-boost for 300 km is comparable to three months of station-keeping.

Several strategies, including shielding of the critical components of a spacecraft, can be adopted for protecting the spacecraft from the consequences of orbital debris impacts. However, the only efficient way to avoid collisions of the spacecraft with orbital debris greater than 1 cm in

size is the manoeuver of changing the spacecraft's orbit - so called collision avoidance manoeuver. To achieve this, the spacecraft must be manoeuvrable and predicted future positions of the spacecraft and space debris must be known with sufficient accuracy. The accuracy requirements of predictions depend on the spacecraft and its manoeuverability. Predictions must be sufficiently accurate to avoid false alarms and to provide high confidence of predicted collisions.

Space debris pose a significant danger for such missions as the International Space Station (ISS), the Hubble Space Telescope and other large satellites.[37] The Space Station's large cross section and the anticipated length of its mission magnify significantly the danger of a catastrophic failure. Because of limitations on the mass, ISS is only shielded to withstand impacts of debris smaller than 1 cm in diameter. To provide an accurate warning of possible collisions, it is essential to maintain a catalogue of debris orbital elements sets and to calculate precise predicted positions of a large number of objects. The Naval Space Surveillance Center plans to maintain a catalog of 25,000 objects larger than 1 cm in support of ISS. Since station's manoeuverability will be limited to a few manoeuvres per year and at a distance of a few hundred metres, the accuracy of the predicted positions must be very high.

For United States manned Shuttle missions, mission rule A4.1.3.-6 addresses on-orbit debris avoidance.[38] The United States Space Command Space Control Centre (SCC) runs a computer program evaluating the next 36 hours of the Shuttle flight to determine possible trackable space objects conjunctions within a radius of 100 km around the orbiter. If an object is identified as predicted to pass within the warning box near the orbiter (25 km along the orbit and 5 km both radial and out of the orbital plane), the Space Surveillance Network is requested to make additional observations and use them to compute a more accurate orbit of that object. When improved prediction confirms the conjunction within the avoidance manoeuvre box (5 km along the orbit and 2 km both radial and out of orbital plane), assessment is made as to whether to execute the manoeuvre or not. If a manoeuvre is executed, it is nominally 0.3 metres per second at an expenditure of 12 to 20 kilograms of propellant. Since 1986, on the eight occasions when the avoidance box was entered, three avoidance manoeuvrers were executed. On the other occasions, mission objectives precluded the opportunity to manoeuvre, or the tracking trend indicated it was not necessary.

When NASA crew were stationed aboard the Mir orbital station for long duration missions, a procedure was developed to provide advisories to the Russian Mission Control Centre (TsUP) in Korolov near Moscow, just as it is done for the Shuttle. Since the Mir station cannot manoeuvre, the only crew action feasible is to take refuge. On 15 September 1997, the Mir crew took up position in the Soyuz reentry module at the time of the forecast

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37 ORBITAL DEBRIS: A TECHNICAL ASSESSMENT, National Research Council, National Academy Press, Washington, D. C., 1995.

38 PROTECTING THE SPACE STATION FROM METEOROIDS AND ORBITAL DEBRIS, National Research Council, National Academy Press, Washington, D. C., 1997.

conjunction with the United States satellite MSTI 2 (1994-028A). The development of this procedure has given some insight as to the procedures that will be needed for the future ISS. It is estimated that 16 conjunctions a year will occur for ISS if the same criteria are used for it as for Shuttle.

5. The technical assessment

Despite the application of a number of debris preventative measures, the number and mass of anthropogenic objects in space are steadily increasing. Projections on the future of the debris population clearly show the need for the application of stronger debris control measures. Each breakup (collision, explosion) which generates debris in long-lived orbits increases the spatial density of debris and is a burden for the future. The objective of the debris control measures is to keep the spatial density of man-made objects within tolerable limits and ensure the safety of spaceflight. Failure to control the growth of the debris population could render some orbital regions useless for space operations. Unfortunately, as can be seen from the above discussion, the space debris issue is highly technical and complex in nature which will require very specific controls. In addition, compulsory space debris mitigation measures would generally introduce some cost increases into mission planning and thus adds to the delicacy of the agreement to be reached on such measures.

Even though the preparation of the technical report on space debris is progressing well and the Scientific and Technical Subcommittee should adopt it at its February 1999 session, there might be a further delays before its introduction as background information for the Legal Subcommittee to officially begin its deliberations on internationally binding space debris mitigation measures. In the meantime, the major space agencies evidently prefer coordination of individual voluntary measures and agreement at the technical level to introducing legally binding rules of conduct.

In 1993, an Inter-Agency Space Debris Coordination Committee (IADC) was formally founded in order to exchange information on space debris research activities between member space agencies; to review progress of ongoing cooperative activities; to facilitate opportunities for cooperation in space debris research; and to identify debris mitigation options. The founding members were ESA, Japan, NASA and the Russian Space Agency (RSA). China joined in 1995, the British National Space Centre (United Kingdom), CNES (France), the Indian Space Research Organization (ISRO) in 1996, and the German Aerospace Research Establishment (DLR) in 1997. Recently, the Italian Space Agency (ASI) applied for membership. All agreements of IADC are made by consensus and these voluntary mitigation measures has proven effective in both low and geostationary orbits.

The IADC is very active in the preparation of the technical report on space debris and in presenting results of its deliberations to the Scientific and Technical Subcommittee of COPUOS. However, only if and when the IADC member space agencies mutually agree on technically founded, economically viable and efficient mitigation measures, could the item on space debris be easily introduced to the agenda of the Legal Subcommittee.

The question of space debris is in fact only a part of a more general problem of protection and preservation of the outer space environment and therefore universal compliance with the full range of mitigation measures will be needed in order to avoid its uncontrolled pollution. Global management of human activities in a near-Earth space seems to be one of the major challenges the future United Nations is facing.

III. Future Regulation And Control Of Space Debris

As the analysis in Section II demonstrates, the Scientific and Technical community has come together in sharing information about the status of space debris, methods for tracking space debris, methods for mitigating debris and methods for preventing further debris. This community of scientists and organizations from various nations has indicated that space debris is a serious issue that needs to be immediately addressed, and requires constant monitoring and updating of technology developments to prevent disasters. Some of the proposals advocated for mitigation include:

1. Prevention of explosions,
2. Minimizing of mission-related debris,
3. Minimizing the unintentional release of surface materials, such as paint,
4. Avoiding intentional breakups, in particular those producing debris with long lifetimes,
5. Re-orbiting of spacecraft and rocket bodies in Low Earth Orbit after their functional lifetime and achieving an international consensus on the magnitude of such maneuvers,
6. Until a verifiably superior strategy is produced, reorbiting spacecraft and rocket bodies in the geostationary orbits at least 300 km beyond that orbit,
7. A proposal for the reduction of debris on a multilateral basis in order not to penalize those engaging in mitigation measures.[39]

Related to this development of international scientific cooperation with regard to space debris has been the creation of the Inter-Agency Debris Committee. Members of the IADC have been working together with COPUOS' Scientific and Technical Subcommittee to provide information on the status of their technology for tracking or identifying debris and mitigation measures. In the period 1996-1998, the activities of IADC included:

1. A joint debris database,
2. The discovery of significant new debris sources in the heavily used near Earth orbit region of 700 km to 1100 km altitude which could be attributable to RORSAT's (Radar Ocean Reconnaissance Satellites),
3. Improvement of meteorid and debris models,

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39 For a discussion of these proposals *see* IISL-ESL Symposium on Space Debris: Issues of Policy and Law, L. Perek, *Space Debris: Discussions in the Scientific and Technical Subcommittee in February 1996,* 39 PROC. COLLOQ. L. OUTER SPACE, 302 (Oct. 1996, AIAA).

4. Debris mitigation in GEO transfer orbits,
5. Optical observations and global inventory of the geostationary ring,
6. Debris management practices in the geostationary ring.[40]

In its report presented to the UNCOPUOS Scientific and Technical Subcommittee in February 1998, the IADC concluded that mitigation of the earth space debris population is essential to keep the hazards from space operations within tolerable limits. It noted that space debris mitigation guidelines have been or are being developed by the United States, Japan, ESA, France, the Russian Federation and voluntary adoption of these measures has proven effective in both the low and geostationary orbits. However, IADC points out that wider compliance with the full range of mitigation measures will be needed in order to avoid an uncontrolled growth of the debris population and therefore it promotes continued research into space debris mitigation options.[41]

The significance of these activities within the scientific and technical arena is to demonstrate that Members States are already working together to understand and combat the space debris problem. The missing factor is that nothing done thus far has any significant legal effect on nations as a whole. The problems associated with space debris are a threat to Earth as a whole and have the potential to effect the interests of every nation. This condition is heightened by the growing interdependence of States in the modern global community. While a number of organizations, such as NASA, NASDA, ESA, and the IADC, have taken measures to assure adherence to standards and practices aimed at combating the effects of space debris,[42] such action will soon be insufficient to adequately deal with the increase in debris producing activities with the multitudes of new States and private actors in outer space. It is therefore in the interests of the entire global community of States to establish international legal mechanisms to regulate and control activities contributing to the proliferation of space debris and mitigate the universally adverse effects that such debris might cause.

It is also apparent from the discussion in Section I of this article that current space law, while able to provide some guidance concerning the way

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40 *See* IISL-ESL Symposium, G. Lafferranderie, *ESA Activities: Status and Organization of the Inter-Agency Space Debris Coordination Committee*, 39 PROC. COLLOQ. L. OUTER SPACE 312 (Oct. 1997, AIAA).

41 *See*, IADC Presentation to the 35th Session of the COPUOS Scientific and Technical Subcommittee February 1998, *Orbital Debris Mitigation Practices and Policies*, UN Doc. A/AC.105.697 (Feb. 25, 1998).

42 *See* NASA Safety Standard (NSS) 170.14, *Guidelines and Assessment Procedures for Limiting Orbital Debris* (1995), the NASDA-STD-18 *Space Debris Mitigation Standard* (1996), the *ESA Space Debris Mitigation Handbook* (to be published soon), and the IADC *Joint Debris Database*, and *Debris Mitigation in the Geo Transfer Orbits*, *see supra* discussions under subtitle "Space Debris Mitigation Measures" and *see also* IADC Presentation to the 35th Session of the COPUOS Scientific and Technical Subcommittee February 1998, *Orbital Debris Mitigation Practices and Policies*, UN Doc. A/AC.105.697 (Feb. 25, 1998).

in which issues relating to space debris might be dealt with legally through the extension of existing provisions, is simply inadequate to deal with the technical complex concepts and specific requirements that regulating space debris will necessitate. At the very least, the vagueness and legal gaps that are so evident in the current treaties will have to be remedied. Far better would be the establishment of a comprehensive set of legal rules, principles, standards, procedures and mechanisms aimed at a holistic approach to space debris.

Since its establishment some forty years ago, the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) has been the focal point for the establishment and international law pertaining to outer space. Thus it would make sense for this Committee, through its Legal Subcommittee, to take the lead in the case of space debris as well, and thereby convey to the resulting legal mechanisms the international credibility and legitimacy associated with its consensus procedure.

However, the traditional approach of the Legal Subcommittee and Committee to the development of space law does not lend itself to a rapid formulation of the comprehensive set of legal rules and mechanisms suggested above. Action by consensus in a body of 61 Member States is by its nature a protracted and laborious process. Member States have exhibited a great deal of reluctance to modify the terms of existing treaties because of the implications such modifications might have on those currently bound to these same treaties. On the other hand, new treaties setting out rules and principles that would have the consensus of all Members could take many years to be negotiated and brought into force. This is especially true given the cost implications that such rules might have for space-faring States and the delicacy of negotiations that the same would necessitate.

Furthermore it is quite conceivable that these technical solutions required for space debris could not be dealt with effectively in only one convention or treaty.[43] As this article demonstrates, space debris and outer space issues continue to develop and require a flexible approach to dealing with them on a frequent basis as technological advancements for detection and mitigation improve, and changes in the Earth's environment evolve. Also, because these issues are of a technical nature, it is more appropriate for an expert technical group to coordinate information and develop recommended standards of practice or procedure for these environmental and space debris issues, rather than a legal body which may lack the necessary technical expertise or current scientific data to develop adequate standards.

It is submitted therefore that some kind of regulatory regime be established, which would be able to effectively deal with these technical problems and establish international legal rules, standards and procedures on a continuing basis. As demonstrated, space-faring nations and non-space faring nations have varying interests which require protection.

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43 *See* Nandasiri Jasentuliyana, *Environmental Impact of Space Activities: An International Law Perspective*, 27 PROC. COLLOQ. L. OUTER SPACE 395 (AIAA 1985).

However, the scientific studies and dissemination of information benefits all and this sharing of information and technology will enable international legal standards and mutually beneficial rules and procedures to be adopted by such a regulatory body or regime. This type of international standard setting or "legislation" has been around since the nineteenth century.[44] It exists in areas such as aviation, health, food, meteorology, telecommunications, and marine and wildlife conservation.

Such "legislation" allows for flexibility and adaptability, yet is still able to provide for the establishment of international norms of conduct and procedure. Often "legislation" of this type falls into three categories: strictly mandatory, non-mandatory, and potentially mandatory.[45] It is submitted that because of the peculiarities of space programs, this international standard setting would best be suited by a voluntary system of adjustable standards with a well-defined legal status.[46]

The question then becomes one of how such a regulatory regime or body might be established. It is here that COPUOS and its Subcommittees might play a much more effective role. The most efficient way to give effect to this type of regulatory regime will be for COPUOS and its Legal Subcommittee to draft a Convention to serve as enabling legislation for such standard-setting.[47] Attention within these bodies could be focused away from the development of actual terms and provisions of prospective agreements and rules relating to specific issues of space debris, and rather concentrate on the establishment of an appropriate regulatory body of experts from Member States, which itself would be responsible for such tasks.

This does not necessarily mean that COPUOS would then become distanced from the work of this regulatory body. It would not be very difficult to establish mechanisms whereby such a body was made accountable to COPUOS and might receive guidance from the latter. In addition, the enabling Convention itself could provide legal norms as are considered necessary to ensure minimization of the harmful effects of space activities on the environment. Furthermore, the Scientific and Technical Subcommittee of COPOUS in conjunction with many space agencies, have already been working for three years on assessing the status of space debris, reviewing models concerning space debris and establishing new methods for preventing space debris, as set forth above. This would need to continue with the expert body setting standards or practice based upon the results of such work.

The mechanisms appearing in the enabling Convention that would determine how such an expert regulatory body might operate would obviously have to be negotiated and ultimately determined in COPUOS.

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44 *Id.* at 396.

45 *Id.*

46 Much like that between NASA, NASDA, ESA, RKA, CNSA, CNES, DRA and ISRO involving the tracking/information transfer relating to space debris and methods for mitigating the effects in further launches.

47 *Id.* at 397.

However some suggestions aimed at maximizing the effectiveness and flexibility of this group would be:

1. That the expert group could perhaps have procedures for adopting international standards perhaps based on a two-thirds majority vote, similar to that of ICAO or IMO. Although consensus is preferable in treaty making agendas, it is not effective in regulatory practices such as setting up standards, where the same will need to be updated on a continuous basis.[48]

2. That these uniform standards would bind all nations except those who opt out of them by filing alternative standards within 60-90 days. This burden of notification may operate in favor of following the international standards set as it may be easier to conform to these standards then create a set of new ones, especially if there is a two-thirds vote to follow them.[49]

3. Absolute liability should be applied to some activities that nations opt out of, as potentially mandatory practices. Then there may be the area of standards that are desirable in minimizing the impact on the outer space environment, but that are not as critical to follow a type of recommended practice. To ensure compliance with these standards states could be required to submit reports detailing actions taken for following these standards or reasons for failing to follow them. Such reports could be subject to inspection by the international group.[50]

As has been previously mentioned, COPUOS was the entity that created the existing five treaties, and five sets of legal Principles, which form the core of space law, and COPUOS is clearly the most appropriate entity to oversee the creation of this regulatory body. This idea has been proposed by various States and also at the ILA Conference in Buenos Aires. The ILA Conference in Buenos Aires produced an extensive proposal[51] for such a regulatory regime, dealing with space debris issues in legal terms based on scientific proposals with suggestions touching on issues relating to the operation of such a body as diverse as negotiations, arbitration, notification and withdrawal. This proposal by the ILA is only one example of what might be developed through COPUOS and an international regulatory body of experts as discussed above.

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48 *Id.* at 396.

49 *Id.*

50 *Id.* at 397.

51 Prof. Dr. Karl-Heinz Böckstiegel, *The Draft of the International Law Association for a Convention on Space Debris,* 38 PROC. COLLOQ. L. OUTER SPACE 73-77 (Oct. 1996, AIAA).

LEGAL STATUS, RIGHTS AND OBLIGATIONS OF THE CREW IN SPACE

*Gabriella Catalano Sgrosso**

1. Introduction

Approximately forty years after the beginning of the space era, the number of astronauts employed in space missions, many of which are by now being carried out in co-operation with other countries and international organisations, has increased systematically. The Soviets Youri Gagarin and Guerman Titov were the first and the second men to be launched into outer space in 1961, the Americans Armstrong and Aldrin were the first to land on the Moon on July 20, 1969, and, in July 1975, the first space adventure carried out by astronauts of a different nationality took place with the Russian-American "Soyuz-Apollo" flight. The Eighties saw the beginning of the missions of the Spacelab, an orbiting research space laboratory developed under the patronage of the European Space Agency (ESA) but carried into orbit by the American Shuttle, both being reusable. The Spacelab consists of a laboratory module hosting from three to four people for short periods.[1]

The first type of permanently manned Space Station was the Soviet station MIR, which, initially, was to be permanently manned by two soviet astronauts and, subsequently, was also occupied by astronauts of different nationalities.

The International Space Station "Alpha" is, however, the most ambitious international scientific co-operation program to be undertaken. It groups together five space agencies: the United States (NASA), Russia (RKA), Canada (CSA), Japan (NASDA) and the European Space Agency (ESA) which represents Europe in this project.[2] In 1984, NASA set up the International Space Station and suggested that the European partners of ESA, Belgium and Canada participate in the construction and use of this infrastructure. Four years later on September 29, 1988, in Washington, the United States, Belgium, Denmark, France, Germany, Italy, the Netherlands,

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* Professor of International Law at Rome University *"La Sapienza"*, Italy; Member of IISL Board of Directors.

1 The Spacelab has been described to consist of a laboratory module, a pressurized experiment with laboratory fixtures and a pallet segment which may be used as a platform for large instruments, such as a telescope and antenna. A pressurized tunnel connects the laboratory module to the Orbiter cabin where the payload specialists can stay when not at work. *See generally* STEPHEN GOROVE, THE SPACE SHUTTLE AND THE LAW (1980).

2 Belgium, Denmark, France, Germany, Italy, Netherlands, Norway, Spain, United Kingdom, Sweden, Switzerland took part in the program of the *European Space Agency*. - *See* Catalano Sgrosso, *La responsabilità degli stati per le attività svolte nello spazio extra-atmosferico* 95 (Padova 1990). For the European co-operative program "Columbus" and all the latest articles, see FARAND, *Space Station Co-operation: Legal Arrangement*, in OUTLOOK ON SPACE LAW OVER THE NEXT 30 YEARS 125 (Lafferranderie-Crowther eds.1997).

Norway, Sweden, Spain, Switzerland, Japan and Canada signed the Intergovernmental Agreement (IGA). In 1993, upon invitation of the western partners who wished to broaden the international dimension of the Station, Russia became a member of the Station. The project therefore became the most important international co-operation program in the scientific and technological field.

Two of the modules will be supplied by NASA: a living module and a laboratory module, as well as a "Crew Return Vehicle System" (CRV) in order to provide for an emergency return from the Station; Japan will also supply a laboratory module; Europe will provide a multi-functional manned research laboratory called "Columbus Orbital Facility" (COF), an "Automated Transfer Vehicle" (ATV) and a "Crew Transport Vehicle" (CTV); Canada will contribute a major tele-manipulator in the shape of a moving arm; Russia will offer its long experience in manned flights and its permanent MIR station. All the Partners may use their own systems of space transportation for the assemblage of the Station, the transport of the crew and the missions for the supply of the Station.[3] According to the program, beginning with the year 2003, six or seven persons will live and work on board the Station since human sojourn in outer space has increased, from an initial period of a few weeks to a few months. The subsequent steps will be the missions towards Mars and the construction of a lunar base.

From this brief *"excursus"* on the evolution of manned missions in outer space, the figure of the astronaut becomes increasingly evident. The astronaut must be a pilot, an engineer, a scientist capable of carrying out a scientific experiment and of knowing not only his vehicle and his work, but also the work of his neighbors in the event of a replacement. The recruiting must be especially strict and respondent to the qualifications established by the Partners.

While in air law a specific discipline exists for the personnel on board, in space law a similar discipline is still in the early stages. Air law has classified two different kinds of persons on board: the crew on one side and the passengers on the other; this division leads to a different legal consideration, and to a different protection and treatment. First of all, the crew members, according to art. 32 of the Chicago Convention must hold a licence which enables them to carry out the profession.[4] The whole legal position of the air crew, according to the activity carried out, is regulated by the discipline established by public, private, international and air law. Air law generally concerns the crew activities with reference to the air navigation operations regulated and disciplined by the rules established by aeronautical Organisations, and within each State by a specific code.

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3 NASA will use the Shuttle, Russia will use its launchers Proton, Soyuz and Zenit and crew transport vehicles, Japan intends to use its future launcher H-II and Europe intends to use its launcher Ariane 5 and the ATV vehicle. The first launch scheduled for November 1998 should place into orbit a reserve module (sub-systems, solar panels, *etc.)* made by the Russians but financed by the Americans.

4 Convention on Civil Aviation, Chicago, December 7, 1944 and Convention on Air Transportation, Warsaw, October 12, 1929. For the texts, see BALLARINO BUSTI, DIRITTO AERONAUTICO E SPAZIALE (Milan 1988).

Public law disciplines the conditions of personnel qualifications, the conditions of the practical execution of the flight, the technical safety characteristics and the services for assistance and ground control. Private law regulates the relationship of the crew deriving from an employment contract. International law, through the texts of the conventions, regulates the matter in order to achieve unequivocal rules for an improved regulation of the field. Within the crew itself it is also possible to make a further distinction between the "Commander", to whom the law attributes a particularly relevant *status*,[5] and the rest of the crew. In air law, passengers do not enjoy any specific rules, they are in fact considered by the discipline established for passengers of other transport systems and by the International Conventions on the responsibility of the carrier.[6]

In space law, despite the conclusion in 1968 of a specific "Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space", the norms are not exhaustive and homogenous. The preparation and conduct of manned international flights lead to a series of legal problems concerning personnel, which must be specifically faced by national and international legislation.

Nevertheless, this paper wishes to outline the **Legal Status of the Astronaut**, as it can be gained from the international rules included in multilateral agreements on outer space, in co-operation agreements made by the States for the realisation of common programmes, and in some specific national regulations.

Certainly, special attention will be given to the rules incorporated in the Intergovernmental Agreement (IGA) for the realisation of the International Space Station "Alpha" and in the relevant Memorandum of Understanding (MOU) in light of the versions revised in Washington on January 29, 1998.

The discussion of the legal status of astronauts, will start from their qualifications and will then consider some special rights, such as: the right to health, the right to safety, the right to privileged communications, the right to compensation for damages and the relevant duties, including: the duty to submit to civil and criminal jurisdiction, the duty to observe the rules established in the code of conduct, the duty of secrecy, the duty of protection of the discoveries made in outer space and, finally, the responsibility for any damage caused.

