

## SOME REMARKS ON ISSUES RELATING TO LEGAL DEFINITIONS OF "SPACE OBJECT", "SPACE DEBRIS" AND "ASTRONAUT"

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### Abstract

As "Space Object" should be considered any object launched by man for a mission into outer space, be it into orbit around the Earth or beyond, into planetary space, to and around the Moon and other celestial bodies of the Solar system, or into deep space.

The earlier concept of "Space Debris" as fragments of non-functional space objects of any size remaining in outer space was closer to the general term of debris as used in aviation. It was also more functional with regard to the protection of space environment. The newer definition of this term, which includes all kind of non-functional space objects, raises the problem of defining the non-functionality of a space object with regard to its possible recovery, repair and reusability. Moreover, this scientific/technical concept is not quite compatible with the present space law. The legal status of "space debris" should be clearly established.

While the term "Astronaut" was introduced into space legislation in its early stage when the presence of any other human being on board the space object was not envisaged, a certain differentiation between human elements of space objects should be established in the future. The status of the commander and other members of the crew should be distinguished from that of other persons not directly engaged in the mission of a given spacecraft.

### Introduction

The care for clarification, stabilization and systematization of fundamental notions in different legal branches is, without doubt, one of the main tasks of each respective discipline. This task seems to be particularly important in space law. For in spite of its relative youth, the law of outer space, the legislative work in this field, both international and national, as well as the evo-

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lution of its doctrine lasting now several decades, have demonstrated not only an obvious growth, but also some evolutionary changes. This concerns not only the substance of the principles and rules already established and newly formulated, but also the terms used in scholarly writings and legal practice.

The need for maintaining consistency and uniformity of terms used in older and newer legal texts has not always been facilitated by the method of progressive development of space law in the United Nations and other focal points where the legal instruments have been drafted. The time span between the elaboration of the main space law instrument - the 1967 Outer Space Treaty - and the fifth UN space treaty - the 1979 Moon Agreement - was about 13 years, but almost 30 years passed between the first UN space law instrument - the 1963 Declaration of Legal Principles - and the latest one - the 1992 Principles Relevant to NPS in Outer Space. Moreover, the necessity to reach consensus on the basis of compromises between different approaches and requirements of individual States or the groups thereof leads often in the final drafts to the use of a language that is not quite clear and certain. "Constructive ambiguity" has become sometimes the last resort by means of which a gap between different standpoints in the negotiating bodies of the United Nations can be bridged.

Another kind of problems emerges from the lack of consistency between different branches of international law, though they deal with comparable issues. Different terms and definitions have been used e.g. in the law of the sea, the law of the air, the law of

Antarctica, the law of outer space and the law of environment, though a more attentive observation of parallel processes in establishing the legal order for all these fields might have helped to prevent the lack of harmony among the respective disciplines.

For all these reasons, a systematic attention to and solution of fundamental problems, which are the aim of the doctrine of each legal branch, must involve the care for and elaboration of exact definitions of all terms which create the structure of the discipline concerned. And the decision of the IISL to include from time to time in the agenda of its Colloquia the item concerning definitions of the main space law terms, has to be welcomed.

The purpose of this paper is to draw attention to some aspects of defining three of the fundamental notions of space law which have been used in the United Nations space treaties and also in other legal documents, and which have been under discussion in the space law doctrine for a certain time.

### Space Object

The first one is "space object" or "object launched into outer space". It should be recalled that thorough examinations of this notion were already made earlier by several authors. <sup>2/</sup>

An excellent analysis of the appearance and meaning of this term in the UN space treaties was made in a paper submitted by Professor Bin Cheng to the first IISL session on definitional issues in space law in Montreal, 1991. <sup>3/</sup> From among the many useful conclusions he made on this subject, it is particularly important to recall the view

he spelled out in connection with Article II /1/ of the Registration Convention, namely that "this article really serves to confirm that "objects launched into earth orbit or beyond" are in fact "space objects", and thereby implies that outer space does begin where satellites are capable of completing a full or whole orbit around the earth, since it is calling any object that is capable of going into any earth orbit, even one with the lowest possible perigee a "space object".<sup>4/</sup> On this basis and in the light of other UN treaties relating to outer space, Professor Bin Cheng concluded that "the term "space object" covers any object launched by humans into outer space, as well as any component part thereof, together with its launch vehicle and parts thereof. Objects launched into earth orbit and beyond are ipso facto regarded as space objects."<sup>5/</sup>

May I recall that during the discussion at the 1991 Colloquium, I defended a similar position by drawing attention to interrelations between the terms "outer space" and "space object". In my paper, I held the view that the criterion of sustainable orbits of Earth satellites /including the lowest perigee at which space objects are still able to continue effectively their orbiting around the Earth for a longer period of time/ offers a realistic and practical basis for a viable definition of outer space.

