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Outer Space

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A. Definition of the Term 'Outer Space'

1 The term 'outer space', like several other basic notions of space law ('outer space activity', 'space flight', 'space object'), although frequently used in space agreements and other space law instruments, has never been defined by them. There are a number of reasons for this, not least the objective difficulty for the States concerned to agree on legal definitions in the context of rapidly developing technology and their apprehension that legally binding definitions might restrict their sphere of operation.

2 The absence of a formal definition of outer space does not mean that no general perception exists as to what is meant by outer space, even if the use of the term in natural sciences and in law may not always be exactly the same. It should be remembered that there is no definitive physical boundary between atmospheric space and extra-atmospheric space, the transition from one to the other being gradual. Although at 100 km the density of the air is but one millionth of what it is at sea level, for natural scientists these two regions of space, in some respects, may be perceived as one single whole. However, with the launching of the first satellite in 1957 the notion of outer space became inextricably linked with the exploration and uses of space by means of man-made spacecraft (→ *Spacecraft, Satellites, and Space Objects*). The physical and technical factors are directly relevant to the legal regulation of the region of space concerned. The atmospheric space of the earth and most of the activities in this space fall within the ambit of → *Air Law*. The space beyond the atmosphere is governed by space law. The 'spatial' element of each of the two above-mentioned branches of law is reflected in their denominations: the first being known as air (ie atmospheric) law, the second as space law, often referred to as outer space (ie extra-atmospheric) law.

3 The legal regimes governing → *airspace* and outer space are fundamentally different. Thus, logically and jurisprudentially it is necessary to know where air space ends and outer space begins. In theory, there must be no 'outer' boundary of application of space law, since outer space itself is limitless, but in practice space law, keeping pace with the development of space technology, does not purport to regulate space activity beyond the solar system (see *Art. 1 Agreement Governing the Activities of State on the Moon and Other Celestial Bodies* [(adopted 18 December 1979, entered into force 11 July 1984) 1363 UNTS 3]). At the same time, 'celestial bodies' of the solar system, other than the earth, but comprising the Moon, are included in the legal notion of outer space (→ *Moon and Celestial Bodies*). This follows from the title and text of the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and other Celestial Bodies* ([signed 27 January 1967, entered into force 10 October 1967] 610 UNTS 205) ('Outer Space Treaty').

B. Basic Differences between the Legal Regimes Governing Air Space and Outer Space

4 The principal difference between the legal regimes governing air space and outer space is that the air space above a State's land area and territorial waters is subject to 'the complete and exclusive sovereignty' of the respective State (*Art. 1 Convention on International Civil Aviation* [(signed 7 December 1944, entered into force 4 April 1947) 15 UNTS 295; → *Chicago Convention (1944)*]), whereas outer space 'is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means' (*Art. II Outer Space Treaty*).

5 The vertical extension of sovereignty is rooted in the Roman law maxim *maxim cuius est solum ejus est usque ad*

coelum (whose is the soil, his is also that which is above it; translated by the author). In contemporary air law, the principle of sovereignty over air space primarily originated from the national security concerns of States and their commercial interests relating to air navigation. However, these concerns and interests did not appear to be of particular relevance in relation to outer space at the beginning of the space era. This facilitated the affirmation by States of the principle of non-extension of sovereignty into outer space, which has since become a part of → *customary international law*. In affirming this principle, States were inspired 'by the great prospects opening up before mankind as a result of man's entry into outer space' and 'the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes' (Preamble Outer Space Treaty; → *Common Heritage of Mankind*). In doctrine, the legal nature of outer space is often characterized as *res extra commercium*, *res communis omnium* or *res communis humanitatis* (→ *Community Interest*; → *Equitable Utilization of Shared Resources*).

6 In a number of unanimously adopted United Nations General Assembly ('UNGA') resolutions, in particular [Resolution 1721 \(XIV\) of 20 December 1961](#) and [Resolution 1962 \(XVIII\) of 13 December 1963](#), and later in the Outer Space Treaty, States elaborated the main principles of the legal status of outer space and of space law generally (→ *United Nations, General Assembly*). These principles have been further developed in various other instruments of space law. Many of the principles and rules of space law are applicable not only to activities in outer space proper, but also to related activities in air space and on earth (→ *General International Law [Principles, Rules, and Standards]*). Moreover, there are instruments of space law which deal practically exclusively with space-related activities on earth, for example, the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space ([opened for signature 22 April 1968](#), entered into force 3 December 1968] 672 UNTS 119).