2. Qualification of the astronaut

2.a Definition of the term

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5 Venet, *Statut juridique et responsabilités du Commandant de bord*, REV. FRANÇ. DROIT AÉRIEN & SPATIAL 169 (1990); Pestel, *Le commandant de bord et la sureté*, *id.* at 5 (1997); Kane-Pyne, *The legal status and liability of the Copilot*, part I, in Annals AIR & SPACE L. 290 (1994), part II, *id*, at 1 (1995).

6 Kayser, *Aux confins de l'air et de l'espace, d'accursius à l'avion spatial*, ANNALS AIR & SPACE L. 479 (1994); Catalano Sgrosso, *Must the special typology of aerospace planes lead to the supplementation of the rules of the Outer Space Treaty?* 40 PROC. COLLOQ. L. OUTER SPACE 402 (Turin 1997).

The riskiness, the hazardousness, and the important value for mankind of space activities have contributed to the formulation of the definition of the astronauts as "**envoys of Mankind**" (art. V, 1967 Outer Space Treaty) in order not to deprive the subjects of their nationality and to allow them to acquire a supranational status. Experience shows that, even in international crews, the astronauts are representatives of their countries and that they cannot be subjected to legal obligations other than those expressed in the Outer Space Treaty and in other sources of space law.[7] The Astronaut does not benefit of a sort of diplomatic immunity, conferred by a higher authority, the contents of which are not clearly expressed. The qualification must not be overvalued and must be considered in connection with the second section of this article, where the protection of the life and health of the Astronaut is mentioned. The expression "envoys of Mankind" is to be considered in the context of the operations of assistance and rescue to which all the Sates are committed, both those taking part in the Outer Space Treaty and those who do not, in view of the fact that these subjects face greater hazards in the carrying out of their activities which are for the benefit of all Mankind, as expressed in art. I of the Treaty itself.[8]

The choice of the term was rather controversial in the beginning, passing from *cosmonaut*, a person navigating in the universe - preferred by the Russians - to *crew*, intended in a more general sense, and then to *astronaut*. The latter term was given many definitions, such as: a person navigating the stars; a person on board a space object who, due to this condition, enjoys legal protection for humanitarian reasons;[9] a person who has received a special professional training.[10] The treaties on outer space themselves use different expressions: "astronaut" (art. 5 of the Outer Space Treaty, and the title and introduction of the Rescue Agreement); "personnel" (art. VIII of the Outer Space Treaty, arts. 1 and 4 of the Agreement on rescue, and arts. 8, 9, 11, 12 of the Moon Agreement); "representatives" (art. XII of the Outer Space Treaty) and finally, rather vaguely "persons on board a space object or on the Moon" (art. III and IV of the Convention on Liability and art. 10 of the Moon Agreement). In actual fact, these terms have been used indifferently to designate all the persons on board or connected to the space object in space or on celestial bodies. In the same sense one must consider the term "personnel on board", used by NASA regulations to cover "the astronauts and other persons during the

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7 Vereshchetin, *Legal Status of international Space Crews*, 3 ANNALS AIR & SPACE L. 545 (1978).

8 Lafferranderie, *Pour une charte de l'Astronaute*, 12 ANNALS AIR & SPACE L. 263 (1987).

9 Hara, *Legal Status of Astronauts and other Personnel on the Moon*, 26 PROC. COLLOQ. L. OUTER SPACE 165 (Budapest 1983); Diederiks-Verschoor, *Quelques réflexions sur les aspects juridiques des mesures de sécurité relatives aux équipages des vols spatiaux*, ANNUAIRE DROIT MARITIME & AEROSPATIAL 382 (1993). On the legal status of astronauts, see Diederiks-Verschoor, Robinson, Gorbiel, Christol, 7 HASTINGS INT'L & COMP. L. REV. (No. 3, Spring 1984).

10 Kamenetskaya, *Cosmonaut ("Astronaut"): an Attempt of International Legal Definition*, in 31 PROC. COLLOQ. L. OUTER SPACE 177 (Bangalore 1988).

flight phase," including "any persons performing extravehicular activity associated with the mission."[11]

In conclusion, the term "astronaut", albeit appearing rather archaic and ready for substitution by the more generic term "person"[12] - intended in the previously expressed sense - seems to be more characteristic. However, it is necessary to distinguish the different categories of the astronauts, such as the Commander, various kinds of crew, scientists and researchers, passengers and visitors having different characteristics, obligations and responsibilities.

2.b Division of the personnel on board

Even though international law guarantees all persons carrying out the flight an equal status as an astronaut, national laws establish a more defined division specifying, in detail, the rights and obligations and the power of the Commander.

First of all, a distinction is to be made between **crew** and **passengers**. The latter do not enjoy a particular status because space law does not know of liability for damage to transported persons or objects, caused by activities of space transportation. Some cases have come up for consideration in jurisprudence of the United States,[13] but it cannot be stated that a regime of private law has been established in the matter. When the cases involving space transportation will be more frequent, especially after the advent of the aerospace plane and the opening to private operators of this sector's market for launching and transportation, a discipline with this sort of responsibility may be foreseen in the transportation contracts, based on the Warsaw Convention and its modifying protocols, and the eventual European Community regulations.[14]

By contrast, with respect to the **crew of a space vehicle**, there are considerable domestic and international laws.

In the Soviet Union the following titles for the crew members have been accepted: Commander of the flight, flight engineer, and researcher-cosmonaut. The international crew flying in an international program made up of foreign citizens is considered in the category of researcher-cosmonaut.[15]

American legislation[16] provides for a subdivision of the personnel on board. This is reflected in the agreements stipulated with other

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11 14 C.F.R. Ch. V, sec. 1214.701(f) (1990) quoted in STEPHEN GOROVE, DEVELOPMENTS IN SPACE LAW 11 (Dordrecht, Boston, London, 1991).

12 Cheng, *"Space Object", "Astronauts" and related Expressions*, in 34 PROC. COLLOQ L. OUTER SPACE 17 (Montreal 1991).

13 For the cases, see Kayser, *op. cit.. supra* note 6, at 478, note 35.

14 Catalano Sgrosso, *op. cit., supra* note 6, at 407.

15 Vereshchetin, *Legal status of international space crews, supra* note 7, at 552.

16 The President's Executive Order of 1977 constitutes the NASA Space Shuttle Astronaut's Program, with the nomination of pilots and mission specialists; see also the Agreement between NASA and DOD on the selection and training of astronauts, the US Code of Federal Regulations (title 14- Chapter V- NASA- part 12/4) on the regulations for the personnel on board the Shuttle, the personal

countries for the development of shared programmes. The **Commander** is a professional NASA astronaut. He holds absolute authority to take any action he might consider necessary in order to maintain discipline and safety on board. His authority extends to all persons on board, both of American or other nationality, even if only passing by. It also extends to the astronauts carrying out activities outside the vehicle. The **pilot**, who is also a professional astronaut, is employed in the flight operations and he can, in case of need, replace the Commander. The **mission specialist** is in the shuttle systems connected to the payload. He takes part in the planning of the mission and is responsible for global co-ordination of the shuttle and the payloads. The **payload specialist** is not part of the flight crew, he is often a researcher conducting an experiment in close contact with the research centre on Earth to whose command he is subjected.[17]

The joint Apollo-Soyouz flight of July 17, 1975, required the development of some special rules.[18]

At the beginning of the Seventies the co-operation between the US Government and Europe began, for the realisation of the transportation of the European **Spacelab** by the American shuttle. The **Shuttle** is a space vehicle with both the characteristics of a space vehicle, because it takes off like a missile and operates in a certain orbit, and of an airplane because it lands like a conventional plane. The Shuttle is capable of transporting the Spacelab, a manned pressurized laboratory in outer space for the conduct of scientific experiments. In the laboratory module three astronauts, at times four, may live for a short amount of time; a pressurized tunnel connects the laboratory module to the Orbiter, a cabin where the payload specialists can stay when they are not at work.[19] An Intergovernmental Agreement (IGA) and an ESA/NASA Memorandum dated 1973[20] regulated the relations between the US Government and Europe. The only stipulation concerning astronauts is included in art. 7 of the Spacelab IGA which reads:

"The Government of the United States of America will provide Spacelab flight crew opportunity to nationals of the European partners in connection with their space missions involving a Spacelab ... a European crew member will be included in the flight crew of the first Spacelab flight." The first flight of the European astronaut, German Ulf Merbold, took place in 1983.

The Spacelab was considered as an integral part of the USA Shuttle, and it was therefore not possible to obtain a separate registration for the

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preference kit, the commander's authority, the chain of command, and on the penalties for the non-observance of these regulations.

17 Lafferranderie, *Pour une charte de l'astronaute, supra* note 8, at 471.

18 EZELL AND NEUMAN EZELL, The Partnership - A History of the Apollo-Soyouz Test Project (NASA History Series, NASA SP 4209, 1978).

19 STEPHEN GOROVE, SPACE SHUTTLE AND THE LAW (Univ. of Mississippi Law Center 1980, Ser. No. 3); Sloup, *The NASA Space Shuttle and Other Aerospace Vehicle: A Primer For Lawyer On Legal Characterisation,* 8 CAL. W. L. REV. (No. 3, Summer 1978).

20 For the text of the 1973 Spacelab Agreement, see J. SPACE L. 53-64 (1974).

shuttle. Consequently, the German astronaut was subject to the American legislation.

A different policy was adopted by the Partner States with reference to the participation of their astronauts in the **International Space Station.** In reply to the invitation of President Reagan to take part in the ISS project, ESA established that "the Agency shall be responsible for tasks relating to the astronauts (selection, training and development of equipment).[21] This led to the production of an Astronaut's Handbook specifying the criteria for the selection, training and qualification of the astronauts who were subject to a "code of conduct" which was an integral part of the contract with the Agency. The Astronauts were subject to the authority of the "flight commander" of the manned Station. All these provisions were stressed in the ESA Resolution on European Astronaut Policy of June 28, 1989, which definitely created for the European astronauts a designation "ESA Staff members." The ESA Astronauts Centre (EAC) is in Germany, near Cologne, and the relations between ESA and Germany are regulated by the Agreement signed on May 10, 1990.[22]

The arrival on December 17, 1993, of Russia in the Space Station renamed "Alpha", instead of its first name "Freedom" led to a revision of the first Intergovernmental Agreement on September 29, 1988. The work ended with the stipulation of an Intergovernmental Agreement among all the member Partners on January 29, 1988, and of the relevant **MOUs** between the American Agency and the related agencies of the Partner States which include more detailed regulations for the functioning of the Station. The resolution, adopted on March 25, 1988, by ESA stressed the creation of a Unique European Body of astronauts according to which by June 30, 2000, at the latest, the member States of the ESA must dismantle their national programmes concerning Astronauts.[23]

From 1998 to the year 2002, 16 national and ESA mission opportunities, including the COF launch, are planned. It is anticipated that the European body of astronauts by the year 2000 will be made up of 16 members, though the number might vary:

4 from France (including Clarevoy, who flew in the Atlas 3 programme in 1994 and in the 6th Shuttle/MIR in 1997),

4 from Germany (including Reiter, who flew in the EUROMIR-95),

4 from Italy (including Guidoni, who flew in the Tethered in 1996, and Nespoli and Vettori),[24]

4 from the other member States (including the Spaniard Duque, assigned to the STS-92 in October 1998; the Swede Fuglesand, reserve crew member for the EUROMIR-95; the Swiss Nicollier who flew in the EURECA 1992, in the HST in 1993, in the STS-75 in 1996).

At present two astronauts per country have been selected and they will alternate every three months in orbit.

In January 1999, an international crew made up of three astronauts will begin living on board the ISS. The crew, which began its training for

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21 The Columbus Declaration, drawn up on 15 December 1987.

22 Lafferranderie, *The European Space Agency and the Astronaut's Policy*, in *Proc. 1988 IISL/ECSL Symposium*, Doc. A/AC.105/C.2/1998/Crp. 4 (24 March 1998).

23 ESA/C/CXXXIV/Res. 2 (Final).

24 P.A. Nespoli, space engineer; obtained two degrees from the New York State Politechnic and R. Vettori, served as a test pilot of the Italian Military Navy.

the mission in 1996, includes the Station Commander Bill Shepherd, a USA astronaut, the Soyuz Commander Yuri Gidzenko, a Russian cosmonaut, and the flight engineer Sergei Krilaev, who is also Russian. This first crew will remain on board the International Space Station for five months. When they arrive, the ISS will be made up of three modules: the Russian Service Module, to be used as living quarters and control centre on board; the Functional Cargo Block, a module providing supplementary energy with propulsion functions, financed by the USA and built by Russia; and the Node 1, built by the USA, a connection module providing the attachment points for the future segments. The first crew will be replaced by a new one made up of three persons, who will be launched with the shuttle on flight 6A. The first crew will continue to orbit while connected to the station in the Soyuz, which will be replaced after six months in order to provide, if necessary, for an emergency return of the crew to Earth.

A new approach in 1998 was characterized by the creation of many bodies: the "Multilateral Crew Operations Panel", a body for multilateral medical policies, and a body for human research.

The basic principles concerning jurisdiction and control remain unchanged. Art. 11 of the 1998 IGA states that "Each Partner has the right to provide qualified personnel to serve on an equitable basis as Space Station crew members." The selections will take place in accordance with procedures provided in the MOUs and implementing agreements.

The second paragraph of the same article states that the code of conduct is to be developed and approved by each Partner who must ensure that its crew members observe the Code of Conduct.

Art. 11 of the Memorandum between ESA and NASA, dedicated to the Space Station crew, establishes the rules for the recruitment of personnel and for the utilization of the latter during the development of the programme. The rules, which may have been influenced by the arrival of Russia, are based on the principle of genuine partnership. The body of astronauts will operate as one integrated team, with one Commander who will be responsible for the mission programme implementation and for safety assurance aboard the Space Station.

Once completed, the Station will have a crew made up of seven members; the RKA has ensured three flight opportunities for its crew, while the remaining four are for the other agencies. The European partner will send out its own astronaut in the year 2003. The MOU provides for the creation of a Multilateral Co-ordination Board (MCB) which will ensure the co-ordination of the activities of the Agencies related to the operation and utilisation of the Space Station, and also of a Multilateral Crew Operations Panel (MCOP), which will be the primary forum for the top-level co-ordination and resolution of Space Station crew matters which affect all partners, including the processes, standards and criteria of selection, certification, assignment and training of Space Station crew.[25] NASA, ESA and the other partners will establish a Multilateral Medical

25 Art. 11.3 of the MOU between NASA and ESA concerning cooperation on the Civil International Station, January 29, 1998.

Policy Board (MMPB) to provide co-ordination and oversight of crew health issues.[26]

According to art. 11 of the IGA and art 11.8 of the Memoranda stipulated by NASA and the relevant co-operating Agencies, the parties are developing the **ISS Crew Code of Conduct** which must be approved and signed by the astronaut and the co-operating Agency. The code is to be applied to each crew member, that is to say to each person having received the approval for flight in the ISS, including the visiting crew, from the moment of assignment until the end of the mission, including all the related post-flight activities. The code of conduct sets forth the minimum standards of applicable conduct, but these may be subject to further requirements from the national Agency or from governmental bodies.

A first group of regulations, included in the "General Standards", forbids the crew members to use undue preferential treatment in favour of anybody or to abuse their position in order to gain financial benefits for themselves or for other persons. Crew members may, in accordance with the Earth to Orbit Vehicle (ETOV), take small personal objects on board as mementos. Crew members are subject to all regulations established for the Station programme, to the operational procedures and, generally speaking, to the management policies, including those concerning health and safety. They are also subject to all the disciplinary rules developed and maintained by the MCOP. There are also rules concerning the secrecy of information concerning health, safety and research.

Special attention is placed on the protection of the human research subjects, which must be approved by the Human Research Multilateral Review Board (HRMRB) and to which the subjects must formally consent in writing. The research must not endanger the life and the safety of the subjects. The consent or the authorization may be revoked at any time by the person, the HRMRB and the Station Commander.

Section VII of the Code deals in detail with the authority of the Station **Commander**. This authority is extended to all elements of the Station in orbit, including those which might be added during its development; to all personnel on board and in orbit close to the Station's elements; to the payloads, the equipment, the data, the personal effects and to all activities taking place on board. During the joint ISS/ETOV operations, the Station Commander must cooperate for the success of the operations with the Commander of the ETOV.

In agreement with the decisional authority of the Lead Flight Director, the Station Commander may carry out any necessary action for the enforcement of order and discipline; for the health and safety of all personnel, including the necessary actions for crew rescue and return; for reinforcement of the safety of operations and data utilisation and, finally, for the protection of the elements of the Station.

In order to achieve these ends, the Commander may use any reasonable means, including physical force, and he may subject any person on board to personal restrictions if necessary for the safety of the elements of the Station or the personnel. Issues concerning the use of such authority are to be referred to the Lead Flight Director.

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26 Farand, *The Astronaut in the Space Station Era*, in OUTLOOK ON SPACE LAW OVER THE NEXT 30 YEARS 147 (Lafferranderie-Crowther eds., The Hague, London, Boston 1997).

A chain of command is established, in which the Commander is the highest authority among all crew members. Matters excluded from the authority of the Commander are to be submitted to the authority of the Lead Flight Director.

Should the Commander no longer be capable of performing his duties, the decision concerning his relief from command, and the succession of the backup Commander, must be taken by the Lead Flight Director and discussed with the Mission Management Team.

The dispositions of the Code of Conduct must be an integral part of the contractual dispositions of each astronaut, with reference both to the contract binding the astronaut, the (inter)governmental Agency the astronaut belongs to, and to the access contract which is to be concluded by the employing organisation and the (inter)governmental agency ensuring the transportation from ground to the Station.

Therefore, a certain number of rights and duties of the astronaut arise which will be shortly examined. They derive from general international law, especially humanitarian law, from international space law, from the agreements stipulated for the implementation of joint ventures with various States, from the code of conduct and, finally, from the specific internal regulations.

3. Rights of the Astronaut

3.a Right to health

Mention must be made of the **right to health** of the astronaut, deriving, first of all, from international humanitarian law. In 1970 the World Health Organisation stated the principle that human health must be recognised as an essential primary benefit and that "health is a condition of complete physical, mental and social well-being and that it does not only consist in the lack of illness." The States solemnly undertook the promise to protect and promote this value in national laws, in order to ensure individual and collective welfare.[27] The right is recognised in the Universal Declaration of the Rights of Mankind (art. 25), the 1966 UN Pacts on Human Rights, the 1979 UN Convention on the Elimination of all Forms of Discrimination against Women (arts. 11 and 12) and in many conventions on labor law. The Pacts on political rights, adopted in New York by the General Assembly of the UN on December 16, 1966, establish in art. 6 that the right to live is inherent to the person, and in art. 7 that "nobody may be subject, without his consent, to a medical or scientific experiment." This concept was reintroduced in the above mentioned code of conduct, in section VI (Protection of Human Research Subjects), and also previously in national USA legislation (NASA Human Research, Policy and Procedures) and ESA regulations (Guidelines and General Procedures for the Conduct of Spacelab experiments using Humans as Test Subjects).[28]

The 1978 Alma Ata Declaration, signed by 134 countries, is very important, because it is the result of the International Conference on Primary Health Care.

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27 Text in *Annuaire des Nations Unies* 799 (New York, Département de l'information, 1984).

28 NASA NMI 7100-8-1987; ESA/SL-79-01 - 12 March 1979.

The Astronaut, being obliged - due to special conditions - to work in a restricted environment, in absence of gravity and subject to accelerations, has a special right to the protection of his/her health and has the right to consent to experiments on humans carried out in space. Protection must begin **before the launch**, with a selection, based on criteria established by the Parties who must consider the consequences of the environment on the physique and mind of the astronaut. In view of this, the Multilateral Crew Operations Panel (MCOP) receives the propositions for the crew candidates from the co-operating agencies, who have already carried out a first selection, verifying that they meet the established standards and criteria. MCOP then decides upon the assignation and preparation with a training programme. A European Astronaut Centre is to be set up near Cologne, in Germany, and the European astronauts will be trained partly in Houston and partly in the European Centre.

The protection of the astronaut's health continues on board and special precautions must be taken in order to obviate the consequences of the absence of gravity on a human. The human skeleton being the main, if not the only, anti-gravitational apparatus, the change from a gravitational acceleration of approximately 1g on Earth, to an acceleration of 0g would certainly cause some consequences. In fact, a loss of minerals, and especially of calcium, has been ascertained, with a negative balance for the skeleton and the somatic muscle structure. The only useful remedy was physical exercise (at least two hours a day) and an appropriate timing of the length of the stay in outer space.[29] The absence of gravity affects heart acceleration, nausea, the blood mass moving to the brain creating the "full Moon face" effect. Another danger for the astronaut's health comes from the potentially dangerous effects of daily cosmic radiation and of the occasional "rain-fall" protons. This effect, which could be irreversible in a female due to the fact that her genetic heritage is not renewable, is obviated by the application of effective protective screening on the outer surface of all space vehicles.[30]

The psychological health of the astronaut is also to be protected, because it could be seriously compromised due to the prolonged stay in restricted space, without any reference points and in promiscuity. Beyond the psychological tests that the astronauts must pass, great attention has been placed on this aspect. We have seen that the code of conduct allows the possibility to take small personal objects on board; however, they must not be later commercialised.

Despite there being no up and down, the walls of the laboratories and of the living modules will be covered in such a way as to create a vertical reference, such as the Earth, for the astronauts, by painting the ceilings in a lighter shade. Until the individual cabins appear in the

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29 XIII National Congress of Italian Association of Air and Space Medicine, 29 Nov. - 1 Dec. 1995, in *Giornale di medicina Militare* 595 (luglio-ottobre 1996); Ascenzi, *Le missioni spaziali nei loro riflessi scheletrici, ibidem,* at 474.

30 Valentina Tereskova, the first woman launched in outer space in June 1963, performed 48 orbits round the earth. The birth, in 1964, of her daughter Aljiona, a physically perfect and healthy child, demonstrated that flights in outer space do not influence fertility and the eventual pregnancy of a female astronaut. *See* Rotondo, *La donna e il volo nella storia dell'aviazione nella medicina aerospaziale, in Giornale della medicina militare,* 536 (luglio-ottobre 1996).

American living module, which will be assembled in the Space Station approximately in the year 2002, the astronauts may position their sleeping bags in any location in the Station.

Section V (Physical and Information Security Guidelines) of the ISS code of conduct forbids the disclosure of personal information on crew members, including medical, financial or other private information. Should information of this kind need to be transmitted to Earth it should be considered as classified information.

In order to co-ordinate and oversee the health of the crew in the international Space Station a Multilateral Medical Policy Board (MMPB) has been created, supported by a Multilateral Space Medical Operations Working Group (MMOWG) which will be the co-ordinating group for issues concerning the health of the crew.

Each country will be financially responsible for the expenses concerning training, instruction and equipment, and for all the necessary facilities for the safeguard of health.

In order to avoid mutual harmful contamination of environment on Earth, Moon and other celestial bodies, as established by the Outer Space Treaty (art. IX), the States are obliged to keep the persons and equipment used in quarantine.[31]

3.b Right to safety

Different rules of space law set forth special obligations to ensure safety and the safekeeping of the life and health of the astronauts who, as "envoys of Mankind" enjoy a special protection.

Many detailed rules regulate the issue of the **rescue and return** of the astronauts in the event of an accident, danger to life or emergency landing outside the territorial limits of the launching State. The obligations, already established in art. V of the Outer Space Treaty, have been restated and developed in the Agreement on the Rescue of Astronauts, the Return of Astronauts and Return of Objects Launched into Outer Space, dated April 22, 1968.[32] The aim of the Agreement is to render all possible assistance to astronauts in danger and to achieve their prompt and safe return.