At the same time, I made it also abundantly clear that all objects successfully launched into orbits around the Earth and beyond should be qualified as objects accomplishing missions in outer space.<sup>6/</sup>

Along the same lines, I now propose the following definition

of "space object": As "space object" should be considered any object launched by man for a mission into outer space, be it into orbit around the Earth or beyond /i.e. into interplanetary space, to and around the Moon and other celestial bodies of the Solar system, or into deep space/. A number of explanatory notes must be made in connection with this definition.

First, the phrase "objects launched by man for a mission into outer space" covers not only all objects successfully launched into orbit around the Earth or beyond, but also attempted launchings of such objects, since the very moment when the launching operation begins. This interpretation was spelled out in Article I /b/ of the 1972 Liability Convention for the purposes of that Convention. Furthermore, with due regard to special aspects of the space objects with nuclear power sources on board, it was made also prominent in the 1992 Principles Relevant to the Use of Nuclear Power Sources in Outer Space.

While under normal circumstances missions of space objects end by their return to the Earth where a space object either evaporates in dense layers of the atmosphere or lands on the Earth surface and can eventually be used again as a new object for another space mission, the mission of a space object may also end by its break-up or collision with another object - this way will be discussed later in relation with the term "space debris". However, another way of fulfilling a space mission may be not destructive but constructive: a space object or its parts may be used as elements for constructing a larger structure in space, or for build-

ing-up a station on the Moon or another celestial body. How to deal with such cases ?

It is true that in general, according to Article VIII of the 1967 Outer Space Treaty, "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"; and "ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth." However, these are but general principles and during their implementation, it is advisable to consider these problems and resolve them individually, with due regard to each specific case, particularly if the construction of such a station should be undertaken as a joint venture of several nations. The above-mentioned principles of the 1967 Outer Space Treaty do not exclude a special regulation of such issues by partners of a space mission, for Article VIII of the Treaty was not established as a peremptory norm of international law. This was done, for example, among the respective partners of the Agreement on Cooperation in the Detailed Design, Development, Operation and Utilization of the Permanently Manned Civil Space Station, signed in Washington on 26 September 1988. <sup>7/</sup>

Similar problems will have to be considered in the light of prospects for establishing permanent bases on the Moon and other celestial bodies. The more so that in these cases the space objects or parts thereof which would land

on the Moon or another celestial body, might be permanently connected with other parts of the construction made of local substances. In this respect, it may be observed that the 1979 Moon Agreement, though providing for in Article 9 the possibility of establishing "manned and unmanned stations on the moon" under certain conditions, has remained silent about these more specific questions arising from the construction of future lunar stations, though such prospects were already known at the time of origin of this Agreement. It may be also interesting to note that Article 12 of the Moon Agreement concerning jurisdiction and control over the personnel, vehicles, equipment, facilities, stations and installations of States Parties on the Moon, and also the ownership thereof, does not mention the component parts as did Article VIII of the 1967 Outer Space Treaty.

In my earlier papers on this subject, I suggested that in the future development of space law, the permanent space stations as large, complex and multipurpose space constructions performing very important missions in space be given a special treatment in comparison with usual satellites and other relatively simple space objects. <sup>8/</sup> This conclusion is valid not only in relation to orbital stations, but also with regard to permanent bases to be constructed on the Moon and other celestial bodies. Such a special status will have to be reflected in registration of these categories of man-made objects in outer space and the text of the 1975 Registration Convention, or at least the practice developed on its basis, should be adequately adjusted to these new needs. Of course, it may be also expected that the construction of each of such stations or bases will be

preceded by a conclusion of a special detailed agreement between the partners participating in such an endeavour.

### Space Debris

The up-to-date space legislation has known only the term "space object" which, according to Article I /d/ of the 1972 Liability Convention, includes "component parts of a space object as well as its launch vehicle and parts thereof". This term has been used as a fundamental element for establishing the principles and rules governing space activities and also as one of the basic notions in the space law doctrine. In recent years, however, attention has been drawn to a growing population of remains of these objects which, having ended their missions, become useless "space debris" unless they perish during their descent or are removed from orbit and brought back to the Earth. The present space treaties and other instruments of space law do not address this problem. Neither the space treaties concluded under the auspices of the United Nations, nor any other international agreements, nor the domestic law of individual space-faring nations provide a definition of this notion and establish any legal rule that should be applied to the ever increasing number of these objects.