7 At the same time, there are a number of other principles and rules which are exclusively applicable to activities in outer space. Among them are the cardinal principles of the freedom of exploration and use of outer space, including the Moon and other celestial bodies and non-appropriation of outer space ([Arts 1 and II Outer Space Treaty](#), respectively). Other important principles and rules applicable solely to activities in outer space include, inter alia, the prohibition to place in orbit around the earth or to station in any other manner in outer space or on celestial bodies nuclear weapons or any other kind of weapon of mass destruction, the obligation to use the Moon and other celestial bodies 'exclusively for peaceful purposes' ([Art. IV Outer Space Treaty](#)) (→ *Nuclear Weapons and Warfare*; → *Peaceful Purposes*), and the stipulation according to which 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 ([Art. VIII Outer Space Treaty](#)).

C. The Issue of Definition and/or Delimitation of Outer Space

8 Although the issue of definition and/or delimitation of outer space had already been identified in 1959 as one requiring attention ([Ad Hoc Committee on the Peaceful Uses of Outer Space, 'Report' \[14 July 1959\] UN Doc A/4141 Part III, Section III, para. A](#)), and despite the strictly spatial application of some major principles of space law, the Outer Space Treaty, which laid down these principles, did not directly address the issue of delimitation between air space and outer space. In this connection, [UNGA Resolution 2222 \(XXI\) of 19 December 1966](#), which recommended the Outer Space Treaty for signature and ratification by States, also requested that the Committee on the Peaceful Uses of Outer Space ('COPUOS') begin, inter alia, to study the question of the definition of outer space. It is recalled that COPUOS and its Legal Subcommittee were designated by UN Member States as the most appropriate forums for the elaboration of rules regulating space activities.

9 The question was placed on the agenda of the Legal Subcommittee of COPUOS as a separate item in 1967, under the title 'Study of Questions Relative to the Definition of Outer Space' (UNGA Committee on the Peaceful Uses of Outer Space, 'Report of Legal Subcommittee on the Work Its 6th Session to the [Committee on the Peaceful Uses of Outer Space](#)' [14 July 1967] UN Doc A/AC.105/37). In the intervening years the title has been modified several times. In 1977 the title was revised to read 'Matters Relating to the Definition and/or Delimitation of Outer Space and Outer Space Activities' (UNGA Committee on the Peaceful Uses of Outer Space, 'Report of the Legal Subcommittee on the Work of Its Sixteenth Session' [4 April 1977] UN Doc A/AC.105/196). After the Bogotá Declaration of eight equatorial States issued on 3 December 1976 in relation to the → *geostationary orbit*, the scope of issues discussed has been enlarged to include questions relating to the geostationary orbit. This was done on the assumption that the common consideration of both issues would help accommodate the wishes of all States. In recent years, both issues have been combined under one comprehensive heading, as follows:

Matters relating to the definition and delimitation of outer space and the character and utilization of the geostationary orbit, including consideration of ways and means to ensure the rational and equitable use of the geostationary orbit without prejudice to the role of the International Telecommunication Union. (UNGA Committee on the Peaceful Uses of Outer Space, 'Report of the Legal Subcommittee on Its Forty-eighth Session, [Held in Vienna from 4 to 15 April 2005](#)' [28 April 2005] UN Doc A/AC.105/850)

10 Notwithstanding the enhanced interest in the issues relating to the definition and delimitation of outer space, in particular, at a time when some equatorial States were seeking to present a claim of → *sovereignty* or exclusive national rights over the geostationary orbit, which is part of outer space, the decades of discussion of the topic by COPUOS and its Subcommittee up to now have not brought about any tangible results. Moreover, the simultaneous consideration of the definition/delimitation issues with the geostationary orbit issues has not helped to reach an agreement on either of them. To support their positions on the access to and exploitation of the geostationary orbit, a number of States have even challenged the validity of some of the basic provisions of the Outer Space Treaty, which were and are widely viewed as reflecting customary international law.

11 Nor was any significant progress made on the definition/delimitation issue when, in accordance with an agreement reached in 2000 in the Legal Subcommittee, a special working group was convened and then reconvened annually to consider those matters separately from the issues relating to the geostationary orbit. As is reflected in the annual reports of the Legal Sub-committee of COPUOS and in the statements made by delegations (see, for instance, UNGA Committee on the Peaceful Uses of Outer Space, 'Report of the Legal Subcommittee on Its Forty-eighth Session, Held in Vienna from 4 to 15 April 2005' [28 April 2005] UN Doc A/AC.105/850 and the unedited verbatim transcripts for meetings of the UNGA Committee on the Peaceful Uses of Outer Space Legal Subcommittee UN Doc COPUOS/Legal/T.715–720 and 726), opposing views among States as to the necessity of definition/delimitation and the methodology to be adopted in this regard continued unabated.