The Outer Space Treaty establishes the return to "the State of registry of their space vehicle", while the Agreement on Rescue foresees the return to the "launching authority". Neither consider the State of citizenship, probably because it is often an international crew, and also because the launching State is more competent for the rescue and for taking all the necessary measures. However, a conflict of jurisdiction over the astronaut could arise should the astronaut be in a territory different from the launching State. The competent jurisdictions could be the one of the launching State, the territorial one of the landing State and the one of the

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31 Stern & Tennen, *Exobiology and the Outer Space Treaty: from Planetary Protection to the Search for Extraterrestrial Life, in* 40 PROC. COLLOQ. L. OUTER SPACE 141 (TURIN 1997).

32 In United Nations Treaties and Principles on Outer Space, United Nations, 1997 (UN Doc. A/AC.105/572/Rev. 2).

State of citizenship.[33] The subject will be discussed further ahead in the section concerning the duties of the Astronauts.

In order to carry out an immediate procedure for the rescue and return of the astronaut, it is necessary to place appropriate identification symbols on his/her space suit and documents.

The assistance foreseen by the Agreement is only for an emergency occurring in territory during landing, but not during the flight phase. Art. V of the Outer Space Treaty concerns the co-operation for any possible assistance to the astronauts in danger in outer space, stating "In carrying out activities in outer space and on celestial bodies, the astronauts of one State Party shall render all possible assistance to the astronauts of the other States Parties." Naturally, the assistance and rescue operations in outer space are extremely dangerous and technically difficult. Only wider principles have been established until now for the crew's safety. The awareness of the necessity to regulate the situation in general was stated in the proposal presented by the United Kingdom and Czechoslovakia to the Legal Subcommittee of COPUOS, suggesting the extension of international co-operation in the event of accidents or critical situations on board a manned space station.[34] Only in the programmes for international co-operation for the development of joint systems have technical emergency and rescue means been foreseen. For the Alpha Space Station, it has been foreseen that in the event of an emergency the crew members can return to Earth on board the "rescue dinghy", a Russian Soyuz capsule permanently moored nearby the Station. Starting from 2003, the future NASA Crew Rescue Vehicle (CRV) will remain moored at the Station and it will be able to return six astronauts at a time back to Earth in case of emergency. NASA and ESA are studying the joint realisation of a CRV.

The safety of the astronaut has also been considered in the Agreement governing the Activities of States on the Moon and Other Celestial Bodies of December 18 1979. Art. 12.3 sets forth that in the event of an emergency involving a threat to human life, States Parties may use the equipment, vehicles, installations, facilities or supplies of other States Parties on the Moon. The involved State Party and the Secretary General of the UN must be informed immediately. The practical fulfilling of the above mentioned provision may cause considerable controversies for the issue of protection of the national interests of the registering State. The procedure for the resolution of any controversies foreseen in art. 15, paras. 2 and 3 of the same Agreement might not be sufficient. A suggestion has been made for the creation of an international Committee of experts in international law, medicine and other areas of space research, under the auspices of the UN, which would serve as an advisory organ in the event of disputes involving the use of installations.[35]

The safety of Astronauts is also mentioned in the last paragraph of art. V of the Outer Space Treaty, where it is established that States Parties shall immediately inform the other States Parties to the Treaty or the

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33 Vereshchetin, *Legal status of International Space Crew*, *supra* note 7, at 555.

34 Working doc. A/AC-105/C-2/L 159 (27 March 1987); Working doc. A/AC-105/C-2/L 161 (1 April 1987).

35 Hara, *Legal Status of Astronauts and Other Personnel on the Moon*, in 26 PROC. COLLOQ.L. OUTER SPACE 166 (Budapest 1983).

Secretary-General of the United Nations of any **phenomena they discover in outer space**, including the Moon and other celestial bodies, which could constitute a danger to the life or health of astronauts. For example, there could be phenomena relevant to solar activity or the danger of an increase in radiation. Immediate information can lead the involved State to take necessary safety measures, including a postponement of the launch, the immediate return of the vehicle, and the prohibition to walk in space.

To complete the measures to be taken to ensure safety in space, the necessity of a legal protection of communications between space and Earth must be mentioned. Optimising communications between a space object and the control centre on Earth is already extremely important in normal conditions. The six crew members of the Station will carry out piloting and research functions on board the Station. They shall keep permanent telecommunication connection with the mission control centre in Houston, with the European Centre and with the various laboratories participating in the experiments, and they shall work interacting with the scientist on Earth. In emergency conditions the efficiency of communications is an extremely important factor. The assignment of special emergency frequencies is already established by the ITU Radio Regulations. The necessity to assign special protected frequencies for the communication between manned space objects and Earth is to be considered.

The security of the crew is a need which cannot be waived. Apart from a generic right to protection, which can be taken from the generic principles of space law, it is necessary to foresee more specific rules. Some suggestions were already made, back in 1987, to the Legal Sub-Committee of UNCOPUOS, on occasion of the definition of a new work theme. The United Kingdom suggested international co-operation in the event of an accident or critical situation on board a manned space Station, and Czechoslovakia suggested to place on the items of agenda of the Committee the legal status of the crew on board the space object and the matter of the rescue operations of the crew itself.[36]

Point 10.4 of art. 10 of the MOU on the ISS states that "NASA, ESA and the other partners will establish contingency procedures for on-orbit emergencies to protect the safety of the Space Station and its crew. NASA, ESA, and the other partners will also establish a process for consultations in the event of on-orbit emergencies for which contingency procedures do not exist". In the event of a particular emergency, "NASA will have the responsibility for making decisions necessary to protect the safety of the Space Station and its crew, following procedures agreed in advance for implementation of such decisions."

3.c Right to compensation for damage

The right to compensation for damage, which the astronaut may suffer on his/her person or properties while carrying out the mission from the launching to the landing, may be considered from different points of view.

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36 Doc. A/AC- 105/C-2/L 159 (March 27, 1987) and doc. A/AC- 105 /C-2/L 161 (February 1,1987).

The damage may be caused by an accident, elsewhere than on the surface of the Earth, caused by a space object of a **Third launching State** not participating in the mission. In this case, the regime of international liability established by the 1972 Convention on Liability[37] becomes effective. As it is known, the Convention establishes a double regime of liability: an objective absolute liability, that is to say without having to prove fault and also unlimited, if the damage is caused on the surface of the Earth or to aircraft in flight (art. II), and a liability for fault if the damage is caused elsewhere than on the surface of the Earth to a space object or to persons or property on board such a space object (art. III). The ambivalence of the regime of liability is justified by weighing the imposed risk against the accepted risk. The third launching State is only liable if the damage is due to its fault or the fault of the persons for whom it is responsible. The solution adopted is due to the attention the space powers placed on not generalising to all kinds of damage and thereby avoiding such a heavy system from a financial point of view.

To the liability for national space activities, according to art. VI of the Outer Space Treaty, one must add the liability for activities carried out by non-governmental entities, that is to say private parties, who shall require authorisation and continuing supervision by the appropriate State Party to the Treaty.[38] The liability, furthermore, may be joint if the launching State differs from the State from whose territory the object is launched (art. I.c), or if two or more States jointly launch a space object (art. V). Because the aim is to help the victim, the full compensation may be requested from any of the States jointly liable.

The astronaut and his/her State of nationality, to which according to the Convention he/she may turn for diplomatic action for the compensation request (art. VIII), may not enjoy the waiver of the burden of proof of the fault of the State whose space object caused the damage, except if the damage to the astronaut is caused on the surface of the Earth. In fact, if the damage has been caused, as is most probable, by another space object in air space or in outer space, the victims might find it difficult to prove fault or negligence. It has been suggested in doctrine that, as set forth in art. IV, when more States have caused damage to another State in outer space, the system of equal apportionment of the burden of compensation may be adopted between the two launching States: the perpetrator and the victim of the damage.[39]

Even if art. III exclusively mentions damage caused "on board" a space object, it would be preferable to adopt an extensive interpretation in order not to exclude damage eventually caused by a space object of another State to an astronaut outside his/her space object in outer space.

The Convention excludes liability for damage caused to **nationals of the launching State** or foreign nationals participating in the operation of that space object from the time of its launching to its descent

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37 Convention on International Liabiliy for damage Caused by Space Objects, March 29th 1972, in UNITED STATES TREATIES AND PRINCIPLES ON OUTER SPACE 14 (United Nations, New York 1997).

38 Catalano Sgrosso, *La responsabilità degli Stati per le attività svolte nello spazio extra-atmosferico*, see *supra* note 2, at 13-14.

39 DUPUY, LA RESPONSABILITÉ INTERNATIONALE DES ETATS POUR LES DOMMAGES D'ORIGINE TECHNOLOGIQUE ET INDUSTRIELLE 75 (Paris, 1976).

(art. VII). Therefore, if the astronaut having suffered the damage is a national of the launching State, he may not make use of the Convention, but he may use - for the compensation by his own State - internal remedies according to the modalities established by national law and by the employment contracts. If, instead, the astronaut is a national of one of the States participating in the operations, it is foreseeable that in the co-operation agreements with the national State or in the employment contracts, all the modalities for compensation have been established, and therefore the astronaut faces an "accepted" risk (art. V.2).

Particular situations might occur if the damage to the astronaut happens during a **joint launching**; the most probable hypothesis could be a space shuttle, belonging to the launching State, transporting a payload belonging to another State or to an international Organisation. If the damage is caused by the payload, even if the Convention excludes that the astronaut may place a claim against his/her State, it cannot be barred that compensation be requested from the State or the Organisation having requested the transportation. The latter may then recoup their losses from the State launching the shuttle. Naturally, exception is made for the eventual international agreements concluded between the Parties.

The compensation claim may also be forwarded to a State not participating in the launch but which might still be involved, such as the State which built the space object which caused the damage to the astronaut. In this case, the compensation claim is to be forwarded to this State according to its national laws on liability for damage and conflict laws.[40]

However, the above mentioned rule for the safeguard of eventual agreements made between the Parties, is still valid. The IGA concluded between the States participating in the realisation of the International Space Station anticipates a **cross-waiver concerning liability actions.**

The complex art. 16 of the IGA initially specifies the meanings to be given to the terms: Partner State, related entity, damage, launch vehicle, payload, protected space operations. It then establishes the clause for cross-waiver. This clause foresees that each member State shall waive the presentation of the compensation claim against another Partner State, against its Co-operating Agency or the entities connected, for any damage which might derive from the activities on the Space Station. The cross-waiver is also extended to the compensation claims for damage to the involved entities, to contractors and sub-contractors involved in the activities of the Space Station. The astronaut, involved in operations on the International Space Station and damaged while carrying out such activities, may only make use of internal possibilities established by the norms of his national State or by the norms undersigned in the employment contract.

The cross-waiver of liability also protects the astronauts when they are active and not passive subjects of the damage caused to third parties and therefore when they have **the duty to give compensation.** In general, the Agencies undertake all liability for damage caused by their astronauts. However, if the damage is caused by willful misconduct,

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40 Stephen Gorove, *Legal aspects of international space flights,* 3 ANNALS AIR & SPACE L. 409 (1978).

according to art. 16, the cross-waiver clause may not be applied. Among the exceptions foreseen for the application of the clause, the astronaut is also concerned with the clause mentioning the "claims made by a natural person, his/her estate, survivors or subrogees (except when a subrogee is a Partner State) for bodily injury to, or other impairment of health of, or death of such natural persons" (art. 13. 3 (d).(2)). In this case compensation claims made by the damaged parties or by the insurance representing them could be made to the Astronaut or to the Agency which subrogates him by contract.

The issue of damage compensation, which may be seen as the object of both rights and duties of the Astronauts, introduces the matter of the other duties which can be configured.

4. The duties of the Astronaut

4.a Duty to observe civil jurisdiction

"**Jurisdiction**" and "**control**" are terms which are not exclusively used in space law, but also in international law and in the domestic law of many countries. The doctrinaire interpretation of the term "jurisdiction" is varied, referring either simply to the authority to impose rules or within the framework of the appropriate exercise of judicial power, up to the identification of jurisdiction with sovereignty. The extension of the rights and duties deriving from jurisdiction are, however, much more restrictive compared to those deriving from sovereignty and this is evident in those places, such as outer space, Antarctica and the high seas, where the exercise of territorial sovereignty is forbidden.

According to an opinion to be shared, the term jurisdiction refers to the exercise not only of judicial power, but also of legislative and executive power in respect of the personnel and objects in outer space and on celestial bodies.[41]

The term "control", considered as an element of jurisdiction, has a more technical meaning. It refers to the right of the State to guide and technically supervise, without interference, the object and the crew for the achievement of the mission of exploration and use of outer space. However, the State is obliged to ensure that the object and the personnel do not infringe the legitimate rights of other States and that they fulfil their mission in accordance with the rules of space law.[42]

Art. VIII of the Outer Space Treaty determines the connection between the State, the space object and the personnel under its jurisdiction and control. The article states: "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." The 1975 Convention of Registration of Objects Launched into Outer Space states that the "launching State", meaning the State which launches or procures the launching of a space object or a State from whose territory or facility a space object is launched, is obliged to register the space object in an appropriate national registry and in the registry of the Secretary General

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41 Vereshchetin, *Legal status of international space crew, supra* note 7, at 545.

42 LACHS, THE LAW OF OUTER SPACE 69-70 (Sijthoff-Leiden 1972).

of the United Nations.[43] When there are two or more launching States, they shall jointly determine which one of them shall register the object (art. II.2) and, therefore, shall carry out jurisdiction and control over the object and the personnel thereof. If the object is launched by an international Organisation, it must be registered in the registry of the Organisation, if the latter has accepted the rights and obligations of the Convention of Registration, and if a majority if the States members of the organisation are States Parties to the Convention on Registration (art. VII).

The Outer space Treaty seems to exclude the exclusive application of the two concepts determining the exercise of jurisdiction, that is to say "nationality" or "territoriality" or "quasi-territoriality." The concept of territoriality is insufficient, because art. VIII of the Outer Space Treaty mentions the exercise of jurisdiction over "any personnel thereof, while in outer space or on a celestial body," and therefore also outside the space object. Since it refers to all the personnel thereof, it does not consider the national origin of the crew members.

The exercise of jurisdiction over the crew members is therefore not limited to the space object, but also to when the astronaut is outside the object or on a celestial body. Art. 12 of the Moon Agreement specifies that "States Parties shall retain jurisdiction and control over their personnel, vehicles, equipment, facilities, stations and **installations on the Moon**"(emphasis added).[44]

Conflicts on the exercise of jurisdiction could arise for those subjects being under the jurisdiction and control of a specific State and being, for various reasons, on installations belonging to another State. The only hypothesis foreseen by the multilateral agreements is the **right to visit** space objects on the Moon (art. XX of the Outer Space Treaty and art. 15.1 of the Moon Agreement). Visiting astronauts, representing the States wishing to verify the activities carried out on board, could be placed under the jurisdiction of both States. In this case, however, the obligation to give a reasonable advance notice of a projected visit in order to arrange the necessary precautions, made by the receiving State, for the safety of the visitors and for the avoidance of disturbance of the normal operations on the installations, lead to consideration of the prevalence of "quasi-territorial" jurisdiction of the launching and receiving State over the "functional jurisdiction" of the State sending the visiting astronauts.[45]

Another concurrent jurisdiction could arise in the event of an emergency or forced landing in the territory of another State or on the high seas or in another free zone. Competent States for the exercise of jurisdiction over the rescued astronauts could be the State where the space object has been registered, the State in whose territory the object has landed and the national State of the crew members. The contents of art. V of

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43 Convention on Registration of Objects into Outer Space, 14 January 1975, in *United Nations Treaties, supra* note 37.

44 The Agreement Governing Activities of States on the Moon and Other Celestial Bodies, December 18th 1979, in *United Nations Treaties, supra* note 37.

45 Sico, *Lineamenti di una disciplina dell'attività svolgentesi a bordo delle stazioni spaziali,* in IL DIRITTO INTERNAZIONALE AL TEMPO DELLA SUA CODIFICAZIONE, studi in onore di R. AGO, Milano 1987, p. 402; Hara, *Legal Status of Astronauts and other Personnel on the Moon,supra* note 35, at 167.

the Outer Space Treaty and of art. 4 of the Rescue Agreement seem to indicate a preference for the jurisdiction of the State of registry. It is therefore necessary that the State of registry supply the astronauts with certificates and symbols, even on their clothes-wear, for the identification of the subjects and the State of registry.

In the event of joint launchings, the agreement concluded between the parties will be most decisive. If it is the case of a payload on board a shuttle which intends to detach itself and remain independent in space, it must be registered separately from the shuttle and the personnel on board will be under the jurisdiction of the State of registry.

The co-operative program between NASA, supplying the transportation shuttle, and ESA, supplying the Spacelab, foresaw a different agreement between the parties. The United States did not acknowledge the individuality of the Spacelab separated from the Shuttle, registered in the United States. They did not allow the registration of the laboratory by Europe, and considered it to be a consistent element, a payload of the shuttle. In the MOU stipulated between NASA and ESRO on September 24, 1973, art. XI.3 established that "In order to assure the integrity of operation and management of the Shuttle system, NASA shall have full control over the first Spacelab unit after its delivery, including the right to make final determination as to its use for peaceful purposes."[46] This leads to the conclusion that at least for the issue concerning the control of the mission, the safety of the space object and for all that concerns navigation, the shuttle commander, being American, had jurisdiction and control over the persons and properties on board. For other issues, the foreign State or the international organisation had jurisdiction and control.[47]

Art. II of the Convention on Registration foresees that, where there are two or more launching States they shall jointly determine which one of them shall register the object. In the Intergovernmental Agreement, even in the 1998 version, the issue of registration is faced and it is established in art. 5.1 that each Partner State and ESA, for the European States, shall register as space objects the flight elements produced for the construction of the **International Space Station**. The Partner States participating in the European programme and represented by ESA shall be considered launching States even if the European contribution shall be inscribed in the registry of the Organisation. The internal ESA regulations for the apportionment of the burden of compensation for damage caused during a joint programme, will need the addition of appropriate agreements between the States of the Agency, the stipulation of which is foreseen by the Convention on Registration, to determine the procedures and the exercise of the power of control and jurisdiction over the module and the other elements of the Columbus.

The exercise of jurisdiction in the ISS finds its specific regulation in art. 5.2 of the IGA which foresees that each Partner shall retain

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46 For the text of the Memorandum see 2 J. SPACE L. 40, (1974); for the text of the 1973 Spacelab Agreements, see J. SPACE L. 53-64 (1974).

47 *See* Bourély, *Legal Regime of International Space Flight: Legal Issues Relating to Flights of the Spacelab*, in GOROVE, THE SPACE SHUTTLE AND THE LAW 73 (1980); Gorove, *The Space Shuttle: some of its Features and Legal Implications*, in STEPHEN GOROVE, DEVELOPMENTS IN SPACE LAW, *supra* note 11, at 193.

jurisdiction and control over the elements it registers. The Partner States extend their jurisdiction over the personnel, within or on the Space Station, who are their nationals.[48] The IGA, adopting both criteria, that is to say the one we may define as "quasi territoriality" (exercise of jurisdiction over the registered elements) and the criterion of nationality (exercise of jurisdiction over their own nationals, wherever they may be positioned, either in or on the Space Station), fosters possible conflicts of rules in the permanent base, made up of more elements, manned by people of different nationalities who must live and work together. Consider the central living module, supplied by the USA, where a mixed crew will live. Once again, in order to avoid the obstacle, the IGA refers to subsequent agreements to be stipulated between the parties, to the MOUs and to other transactions, for the establishment of more specific norms for the exercise of jurisdiction and control. However, the effort made by the draftsmen of the IGA for a uniform regime, to be defined and accepted by all the Partner States for the regulation of some of the most important legal issues, such as the status of the crew, the property regime, and liability, is to be mentioned. The attempt is to avoid all possible jurisdictional conflicts between partners.

As for the personnel on board, in all those cases contemplated by the Code of Conduct where there could be a concurrence between the application of the rules of the State of registry of the ISS element and the rules of the national State of the crew member, it will be necessary, as a preventive measure, to clarify the **exercise of simultaneous competence**, by establishing priorities. A regime similar to the NATO Treaty on the status of armed forces abroad,[49] concluded in London in 1951, could be considered. It establishes that, in case of the concurrence of two jurisdictions, the national State has priority as to issues concerning prejudice against persons or property of the national State, both for issues due to an act or negligence caused in the exercise of duty. In all other cases, the competent State is the State of sojourn.

Finally, the IGA offers no solution to the problem of jurisdiction to be applied to the crew members supplied by another Partner State, who are not citizens of any of the member States or who are nationals of more States. The provisions of the IGA do not consider the astronauts visiting the Station for a short period, for example in a capsule docked to the Station during crew rotation, because these are hardly ever nationals of the States who sent them.

4.b The duty to submit to criminal jurisdiction

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48 Art. 5.2 "Pursuant to Article VIII of the Outer Space Treaty and Article II of the Registration Convention, 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 excercise of such jurisdiction and control shall be subject to any relevant provisions of this Agreement, the MOUs, and implementing agreements, including relevant procedural mechanisms established therein."

49 For the Conventions concerning civil and criminal jurisdiction over armed forces and for the study in particular of the NATO Treaty, see Catalano Sgrosso, *Giurisdizione civile e penale sugli aeromobili militari stranieri*, IL DIRITTO AEREO 82 (1975).

The rule on the exercise of jurisdiction determined generally by art. VIII of the Outer Space Treaty, also extends to the criminal jurisdiction according to which each State having registered a space object has criminal jurisdiction over the object itself and the personnel thereof.

If the crime is committed on board an international flight within the boundaries of the object - for example on a space shuttle, transporting a space object or a payload registered by another State - either by an American or foreign national, it must be placed under the criminal jurisdiction of the United States. If an American astronaut commits a crime in a space object registered by another State, the United States may invoke criminal jurisdiction, but it may not be exclusive. It shall be secondary in respect of the jurisdiction of the State of registry of the Space object which will hold primary jurisdiction according to the provisions of the Treaty on Outer Space.

In the event, however rare due to the accurate selection of the astronauts, of **a crime taking place on board the ISS**, the criminal jurisdiction of the State of registry of the element might concur with the jurisdiction of the national State of the perpetrator of the crime and, therefore, it would be necessary to define the primary jurisdiction. Criminal jurisdiction is taken into consideration by art. 22 of the IGA. By establishing the connection between the State and the alleged perpetrator's citizenship, art. 22 stipulates that "Canada, the European Partner States, Japan, Russia, and the United States may exercise criminal jurisdiction over personnel in or on any flight element who are their respective nationals". In the previous version of art. 22 of the 1988 IGA, primary jurisdiction was given to the United States if the crime had been committed in any element and by a subject of any nationality, if the safety of the Station or of a crew member had been prejudiced. With the participation of Russia in the programme, it obviously became urgent to amend this article.

The new art. 22 establishes that any of the Partner States, except the national State, may exercise criminal jurisdiction over the alleged perpetrator only if, having suffered prejudice for the life or safety of one of its nationals or damage to one of its elements due to a crime committed in orbit or within its element, it has immediately consulted with the Partner State whose national is the alleged perpetrator concerning their respective prosecutorial interests. These, however, may not be opened before 90 days of the date of consultation or a reasonable amount of time to be decided between the parties, and if the State concurs in such exercise of criminal jurisdiction or fails to provide assurances that it will submit the case to its competent authorities for the purpose of prosecution. The main aim of the parties is not to leave a crime committed on board unpunished.

The extradition of the alleged perpetrator may be requested if an extradition treaty exists between the two States, otherwise the Parties may consider the IGA as a legal basis for extradition.

The last paragraph of art. 22 reconciles the dispositions of the Code of Conduct with the disposition of art. 22. As mentioned above, the code of conduct establishes a chain of command lead by the Commander. The latter may carry out any action he considers necessary in order to achieve order and discipline and the other members have the duty to observe these measures. In order to safeguard the health and safety of the personnel, even in the event of rescue and return of the crew, and also to protect the safety of operations and the utilisation of data, the Commander may use any

reasonable measure, including physical force and he may place any person on board under personal restrictions. The exercise of this kind of command and therefore jurisdiction must not be limited by the application of the above mentioned art. 22 and, on the other hand, the Code of Conduct must not limit the application of this article.