Fortunately, the scientific and technical community, both at national and international levels, has already investigated this problem in greater detail and produced a number of reports and studies that can be used as a basis for consideration of its legal aspects. <sup>9/</sup> In earlier studies relating to this issue, the concept of space debris was closer to fragments of non-functional space ob-

jects and the parts thereof down to millimeter and submillimeter size.<sup>10/</sup> It was just the growing number of these small pieces of space debris which alarmed the world community, arousing its anxiety concerning the future space environment. In recent expert reports and papers, however, a wider definition of the term "space debris" / or "orbital debris"/, which takes better into account the causes of its origin and growth, has prevailed. Thus e.g. in the IAA Position Paper on Orbital Debris, this kind of objects includes "any man-made Earth-orbiting object which is non-functional with no reasonable expectation of assuming or resuming its intended function or any other function for which it is or can be expected to be authorized, including fragments and parts thereof. Orbital debris includes non-operational spacecraft, spent rocket bodies, material released during planned space operations, and fragments generated by satellite and upper stage break-up due to explosions and collisions." <sup>11/</sup>

This approach was also adopted by the Space Law Committee of the International Law Association which was considering a Draft International Instrument Concerning the Protection of the Environment from Damage Caused by Space Activities. According to an earlier version of this document of a non-governmental nature, "Debris" meant "objects in outer space, other than active satellites, in the vicinity of the Earth environment, implying a risk of collision with active spacecraft or other undesirable interference with activities in outer space." This older version of ILA's Draft International instrument should only consider as debris "man-made objects in the environment". And

as explicitly stated, non-identifiable small particles did not come under the term of this text.<sup>12/</sup>

While the 1992 version of ILA's Draft rather surprisingly limited its interest to debris in the vicinity of the Earth environment, in the final version of this document, as adopted by the 66th Conference of the ILA at Buenos Aires in August 1994, the meaning of "space debris" is already wider and includes "man-made objects in outer space, other than active or otherwise useful satellites, when no change can reasonably be expected in these conditions in the foreseeable future". And the scope of application of the final version of ILA's Draft, which according to its title should no longer protect the environment from damage caused by "space activities" in general but only by "space debris", has been adjusted to its newly formulated definition, for this instrument "shall be applicable to space debris which causes or is likely to cause direct or indirect, instant or delayed damage to the environment, or to persons and objects."<sup>13/</sup> This seems to be in full harmony with the above-mentioned scientific/technical definition formulated in the IAA Position Paper.

However, the wide concept of space debris should be carefully considered in the light of the present provisions of space law. In particular, it should be taken into account that Article VIII of the 1967 Outer Space Treaty, which guarantees the retaining of jurisdiction and control of States over space objects carried on their registry as well as the continuing ownership of space objects and of their component parts, creates certain obstacles for a full application of this concept. Neither

seems this concept to be in conformity with the philosophy of the 1972 Liability and the 1975 Registration Conventions.

For these and other reasons, a special legal document on space debris is indispensable, be it a complete instrument that would deal with all aspects of space debris, or only an interpretative document to the existing space treaties and other instruments with regard to their application to space debris. Such a legal document should clearly establish from which moment a space object or its parts become non-functional and useless, and may be treated by anybody as "space debris". The non-functionality of a space object must be examined in the light of its possible recovery, repair and reusability.

It is possible to agree with Professor Bin Cheng that "there is no reason to think that non-functional space objects are no longer space objects. The definition of space object is not related to the object's use or usefulness."<sup>14/</sup> It is also possible to accept the view of Professor S. Gorove as expressed in his comprehensive introductory report to the present discussion, namely "that the Liability Convention is clearly applicable to damage caused by space debris."<sup>15/</sup> On the other hand, there is some merit in the observation expressed in the OTA Background Paper according to which the 1972 Liability Convention, in addition to damage caused by a space object on the surface of the Earth or to aircraft in flight, has been primarily concerned with possible collisions between active space objects.<sup>16/</sup> It will be indeed appropriate if a régime of absolute liability or at least a régime of presumed fault is established for damage caused by space debris, as suggested by

Professor Bin Cheng. <sup>17/</sup> Perhaps this consequence might be made conditional on neglecting the standards and recommended practices to be elaborated by scientific and technical experts and adopted by the international community as measures to be applied against the generation of space debris. <sup>18/</sup> Moreover, it will be also desirable that "in cases where orbital debris causes damage, those who create the risk should bear the cost of not only compensating for damage done to persons and property in outer space, but also protecting the space environment itself." <sup>19/</sup>

The elaboration and adoption of an exact legal definition of "space debris", which would be in harmony with the best scientific and technical knowledge, should thus be accompanied by the formulation and adoption of new rules that would govern liability for damage caused by an inactive object or its parts and exclude "space debris" from the general protection guaranteed by the present space law to all space objects and their parts.