12 Two main approaches by States have dominated the debate, corresponding to the two principal scholarly views. According to one approach, often characterized as 'spatial', geometrical criteria should be used for the fixing of a boundary between air space and outer space. As a clearly articulated example of this approach reference can be made to a working paper of the Soviet Union entitled 'Approach to the Solution of the Problem of the Delimitation of Air Space and Outer Space', first presented to the Legal Subcommittee in 1979 and later amended (in 1983 and 1987). According to this proposal, States would formally agree that the space above an altitude of 100–110km from the sea level of the earth would be considered as outer space, while space objects of States would retain the right of innocent (peaceful) passage (→ *Innocent Passage*) over the territory of other States at an altitude lower than 100–110km above sea level for the purpose of reaching orbit or returning to earth. The Soviet proposal was supported in substance by a number of States as one that met the scientific criteria of space flights and corresponded to established practice. However, this proposal as well as several other proposals of States based on the 'spatial' approach were opposed by other States that either adhered to the 'functional' approach to the delimitation or considered the whole problem of definition/delimitation premature for legal resolution.

13 This 'functional' approach proceeds from the premise that there is no need for a boundary between air space and outer space since activities in both regions of space should be regulated according to their objectives and missions rather than according to the space where these activities are carried out. The proponents of the functional approach propose that air space and outer space be viewed as a single whole—'aerospace'—with two parallel legal regimes in place to govern space and aeronautical activities, depending on their objectives and missions. Some of the scholars advocating such an approach suggest the elaboration of a single aerospace law based on the functional notions of sovereignty and freedom of use of all space above the earth.

14 In rejecting both the spatial and functional approaches or rather in favouring a third 'wait and see' approach, some States—the United States of America ('US') among them—have taken the view that over the years during which the subject has been considered, no compelling legal or technical need or justification for a definition/delimitation has appeared. They consider that premature definition/delimitation may create difficulties for space activities.

D. The Concept of Customary Delimitation

15 Another important school of thought which has developed against the backdrop of these discussions reflecting a wide range of views on the pros and cons of a treaty-based agreement on a boundary between air space and outer space, advocates the customary character of such a boundary. The concept of customary delimitation between air space and outer space assumes that the absence of a treaty-based delimitation of the boundary between the two regions of space did not exclude the formation of a customary rule to this effect. A persuasive argument in support of such an approach has been the lack of objection to the continued practice of States since the first satellite launch in 1957. In the view of many commentators this resulted in the establishment of a customary lower boundary of outer space at the level of the lowest perigees of artificial earth satellites, ie at approximately 100–110km above sea level. For all practical purposes, below this altitude space objects cannot safely remain in orbit because of the physical properties of space, and therefore such a boundary has the soundest scientific basis.

16 It is argued that this customary rule emerged before 1976, when the equatorial States began to link the issues of geostationary orbit with that of delimitation. Moreover, the wording of a number of the provisions of space law agreements implicitly confirm that the drafters proceeded from the assumption that a satellite placed in any sustainable orbit around the earth—including the very lowest—must be seen as situated in outer space (see [Art. IV Outer Space Treaty](#), [Art. II Convention on Registration of Objects Launched into Outer Space](#) [(opened for signature 14 January 1975, entered into force 15 September 1976) 1023 UNTS 15]). It has also been argued that the existence of a customary lower boundary of outer space does not negate the importance of a formal agreement on delimitation between air space and outer space, fixing it in clear and specific terms. No less important would be an agreement or agreements on the rights and conditions of passage through foreign air space by launched and returning space and aerospace objects.

17 With further technological progress and diversification of space-related activities, including wider use of aerospace objects and sub-orbital launching vehicles, the prolonged absence of a treaty-based delimitation may lead to the enactment of unilateral national legislation establishing such a delimitation (→ *Unilateral Acts of States in International Law*; → *Unilateralism/Multilateralism*). The *Australian Space Activities Act 1998 as amended in 2002*, which makes specific reference to the distance of 100km above mean sea level for the purposes of space regulation, appears to be the first national law of this kind.

E. Protection of Outer Space Environment

18 The problem of the environmental effects of activities in outer space is multifaceted. To a large extent, the question concerns the implications of activities in outer space for the earth's environment. Under this entry, however, the focus will be on those effects with a direct impact on the environment of outer space, per se.