4.c The duty to protect intellectual property

The astronauts are the first persons to have access to the data concerning new discoveries made in the Spacelabs in outer space and have the duty to respect all the established procedures for the protection of the intellectual property of the users of the Space Station.

To facilitate this duty, art. 8.4 of the MOU between NASA and ESA establishes that "In order to protect the intellectual property of Space Station users, procedures covering all personnel, including Space Station crew, who have access to data are developed by the Multilateral Co-ordination Board"(MCB). The development of these procedures is currently followed by the User Operation Panel which must submit them to the MCB for final approval.

It is useful to examine which regime the IGA has established for the protection of intellectual property of inventions made in the laboratories of the Station, which is, *par excellence,* an international environment.

The draftsmen of the Agreement faced the difficult task of protecting the intellectual property of the inventor while reconciling the application of different concepts such as the "first to invent" and the "first to file an application for patent" which are at the basis of the different systems foreseen by the regulations of the Partner States.[50]

The negotiators of the IGA identified some common principles and art. 21, dedicated to intellectual property, seems to prefer the connection determined by "territoriality." For purposes of intellectual property law each State shall consider an invention made in its own registered element as having occurred on its territory, and for the ESA element each European Partner State shall deem the activity as having occurred within its territory. The protection of the rights of intellectual property in all the European Partner States has been agreed upon, once protection for one of these has been obtained, and once the suspension of judgements for infringement in case of a previous appeal has been forwarded in another Partner State (principle of the first appeal). Even in the event of the participation of another Partner State, of its Co-operating Agency or related entities, in an activity taking place in the element in or on any other Partner State's element, the legislation of the latter shall be applied (art. 21.2). The patent application for the invention made by an astronaut of a nationality other than the State having registered the element where the discovery occurred, must be forwarded first to the registry State of such element and in observance of its laws.

Paragraph 3 of the same article establishes that if the inventor is not a national or resident of the State in whose element the invention

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50 *See* Farand, *The Astronaut in the Space Era, supra* note 26, at 158; Catalano Sgrosso, *La responsabilità degli Stati per le attività svolte nello spazio extra-atmosferico, supra* note 2, pp. 116-28.

occurred, he may subsequently forward a patent application in another Partner State.

This solution arises from the context which deals ,mainly with the secrecy of information. While on one hand the "quasi territorial" State cannot hinder for secrecy reasons a patent application to be forwarded to another State, the latter must guarantee the secrecy of the applications containing "classified" information or otherwise protected for security reasons, forbidding the subsequent application to other States.

Art. 21.6 establishes that the transit in the territory of a Partner State of any articles, including the components of a flight element, shall not in itself form the basis for any proceedings in the first Partner State for patent infringement or for the infringement of other rights ensuring a similar protection so that the transit State may nor forbid, in application of its laws, the forwarding towards the Station or the restitution to the original Partner.

A first remark to be made on such a regime of protection is that it is possible to foresee conflicts between the laws establishing different systems and procedures for protection, since the automatic acknowledgement of the patent is only contemplated by the European partners. The latter must still define a mechanism for the practice of the disposition of the IGA concerning the inventions made in the ESA laboratory. A system ensuring complete secrecy of information, of the data previously supplied by the experimenters for safety reasons, and of the data acquired on board and subsequently transmitted to the ground is not guaranteed. Finally, the issue concerning the property of the rights on the technical information deriving from the same joint venture is still unsolved.

Conclusions

In an era where manned flights or the positioning in orbit of objects or complex space stations, being the fruit of a co-operative effort among various States, have become more and more frequent, we have realised that human presence in outer space is to be regulated with precise dispositions to solve the new situations the astronaut might have to face.

It is not easy to reconcile the different domestic regulations of the veteran space States who faced the matter long ago and of countries new to these activities, especially when they have joined for a co-operative effort such as the European one. It is neither easy to reconcile the new situations the astronaut might have to face, because these are the first attempts, such as the International Space Station, to realise co-operative programs in space which are carried out by an increasing number of States.

The conflicts between the different laws to be applied, justified by a relationship of nationality or jurisdiction over the registered object and persons therein, must be solved equally, with the aim of a positive result of the mission, of the safeguard of basic human rights, of equality which the States must ensure in carrying out the joint program and, finally, of the progress of the mission for peaceful ends and for the benefit of all Mankind.

However, it must be observed that a development in the norms establishing the status of the astronaut has been achieved, and it can, therefore, be stated that this figure, being basically considered in a

romantic aura as an "envoy of Mankind", is now the beholder of a series of rights and duties.

We have tried to reconstruct a legal status determined principally by the norms of international outer space law and by the existing domestic laws. The dispositions of the Outer Space Treaty, of the Rescue Agreement and the Convention on Registration are pre-eminent. However, the agreements concluded between Partner States participating in international space flights, have greatly helped the development of a more specific regulation: in particular, the regulations issued in connection with the joint launching of the Spacelab in the Shuttle and the agreements which are being concluded between the parties for the realisation of the International Space Station.

The astronaut has his/her own qualification, and among the various figures the Station Commander stands out together with a series of control entities created to guarantee the observance of duties and the protection of legitimate rights.

The astronaut's right to health and safety derives from a humanitarian appeal, whereas economic and social needs have led to the characterisation of the right to damage compensation and the duty to protect intellectual property.

As for the exercise of civil and criminal jurisdiction over the crew, instead of identifying uniform law rules, the agreements refer to criteria which are at times conflicting, and therefore still arguable under the applicable law.

The most important innovation arising from the Agreement among the Partner States of the International Space Station and contributing to the configuration of the legal status of the astronaut, is the Code of Conduct. It represents a true agreement among the parties, offering the possibility to develop further rules for the regulation of the life of the Space Station crew members. We are now close to the assembling of the Space Station in low terrestrial orbit with the first launch, with a Russian Proton, of the energy module (FGB) financed by the United States and built by Russia. Before the arrival of the first Russian-American crew, made up of three members, who will presumably settle in the Russian module in 1999, the Code of Conduct will have to be signed and ratified by the parties.

SPACE LAW IN THE 21st CENTURY

Eilene Galloway*

The task of formulating space law in the 21st century is different from that which suddenly skyrocketed beyond the Earth when the Sputnik was orbited on October 4, 1957. At that time the fear of space wars caused three action groups to merge in their determination to preserve this new fourth environment for beneficial purposes for all mankind. Scientists and engineers engaged in the International Geophysical Year, national political decisionmakers, and the United Nations quickly combined their efforts to forge policies and create organizations with implementing programs that have stood the test of time for 40 years of international cooperation in exploring outer space and developing an ever-expanding variety of benefits.

The conditions that made possible four decades of peace were fear of orbiting weapons of mass destruction; promised benefits that far outweighed the relinquishment of some sovereign rights; acceptance of national overflights; the international nature of space science and technology which requires cooperation among nations and participation in a system of regulation; the predominant role of nation states which could be charged with responsibility for authorizing and continually supervising national governmental and nongovernmental entities; and the universal desire to preserve this new environment for mankind and future generations.

As we enter the 21st century, new trends are already discernible and can be expected to continue even if we do not pause to assess the situation. The millennium is a dramatic event, affording the opportunity to evaluate what has been accomplished since the space age began, identify factors that have enabled expansion of space operations in an orderly, dependable environment, rid ourselves of dead-end legal discussions, and set priorities for the future.

The rapidity of developing space activities following the advent of Sputnik is remarkable. The U. S. 1958 National Aeronautics and Space Act set the tone by stating that "the Congress hereby declares that it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind", and providing for "international cooperation with nations and groups of nations." In 1962 the United Nations passed resolutions with values that were incorporated in the fundamental 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. Although the Soviet Union and the United States were first in developing space technology, neither sought a monopoly and

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* Honorary Director, International Institute of Space Law of the International Astronautical Federation. Member, NASA Advisory Committee on the International Space Station. Trustee Emeritus, International Academy of Astronautics.

despite other differences were united in adopting international space cooperation.

Two kinds of organization emerged to carry out specific programs to implement basic international and national policies: new institutions that were devoted only to exploring and developing uses of outer space, and existing organizations with space-related functions. Examples of national space organizations are the U. S. National Aeronautics and Space Administration and the Communications Satellite Corporation, and the international are the International Telecommunications Satellite Organization (INTELSAT), the International Organization of Space Communications (INTERSPUTNIK) and the European Space Agency (ESA).

Space-related international organizations are those that added space science and technology to improve functions they were already performing: the International Telecommunication Union (ITU), the World Meteorological Organization (WHO), the Food and Agriculture Organization (FAO), etc. Those that took advantage of benefits to be derived from satellite-produced information to solve or mitigate functional problems were either governmental or nongovernmental, national or international. It was natural and inevitable for both civilian and military organizations to adopt the new technology to improve their capabilities, a practice that has been followed throughout the history of industrialization. In this case, civilian benefits prevailed and space wars have been prevented, a situation upheld by the fact that only by complying with the laws of physics and other technical space requirements is it possible to conduct space operations successfully.

The functions of communication, meteorology in all its forms, and methods of preserving the environment were already organized, nationally and internationally, with operating programs before the space age started, and the same functions were enhanced and continued in the new area of outer space in accordance with the 1967 Outer Space Treaty. Use of the new satellite tool was not delayed by lack of a decision on where airspace ends and outer space begins, especially because no scientific basis could be found for such a distinction.

The attitude of decisionmakers was pragmatic in adjusting legal concepts to unusual technological requirements and we proceeded with two practices that have been followed so consistently that they can be classified as "customary space law": (1) no nation objected to satellites flying over its territory, leading to the conclusion that a right has been developed for such flights; and (2) there is no legal distinction of where airspace ends and outer space begins, but space activities have been conducted on the basis that airspace extends to the height where planes can fly and outer space begins where objects can go into orbit. Thus far no problem has arisen that demanded for its solution an exact demarcation between airspace and outer space.

The boundary between airspace and outer space has been debated academically for years and is still on the agenda of COPUOS' Legal Subcommittee, commingled with observations about the role of the International Telecommunication Union and the geostationary orbit. The

advent of the aerospace plane that can fly both in sovereign airspace and non-sovereign outer space will bring a new dimension to the discussion and require innovative approaches in the 21st century. For example, lawyers usually want a map in order to determine the location of a contested incident, but now we have the Global Positioning Service (GPS) which can record the precise time and exact place where a space object is located. The legal problem could be defined as controlling the functions of such air/spacecraft rather than a system of prohibitions and permissions based on the area of performance. We already have experience in checking the functions of space vehicles and launching into specific orbits, as well as a system for registering space objects with the United Nations.

The United Nations is so well organized for international space activities, including the formulation of space law, that its continuance as a forum is certain. In addition to the Committee on the Peaceful Uses of Outer Space (COPUOS) the space functions of relevant UN specialized agencies are coordinated. The Office for Outer Space Affairs in Vienna performs an outstanding role as a center for information and direction. COPUOS adopted the process of moving an agenda item from the Scientific and Technical Subcommittee to the Legal Subcommittee, and then to the full Committee. Action can then be taken by the General Assembly's Special Committee and finally by the General Assembly. Space science, technology, and legal matters are integrated and the entire procedure is strengthened because decisions are made by consensus. When problems have ripened for solution, relevant general principles in the 1967 Outer Space Treaty have been expanded and reaffirmed into new specific international conventions and agreements, a practice that has proved so successful in constructing an harmonious body of space law that it should be continued.

Although there have been criticisms of the slower pace of formulating space law in recent years, it is inevitable that more time is required for solving some problems than others. Insofar as delays are caused by emphasizing national policies based on differing economic and political philosophies, means must be found of separating technical from political factors.

In recognizing the development of space law as a specialized branch of international law, reference is usually made to the UN-formulated treaties whose principles guide States in the conduct of their space activities. However, there are additional sources of law to consult when working on legal problems arising from the exploration and uses of outer space. This is because space activities are largely concerned with information recorded to assist in solving problems that occur on the Earth, and the scope of coverage is constantly increasing as more subjects become involved. Additional legal sources are national and international, and can include relevant laws and regulations of institutions concerned with space-related matters, *i. e.,* communications, transportation, agriculture, medicine and health, environments, education, intellectual property rights, computers -- indeed, all activities depending on satellite-derived information. Looking at this development from the point of view of choosing a career, one would

need to decide whether to become an expert on strictly space matters or choose a field such as communications, meteorology or medicine and add the requisite legal aspects.

It will be more difficult now than when the space age began to get international agreement on defining problems and proposing solutions because (1) fear of space wars has been replaced by taking peace for granted; (2) original acceptance of the necessity for regulating space activities is being dissipated by a strong movement for deregulation; (3) commercialization is increasing privatization of the global space industry and diminishing the role of government in the future development of space activities, thus creating a problem for determining regulations essential for maintaining an orderly space environment; and (4) theoretical legal proposals that are not based on a knowledge of space science and technology and the unique characteristics of outer space.

The positive elements in this situation are (1) realization by all participants that identifiable scientific and technical conditions must be maintained in order to conduct successful space operations; (2) the motive of maintaining dependable conditions for an industry that is producing billions of dollars and employing hundreds of thousands of employees throughout the world; (3)) the existence of the United Nations Committee on the Peaceful Uses of Outer Space as a forum for negotiations with a proven process and record of finalizing international agreements; (4) the value of historic experience in controlling space activities by functions: -- registration of space objects, selection of orbits for specific launchings, notification to States potentially affected by orbiting and deorbiting satellites; and (5) possible lessons from the International Civil Aviation Organization in establishing standards of reliability and safety for planes.

It is obvious that the items already on the agenda of the COPUOS Legal Subcommittee will be carried over into the next century. These include the definition and delimitation of outer space and the character and utilization of the geostationary orbit; 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 interest of all States, taking into particular account the needs of the developing countries; review of the status of the five international legal instruments governing outer space; and continuance of attention to the principles relevant to the use of nuclear power sources in outer space. There is the possibility that space debris could move from the Scientific and Technical Subcommittee to the Legal Subcommittee.

Consideration could be given to adding matters that require attention.

1. Determination of the parameters of the main body of space law. This involves identification of the body of space law we now refer to as a special branch of international space law. This matrix must be distinguished from laws and regulations formulated for specific purposes, essentially a difference between the general guiding principles of the 67 Outer Space Treaty and the expanded specific provisions in subsequent conventions and agreements, as well as some related treaties. International space cooperation needs to be held together by a basic core of essential

guidelines, a kind of center of gravity to which proliferating space activities can develop harmonious connections. Rapid advances in space technology cause changes which should not affect fundamental standards of conduct. The problem is to strike a balance between the general and the specific, but always ensuring that precisely understood words should be used for general statements. The process for achieving this has been developed by COPUOS but there is now a danger of chipping away at the 1967 Outer Space Treaty by protocols instead of adding more agreements. As long as the general principles are solidified in terms of what is required to preserve international cooperation, it will be practicable to extend agreements for specified purposes. Although we have the institution and process, we still need consensus on the goal.

2. Space debris should be moved from the Scientific and Technical Subcommittee to the Legal Subcommittee provided there is evidence that the legal aspects will be shaped by scientific and technical facts and not unrelated political concerns.

3. Commercial developments of space should be analyzed to attain more insight into guidance and control by nation states in relation to international nongovernmental entities. Such an analysis should include requirements for standards, insurance, liability for damage and intellectual property rights.

4. The growing number of satellite launches should be studied to determine consequences for the environments of the Earth and outer space, and with a view toward establishing principles for what now appears to be uncontrolled development. This is a problem that would benefit from being considered first by the Scientific and Technical Subcommittee.

5. The Moon Agreement presents a problem because unlike other space treaties it has proved unacceptable to the international community. In almost 20 years only 9 nations have become member States and no spacefaring nation has ratified it. Allowing more time will not overcome difficulties caused by an outdated and partial assumption of the total problem, and the wording of some provisions so they are subject to different interpretations and arouse arguments based on assumptions rather than scientific and technical facts. It is not prudent to let this matter drift because some of the issues will not fade away. Principles on identifying and handling the natural resources of outer space and celestial bodies could be considered in connection with studies on space commercialization. The original perception of the problem has changed.

6. Peace cannot be taken for granted and the expansion of arms controls for outer space and celestial bodies must be a priority.

We can approach the 21st century with optimism not only because of the 40-year history of maintaining peace and producing major benefits, but also on the eve of the millennium the United Nations is leading a world Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) from July 19-30, 1999 in Vienna, Austria. The primary objective is

> to promote effective means of using space technology to assist in the solution of problems of regional or global significance and to

strengthen the capabilities of Member States, in particular developing countries, to use the applications of space research for economic and cultural development.

EVENTS OF INTEREST

A. PAST EVENTS

U.N. REPORTS

Review of the Work of the United Nations Committee on the Peaceful Uses of Outer Space and its Subcommittees, 1998

I. Scientific & Technical Subcommittee (9-20 February, 1998)

a) Introduction

The thirty-fifth session of the Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) was held in Vienna, Austria, and was chaired by Prof. Dietrich Rex of Germany. The session was attended by 51 of the 61 States Members of the Committee,[1] by the representatives of specialized agencies and international organizations,[2] and ten observers.[3]

Pursuant to General Assembly resolution 52/56, the Scientific and Technical Subcommittee paid particular attention to the United Nations Programme on Space Applications and the coordination of space activities within the United Nations system, preparations for the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), use of nuclear sources in outer space, and space debris. In addition, the Subcommittee considered issues relating to remote sensing of the Earth by satellites, space transportation systems and their

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1 Argentina, Australia, Austria, Belgium, Brazil, Bulgaria Burkina Faso, Canada, Chile, China, Colombia, Czech Republic, Ecuador, Egypt, France, Germany, Greece, Hungary, India, Indonesia, Iran (Islamic Republic of), Iraq, Italy, Japan, Kazakhstan, Kenya, Malaysia, Mexico, Morocco, Netherlands, Nicaragua, Nigeria, Pakistan, Peru, Philippines, Poland, Romania, Russian Federation, South Africa, Spain, Sudan, Sweden, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, United States, Uruguay, Venezuela and Viet Nam.

2 United Nations Educational, Scientific, and Cultural Organization (UNESCO), International Telecommunications Union (ITU), World Meteorological Organization (WMO), International Atomic Energy Agency (IAEA), European Space Agency (ESA), Committee on Space Research (COSPAR), International Academy of Astronautics (IAA), International Astronautical Federation (IAF), International Astronomical Union (IAU), International Society for Photogrammetry and Remote Sensing (ISPRS), and International Space University (ISU).

3 Representatives from Azerbaijan, Bolivia, Costa Rica, Cuba, Paraguay, Republic of Korea, Slovakia, Thailand, Tunisia, and the permanent observer from the League of Arab States.

implications for future activities in space, the physical nature and technical attributes of the geostationary orbit and its utilization and applications, life sciences including space medicine, planetary exploration, astronomy, progress in national and international space activities related to the Earth's environment (in particular the International Geosphere-Biosphere Programme), and the scientific and technical aspects and applications of space-based meteorology.

b) United Nations Space Applications Programme

The agenda item on the United Nations Space Applications Programme was discussed in some detail by the Subcommittee, with Member States indicating their general satisfaction with the previous activities of the Programme administered by the Office for Outer Space Affairs Space Applications section, as well as the planned activities for the following year. It was noted in particular that most of the planned 1998 activities of the Programme will be utilized as regional preparatory meetings for the UNISPACE III Conference in 1999. A general concern and regret was voiced by both developing and some developed countries concerning the continued insufficiency of funds available to the Programme for the carrying out of its work.

The efforts by the Office for Outer Space Affairs (OOSA) to establish regional centres for space science and technology education in existing national or regional educational institutions in developing countries, received particular attention by the Subcommittee. The Subcommittee noted that the Regional Centre for Asia and the Pacific, which is situated in India, would begin its next regular nine-month education programme in March of 1998, and was also able to reach consensus for the first time in recommending that OOSA facilitate discussions among interested Member States within the region, in order to advance the proposed expansion of the Centre into a network of nodes.

Following up on the joint announcement of their intention to do so at the Subcommittee's previous session, Brazil and Mexico confirmed at this session that both their Governments had signed and ratified the agreement establishing the Regional Centre in Latin America and the Caribbean. Chile, on behalf of the Group of Latin American and Caribbean States (GRULAC), indicated the interest and support of those States in the establishment, and participation in the activities of the Centre. The Subcommittee was also presented with a list of training activities that would be offered by the Centre in 1998.

Regarding the proposed Centres in Africa, Morocco (on behalf of the French-speaking African countries) and Nigeria (on behalf of the English-speaking countries) developed and circulated at the Subcommittee for comment, proposed cooperation agreements to be entered into by the States of the region. The Subcommittee also noted that the first node of the Centre would be inaugurated in Morocco in 1998.

During the 1997 session of the Scientific and Technical Subcommittee, the representatives of Bulgaria, Greece, Poland, Romania,

Slovakia, and Turkey had agreed to establish a network of space science and technology education and research institutions for the central-eastern and south-eastern European regions. During the course of this session, arrangements to this end continued, with the added inclusion of Hungary.

c) Preparations for UNISPACE III

In accordance with General Assembly resolution 52/56, the Working Group of the Whole was reconvened during this session to conclude its work on the evaluation of the implementation of the recommendations of the UNISPACE '82 Conference and assist the Advisory Committee for UNISPACE III on the preparatory work for that Conference, which is to held from 19 to 30 July, 1998, in Vienna.[4]

The Office for Outer Space Affairs, as executive secretariat for the UNISPACE III Conference, prepared and submitted to the Working Group of the Whole, a report (A/AC.105/685) which contained proposals on all organizational issues that had been assigned by the General Assembly in 1997 to the Advisory Committee for consideration. With relatively few modifications, the Working Group of the Whole, and subsequently the Advisory Committee, were able to reach consensus on these proposals and submit the same as recommendations for consideration by the Preparatory Committee during the COPUOS session in June 1998. Issues which were settled during the course of this session included the structure and bureau of the UNISPACE III Conference, the role and form of participation of international organizations and space-related industry in the Conference, the different elements of the Technical Forum and the organization of a space exhibition by the American Institute of Aeronautics and Astronautics, and the manner in which the regional preparatory meetings could contribute to the draft report of the Conference.[5]

Two key issues that remained outstanding for consideration during the Preparatory Committee meetings in June, were the allocation of agenda items among the Plenary, two main Committees and Technical Forum of the Conference, and the text of the Conference Rules of Procedure. In addition, following informal discussions in the Working Group of the Whole on a draft document submitted for consideration by the secretariat, the Advisory Committee set out clear guidelines for the preparation by the secretariat of a first draft of the report of the Conference. These guidelines indicated that the draft report should contain a limited number of realistic

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4 General Assembly resolution 51/123 had previously requested that the Committee and the Scientific and Technical Subcommittee should serve as the Preparatory and Advisory Committees, respectively, for the UNISPACE III Conference.

5 *See Report of the Scientific and Technical Subcommittee on the Work of its Thirty-Fifth Session* (A/AC.105/697) *Annex II* for a complete report of the decisions of the Working Group of the Whole.

recommendations and proposals, incorporating action-orientated programmes, which would form the basis for a Plan of Action that would result from the UNISPACE III Conference. The first draft of the UNISPACE III report was to be submitted for consideration by the Preparatory Committee in June 1998.

d) Space Debris

The Subcommittee considered the issue of space debris as a priority item for a fourth year during this session, focussing on mitigation measures for space debris in accordance with its multi-year work plan. The Subcommittee heard technical presentations on space debris mitigation measures from France, Germany, Japan, the Russian Federation, The United Kingdom, the United States, the Inter-Agency Space Debris Coordination Committee (IADC), International Academy of Astronautics (IAA) and the European Space Agency (ESA). In addition, the Subcommittee had before it a report by the secretariat on various steps taken by space agencies for reducing the growth or damage potential of space debris and containing information on national research on space debris.