### Astronaut

In early years of the space era, two kinds of space objects were distinguished - manned and unmanned objects. Since that time, all people flying in manned objects /also called space vehicles or spacecraft/ have been considered as astronauts. <sup>20/</sup> Because of their risky business, all of them deserved equal admiration, protection and any possible assistance in the event of accident, distress, or emergency landing. This philosophy has been reflected in Article V of the 1967 Outer Space Treaty which even designated as-

tronsauts as "envoys of mankind in outer space". This language, though, has not meant that the diplomatic privileges and immunities should be granted to astronauts; only a special care as to their rescue and return, as well as all possible assistance in their activities in outer space and on celestial bodies, have been stipulated.

In addition to the term "astronaut", another term relating to manned space flights has been used since the beginning of space legislation. Already in 1967 Outer Space Treaty, it is declared in its Article VIII that "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." <sup>21/</sup> The term "personnel" used in this provision already indicated that the situation in manned space flights was changing: while originally "astronauts" were viewed as heroes who took a great risk of being launched into outer space, the improving space technology was opening the door for sending whole groups of individuals for space missions lasting not only hours, but weeks and months.

The term "personnel of a space object" became soon more appropriate and common. This transition from rather exceptional ventures to routine operations was already evident from the 1968 Rescue Agreement. While in its title and preamble the language of Article V of the Outer Space Treaty was still used, the substantive provisions of the Rescue Agreement speak about assistance to and return of "the personnel of a spacecraft". This difference of language in one and the same instrument, however, does not mean a dichotomy of notions.

It is evident from the spirit and language of the Rescue Agreement that all members of "the personnel of a spacecraft" are to be considered and treated as "astronauts" and vice versa.

The same conclusion may be derived from the language of the 1979 Moon Agreement in which the phrase "persons on the moon" is used. Article 10 of this Agreement stipulates first that "States Parties shall adopt all practical measures to safeguard the life and health of persons on the moon". But it is explicitly added in the following sentence of the same Article that for this purpose "they shall regard any person on the moon as an astronaut" within the meaning of Article V of the 1967 Outer Space Treaty. The word "persons" instead of "the personnel" was probably used in connection with activities on the Moon because it was already obvious that in the future, not only the personnel /i.e. the staff/ of a given spacecraft, but also researchers and other specialists would be sent to the Moon for its exploration and longer stays in lunar stations. These persons will be only transported to the Moon and will not exercise any function during their travel to and from the lunar station.

While the term "astronaut" was introduced into space legislation when the presence of other human beings than members of its crew on board a space object was not yet envisaged, a certain differentiation between human elements of space objects will probably become necessary. Amongst the members of the crew, the commander of a spacecraft has already acquired an outstanding position in up-to-date practice of spaceflights, but his rights and responsibilities will have to be

firmly established and unified, not only by domestic laws but also internationally. He will have to bear responsibility for compliance of all activities carried out by the spacecraft with international law and with the rules and regulations of the flight. Also his position as representative of the State of registration should be clearly spelled out. As the captain of a ship or the commander of an aircraft, the commander of a manned space object will be called to perform legal functions during the flight. His legal position, powers and responsibilities will have to be defined in an international instrument. In a similar way, the position of the chief of an orbital station or a lunar base should be fixed.

Furthermore, a specialization amongst the other members of the crew, licenced for different assignments, becomes a necessity. Already today, in addition to the commander and pilots, engineers, mission and payload specialists, and research scientists participate in different missions on board the spacecraft. This trend will develop further when a big international space station is established in the near future. 22/

Sooner or later, the legal status of members of the crew will have to be distinguished from that of other persons not directly engaged in the performance of the mission. Members of the crews of other spacecraft, e.g. those returning from future space bases or rescued astronauts, may also stay on board the space object. While the position of these persons can be still compared to a certain extent with that of the personnel of a spacecraft, can the same status be granted to such other persons as visitors,



newsmen and in the long run even space settlers? Should they not be rather considered as passengers which will simply participate in the space flight on the basis of a contract with the operator of the spacecraft? This does not mean that these other persons should no longer be entitled to receive all possible assistance in the event of accident, distress, or emergency landing, as stipulated in Article VIII of the 1967 Outer Space Treaty and the provisions of the 1968 Rescue Agreement. However, their role during the flight, their rights and duties will be clearly different.

Further expected achievements in astronautics, such as the construction and operations of orbital stations and the establishment of permanent bases on the Moon and other celestial bodies, and last but not least, the prospects for development of aerospace transportation systems, will require improvements of the present legal basis of space flights and perhaps even some new approaches to its development, for which the clarification of fundamental notions of the international law of outer space is one of indispensable prerequisites.

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### References

1. The texts of the United Nations space treaties in this paper are quoted in accordance with Doc. A/AC.105/572 "United Nations Treaties and Principles on Outer Space" published by the Office for Outer Space Affairs, United Nations Office at Vienna, 1994.

2. See e.g. M.G. Marcoff, *Traité de Droit international public de l'espace*, Editions universi-

taires Fribourg Suisse, Fribourg-Genève-Paris-New York, 1973, pp. 397-473.

3. See Bin Cheng, "Space Objects", "Astronauts" and Related Expressions, in IISL Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space, October 5 - 11, 1991, Montreal, Canada, AIAA, 1992, p. 17 ff.

4. Ibidem, p. 19.

5. Ibidem, p. 26.

6. See V. Kopal, Issues Involved in Defining Outer Space, Space Object and Space Debris, in Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space, October 5 - 11, 1991, Montreal, Canada, AIAA, 1992, p. 40.

7. See its text in Space Law, Basic Legal Documents, Edited by Prof. Dr. Karl-Heinz Böckstiegel and Dr. Marietta Benkš, Martinus Nijhoff Publishers, Dordrecht, 1990, Vol. 2/1, D.II.4.2.

8. For the first time, this idea was advanced in my paper "Future Activities and Actions of the Various International Organizations in the Field of Space Law", in IISL Proceedings of the Thirteenth Colloquium on the Law of Outer Space, October 4 - 10, 1970, Constance, Germany, published in 1971, p. 326. See also the paper mentioned in reference 6, p. 41.

9. A great contribution to these efforts was made by convening, under the auspices of ESA, the First European Conference on Space Debris held in Darmstadt, Germany, 5 - 7 April 1993. See the voluminous Proceedings of this Conference /741 p./, Doc. ESA SD-01, July 1993.

10. See e.g. Environmental Effects

of Space Activities. A Report prepared by COSPAR and IAF for the United Nations Scientific and Technical Subcommittee of the COPUOS, November 1988, p. 4.

11. See International Academy of Astronautics, Position Paper on Orbital Debris. Prepared by an Ad Hoc Expert Group of the IAA Committee on Safety, Rescue and Quality, November 1993, p. 3.

12. See The International Law Association, Report of the Sixty-Fifth Conference held at Cairo, Egypt, 21 to 26 April 1992, Cairo, 1993, p. 154-155.

13. See the text of Buenos Aires Resolution August 1994 as printed in the Report of the ILA Space Law Committee.

14. See the paper mentioned in reference 3, p. 24.

15. See S. Gorove, Definitional Issues Pertaining to "Space Object", Paper submitted to the IISL Colloquium in Jerusalem, Israel, 1994, p. 4.

16. See U.S. Congress, Office of Technology Assessment, Orbiting Debris: A Space Environmental Problem - Background Paper, OTA-BP-ISC-72 /Washington, DC: U.S. Government Printing Office, September 1990/, p. 31.

17. See the paper mentioned in reference 3, p. 25.

18. The elaboration of technical standards and recommended practices as an appropriate means to mitigate the environmental impact of space activities was first suggested by N. Jasentuliyana, Environmental Impact of Space Activities: An International Law Perspective, in IISL Proceedings of

the Twenty-Seventh Colloquium on the Law of Outer Space, October 7-13, 1984, Lausanne, Switzerland, AIAA, 1985, p. 390 ff.

19. See the document mentioned in reference 16, p. 31.

20. There is no reason for drawing any distinction between different language versions of this term. Both "astronauts" and "cosmonauts" /as well as "spationeutes" which were used in French for some time/ have had the same meaning.

21. The language of this provision of the 1967 Outer Space Treaty is a slightly improved wording of Para. 7 of the 1963 Declaration of Legal Principles in which the term "personnel" also appeared.

22. As to the nature and extent of these issues, see M. Bourély, The Legal Status of Personnel on International Space Station Missions; and V. Kopal, Some Problems Relating to the In-Flight Personnel Regime of Manned Space Objects, in Manned Space Flights, Legal Aspects in the Light of Scientific and Technical Developments, Carl Heymanns Verlag, Köln-Berlin-Bonn-München, 1993, p. 69 ff. and 85 ff.