Under the leadership of its Chairman, Prof. Rex, himself an expert in this field, the Subcommittee made significant progress in drafting the third part of the technical report on space debris within two half-day sessions. Additionally, the first two parts of the technical report on space debris, consisting of an introduction and chapters on space debris measurements, modelling and risk assessment, which had been prepared at previous sessions, were corrected and updated.

Due to the fact that space debris mitigation measures generally would lead to the introduction of cost-increases in missions, the third part of the report is of a particularly sensitive nature. Consequently, the Subcommittee was unable to reach consensus on the inclusion of specific conclusions to the report and was forced to leave this issue open until the finalization of the full report, scheduled to occur at its thirty-sixth session in 1999.

e) Nuclear Power Sources in Space

The Working Group on this item was re-convened to discuss technical aspects of the Principles Relevant to the Use of Nuclear Power Sources in Outer Space.[6] Some delegations argued that the existing Principles were developed based upon technologies and generally accepted safety standards of the 1970's and 1980's, and consequently did not cover the use of nuclear power sources for propulsion or extra-terrestrial bases nor take into account the potential effects of space debris on such power sources. These arguments were supported by calls which have been made by the International Atomic Energy Agency (IAEA) in recent years for a

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6 Adopted by General Assembly resolution 47/68 of 1992.

review of the Principles in light of the most recent International Commission on Radiological Protection recommendations on radiation safety, which have been incorporated into the IAEA International Basic Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources.

The main outcome of the Working Group deliberations was the recommendation for the adoption of a four-year work plan, which was jointly proposed in a work paper by the United Kingdom, Russian Federation and United States. The work plan is scheduled to begin in the year 2000 with the identification of terrestrial processes and technical standards that may be relevant to nuclear power sources, including consideration of factors distinguishing the use and application of such power sources in outer space from terrestrial nuclear applications. In 2001, national and international processes, standards and proposals relevant to the launch and peaceful use of nuclear power sources in space would be reviewed. This would be followed by the development of a report on the findings of the Working Group in 2002, and a determination by the Scientific & Technical Subcommittee in 2003 as to whether any additional steps should be taken in this regard, including the need to refer the matter to the Legal Subcommittee for consideration.

f) COSPAR/IAF Symposium

The Committee on Space Research (COSPAR), in collaboration with the International Astronautical Federation (IAF) organized a symposium entitled "Scientific and technical aspects and applications of space based meteorology", at the end of the first and second day's sessions of the Subcommittee.

II. Legal Subcommittee (23-31 March 1998)

a) Introduction

The thirty-seventh session of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space was held in Vienna, Austria, and was once again chaired by Mr. Václav Mikulka of the Czech Republic. The session was attended by 43 of the 61 States Members of the Committee[7], by the representatives of specialized agencies and other international organizations[8] and five observers.[9]

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[7] Argentina, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, the Czech Republic, Ecuador, France, Germany, Greece, Hungary, India, Indonesia, Iran (Islamic Republic of), Iraq, Italy, Japan, Lebanon, Malaysia, Mexico, Morocco, the Netherlands, Pakistan, Peru, Philippines, Poland, Romania, the Russian Federation, South Africa, Spain, Sudan, Sweden, Turkey, Ukraine, United

The Legal Subcommittee continued its consideration of the "Question of Early Review and Possible Revision of the Principles Relevant to the Use of Nuclear Power Sources in Outer Space" (agenda item 3) as well as "Matters relating to the Definition and Delimitation of Outer Space and 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 Telecommunications Union" (agenda item 4). In addition to the above the Legal Subcommittee began its consideration of the new agenda item, "Review of the Status of the Five International Legal Instruments Governing Outer Space". Under its agenda item 6, "Other Matters", the Subcommittee had the opportunity to consider proposed new agenda items, as well as its contribution to the UNISPACE III Conference

b) Item 3: "Question of Early Review and Possible Revision of the Principles Relevant to the Use of Nuclear Power Sources in Outer Space".

This year there was no debate on this item. The Subcommittee again agreed to suspend discussion of this item in the Working Group for its thirty-eighth (1999) and thirty-ninth (2000) sessions, pending progress being made on this matter by the Scientific and Technical Subcommittee. It was agreed, however, that the item should remain on the Legal Subcommittee's agenda for debate in the plenary.

c) Item 4: "Matters Relating to the Definition and Delimitation of Outer Space and 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 Telecommunications Union".

As in previous years, two different issues were discussed by the Subcommittee under this agenda item, namely, the question of the definition and delimitation of outer space and the rational and equitable use of the geostationary orbit. The Working Group on this item was established once again under the Chairmanship of Mr. Gabriel Maffei, the representative of Argentina.

Kingdom of Great Britain and Northern Ireland, the United States, Uruguay and Venezuela.

8 International Telecommunications Union (ITU), United National Educational, Scientific and Cultural Organization (UNESCO), European Space Agency (ESA), League of Arab States and the International Astronautical Federation (IAF).

9 Bolivia, Cuba, Finland, Republic of Korea and the Slovak Republic.

This year no debate took place in the Working Group with regard to the first issue of this agenda item, the definition and delimitation of outer space. However, during the plenary sessions of the Subcommittee, the Russian Federation proposed that the legal issues relating to aerospace objects be dealt with in two stages; the first stage to be implemented between the years 2000-05, and the second stage taking place during 2005-10.[10] This delegation also suggested that the Legal Subcommittee recommend to COPUOS that the Scientific and Technical Subcommittee be requested to examine the scientific and technological aspect of aerospace objects, including their physical and functional features. Although interest was expressed in the second proposal, a lack of consensus as to the necessity of the suggestions resulted in their not being developed further.

No substantive debate took place with relation to either the Secretariat's note, "Questionnaire on possible legal issues with regard to aerospace objects: replies from member States"[11], which was before this year's session of the Legal Subcommittee, or the Secretariat's note entitled "Comprehensive analysis of the replies to the questionnaire on possible legal issues with regard to aerospace objects"[12], which had also been before the Subcommittee at its thirty-sixth session.

The second issue of this agenda item, the rational and equitable use of the geostationary orbit, was debated both in the plenary and the Working Group sessions. Despite the eager discussions which took place, little progress was made. The delegation of Colombia invited the Subcommittee to work with them in order to find a resolution to the issue. It confirmed its long standing viewpoint regarding preferential rights for developing countries but stated that they were open to consider proposals for the revision of the text of their working paper "Some considerations concerning the utilization of the geostationary orbit",[13] submitted at the thirty-fifth session, in order to move closer to its adoption. Other delegations, however, were not prepared to move away from their previously stated standpoints against such preferential rights, and no consensus or progress

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10 During the first period, when the use of aerospace objects would not be intense, legal issues relating to aerospace objects could be dealt with by directly applying space and air laws which have already been endorsed and accepted and, should it be necessary, to create certain new combined norms of international space and air law, for example, issues associated with the innocent passage through airspace. During the second stage, where there will be more frequent and intense use of aerospace objects, a proposal to enhance the international space and air laws can be developed, based on the experience which will be accumulated by that time in solving legal issues relating to aerospace objects.

11 *See* U. N. Doc. A/AC.105/635 and Add. 1-5

12 *See* U. N. Doc. A/AC.105/C.2/L.204

13 *See* U. N. Doc. A/AC.105/C.2/L.200 and Corr.1.

on this aspect of item 4 was possible. No suggestions were made to improve the Colombian text.

d) Item 5: Review of the Status of the Five International Legal Instruments Governing Outer Space

The new agenda item, "Review of the Status of the Five International Legal Instruments Governing Outer Space", was introduced for the first time at this year's session of the Legal Subcommittee and was greeted by Member States with some degree of enthusiasm. The Subcommittee had before it a note by the Secretariat on the review of the status of the five international legal instruments governing outer space[14] as well as a working paper submitted by Germany on behalf of the ESA Member States and States having signed cooperation agreements with ESA.[15]

As per the agreed working schedule, no Working Group was established for this item at this year's session. During the plenary debate, Member States participating in the discussion, reported to the Subcommittee on the status of, and further intended action concerning their own accession to the five international legal instruments governing outer space. Furthermore, while the Subcommittee noted that the purpose of the agenda item 5 was not to re-open substantive debate on, or revise or amend the five international instruments, many Member States addressed issues relating to the improvement and maximization of universal accession and adherence to these five international legal instruments within the agreed restrictions of this agenda item. A number of States also raised issues concerning the practical adherence to, and the effectiveness of the treaties.

Various States, in particular the co-sponsors of the working paper submitted by Germany, saw discussion on this agenda item as an opportunity to propose practical solutions to improving specific aspects of adherence to the five international legal instruments governing outer space. The working paper itself proposed the introduction, as a new agenda item, of a plan for the clarification and improvement of the Registration Convention of 1975. In addition, Austria and Sweden called for States to bind themselves reciprocally under the existing provisions of the Convention on International Liability for Damage Caused by Space Objects,[16] to the decision (GA Resolution 2777 (XXVI)), to the decisions of Claims Commissions, thereby granting those States greater protection and ensuring the more effective use of the mechanisms established under this Convention.

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14 *See* U. N. Doc. A/AC.105/C.2/L.210.

15 *See* U. N. Doc. A/AC.105/C.2/L.211. The revision of this document was formally introduced by Germany under agenda item 6 (A/AC.105/C.2/L.211/Rev.1).

16 General Assembly Resolution 2777(XXVI).

Other States, however, most notably the Russian Federation, held the view that the five international legal instruments governing outer space were by their nature interdependent and that a holistic approach should be adopted in their review and possible revision. This viewpoint favoured a more cautious approach, taking into account the possible impact that revision, in any form, of the principles and concepts elaborated in one of the treaties might have on the other four treaties. Informal discussions were held in order to consider this approach, but after an exchange of ideas no agreement was reached. The Russian Federation also presented a program of methodology for the review of the five treaties, together with a working paper "Methodology for Reviewing the Status of the Five International Legal Instruments Governing Outer Space"[17] setting out their viewpoint.

Some other States pointed to the deficiencies of the 1979 Moon Agreement in relation to its accession and implementation by States, in particular the major space-faring States, as an issue which requires further examination and attention. A call was made on the major space-faring States to take the initiative in the further development of effective international legal regimes and mechanisms.

The introduction of this new agenda item has laid the foundation for further debate on various issues relating to the review of the status of the five international legal instruments governing outer space by Member States. A Working Group on agenda item 5 will be established at the Legal Subcommittee's next session, in 1999, and many of the issues raised in this session will be reconsidered and debated at that time.

Furthermore, while it was generally accepted that the proposals of part III of the working paper submitted by Germany went beyond the scope of this agenda item, a revised version of these proposals was introduced within the context of agenda item 6, Other Matters, for consideration as a possible new agenda item of the Subcommittee.

The Subcommittee also agreed, in accordance with a proposal in the German working paper, to request the Secretariat to prepare, within existing resources, an inventory of international agreements and other available legal documents, including those relating to environmental law, relevant to space-related activities, as a working document for Member States.

e) Item 6: Other Matters

Two issues were raised for debate at this year's session. In the first instance, the Subcommittee continued its consideration of new agenda items in order to present an agreed list to COPUOS for possible inclusion in the agenda of the legal Subcommittee. There were several proposals tabled but only two items, "Improvement of the Convention on Registration

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17 *See* U. N. Doc. A/AC.105/698.

of Objects Launched into Outer Space"[18], presented at this session of the Legal Subcommittee by Germany on behalf of the ESA Member States and States having signed cooperation agreements with ESA, and the Czech Republic's "Review of existing norms of international law applicable to space debris", were ready to be substantially discussed as possible new agenda items. Despite the limited number of items which were ready for discussion and various open-ended informal consultations, the Subcommittee was unable to reach consensus and recommended that further informal discussions on this matter take place at the next COPUOS session.

The second issue to be raised under this item was the Legal Subcommittee's contribution to the UNISPACE III Conference which will be held in Vienna in July 1999. Following the views expressed by various countries, most notably that of the delegation of China, during the General Exchange of Views, the delegation of Argentina proposed that the Legal Subcommittee should make a contribution to the work of UNISPACE III in its consideration of legal issues. This proposal was greeted with enthusiasm by many delegates, who, while acknowledging the role of COPUOS and the Scientific and Technical Subcommittee as the Preparatory and Advisory Committees for UNISPACE III, were all of the opinion that the Legal Subcommittee had its own role to play in this regard.

After considering and debating the issues involved[19], the Subcommittee recommended that the Chairman of the Legal Subcommittee should report to UNISPACE III on the work of the Subcommittee, including its past achievements, current work and new challenges in the development of space law.

f) Space Law Symposium

The International Institute for Space Law (IISL), in collaboration with the European Centre for Space Law (ECSL) organized a space law Symposium entitled "Review of the Status of the Outer Space Treaties", at the end of the first day's session of the Legal Subcommittee. The Symposium was well received by the Member States, particularly in the

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18 General Assembly Resolution 3235 (XXIX), annex, of 12 November 1974. See U.N. Doc. A/AC.105/C.2/L.211/Rev.1, paras. 10-13 for the text of the proposal.

19 The Subcommittee noted that the provisional agenda of the UNISPACE III Conference included a review of the current status of the law of outer space, that the Chairman of the Legal Subcommittee would be included as a member of the bureau of the Conference, that a workshop or symposium on space law would be organized by the International Institute of Space Law, that the background paper on the promotion of international cooperation being prepared by the Secretariat would cover issues relating to international space law and that the draft report of the UNISPACE III would include a subsection on space law entitled "Promotion of International Cooperation", upon which the Legal Subcommittee would be able to provide comments at its 38th session in 1999.

light of its relevance to the new agenda item under consideration by the Legal Subcommittee.

g) Technical Presentation

A technical presentation on the possible role of the Committee on the Peaceful Uses of Outer Space in applying the provision of the Outer Space Treaty to intellectual property issues was made by Mr. B. Smith (France) at the 607th meeting of the Subcommittee.

III. The Committee for the Peaceful Uses of Outer Space (3-12 June 1998)

1) Introduction

The forty-first session of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) was held in Vienna, Austria, and was once again chaired by Prof. U.R. Rao of India. The session was attended by 47 of the 61 States Members of the Committee[20], by the representatives of specialized agencies and other international organizations[21] and seventeen observers.[22]

Preparations for the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) dominated the work of COPUOS, as the Preparatory Committee for the Conference, during this years session. Extensive progress was made in organizational and preparatory matters relating to the Conference, including the provisional

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20 Argentina, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, the Czech Republic, Ecuador, Egypt, France, Germany, Greece, Hungary, India, Indonesia, Iran (Islamic Republic of), Iraq, Italy, Japan, Lebanon, Malaysia, Mexico, Morocco, the Netherlands, Pakistan, Peru, Philippines, Poland, Portugal, Romania, the Russian Federation, South Africa, Spain, Sudan, Sweden, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, the United States, Uruguay, Venezuela, and Viet Nam.

21 United Nations Educational, Scientific, and Cultural Organization (UNESCO), International Telecommunications Union (ITU), World Meteorological Organization (WMO), European Space Agency (ESA), International Law Association (ILA), International Academy of Astronautics (IAA), International Astronautical Federation (IAF), International Society for Photogrammetry and Remote Sensing (ISPRS), International Mobile Satellite Organization (INMARSAT), International Telecommunications Satellite Organization (INTELSAT), and International Space University (ISU).

22 Algeria, Angola, Azerbaijan, Bolivia, Costa Rica, Cuba, the Democratic People's Republic of Korea, Finland, Guatemala, the Holy See, Libyan Arab Jamahiriya, Paraguay, Republic of Korea, Slovak Republic, Thailand, Tunisia, and the League of Arab States.

Rules of Procedure, Technical Forum, draft report, draft report executive summary and the proposed Vienna Declaration that is expected to emerge from the Conference. In addition, some progress was made in relation to the issue of the geostationary orbit, while developments within the Legal Subcommittee session concerning new items for the agenda carried over into substantial discussion and negotiations within COPUOS. Also important was the agreement reached concerning a time schedule for shortened sessions of both Subcommittees and COPUOS in 1999, to account for the holding of the UNISPACE III Conference.

One other development which bears mention was the announcement by Morocco that the Second Vice-Chairman/Rapporteur of the Committee, Prof. M. Kabbaj (Morocco), would be unable to complete his term of office in accordance with the package proposal agreed upon last year. In terms of this package proposal, it fell upon the Africa Group to nominate a replacement for Prof. Kabbaj. Unfortunately, due to the relative suddenness of this development, consensus on a nominee was unable to be reached before the end of the session. However, it is anticipated that the matter will be resolved through negotiations within the Africa Group in due course.

b) Preparations for the UNISPACE III Conference

In order to assist COPUOS in its function as Preparatory Committee for the UNISPACE III Conference, a Working Group of the Whole was established under the able chairmanship of Ms. U. Butshek of Austria. The main responsibility of the Working Group was to comprehensively review and comment on the draft report of the Conference developed by the secretariat following the Advisory Committee meeting in February 1998. Additionally, an informal drafting group, under the guidance of the delegations of Pakistan and Canada, was established in order to develop a draft executive summary of the Conference report, together with a draft text of the Vienna Declaration (the instrument setting out the recommendations and Plan of Action of the Conference).

On the basis of the excellent work done by the drafting group, together with the comments received from Member States during the review and discussion of the draft report, the Committee agreed that the secretariat would prepare and circulate revised drafts of the three texts mentioned above during the course of 1998, to enable further comment and consideration, with a view to their finalization, during the Advisory Committee session in 1999.

In addition to the extensive work carried out relating to the UNISPACE III draft report, the Preparatory Committee considered other outstanding organizational matters of the Conference. The primary focus of discussion in this regard were the Provisional Rules of Procedure of the UNISPACE III Conference. The secretariat had prepared for consideration by the Preparatory Committee a draft text of these provisional rules which sought to follow the General Assembly Rules of Procedure, except to the extent that the unique nature of the UNISPACE III Conference necessitated variances. While the text was generally well received by the majority of

Member States, complex discussions arose concerning the rules dealing specifically with the composition of the bureau of the Conference. This matter had been agreed upon by consensus during the Advisory Committee session in February 1998, but once again became an issue of contention for some Member States. After extensive debate in the Working Group of the Whole however, the Preparatory Committee was able to reach consensus on a text of the Provisional Rules of Procedure[23] which will be presented to the General Assembly for endorsement at its 1998 session.

Unfortunately, due to the extent of discussions on the draft report, executive summary, Vienna Declaration and Provisional Rules of Procedure, the Preparatory Committee was unable to finalize issues such as the allocation of agenda items among the Plenary, two main Committees and Technical Forum of the Conference and the identification of the Conference bureau officers. It is anticipated that these issues will be resolved during the February 1999 Advisory Committee session.

c) Space Debris

The Committee noted with satisfaction the work of the Scientific and Technical Subcommittee on the current stage of the multi-year work plan, specifically dealing with the issue of space debris mitigation measures. The Committee further endorsed the third part of the Subcommittee technical report on space debris, together with the updated versions of the first two parts of the report. As in the earlier Subcommittee session, the sensitive issue of conclusions for the technical report was raised and discussed in the Committee. However, consensus again proved elusive and the issue remains open for consideration at the next session of the Subcommittee.

d) Technical Attributes of the Geostationary Orbit

Significant progress was made in the matter of the technical attributes of the geostationary orbit (GSO). The delegation of Ecuador, which together with Colombia has for many years actively advocated views which prevented consensus on this issue, announced its acceptance of two principles proposed by the Czech Republic in a working paper submitted to the Scientific and Technical Subcommittee. The working paper proposed formulation of two principles universally accepted by the scientific and technical community in order to facilitate a basis for progress in the discussions on the GSO. During the 1998 session of the Subcommittee, Ecuador had not been prepared to concede these principles and had effectively prevented the reaching of consensus. Ecuador's acceptance of these principles during the Committee discussions did not raise any objections from Colombia, who restricted comments to ensuring that the

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23 *See* U. N. Doc. A/53/20, Annex (not yet released as of the writing of this article).

issue remained open for deliberation and discussion in the Legal Subcommittee. Consequently, consensus was reached by the Committee on the universal acceptance of the two principles, and it is anticipated that this development will have a positive impact on the progress of discussions on the GSO in both the Scientific and Technical and the Legal Subcommittees.

e) Regional Centres for Space Science and Technology Education

The Committee noted with appreciation the efforts made by the Office for Outer Space Affairs with regard to the establishment of regional centres for space science and technology education and endorsed the Scientific and Technical Subcommittee's recommendation that the Office facilitate discussions among interested Member States within the Asia and Pacific region, in order to advance the proposed expansion of the Centre into a network of nodes. Further progress was also made in connection with the establishment of a network of space science and technology education and research institutions for the central-eastern and south-eastern European regions. Italy, in particular, indicated its intention to support the evaluation mission to the region which will be organized by the Office in this regard.

f) Nuclear Power Sources in Space

The Committee noted and endorsed the recommendations for the adoption of a four-year work plan by the Scientific and Technical Subcommittee on nuclear power sources in space, which had been jointly proposed in a working paper by the United Kingdom, Russian Federation and United States. The Committee also agreed that, as a first step to the implementation of this plan, the secretariat should invite Member States and international organizations to submit information on the topics scheduled to be considered under the work plan in 2000 and 2001.

g) Review of the Status of the Five Legal Instruments Governing Outer Space

The Committee noted that the Legal Subcommittee had begun its consideration of this new agenda item, and agreed that the Subcommittee's review of the status of the five international legal instruments governing outer space was a significant development in the revitalization of its work. Many Member States expressed views on this item which reiterated the main substantive themes raised at the Legal Subcommittee with regard to the formal and practical adherence of States to the five treaties, as well as the role of this review in possibly identifying further agenda items for consideration.

The Committee endorsed the recommendation of the Subcommittee that the Secretariat should be requested to prepare, within existing

resources, a list of international agreements and other legal documents relevant to activities in outer space, and where they might be found, as a working document for the Member States. The Committee further recommended that the Legal Subcommittee should continue its consideration of the item at its session in 1999, and establish a working group for this purpose in accordance with the its previous recommendation of 1997.

h) New Agenda Item for the Legal Subcommittee

While the Committee noted that various new agenda items were under consideration for possible inclusion by the Legal Subcommittee, the primary focus of discussions was on the possible new agenda item, "Improving the Registration Convention" which had been proposed by Germany (on behalf of the Member States of ESA and States having signed cooperation agreements with ESA) in Section III of its working paper "Review of the Status of the Five International Legal Instruments governing Outer Space"[24], submitted to the Legal Subcommittee at its 1998 session.

This proposed new agenda item received a great deal of support within the Committee, as a result of continuing informal negotiations between its major sponsors and other delegations. However the United States, in particular, was not prepared to accept the adoption of this new agenda item or the suggested compromise of a consideration of the adequacy of the concept of the "launching State" as contained in the Registration Convention and the Liability Convention, without the opportunity to further analyse their possible implications. It was therefore agreed that inter-sessional consultations would be carried out by interested delegations in an attempt to achieve consensus on this matter for the next session of the Legal Subcommittee.

i) Shortened Committee and Subcommittee Sessions for 1999

The Committee agreed that the 1999 Committee and Subcommittee sessions should be shortened and somewhat re-organized as a result of the holding of the UNISPACE III Conference in July of that year. Consequently it was decided that the Scientific and Technical Subcommittee and Legal Subcommittee sessions should be held back to back, each for five days, from 22 February to 5 March 1999. Due to the fact that the Scientific and Technical Subcommittee will continue to serve as the Advisory Committee for the UNISPACE III Conference, it was agreed that its session could be extended up to three additional days if so required. The COPUOS session for 1999 will be held from 14 to 16 July and focus primarily on a review of

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24 *See* U. N. Doc. A/AC.105/C.2/L.211/Rev.1.

the work of the two Subcommittees and resolution of any outstanding issues related to the UNISPACE III Conference.

Philip R. McDougall & Natercia F. Rodrigues
Assoc. Legal Affairs Officers, Office for Outer Space Affairs, United Nations Office at Vienna.

COMMENTS

PROTECTION OF THE SPACE COMMONS: NEW CUSTOMARY LAW?

*K. Gorove**

There has been considerable scientific and legal literature for some years on the problem of space debris[1] and the gaps or lacunae in the existing space treaties.[2]

Although the Outer Space Treaty and the Liability Convention can be of some assistance when specific damage[3] has occurred to a specific person or property and when the source of the damage can be identified,[4]

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* Visiting Associate Professor, American University, Washington College of Law.

1 *See, e.g.,* H. BAKER, SPACE DEBRIS: LEGAL AND POLICY IMPLICATIONS (1989). *See also* the numerous chapters contained in ENVIRONMENTAL ASPECTS OF ACTIVITIES IN OUTER SPACE (K. H. Böckstiegel ed.) (Cologne 1990); *idem, The Draft of the International Law Association for a Convention on Space Debris*, 38 PROC. COLLOQ. L. OUTER SPACE 73-77 (1996).

2 *See* K. Gorove & E. Kamenetskaya, *Tensions in the Development of the Law of Outer Space*, in BEYOND CONFRONTATION 225-275 (L. Damrosch, *et. al.*, eds. 1995).

3 "Damage" means the "loss of life, personal injury or other impairment of health; or loss of or damage to property of states or of persons, natural or juridical or property of international intergovernmental organizations." Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 UST. 2389, T.I.A.S. 7762, 672 U.N.T.S. 119 (eff. Oct. 9, 1973) (hereinafter "Liability Convention").

4 *Id.*, arts. II (strict liability for "damage" occasioned by a launching state's space object to the surface of the earth or to aircraft in flight) and III (negligence standard when the damage is caused "elsewhere than on the surface of the earth to a space object" or to "persons or property on board such a space object." *See also* Treaty on Principles Governing the Activities of States in the Exploration and Use of Oputer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, T.I.A.S. 6347, 610 U.N.T.S. 205 (eff. Oct. 10, 1967) (hereinafter "Outer Space Treaty"), art. VI (mandates international responsibility for national activities in outer space, irrespective of whether they are carried out by governmental or non-governmental entities) and art. VII (launching state is liable

neither provides much assistance in dealing with problems of over-cluttering of the lower earth orbit[5] or protection of the space commons generally.[6]

There have been efforts to have the Legal Subcommittee of the UN Committee on Peaceful Purposes Of Outer Space ("COPUOS") place space debris on its agenda,[7] but they have met with no success. The debris issue is currently only being addressed as an agenda item within the Scientific and Technical Sub-Committee of COPUOS.[8]

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for injuries caused by such launch object to another state or to natural or juridical persons).

5 General or specific damage to the space environment from chemical, biological, or radiological contamination or large amounts of debris does not fall within the Liability Convention's definition of "damage" because the space environment is not property belonging to people or institutions.

6 For an excellent and thorough discussion of the shortcomings of the Outer Space Treaty in dealing with the issues of space debris, see the piece by N. Jasentuliyana, *supra*, at 139-162 of this issue of the Journal. Article IX of the Outer Space Treaty imposes an obligation on the States Parties to avoid harmful contamination of the moon and other celestial bodies. Article IX could be interpreted to apply to outer space as well, the obligation being only "to avoid harmful contamination." That phrase is not defined in the Treaty and it is not clear whether it means debris, or some type of biological contamination. In addition, Article IX requires States Parties to prevent the introduction into the earth's environment of extraterrestrial matter which may cause adverse changes. This provision would not apply to debris of terrestrial origin. Also, the phrase "adverse changes" is not defined nor is it stated when states should think it necessary to adopt appropriate measures and what those measures should be. Article IX also stipulates that States Parties shall conduct their activities in outer space "with due regard to the corresponding interests of all other States Parties to the Treaty." Further, if a State Party has reason to believe that an activity planned by another State Party would cause "potentially harmful interference" with its activities "in the peaceful exploration and use of outer space," it "may request consultation" with the potentially interfering state. Nonetheless, the other State Party's obligation to consult exists only when it has a reasonable belief that its activities "would cause potentially harmful interference" to another State Party's activities. Presumably, in such a case, if the State decided not to consult, it would be in breach of its international treaty obligations. Apart from this, there is the "common interest" provision in Article I and some other general provisions in the Outer Space Treaty which require compliance with international law and call for promotion of international cooperation.

7 For the treatment within U N COPUOS, see Philip R. McDougall & Natercia F. Rodrigues, *Review of the Work of the United Nations Committee on the Peaceful Uses of Outer Space and its Subcommittees 1998,* in this issue of the Journal.

8 The issue was placed on its agenda in 1994. Report of the Scientific and Technical Subcommittee on the Work of its Thirty-first Session, UN Doc. A/AC.105/571 (1994).

Most of the literature pertaining to debris calls for one or more of the following actions: further study of the debris problem, particularly in terms of tracking the existing debris to collect data and adopting mitigation measures; the drafting of a new space treaty or protocol to an existing treaty; or the formulation of guiding principles or standards and recommended practices. Some progress is being made on the first.[9] To date, there has been no movement on the latter actions.

In the meantime, the gaps or lacunae in the legal regime for problems arising from space debris will have to be filled by customary international law norms applying to the areas outside the jurisdiction and control of states. As to mitigation of debris, states will continue to develop their own requirements and plans of action until global norms develop. There have been three recent decisions of international tribunals that bear upon customary norms and unilateral actions for protection of the environment of the space commons.

Of particular note is that for the first time, the International Court of Justice has had the opportunity to set forth its view of a state's environmental obligations vis-a-vis the commons in both an Advisory Opinion in 1996 and a Judgement in 1997.[10] The Court stated:

> the environment is not an abstraction but represents the living space, the quality of life and the very health of human beings, including generations unborn. The existence of the general *obligation of States to ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control* is now part of the corpus of international law relating to the environment. (Emphasis added).[11]

This language used by the Court reflecting its view of the state of customary international law for protection of the environment of the commons departs from earlier formulations. For example, Principle 21 of the Stockholm Declaration on the Human Environment provides that "States have ... the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other

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9 Recently, the US and Norway have agreed to set up a radar station named "Globus II" to track space debris.

10 *See* Legality of the Threat or Use of Nuclear Weapons (Advisory Opinion of July 8, 1996), 35 ILM 809 & 1343 (1996); Gabcikovo-Nagymaros Project (Hungary/Slovakia) (Judgement of September 25, 1997), 1997 ICJ 3, 37 ILM 162 (1998).

11 Gabcikovo-Nagymaros Project, *id.*, para. 54, citing Nuclear Weapons Advisory Opinion, *id.* at para. 29.

states or of areas beyond the limits of national jurisdiction."[12] The view expressed by the drafters of the Restatement (Third) of Foreign Relations Law of the United States as of 1987 was that under customary international law:

> A state is obligated to take such measures as may be necessary, to the extent practicable under the circumstances, to ensure that activities within its jurisdiction or control
>
> a conform to generally accepted international rules and standards for the prevention, reduction, and control of injury to the environment of areas beyond the limits of national jurisdiction; and
>
> b are conducted so as not to cause significant injury to the environment of areas beyond the limit of national jurisdiction.[13]

The question, therefore, is whether the ICJ's use of the word "respect" encompasses earlier formulations of a state's environmental obligation to the commons. It could be said that the term "respect" would surely include an obligation not to cause significant injury and an obligation to apply international standards of prevention, reduction and control of injury. It is doubtful, however, whether it encompasses the language of the Stockholm Principle "to not cause damage." But, irrespective of whether the ICJ's pronouncements can be viewed as a narrower formulation of what had heretofore been considered a patchwork quilt of customary obligations of states, its pronouncements significantly strengthen the body of customary norms governing the commons. In short, there is now no doubt that states have an obligation to ensure that activities within their jurisdiction and control respect the space commons.

Also of relevance to the protection of the space commons issue is a recent Appellate Body decision of the World Trade Organization pertaining to the protection of sea turtles. The decision wrestles with the legality of a state adopting regulations which have the effect of proscribing conduct outside its territory for the purpose of protecting an exhaustible natural resource not located exclusively within its jurisdiction.[14] The United States had placed a prohibition on imports of shrimp from countries which did not receive U.S. certification of being in compliance with U.S. shrimp

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12 Declaration of the United Nations Conference on the Human Environment in Support of the United Nations Conference on the Human Environment, UN Doc. Conf. 48/14/Rev.1 (UN Pub. E.73.II.A.14), at 2, 7 (1972).

13 RESTATEMENT (THIRD) OF FOREIGN RELATIONS LAW OF THE UNITED STATES § 601 (1987).

14 United States, Import Prohibition of Shrimp and Certain Shrimp Products, WT/DS58/AB/R, 12 October 1998 (hereinafter "Sea Turtle Case").

trawler regulations aimed at protecting the sea turtle.[15] Normally, such restraints of trade are illegal under the GATT unless they fit into one of the GATT exceptions, one being Article XX (g). That provision permits such measures if they: "relat[e] to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption...." The Appellate Body stated that there was sufficient nexus between the endangered marine populations involved and the United States for purposes of Article XX (g), even though many of the turtles were not within U.S. jurisdiction. Because the provision of the U.S. was designed to "influence countries to adopt national regulatory programs" in line with U.S. standards,[16] the Appellate Body found that "the means and ends relationship between [the US legislation] and the legitimate policy of conserving an exhaustible...[resource] is observably a close and real one... 'relating to' the conservation of an exhaustible natural resource within the meaning of Article XX(g) of the GATT 1994."[17] Nonetheless, the Appellate Body stated that the measures constituted "a means of arbitrary or unjustifiable discrimination", partly because the U.S. had failed to engage in "serious, across-the-board negotiations with the objective of concluding bilateral or multilateral agreements for the protection and conservation of sea turtles, before enforcing the import prohibition..."[18]

The relevance of this case for the treatment of the space commons may be somewhat speculative since currently the General Agreement on Trade in Services does not apply to launch services. Nonetheless, outside the WTO context, conflicts have arisen between countries when one country attempts to apply its laws in such a way as to effect a change in the policies of another country.[19] The Sea Turtle Case stands for the proposition that a country or group of countries could impose restrictions in order to effect a change or impose requirements for space debris mitigation to protect the natural resource of the space commons. The pre-condition to adopting such

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15 The U.S. passed regulations whereby shrimp trawlers had to use turtle excluder devices, with a few exceptions, in particular areas with high incidence of mortality among certain types of sea turtles. India, Malaysia, Pakistan and Thailand asked the WTO Panels be established to examine U.S. actions and their consistency with WTO obligations.

16 Sea Turtle Case, *supra* note 14, para. 138.

17 Sea Turtle Case, *supra* note 14, paras. 141-2.

18 Sea Turtle Case, *supra* note 14, para. 166.

19 *See, e.g.*, the blocking legislation implemented by the European Union, Canada, and Mexico in response to U.S. legislation imposing penalties on persons "trafficking" in Cuban property, *reprinted in* 36 ILM 133 (1997). The Cuban Liberty and Democratic Solidarity Act of 1996, U.S. Public Law 104-114, March 12, 1996, *reprinted in* 35 ILM 357 (1996).

restrictions would be that serious efforts had been made to negotiate multilateral or bilateral arrangements to address the issue. For example, if a country makes several attempts to negotiate multilateral mitigation measures aimed at preserving the space commons, that country could prohibit its nationals from utilizing launch services of countries with lesser standards, justifying its actions with reference to the WTO Appellate Body decision.

The conclusion that emerges from this presentation is that the reviewed ICJ pronouncements significantly strengthen the body of customary norms governing the commons and that there can be little doubt that states now have an obligation to ensure that activities within their jurisdiction and control respect the space commons. The recent Appellate Body decision of the World Trade Organization provides further support for the ability of States to take action to protect it. All in all, these developments suggest that there appears to be an ongoing gradual emergence of a body of customary norms pertaining to the protection of the space commons.

SHORT ACCOUNTS

Melbourne Colloquium on the Law of Outer Space

The 41st IISL Colloquium on the Law of Outer Space was held in Melbourne, Australia, September 29 to October 2, 1998. Papers were presented on a wide range of subjects in four sessions: (1) Managing Space Resources and Revitalizing the Space Treaties; (2) Confidence Building and Commercial Interests in Outer Space; (3) Legal Aspects of Navigation Satellites, Space Applications and Space Uses; and (4) Other Legal Matters, Including the Thirtieth Anniversary of the Rescue Agreement of 1968.

The Colloquium was well attended throughout to hear expert authors from a dozen countries. The opening session took up the question of managing space resources. Several papers focused on the management of resources on the moon and the need for institutional organization to facilitate effective management. The session dealing with uses of space generated substantial discussion about the status of extraterrestrial resources and the extension of personal property rights to resources beyond the Earth. One paper directly discussed the landing on and declaration of ownership of an asteroid. The author, recognizing the incompatibility of the arguments of the paper with the existing law, declared his company's current intent to challenge the law by the actual flight to and taking control of an asteroid, to force the issue. In discussion of this paper, a number of comments reflected the concern that there are better ways to test the law than to set out intentionally to violate it, but the author believes this approach will engage all parties and all issues of relevance to the matter of exercise of property rights over resources in outer space. This subject was earmarked to be discussed at greater length in future colloquiums. Other papers in this session addressed the need for regulation of routine and recurring flights into outer space; proposed

European initiatives to improve the 1975 Registration Convention; the probable needs in the future to expand and improve the 1968 Rescue and Return Agreement; and finally, a comparative survey was done of the limits to sovereignty in treaties relating to outer space, the high seas, and Antarctica.

The second session heard three papers dealing with the use of space resources, particularly remote sensing systems, as tools for reducing tension in international security by offering confidence building measures. As new technology is acquired and made more widely available, national and regional security interests are affected. These papers argued that the sharing of knowledge and information through establishment of a range of confidence building measures could reduce or eliminate tensions generated by the spread of new technologies, particularly those relating to missile launch capacity and the conduct of reconnaissance. Another paper in this session described the confidence building of private business interests in spaceflight activity through expanding experience with contracts and related agreements. Other papers addressed the legal framework in Japan for third party liability for injury or damage caused by NASDA's launch activities; an interesting assessment of secured interests in satellites; and the effects of US policies on international trade in provision of launch services.

The third session included two papers discussing legal aspects of current developments and program plans in the navigation satellite service area. Three papers discussed aspects of international regulation and spectrum management problems associated with the use of communication satellite systems, and the role of the International Telecommunication Union in this connection. One paper addressed the process of privatization of INMARSAT, one discussed legal and regulatory issues of routine and recurring passenger space travel, and several of the papers planned for this session were withdrawn.

In the fourth session, a summary of a paper was presented recommending the review and formulation of guidelines for examination of the 1967 Outer Space Treaty. Another paper addressed the long-standing issue of the delimitation of outer space, and a survey paper was presented on the recent developments in space law in Brazil. The final paper presented addressed the status of the concept of the common heritage of mankind in modern space law. Several of the papers of the planned fourth session were also withdrawn by authors unable to attend the colloquium.

The general discussion period that followed conclusion of the fourth session was largely focused on issues raised in the opening session related to the use of space resources and the possibility of extension of property rights and even of sovereignty to resources located in outer space. In concluding the Colloquium, IISL President, Dr. Jasentuliyana, noted that the status of resources in outer space was a matter of high interest to many

people. He indicated that this topic will be given additional attention in future colloquia of the Institute.

Stephen E. Doyle
Director, International Institute of Space Law (IISL)

Establishment of the Chinese Institute of Space Law

After long years of preparation, the Chinese Institute of Space Law (CISL) was established on December 21, 1997.

The plenary meeting adopted the constitution of the Institute and elected members of the Board as its leading organ.

During the plenary meeting, *Dr. Qizhi He*, Deputy President of CISL, made a Key-note speech entitled "Space Law Problems under Current Situation", which recapitulated the important developments of space activities and the relevant space law issues, stressing the elaboration and adoption of space law and regulations governing Chinese space activities as a primary and urgent task for Chinese Space Law workers. Meanwhile, he noted the necessity of strengthening legal awareness and measures of space commercialization, as well as the perspectives of certain legal issues, such as the controversies over the delimitation of air space and outer space, the growing importance of environment protection by space technology, space debris and the legal issues of manned space flight and space station.

The founding of CISL will provide a forum and organization which will attract students in the legal, social and other sciences as well as people from government, academia and other walks of life. It will also create favorable conditions for studying space law in China. The CISL will carry out academic research activities and will promote exchanges with the International Institute of Space Law, as well as corresponding organizations in other countries for the purpose of progressive development of international space law.

Dr. Qizhi He
Deputy President
Chinese Institute of Space Law

CASE DEVELOPMENTS

A patent infringement lawsuit brought in 1995 by TRW against ICO Global Communications, London, claiming that ICO Global's satellite mobile-telephone system was based on designs patented by TRW for its own satellite mobile telephone system, called Odissey, was dropped by TRW in return for a specified share in ICO's system.

On Jan. 30, 1998 Comsat filed a lawsuit against IDB Mobile Communications Inc. for breach of contract seeking payment for satellite services rendered to IDB in 1997. IDB's parent company, Stratos Mobile Networks, claimed that it has paid for all Comsat's services and earlier in 1997 filed a complaint against Comsat claiming unfair pricing practices.

Executive and Legislative Notes

The Pentagon could revive funding for the U.S. military space plane in 1999 by using funds left over from prior years. The $10 million funding for the program was slashed from the 1998 budget by Presidential veto.

Under a 1996 U.S. law, known as the **Kyl-Bingaman amendment,** American companies were restricted from imaging Israel at a resolution better than what is commercially available from non-U.S. sources. Russia has marketed reconnaissance satellite imagery with a 2-meter film based imagery which was deemed by U.S. government officials to be the qualitative equivalent of 1-meter digital imagery. Notwithstanding this prior determination the Departments of State and Commerce in a surprise July ruling concluded that there is no "readily and reliably available commercial imagery" with 1-meter resolution and over industry's objection barred U.S. companies from selling satellite imagery of Israeli territory with 1-meter resolution.

Under a July 27, 1998 decision of the Department of Defense a new type of booster will be used for launching ground-based interceptors into space to destroy incoming warheads by impact. However, legislation to speed up implementation of the **National Missile Defense** system failed by one vote in the Senate in September.

Under the **Commercial Space Act of 1997** (H.R. 1702), signed by President Clinton on Oct. 28, 1998, the Federal Aviation Administration has been given authority to license privately-owned reusable launch vehicles to re-enter the Earth's atmosphere (see CURR. DOCS. *infra*). The previous law had not permitted Space Shuttle-type atmosphere re-entry for private industry. A provision which sought to impose a 60-day time limit on the U.S. Defense and State Departments to respond to remote-sensing licensing requests was dropped from the Act.

The NASA spending bill approved by the House on July 29, banned any funding for **Triana,** an Earth-observing satellite program and cut funds from NASA's Earth Science program. However, a peer review resulted in the selection of Triana which would be launched from the space shuttle's cargo bay in December 2000. The project would also contribute to a better understanding of the role the Sun plays in global warming models.

The U.S. Dept. of Commerce granted Research and Development Laboratories of Culver City, Calif. a license to build and operate **Radar 1,** a satellite capable of taking radar images with 1-meter resolution.

The proposed **"Space Launch Cost Reduction Act of 1998,"** (S. 2121), if enacted, would provide loan guarantees for qualifying private sector companies to receive otherwise unattainable financing.

Congress in two bills (S. 2365 and H.R. 1872) has been considering changing the 1962 law that established Comsat Corp., the U.S. signatory to and partial owner of **INMARSAT and INTELSAT** which are in the process of privatization. While the House passed the measure, it failed to receive Senate approval. It is likely to be reintroduced in 1999.

NASA's $13.6 billion **1999 budget** (H.R. 4194), a small fraction of the $1.7 trillion U.S. budget, included $245 million in unsolicited funds

earmarking money mostly for University associated projects in specific congressional districts. The International Space Station was fully funded at $2.27 billion.

The DoD authorization bill (H.R. 3616) approved overwhelmingly by the Senate on Oct. 1, 1998 would shift responsibility for **satellite export licenses** next March from the Commerce Department, where President Clinton had transferred it in 1996, back to the State Department.

International Developments

A new era in space exploration and colonization opened up on Nov. 20, 1998 with the successful placement into orbit of the 43,000-pound Zarya (Sunrise, formerly known as the Functional Cargo Block), the first module of the **International Space Station** in which 16 nations participate. Launched by Russia's powerful Proton booster from Kazakhstan Zarya was joined by Unity, a 25,000-pound American built connecting passageway, which was placed into orbit by the space shuttle Endeavour on Dec. 4. The launching of the oft delayed, Russian-built Service Module has been pushed back to July 1999. Canada's Remote Manipulator arm is to be launched in 2000 and pieces of the Japanese Experiment Module in 2002 and 2003. The Bilateral Crew Operations Panel, made up of top Russian and U.S. managers, agreed on the makeup of the first crew, to arrive in space in 1999. It will be commanded by astronaut William Shepard who will be accompanied by two veteran cosmonauts. Shepard's crew will be replaced in late 1999 or early 2000 by commander Yuri Usachev and two U.S. astronauts. The cost by completion around 2004 will exceed $60 billion, of which $53 billion is to come from the United States (including launches).

Under a decree signed by Russian President Yeltsin the **Russian Space Agency** is given integrated oversight authority over civilian, military and industrial space policy.

Sea Launch, an international partnership of American, Ukrainian, Russian and Norwegian companies to launch Zenith rockets from an offshore platform in the equatorial Pacific 2,240 kilometers southeast of Hawaii awaited its first payload's arrival in August 1998, but because of safety concerns, Boeing's license to cooperate with its foreign partners in the Sea Launch of a PanAmSat Galaxy 11 satellite was temporarily suspended by the U.S. State Department, but has been reinstated after a settlement between Boeing Co. and the Department over technology transfers.

In June 1998, the **Australian** government decided to grant a 22 percent wholesale **tax exemption** for equipment launched into space thereby providing a significant incentive for the commercial space launch industry in Australia.

ITU's Radio Regulation Board ruled in July that **EUTELSAT** failed to meet its mid-1997 deadline for occupying its assigned orbital slot when it had tried to keep the slot by testing a satellite in that location before moving it on to its intended orbital slot elsewhere. The ruling allowed the

Société Européenne des Satellites to use its slot situated less than one degree away from EUTELSAT's intended location.

ITU's Minneapolis Plenipotentiary Conference concluded Nov. 6 adopted a number of measures aimed at reflecting the importance of the private sector in fulfilling the mission of ITU and agreed to adjust ITU's Constitution and Convention to reflect this need. The conference also established fees beginning Nov. 7 for satellite applications to offset the cost of coordinating orbital slots

The **Tampere Convention** on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations was signed by 33 countries on June 18, was opened for signature in New York on June 22, 1998 and will remain open until June 21, 2003. It will enter into force 30 days after it is ratified or accepted by 30 countries.

An Internet search engine enabling users to easily find satellite **remote sensing** data **(Infeo)** is to be ready in December 1998 as contemplated by the European Commission's Center for Earth Observation.

INMARSAT government members meeting in Rhodes, Greece, Sept. 23-25, decided to make INMARSAT a private company by April 1, 1999 with a publicly traded stock offering about two years later.

The U.S. and Norway are planning to build in the Norwegian Arctic region a radar station, named **Globus 2,** to track space debris.

Manfred Lachs Space Law Moot Court Competition

The final competition of the 7th Manfred Lachs Space Law Moot Court program was held in the Supreme Court of Victoria, Melbourne, on October 1, 1998, between the teams of the University of North Carolina (USA), including Robin Frankenberry and Gary Smith, and the University of Helsinki (Finland), including Mirkka Mykkänen and James Summers. The competition was adjudged by ICJ Justices Weeramantry (Vice President of the Court), Koroma, and Vereshchetin.

The winning team was the University of North Carolina and the best memorial, awarded at the initiative of Prof. Stephen Gorove with the 1998 issues of the JOURNAL OF SPACE LAW, was written by members of the Helsinki team. ** Robin Frankenberry was selected as the best oralist receiving a certificate and a prize at the initiative of the Law Offices of Sterns and Tennen.***

** The case involving the Commercial Exploitation of the Moon -- The Rover Games Project -- and the text of the winning memorial may be found in **CURRENT DOCUMENTS**, *infra.*

*** On the 1999 Competition, please see ***Forthcoming Events, infra.***

Other Events

The explosions of Boeing's Delta 3 launcher in August, and China's Long March 3B, ESA's Ariane 5, and Lockheed-Martin's launch vehicle in recent years provides an alert to insurance companies and satellite owners.

An **IAA** session at COSPAR's July 1998 Congress urged a new cosmic study to establish a Radio Observatory on the Far Side of the Moon, needed not only for SGTI but also for the future of high sensibility radioastronomy for the next 20/30 years.

A U.S.-Russian agreement signed September 2 in Moscow provides for sharing missile early warning information.

The **Mars** Society Founding Convention held at the University of Colorado, August 13-16, 1998 addressed Mars science, politics, economics, law, as well as cultural and ethical issues.

During the International Law Weekend on November 13, 1998 in New York City a panel discussion sponsored by the National Space Society focused on the Future of **World Peace** and **Outer Space** with an emphasis on telecommunications and the United Nations.

Brief News in Retrospect

New pictures taken in October 1998 by a new camera of the ***Hubble Space Telescope*** revealed the oldest galaxies as they appeared when universe was only about one-twentieth of its present age, or much less than a billion years old.

A **micrometeorite,** one of the oldest extraterrestrial debris to have hit the earth 1.4 billion years ago, has been discovered in a layer of sandstone in Finland.

ESA's Infrared Space Observatory satellite using infrared sensors to measure radiation has detected 24 distant **galaxies.**

A NASA sponsored conference at the Ames Research Center earlier this year considered the question of **extraterrestrial life** which has moved beyond the question of whether it exists to where and how we should look for it.

Lunar ice containing as much as 10 billion tons of water, enough to sustain life for a colony and provide hydrogen and oxygen propellant for the space shuttle's main engines, appears to be at both poles according to data from Lunar Prospector launched in January 1998.

Use of nuclear thermal rockets which may be capable of reaching **Mars** in only 180 days could help in the eventual colonization of Mars.

"Deep Space 1" launched Oct. 24, 1998, destined to visit an asteroid and make close-up pictures of two comets, uses an economical and efficient ion propulsion engine providing 10 times more power than conventional fuel. It requires less space and a lighter launch vehicle, knows where it is in the solar system, and can correct its course automatically on its own. It may lead to frequent, affordable trips to space.

The use of satellites equipped with **hiperspectral sensors,** an emerging NASA program in its Earth Observing System (EOS), may generate up to 40 times more data than multispectral sensors used by LANDSAT satellites with similar coverage.

The delayed launches of LANDSAT 7 and of NASA's EOS AM-1 satellite are not expected before March and June 1999, respectively.

An **Air Force rocket** carrying a classified military satellite exploded shortly after liftoff on August 12, 1998. The cost of the rocket, the launch and the satellite was about $1.3 billion, making it one of the worst American unmanned launch failures.

The first suborbital launch from the new spaceport on **Kodiak** Island, Alaska, took place in early Nov. 1998.

The Nov. 17 **Leonid** meteor onslaught, the most intense in 33 years, appears to have damaged no satellites to the relief of operators.

The inauguration of **Iridium's** commercial service in November permits users to make and receive calls via satellite from virtually any spot on Earth. Efforts to improve voice quality continue.

Alan Shepard, the first American to fly in space in 1961 who planted the American flag on the moon in 1971 during Apollo 14 which he commanded, died at 74.

The 77 year-old U.S. Senator **John Glenn,** the first American to orbit the Earth in 1962, returned to space Oct. 29 as a mission specialist to study the effects of weightlessness on aging. He landed safely on Nov. 7 and, later, together with the other participating astronauts, including a Spanish and a Japanese astronaut, received a hero's welcome in New York's ticker tape parade.

After Feb. 1, 1999, passenger ships and cargo ships of 300 gross tons or more will no longer use the Morse code for distress calls but will rely on global satellite communications by using the **Global Maritime Distress and Safety System.**

NASA is planning to set up a Near-Earth Object Program Office at its Jet Propulsion Lab in Pasadena, Calif. to track an estimated 2,000 asteroids and comets larger than 1 km wide that are approaching the Earth.

The test flight of NASA's **X-33** reusable launch vehicle has been postponed until about December 1999 because of manufacturing problems.

A Space Infrared Telescope Facility providing views of hitherto invisible objects in the universe is expected to be launched in 2001.

The heaviest **Ariane** 4 ever launched put two telecommunications satellites into orbit Oct. 28. Ariane 5, a new European launcher, will start its commercial operations with flight 503 carrying two satellites.

NASA's plan for the robotic exploration of **Mars** is predicated on international collaboration with France, Italy and ESA. The French CNES would build a Mars orbiter to be launched by Ariane 5 in 2005.

Japan's first automated rendezvous and docking experiment between two orbiting satellites, one of six planned, succeeded on July, 7.

Russia's Cosmos 2350, an early warning satellite responsible for detecting possible ballistic missile strikes, stopped functioning on July 6, 1998 and could not be recovered.

Hungary is the first Central European country to provide links via EUTELSAT satellites for digital video, audio and data satellite broadcasting.

B. FORTHCOMING EVENTS

The Second International Conference on "Russian Small and Medium Class Launch Vehicles in Space Projects of 21st Century" is to convene December 7-11, in Moscow and at the Plesetsk Space Center.

The **Global Air & Space '99** International Business Forum and Exhibition is scheduled for May 3-5, 1999, in Arlington, VA.

An International Colloquium **on "International Organisations and Space Law: Their Role and Contributions,"** co-organized by ESA/ECSL, the University of Perugia and the Italian National Research Council will be held May 6-7, 1999 in Perugia, Italy.

The **UNISPACE III** Conference will meet in Vienna, Austria, July 19-30, 1999.

As reported by our Journal previously, the 42nd IISL **Colloquium** will take place in **Amsterdam,** The Netherlands, **Oct. 4-8, 1999.** The following sessions and chairs have been proposed:

Session 1: Legal aspects of Space Station utilization (patents, property rights, crew, commercial uses, debris, international cooperation, private sector...)

Chairman: Prof. Dr. I. Diederiks-Verschoor (The Netherlands) & Prof. Dr. H. A. Wassenbergh (The Netherlands);

Session 2: New developments relating to legal aspects of telecommunications (LEOs, tethered structures, geostationary platforms in the stratosphere, and recent ITU regulations)

Chairmen: Ms. Marcia Smith (USA) & Dr. L. Perek (Czech Republic);

Session 3: Legal Implications of expanding privatization in space national law aspects, interaction between government and industry...);

Chairmen: Prof. Jonathan Galloway (USA) & Ms. T. Masson-Zwaan (The Netherlands);

Session 4: Other issues of Space Law, including legal aspects of launching space objects from non-terrestrial sites.

Chairmen: Dr. J. Monserrat, Filho (Brazil) and Dr. L. Tennen (USA).

Finals of the 8th Manfred Lachs Space Law **Moot Court** Competition are scheduled to be held during the Colloquium in the World Court Chambers at the Peace Palace in The Hague. The case deals with sea-launch and problems of liability ("The Mor-Toaler Sea-Launch Project").

Telecom 99 and Interactive 99 exhibition and forum will be held at Palexpo, in Geneva, Switzerland, from Oct. 9-17, 1999 under the general theme Join the World. In addition to a Telecom Development Symposium, the forum will include three summits, a Policy and Regulatory Summit, an Infrastructure Summit and an Interactive Summit.

Americas Telecom 2000 will be in Rio de Janeiro, Brazil, as will the 51st **IAF Congress.**

The **World Radiocommunication Conference** will consider radio frequency allocation issues in 2000.

The 69th and 70th Conference of the **International Law Association** will take place in London in 2000 and in New Delhi in 2002, respectively.

The next **ITU** Plenipotentiary Conference will meet in 2002 in Morocco.

BOOK REVIEWS/NOTICES

REVIEWS

THE USE OF AIR AND OUTER SPACE - COOPERATION AND COMPETITION, edited by CHIA-JUI CHENG (Kluwer Law International, The Hague/London/Boston 1998), pp. 448.

While space law has developed into a distinct legal discipline, it proved to be a common sense approach to organize international space law conferences under a wider umbrella which juxtaposes both air and space developments, attracts the support of airlines, the aviation industry and concentrates on issues of special interest to them.

Far Eastern international conferences focusing on the use of air and outer space have been held every two years since a 1991 meeting in Taipei, Taiwan. Organized by such leading academic institutions as Leiden, McGill, Peking (Beijing), and Soochow (Taipei) Universities, this hardcover book deals with the proceedings of the third meeting that took place in Beijing from August 21-23, 1995.* The conference brought together many eminent scholars associated with the aforementioned institutions as well as other authorities who provided an instructive overview of selected subjects with an emphasis on the legal and practical issues of international air transport.

The treatment of space law, which occupies only about one-fourth of the publication but is the major preoccupation of this Journal, starts off with a keynote address (*Qizhi He,* Beijing), which reviews the development of international space cooperation, both bilateral and multilateral, and recalls China's entry into the space age with the placement into orbit of its first artificial satellite on April 24, 1970. In the mid-nineties, the organization of space cooperation in the Asia-Pacific region was still at a preliminary stage but it was the Chinese bilateral agreements pertaining to space activities which, *inter alia,* paved the way for China's entry into the international space launch service market, a topic which has also been the subject of important U.S.-China agreements.+

Who owns the orbit and issues of equitable access constituted other important areas for discussion dealing with space telecommunications in the Asia-Pacific region (*Toshio Kosuge,* Tokyo). The applicable international regime precluded stakeholder rights, but it did not prevent the valuable economic resource from being used under conditions of unethical business practices (p. 204).

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* Since then a fourth conference assembled in Seoul in 1997. *See* 25 J. SPACE L. 54-5 (1997).

+ For details, see 24 J.SPACE L. 82 (1996); 24 *id.* at 161.

As to new sources of international space law (*Chia-Jui Cheng,* Taipei), a substantial part can be expected to emerge from the private law sector as a result of anticipated commercial activities of private enterprises in outer space.

While the settlement of disputes in the field of space law is regarded as a "must" (*I.H.Ph. Diederiks-Verschoor,* Leiden), it is desirable to make more use of arbitration procedures. It is equally important to review the grounds for product liability established in a series of court decisions and also to further the development of intellectual property protection.

International responsibility and liability is an area that deserves major attention by both individuals and organizations associated with launch activities (*Bin Cheng,* London).* An adequate analysis requires a clarification of terms and a clear distinction between responsibility and liability in light of the applicable rules under general international law and under provisions of relevant space treaties.

A discussion of the future of space applications, including the future technical and legal framework within the United Nations (*N. Jasentuliyana,* U.N., Vienna), points to the vital role that the U.N. has played and the need for the international community to adapt itself "to a more flexible, more technological and more commercial world." There is a need for countries of the Asia-Pacific region to "develop draft position papers" on a variety of space law topics, including remote sensing, verification, disaster management and mitigation, tele-education, mobile communications systems and space debris (pp. 395-6).

There can be little doubt that the space law chapters of the book provide thought-provoking insights into key issues and practices and raise challenging notions which spur further legitimate inquiries. Within the confines of a brief review, one would be hard up to argue with the thorough and well thought-out assertions, forecasts and conclusions of the various space law analyses, especially since much of the surmised expectations and trend perspectives appear to have been borne out by recent developments. As to some specifics, by way of example, the approach of Professor Bin Cheng deserves mentioning. While his presentation is done with thoroughness and logic in a step-by-step approach, it deviates from the customary summary by restating on eight printed pages, in a slightly abbreviated fashion, all the findings set forth in the preceding 23 pages, a procedure that might be repetitious to the knowledgable, but of probable need to the less well-versed reader.

All in all, the great care that must have gone into the preparation of the conference and the meticulous work reflected in the editorial effort set a fine precedent for subsequent conferences.

Stephen Gorove
Chair, Ed. Bd., J. SPACE L.

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* The topic is scrutinized in great detail in the first issue of this Anniversary volume. *See* Bin Cheng, *Article VI of the 1967 Space Treaty Revisited: "International Responsibility", "National Activities", and "The Appropriate State",* 26 J. SPACE L. 7 (1998).

NOTICES

SPACE SAFETY AND RESCUE 1996, edited by Gloria W. Heath (Am. Astronautical Soc'y, Science and Technology Ser., vol. 95, Univelt 1998), pp. 350.

The sessions of the 1996 Safety and Rescue Symposium were organized, as those in prior years, by the International Academy of Astronautics Committee on Safety, Rescue, and Quality. The era of budgetary constraints appeared to have left its mark on the presentations of the technical aspects of the subject to develop effective, efficient collision avoidance and mitigation strategies. As noted by the editor, the papers presented in the three debris sessions revealed that space debris is more determined by collisions than by explosions, that constellations of satellites present new problems for collision risk management, that international approaches are called for if the space environment is to be preserved for future exploration, and that our understanding of the debris environment is still incomplete.

One of the definitive improvements, from a legal point of view, over prior Space Safety and Rescue symposia was the inclusion of a much needed review of the legal regulation and management of outer space, including the monitoring of objects in outer space and the status of space debris issues in the UN which was eminently described in the Appendix by Luboš Perek, former chief of the Outer Space Affairs Division of the UN Secretariat.

LEGAL ASPECTS OF COOPERATION BETWEEN THE EUROPEAN SPACE AGENCY AND CENTRAL AND EASTERN EUROPEAN COUNTRIES, PROCEEDINGS OF THE INTERNATIONAL COLLOQUIUM, CHARLES UNIVERSITY, PRAGUE, CZECH REPUBLIC, 11-12 SEPT. 1997 (ESA & ECSL 1998), pp. 195.

This book is a compilation of all papers presented at the International Colloquium held on 11-12 September 1997 in Prague, the subject of which focused upon the legal and policy aspects of cooperation between Eastern, Central, and Western Europe.* The contributions from the many scholars and experts in the field of space law review the fruits of existing cooperation, including those borne out in a variety of agreements between ESA and non-member states or international organizations, and provide perspectives and insights into the means to expand, improve and facilitate this cooperation.

From the many papers presented with differing viewpoints on the subject matter, it is evident that a solid framework for establishing cooperative agreements presently exists and is producing tangible benefits for the Parties involved. It also appears that all parties possess the desire to build upon and expand the areas of cooperation. The ongoing identification of specific projects in which joint cooperation would provide

* For a short account of the Colloquium, see 25 J. SPACE L. 164 (1997).

mutual benefits to all Parties will be crucial in fostering the formation of new Agreements, as well as broadening the scope and subject matter therein. How dedicated the Parties are to efficiently use these agreements to produce synergistic results will determine how quickly integration of countries in Central and Eastern Europe with ESA occurs.

Michel A. Gorove
Attorney at law
Associate Editor, J. SPACE L.

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Corrigenda

In Bin Cheng's discussion *Article VI of the 1967 Space Treaty Revisited: "International Responsibility", "National Activities", and "The Appropriate State"* which appeared in No. 1 of the Anniversary Volume 26 (1998), an extra sentence in footnote 24, erroneously reproducing the last sentence of note 26 "The Court spoke &c.", is to be deleted. Similarly, the words "we know that" on p.23, line 20 of the same article should also be deleted.

In the same issue (Vol. 26, No.1, 1998), the following lines should be inserted at the bottom of p. 77:

The last Chapter of Part VI, on "The Commercial Development of Space: The Need for New Treaties", originated in 1990. As commercial use of outer space develops, there appears a need for new international agreements. There is a need to delimit outer space as well as airspace, need

ANNIVERSARY EDITOR AND CONTRIBUTORS

EDITOR

Gorove, Stephen a *"summa cum laude"* recipient of the J.D. degree from the University of Budapest and a holder of fellowships from Harvard, Oxford and Yale, received his J.S.D. and Ph.D. degrees from Yale. He served as Research Associate at Yale, Columbia and Georgetown Universities and as Law Editor of the Grolier Corporation, publishers of the Encyclopedia Americana and the Encyclopedia International.

Prior to joining the Law Faculty of the University of Mississippi in 1965 as Chairman of the Graduate Law Program and Professor of Law, he taught as Professor of Law in Colorado, Ohio and New York. Currently, a Professor Emeritus of Law at the University of Mississippi, he chairs the Editorial Board of the JOURNAL OF SPACE LAW, the Int'l Space Law Committee of the International Law Association (ILA, Am. Branch) and Int'l Space Law Interest Group of the American Society of International Law (ASIL), directing space law and policy studies.

During the formative development of space law, Professor Gorove served as an observer/representative of the International Astronautical Federation (IAF), the ILA, and the ASIL before the U.N. Committee on the Peaceful Uses of Outer Space and its Legal Subcommittee, where he also chaired several symposia presented to the delegates. A member of the International Academy of Astronautics, he also served as a consultant to the Advisory Committee of the Institute of Air and Space Law of McGill University and chaired several Committees of the American and Inter-American Bar Associations and the Association of American Law Schools.

He has lectured before leading academic institutions around the world which include California, Cambridge, Chicago, Cologne, Columbia, Geneva, McGill, Princeton and Virginia universities, the Institut des Hautes Etudes Internationales and The Hague Academy of International Law as well as many other notable institutions of higher learning in Australia, China, Hungary, Latin America, Japan and the former Soviet Union.

He is a recipient of distinguished testimonials from the International Institute of Space Law (IAF), the American Astronautical Society, the Centro de Investigacion y Difusion Aeronautico-Espacial of Uruguay, the Consejo de Estudios Internationales Avanzados of Argentina and the Japanese Society for the Study of Space Law and Policy on Space Utilization.

He is the author/editor of, or contributor to, twenty books and over 200 publications in the space law field. His books include: UNITED STATES SPACE LAW - NATIONAL AND INTERNATIONAL REGULATION (Oceana, 1982-present); CASES ON SPACE LAW - TEXTS, COMMENTS AND REFERENCES (1996); DEVELOPMENTS IN SPACE LAW: ISSUES AND POLICIES (1991); THE TEACHING OF SPACE LAW AROUND THE WORLD (1986); THE SPACE SHUTTLE AND THE LAW (1980); SPACE LAW: ITS CHALLENGES AND PROSPECTS (1977).

CONTRIBUTORS

BOURÉLY, Michel, Doctor of Law, University of Paris. Former Legal Adviser of ELDO and ESRO (now the European Space Agency). Honorary Director, International Institute of Space Law (IISL). Member, International Academy of Astronautics. Honorary Member, Académie National de l'Air et de l'Espace. Vice President, Association Française pour le Développement du Droit de l'Espace. Member, Association Aéronautique et Astronautique de France. Author, *The European Space Conference* and articles on space law.

CHENG, Bin, Licencié-en-droit (Gve), Ph.D., LL.D. (Ldn), Hon. LL.D. (CUHK), FRAeS; Emeritus Professor of Air and Space Law, University of London; Visiting Professor of Law, University of Detroit Mercy; Officier, Ordre des Palmes Académiques (France); Santo Dumont Merit Medalist (Brazil); Fellow of University College London; International Institute of Space Law Lifetime Achievement Book Award, &c.

COCCA, Aldo Armando, Doctor in Law. Doctor and Professor Honoris Causa. Professor Emeritus. In 1944, he anticipated ideas on Space Law. Appears as student in IBN Index Bio-Bibliographicus Notorum Hominum. Honorary President, Inter-American Law Professors Ass'n; Honorary Director, IISL. Recipient: Andrew Haley Space Law Award, IISL (1965); Inter-American Award, Telecommunications (1987); Social Sciences Award, IAA (1994). Author of 617 Publications.

DIEDERIKS-VERSCHOOR, I.H.Ph. President Emeritus, International Institute of Space Law (I.A.F.); Professor, Leiden University, The Netherlands.

DOYLE, Stephen, Director of the International Institute of Space Law. Former federal civil servant, now doing consulting, writing, and teaching in space law and policy.

FASAN, Ernst, Honorary Director, International Institute of Space Law. Member, International Academy of Astronautics. Author of two books and several articles on Space Law.

GAL, Gyula, Member, International Academy of Astronautics; Honorary Director, International Institute of Space Law (IISL) of the International Astronautical Federation (I.A.F.); Legal Counselor, Budapest, Hungary.

GALLOWAY, Eilene, Dr., Honorary Director, International Institute of Space Law of the International Astronautical Federation. Member, NASA Advisory Committee on the International Space Station. Trustee Emeritus, International Academy of Astronautics. Fellow of American Astronautical Society and American Institute of Aeronautics and Astronautics.

GOROVE, K. Visiting Associate Professor, American University, Washington College of Law; Vice-Chair, Ed. Bd., *J. Space Law*. M.Sc., London School of Economics, 1982; J.D., Columbia University, 1985. Member, IISL; Rapporteur, Space Law Committee of the ILA (Am. Branch). Former positions include: one of the counsels for the Republic of Hungary in the Gabcikovo-Nagymaros Project (Hungary/Slovakia), ICJ, 1997; Legal Officer, UNRWA; Visiting Fulbright Professor of Law, Eötvös Lóránd University, Budapest, Hungary; Assistant Professor of Law, University of Mississippi School of Law. Author of a number of space law publications.

GOROVE, Michael A., Graduate of the University of Florida and holder of J.D. degree from Boston University. Served as Research Attorney on the case of *Hungary v. Slovakia* litigated before the International Court of Justice. Attorney-at-Law in Atlanta, GA and Associate Editor, *J.Space Law.*

HE, Qizhi, Legal Adviser of the Ministry of Foreign Affairs of the People's Republic of China, Member of International Law Commission, Member of Board of Directors of IISL, Member of Board of Trustees of the International Academy of Astronautics (IAA), Deputy President of the Institute of Space Law of China, Part-time Professor of international law of Beijing University.

JANKOWITSCH, Peter, Past chair (1972 - 1991) of UN COPUOS. As Foreign Minister, Ambassador and Permanent Representative to the UN and OECD, he held senior positions in the government and diplomacy of Austria, representing currently the host country in preparations for UNISPACE III to be held in Vienna in 1999.

JASENTULIYANA, Nandasiri, National of Sri Lanka, holds advanced degrees in Law and International Relations from the University of Ceylon, London and McGill, and is an Attorney-at-Law. An official of the United Nations since 1965, he is currently the Deputy Director-General of the United Nations Office at Vienna and Director of the Office for Outer Space Affairs. President of the International Institute of Space Law (IISL), he is the author of many volumes on space law, most recently editor of *Perspectives on International Law* (Kluwer, 1995). Visiting lecturer at distinguished universities, member and trustee of learned societies and recipient of many awards, he was selected by the United States National Space Society to its unique world-wide list of "100 space people who have had the greatest impact on our lives."

LYALL, Francis, Professor of Public Law of the Faculty of Law of the University of Aberdeen, Scotland, U.K. since 1974. Director of the International Institute of Space Law since 1992. His other interests include Constitutional Law, Environmental Law, and writing crime fiction.

MCDOUGALL, P. Ruari, B.A. LL.B. (University of Natal, South Africa), LL.M. (University of Georgia, USA); Associate Legal Affairs Officer, United Nations Office for Outer Space Affairs.

PEREK, Lubo$\check{s}$, Member of the IAU, IAA, Leopoldina, IISL Board of Directors. Emeritus of the Astronomical Institute of the Academy of Sciences, Prague, Czech Republic. Former Chief of the Outer Space Affairs Division, U.N. Secretariat.

RODRIGUES, Natercia F., BLC, LL.B. (University of Pretoria, South Africa); Attorney at Law, South Africa; Associate Legal Affairs Officer, United Nations Office for Outer Space Affairs.

SGROSSO, Gabriella Catalano, appointed to the Faculty of Economics of Rome University in 1981 as researcher in international law and to the University of Rome (centre of Latina) in 1991 as professor in International Law and International Organization. A lawyer, her contributions to the analysis of legal problems arising from the uses and exploration of outer space (commercialization, Italian Agency, environment, natural disasters responsibility, remote sensing, demilitarization, insurance, intellectual property, space debris, aerospace plane) have been expressed in books, articles and lectures. She organized the first Italian Colloquium on "Outer Space Law: New Developments and Prospects" in Rome, March 1992 and the publication of the Proceedings. She was elected as legal counsellor in the Working Group of ASI (Italian Space Agency) on "Space Debris" in 1995-96. She has been a member of IISL since 1988 and a director of the IISL Board since 1993, a member of the Italian Center for Space Law (ICSL) since 1990 and a director of the Board since 1994. She has also been an alternate member of the INTELSAT Assembly of Parties since September 1995.

CURRENT DOCUMENTS

Commercial Space Act of 1997

(Excerpts)*

Sec. 1. Short title; table of contents

(A) Short title. - This act may be cited as the "Commercial Space Act of 1997".

(B) Table of Contents. -

Sec. 2. Definitions.

For purposes of this Act -

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* The excerpts are from the Aug. 3, 1998 Lexis-Nexis version of 105 H.R. 1702 entitled "An Act to encourage the development of a commercial space industry in the United States, and for other purposes." (Some bold letters and capitals added).

(1) the term "Administrator" means the Administrator of the National Aeronautics and Space Administration; . . .

TITLE I - PROMOTION OF COMMERCIAL SPACE OPPORTUNITIES

Sec. 101. Commercialization of space station.

(A) Policy. - The Congress declares that a priority goal of constructing the international space station is the economic development of earth orbital space. The Congress further declares that free and competitive markets create the most efficient conditions for promoting economic development, and should therefore govern the economic development of earth orbital space. The Congress further declares that the use of free market principles in operating, servicing, allocating the use of, and adding capabilities to the space station, and the resulting fullest possible engagement of commercial providers and participation of commercial users, will reduce space station operational costs for all partners and the federal Government's share of the United States burden to fund operations.

(B) Reports. - . . .

Sec. 102. Commercial space launch amendments.

(a) Amendments. - Chapter 701 of Title 49, United States Code, is amended - . . .

(15) In Section 70117 - . . .

(C) by amending subsection (f) to read as follows:

"(f) Launch not an export; reentry not an import. - . . . except that payloads launched pursuant to foreign trade zone procedures as provided for under the Foreign Trade Zones Act (19 U.S.C. 81a-81u) shall be considered exports with regard to customs entry."; . . .

Sec. 103. Promotion of United States Global Positioning System Standards.

(a) Finding. - The Congress finds that the global positioning system, including satellites, signal equipment, ground stations, data links, and associated command and control facilities, has become an essential element in civil, scientific, and military space development because of the emergence of a United States commercial industry which provides global positioning system equipment and related services.

(b) International cooperation. - In order to support and sustain the global positioning system in a manner that will most effectively contribute to the national security, public safety, scientific, and economic interests of the United States, the Congress encourages the President to -

(1) ensure the operation of the global positioning system on a continuous worldwide basis free of direct user fees;

(2) enter into international agreements that promote cooperation with foreign governments and international organizations to-

(a) establish the global positioning system and its augmentations as an acceptable international standard; and

(b) eliminate any foreign barriers to applications of the global positioning system worldwide; and

(3) provide clear direction and adequate resources to United States representatives so that on an international basis they can-

(a) achieve and sustain efficient management of the electromagnetic spectrum used by the global positioning system; and

(b) protect that spectrum from disruption and interference. . . .

Sec. 104. Acquisition of space science data.

(a) Acquisition from commercial providers. - In order to satisfy the scientific and educational requirements of the National Aeronautics and Space Administration, and where practicable of other federal agencies and scientific researchers, the Administrator shall to the maximum extent possible acquire, where cost effective, space science data from a commercial provider. . . .

Sec. 105. Administration of commercial space centers.

The Administrator shall administer the commercial space center program in a coordinated manner from National Aeronautics and Space Administration Headquarters in Washington, D.C.

TITLE II - REMOTE SENSING

Sec. 201. Land remote sensing policy act of 1992 amendments.

(a) Findings. - The Congress finds that -

(1) a robust domestic united states industry in high resolution earth remote sensing is in the economic, employment, technological, scientific, and national security interests of the United States;

(2) to secure its national interests the United States must nurture a commercial remote sensing industry that leads the world;

(3) the federal Government must provide policy and regulations that promote a stable business environment for that industry to succeed and fulfill the national interest;

(4) it is the responsibility of the federal Government to create domestic and international conditions favorable to the health and growth of the United States commercial remote sensing industry;

(5) it is a fundamental goal of United States policy to support and enhance United States industrial competitiveness in the field of remote sensing, while at the same time protecting the national security concerns and international obligations of the United States; and

(6) it is fundamental that the States be able to deploy and utilize this technology in their land management responsibilities. To date, very few States have the ability to do so without engaging the academic institutions within their boundaries. In order to develop a market for the commercial sector, the States must have the capacity to fully utilize the technology. . . .

Sec. 202. Acquisition of Earth Science Data.

(a) Acquisition. - For purposes of meeting government goals for mission to planet earth, and in order to satisfy the scientific and educational requirements of the National Aeronautics and Space Administration, and

where appropriate of other federal agencies and scientific researchers, the Administrator shall to the maximum extent possible acquire, where cost-effective, space-based and airborne earth remote sensing data, services, distribution, and applications from a commercial provider. . . .

TITLE III - FEDERAL ACQUISITION OF SPACE TRANSPORTATION SERVICES

Sec. 301. Requirement to procure commercial space transportation services.

(a) In general. - Except as otherwise provided in this section, the federal Government shall acquire space transportation services from United States commercial providers whenever such services are required in the course of its activities. To the maximum extent practicable, the federal Government shall plan missions to accommodate the space transportation services capabilities of United States commercial providers. . . .

Sec. 304. Shuttle privatization.

(a) Policy and preparation. - The Administrator shall prepare for an orderly transition from the federal operation, or federal management of contracted operation, of space transportation systems to the federal purchase of commercial space transportation services for all nonemergency launch requirements, including human, cargo, and mixed payloads. In those preparations, the Administrator shall take into account the need for short-term economies, as well as the goal of restoring the National Aeronautics and Space Administration's research focus and its mandate to promote the fullest possible commercial use of space. As part of those preparations, the Administrator shall plan for the potential privatization of the space shuttle program. Such plan shall keep safety and cost effectiveness as high priorities. Nothing in this section shall prohibit the National Aeronautics and Space Administration from studying, designing, developing, or funding upgrades or modifications essential to the safe and economical operation of the space shuttle fleet.

(b) Feasibility study. . . .

Sec. 306. National launch capability study.

(a) Findings. - Congress finds that -

(1) a robust satellite and launch industry in the United States serves the interest of the United States by-

(a) contributing to the economy of the United States;

(b) strengthening employment, technological, and scientific interests of the United States; and

(c) serving the foreign policy and national security interests of the United States. . . .

(b) Definitions. . . .

(c) Report. . . .

(d) Recommendations. . . .

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INTERNATIONAL INSTITUTE OF SPACE LAW
OF THE INTERNATIONAL ASTRONAUTICAL FEDERATION
INSTITUT INTERNATIONAL DE DROIT SPATIAL
DE LA FEDERATION ASTRONAUTIQUE INTERNATIONALE
3-5, RUE MARIO NIKIS Tél. 33-1-45.67.42.60
75015 PARIS - FRANCE Telefax 33-1-42.73.21.20

Manfred Lachs Space Law Moot Court Competition 1998 *

Case Concerning the Commercial Exploitation of the Moon

-- The Rover Games Project --

Nation of Freedom (Applicant) v. Nation of Bravatia (Respondent)

INTRODUCTION

The year is 2015. The International Civil Space Station has been in operation for 14 years. A fleet of single-stage-to-orbit ("SSTO") space launch vehicles and space "tugs" service the Moon on a regular basis. The Lunar Port Authority ("LPA"), an international regime established by governments pursuant to Article 11.5 of the Moon Treaty (and which now numbers as its member states a majority of the world's nations), is celebrating its tenth anniversary, its mission being to govern the exploitation of the natural resources of the Moon. It is clear that Lunar settlement is not far off.

STATEMENT OF THE CASE

The Applicant before the International Court of Justice ("the Court") is the Nation of Freedom ("Freedom"), a sovereign state, member of the United Nations ("UN"), and through its Ministry of Environment and Space, a founding member of LUNAVIRONMENT which is an international, non-governmental organization established pursuant to a United Nations resolution in 2001. LUNAVIRONMENT is composed of 101 environmental agencies and non-profit organizations worldwide. Its principal purpose is the preservation of the Lunar environment. LUNAVIRONMENT and its member states have authorized Freedom to represent the interests of the organization before the Court.

The Respondent is the equatorial Nation of Bravatia ("Bravatia"), also a sovereign state and a member of the United Nations but not a member of LPA or LUNAVIRONMENT. Both Freedom and Bravatia are parties to the Outer Space Treaty of 1967, the Rescue Agreement of 1968, the Liability Convention of 1972, the Registration Convention of 1976 and the Moon Treaty of 1979 (hereinafter referred to collectively as "the Space Treaties"). Bravatia had gained considerable

notoriety in the world community in 1999 by registering ten positions on the geostationary orbital arc, along with associated fixed and mobile satellite frequencies with the International Telecommunication Union ("ITU"), and reselling its acquired rights soon thereafter for large sums of money.

Bravatia's most recent commercialization endeavor in outer space is the development of a commercial amusement venture using a large (5 square kilometer) venue on the Moon. In 2011 Bravatia organized under its municipal laws a for-profit corporation, LUNABRAT, with majority ownership and control vested in the Ministry of Finance of Bravatia and minority ownership held by some fifty domestic and foreign private investors. The space activities of LUNABRAT are also supervised by the Ministry of Environment and Space of Bravatia which is represented on the board of directors of LUNABRAT.

LUNABRAT has deployed 2,000 small rover vehicles (each being roughly one meter square by 60 centimeters in height) on the 5 square kilometer Lunar venue, with an additional 8,000 vehicles planned for deployment within the next 24-months. Each rover is equipped with a SOLAR power source for mobility, a small TV camera, a transmitter and receiver, and a low-power laser "gun". Movement of the rovers over the Moon's terrain and the aiming and firing of the laser "guns" are controlled from small, easily-operated "controller" booths on Earth. When the project is fully established there will be in excess of 100,000 of these booths located worldwide in amusement parks, shopping malls and the like. Communications between the booths on Earth and the Lunar rovers is via communications earth stations located in various countries and a fixed communications base station centrally located in the Lunar venue. (In this way, communications signals, such as commands to the rovers sent from booths on Earth, are received by the Lunar base station and relayed to the appropriate Lunar rover vehicle, and *vice versa*.) A child or adult wishing to play the game of "Rover Tag" sits at a controller and for set 10-minute periods "drives" via the communications links an assigned rover on a "search and shoot" mission across the Lunar venue. The object of the game is to see how many other rovers the player can find with its rover, target with its laser, and "zap" (that is, temporarily immobilize) during the 10-minute period without, itself, being "zapped" by another player's laser or actually immobilized by some natural Lunar object. Depending on the player's score during a ten-minute session, the player may earn one or more additional free 10-minute sessions, assuming, of course, it has not been immobilized. The current price of a game is USD 10 (EURO 10) per

minute. The gross revenues of this activity so far have averaged USD 3 million per week and are projected over the next ten years to average in excess of USD 12 million per day.

Being mindful of the negative publicity which resulted following its 1999 commercial exploitation of rights on the geostationary arc, Bravatia has made a concerted effort to obtain international acceptance of its Lunar amusement project. For more than five years, Bravatia sought international approval for its activities from the LPA, but to no avail. Then in 2012, Bravatia applied to the Artemis Development Organization ("ADO") for a license to operate the rovers and ancillary communications equipment at the Lunar venue. ADO is an international inter-governmental organization established pursuant to treaty in 2011 and headquartered in the State of Alpha. Its member states total nearly a majority of the member states of the United Nations, although ADO is not an agency of the United Nations. ADO was established to control and regulate space vehicles operating within 1000 kms of the surface of the Moon and to license and regulate vehicular traffic on the surface of the Moon. Both Freedom and Bravatia deposited their instruments of accession to the ADO treaty in 2011. ADO has declared its acceptance of the rights and obligations under the Rescue Agreement, the Liability Convention, the Registration Convention and the Moon Treaty.

The establishment of an organization such as ADO had initially been suggested at an international "citizens" convention held in the State of Alpha during October - November 2008. Citizens from a majority of nations, including Freedom and Bravatia, attended the convention as participants, and many international organizations, including the UN, sent observers. The persons on the Governing Council and in the Executive Body of ADO consist of a broad international mix of engineers, architects, environmentalists and scientists possessing professional credentials in disciplines relevant to the planning and conducting of activities in outer space and on the Moon. Some of these persons are nationals of either Freedom or Bravatia.

Sixteen months after submitting its application to ADO, Bravatia successfully completed the required licensing procedures involving such matters as planning, engineering standards, environmental compliances, and legal and financial qualifications in accordance with ADO procedures and regulations, and its project was approved and licensed by ADO subject to two principal conditions, which Bravatia unequivocally accepted:

1. Fifty percent of all profits derived from the rover games are to be contributed to the LPA for the "Apollo 17 Site". This site, occupying 1,000 kms^2 on the surface of the Moon, is to be developed and operated by the LPA using mineral-mining and oxygen-generating equipment so that free gases and minerals eventually can be produced, refined, and stored at the site for the use of future Lunar settlers and generations of mankind. This activity will be managed for all peoples, as an interplanetary free "gas station."

2. When the 5 km^2 Lunar rover venue has been compacted by the lunar rovers so as to render that venue unsuitable for the rover games, Bravatia's license will revert to ADO for redevelopment as a lunar spaceport settlement and "dust-free" industrial park. In return, ADO will license Bravatia the use of another, perhaps larger, venue on the Moon for the continuation of the rover games.

Freedom and LUNAVIRONMENT vigorously opposed, within the organs of ADO and elsewhere, Bravatia's rover games project. In particular, Freedom sought unsuccessfully to persuade a majority of its fellow member states represented in ADO's Governing Council to reject Bravatia's application on the basis that Bravatia's proposed Lunar rover games would be inconsistent with international law as set forth in the Space Treaties. Moreover, Freedom contends that LPA, not ADO, is the only body competent under international law to license an activity on the Moon such as the rover games project. Having failed within ADO to stop the project, Freedom resorted to electronically jamming, intermittently, all signals between Bravatia's Lunar base station and the Lunar rovers. As intended, the jamming seriously interfered with the rover games thereby causing a precipitous drop in customer interest and revenues. It has also placed the 2000 deployed rovers in physical peril since the jammed signals also include system telemetry and command signals between the rovers and the base station. Consequently, the rover on-board systems (e.g., power and thermal systems) can no longer be continuously monitored and controlled as is absolutely necessary for their maintenance in the harsh Lunar environment.

Attempts through diplomatic channels to settle this matter proved unsuccessful. However, in an attempt to deflect increasing international opposition to the jamming of Bravatia's signals, Freedom signaled that it was prepared to institute proceedings against Bravatia in the International Court of Justice. Through the good offices of the Foreign Ministry of Alpha, Freedom and Bravatia agreed to the terms of a *compromis* with four submissions (set forth,

infra) for adjudication by the Court and agreed to be bound by the judgment of the Court.

Applicant contends that the Lunar rover games are environmentally unacceptable since they would disturb the Lunar surface, scatter manmade debris, and unnaturally disturb the lunar regolith. In addition, Applicant contends that the perception of the Moon as a peaceful, unspoiled celestial environment will be seriously diminished for mankind by pictures of rovers carrying out their "search-and-shoot" missions for the leisure of people financially able to engage in such amusement. Applicant asserts that mankind has a protected interest in preserving the peaceful environment of the Moon for future generations, as reflected in the provisions of the Outer Space Treaty and the Moon Treaty, and that LPA is the only authority competent under international law to act on an application for a proposed commercial use of the Moon. Therefore, in response to Bravatia's proceeding with its rover project without first obtaining approval of that project from LPA, Applicant contends that it has acted in a manner not inconsistent with the provisions of the Space Treaties in jamming Bravatia's Lunar signals, regardless of any damage this may cause to Bravatia.

Respondent, on the other hand, contends that under international law as reflected in the Space Treaties, the Moon is free and available for exploration and use by the parties thereto and that Bravatia is fully within its rights having fully disclosed its intentions and obtained the necessary authorizations from ADO, the international body charged with licensing and regulating vehicular traffic on the surface of the moon. Bravatia contends that LPA's scope of legal and regulatory competence is confined, in the words of its constitutive agreement, to "governance of the exploitation of the natural resources of the Moon as such exploitation becomes feasible" and therefore does not encompass the rover games project since neither Bravatia nor LUNABRAT will be engaged in the exploitation of such resources. Furthermore, Bravatia agreed to the license conditions specified by ADO from which substantial economic benefits will inure to the benefit of mankind's future exploration and use of the Moon. Respondent further contends that it has suffered, and continues to suffer, extensive economic harm as a result of the unlawful actions of Freedom in jamming all communications between the rovers and the base station on the Moon, and seeks relief from the Court.

ISSUES

The following four issues are reserved for briefing and argument to the Court under the agreed compromis. There are no issues of jurisdiction or

standing, and briefs and arguments with regard to the issue of remedies are to be confined solely to legal principles and not speculate as to monetary amounts.

1. Which international obligations do the Space Treaties impose on states parties to such treaties to refrain from causing environmental damage to the Lunar surface?

2. To the extent the Court establishes such obligations under the first issue, what would be the legal consequence under international law of Bravatia having obtained the approval from ADO, instead of LPA, to conduct its commercial rover activities?

3. Are the actions of Freedom in jamming the Lunar communications in the manner described in violation of its international obligations as a party to the Space Treaties?

4. To the extent the Court establishes the existence of international obligations under the third issue, to what remedies (if any) is Bravatia entitled under international law?

* * *

SUMMARY OF THE MEMORIAL FOR THE APPLICANT
James Summers and Mirkka Mykkänen

Winners of the "JOURNAL OF SPACE LAW" Award for the Best Memorial

The memorial requested provisional measures based on the argument that the jamming conducted by Freedom was preventing the operation of the Rover Games. Bravatia argued that such action was prima facie incompatible with the provisions of the Space Treaties. Bravatia then sought to undermine any legal justification for the jamming with two lines of jurisprudence. Firstly, citing the US/France Air Services Agreement Arbitration, Bravatia claimed that the jamming could not be justified as a counter-measure as the dispute was before a judicial body. The second line of argument was following from the Electricity Co. of Sofia and Bulgaria that the jamming was aggravating the dispute. However following the ICJ's recent decision in the Case Concerning the Vienna Convention on Consular Relations, this second line of argument was used subsidiarily. The memorial established as its basis the freedom of use of outer space. It cited that the principle was provided in the Outer Space and Moon Treaties and also in customary law and that it has been recognized as jus cogens by some authors.

Bravatia's main problem in the case was perceived to be one of image: that it was damaging the lunar environment for profit. Therefore the memorial sought to highlight that Bravatia was very conscious of the value of the environment. This was done by citing, in an objective way, the provisions and principles relevant to the preservation of the lunar environment and then explaining how Bravatia was complying with them..

The memorial examined the prohibition of "harmful contamination" in Article IX of the Outer Space Treaty and "adverse changes" in Article 7 of the Moon Treaty. It sought to establish the criteria by which these standards should be measured with the statement of UNCOPUOS that activities were not prohibited but that disruption should be minimised. The memorial also cited general provisions of international environmental law including the duty to respect the environment in areas beyond national jurisdiction contained in the Stockholm and Rio Declarations.

The memorial divided Bravatia's compliance with these provisions into three sections: the Rover Games site, the lunar spaceport and a future Rover Games site. Firstly, the memorial argued that Bravatia has followed the precautionary principle of the Rio Declaration by only starting the games once they had been approved by the environmentalists of the ADO. The ADO, it was emphasised, was a serious international organisation with a membership of just under half the world's nations.

Secondly, the memorial claimed that the Rover Games would not cause harmful contamination as debris from the games would not react with the lunar surface and could be collected and removed. Thirdly, the memorial recognised that the Rover Games would compress the regolith. However it argued that all lunar surface activities have that effect and the scale of the disruption was small. It further argued that if this disruption were to be considered unacceptable then it would be hard to conceive of the establishment of manned bases or exploitation of natural resources.It was further stated that the lunar spaceport would help to minimise the disruption of landings of the surface of the moon and that any future Rover Games site would be strictly regulated.

On peaceful use, the memorial argued that as the Rover Games were non-military, they complied with the definition of "peaceful" in the Space Treaties.

The memorial then sought to establish the competence of the ADO over the LPA in the regulation of the games. Bravatia claimed that the CHM was strictly restricted to the exploitation of the natural resources of the moon, and that under

Article 8 of the Moon Treaty, the placement of vehicles on the surface of the moon was considered to be use. This then raised the issue of why Bravatia applied first to the LPA. It was argued that even though the mandate of the LPA was restricted to the exploitation of natural resources, through implied powers, it could expand its mandate to regulate other activities. However it was stressed that since the establishment of the ADO, and by lex posterior, the LPA's mandate was now restricted.

On the issue of non-appropriation, the memorial cited Article 11(3) of the Moon Treaty which provides that the placing of vehicles on the surface of the moon does not constitute an appropriation. It was further argued that the agreement between the ADO and Bravatia was only to facilitate international co-operation rather than to claim property rights.

The memorial then asserted that by jamming the Rover Games, Freedom was in violation of its treaty obligations. Firstly, it has frustrated the activities of the ADO in a way contrary to its obligations under the ADO Convention. Secondly, Freedom was in breach of an obligation not to cause harmful interference contained in Article IX of the Outer Space Treaty and Article 15 of the Moon Treaty. Thirdly, Freedom had failed to request consultations with Bravatia and this was also in violation of the same articles of the Space Treaties. Fourthly, as Freedom knew its actions would cause potential danger to Bravatia's rovers, its actions were a hostile act, contrary to Article 3 of the Moon Treaty.

Having established Freedom's responsibility, the memorial then sought to prevent a successful defence of counter-measures. This was done in two ways: firstly that there was no breach to remedy, and secondly that the counter-measures were disproportionate. There are no guidelines as to what is proportionate, so the memorial extrapolated from cases, principally the US/France Air Services Agreement Arbitration, possible criteria for determining proportionality. The criteria used were that; Freedom could have resolved the situation through the dispute settlement procedures of the Space Treaties, the lack of equivalence with the alleged breach, the danger of escalating the dispute and that the counter-measures will affect third parties.

Finally, the memorial dealt with the issue of remedies available to Bravatia. The remedies requested were a declaratory judgement, satisfaction: an apology from Freedom and an undertaking not to repeat similar action, and financial compensation.

INDEX TO VOLUME 26

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