19 From the very outset of outer space exploration, the scientific community has been concerned with the protection of the earth's environment from harmful space contamination and the protection of the space environment from harmful earth-generated contamination. The matter was discussed by an authoritative international scientific organization, the International Council of Scientific Unions, which in 1958 formed a special Ad Hoc Committee on Contamination by Extraterrestrial Exploration ('CETEX'). The problem of contamination was also identified in the 1959 Report of the UN Ad Hoc Committee on the Peaceful Uses of Outer Space. At that period, the terms 'contamination' and 'pollution' were primarily linked with possible biological, chemical, and radiation harm to the environment. The communication experiments of the US, in 1961 and 1963, known as the 'West Ford' project, which consisted in distributing a vast quantity of copper needles in a circular orbit around the Earth, added to the anxiety of the international scientific community.

20 All these concerns found their expression in [Art. IX Outer Space Treaty](#), which stipulates that

States Parties to the treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose.

[Article IX Outer Space Treaty](#) links harmful contamination with other 'potentially harmful interference with activities in the peaceful exploration and use of outer space' and envisages the use, in certain circumstances, of an international consultation procedure.

21 The term 'harmful contamination' was not defined in the Outer Space Treaty, and therefore it is open to broad interpretation. The rapid growth in the number of non-functional space objects and parts thereof, especially in the low earth and geostationary orbits, has led to a new kind of pollution of outer space, potentially harmful for space exploration and practical uses, which is now generally termed 'space debris' or 'orbital debris'. The risk posed by space debris was recognized in authoritative studies and technical reports of national and international space organizations in the 1970s and 1980s. In 1993, the leading space agencies established an Inter-Agency Space Debris Coordinating Committee ('IADC'). The IADC meets every year and submits its findings to the Scientific and Technical Subcommittee of the UN Committee on Peaceful Uses of Outer Space.

22 At present, the term 'space debris' does not appear in any legal instrument. Technically, it is used to denominate human-made space objects, which terminated their functions or fragmented from their parent bodies. The number of traceable debris is approaching 10,000, while the number of pieces of debris, which are too small to be detected but still may cause serious damage in case of a collision with active space objects, is at least 10 times higher than that. According to technical studies, the probability of a close encounter or a collision with active space objects is still low, but the risk is increasing with the growth of the debris population in outer space. The quest to restrict this growth is a complex scientific and technical task.

23 On the international level, the problem is now tackled by the abovementioned IADC, which in 2002 elaborated the [IADC Space Debris Mitigation Guidelines \(UN Doc A/AC.105/C.1/L.260\)](#). On the basis of this document and updated technical information, the Scientific and Technical Subcommittee of COPUOS adopted in 2007 a set of Space Debris Mitigation Guidelines, which should be implemented on a voluntary basis through a national mechanism by all States concerned (UNGA Committee on the Peaceful Uses of Outer Space, '[Report of the Scientific and Technical Subcommittee on Its Forty-fourth Session](#)' [6 March 2007] UN Doc A/AC.105/890, Annex IV).

24 In spite of several proposals to discuss space debris issues in the Legal Subcommittee of COPUOS, no consensus has been reached in this matter. Moreover, in its 2007 Report the Scientific and Technical Subcommittee of COPUOS noted that the space debris mitigation guidelines 'are not legally binding under international law' (ibid).

25 Legal aspects of space debris continue to remain the subject of academic studies and discussions at the meetings of international non-governmental organizations, such as the → [International Law Association \(ILA\)](#) and the International Institute of Space Law ('IISL'). The former organization adopted at its 66th Conference held in Buenos Aires, in 1994, a draft International Instrument on the Protection of the Environment from Damage Caused by Space Debris.

26 In addition to concentrating on the legal nature of an instrument containing technical safety standards, the ongoing legal debate on the desirability of elaborating a special legal regulation on space debris highlights the relevance vis-à-vis space debris of the space treaties and sets of principles which have been built around the notion of a 'space object'. Is space debris legally distinguishable from space objects? Is the space law liability regime applicable to damage caused by space debris? Should any forms of de-orbiting or re-orbiting measures relating to 'foreign' debris be legally permitted in special circumstances? Should the protection of ownership of space objects, and of their component parts, also be extended to space debris? These and similar questions permeate the legal literature on the subject of space debris. Irrespective of the divergent answers to these concrete questions, the common denominator in the views expressed is the affirmation that the general principles and rules of space law, particularly those relating to the protection of the environment (→ [Environment, International Protection](#)), are applicable to space debris (see → [Outer Space, Liability for Damage](#)).

27 A step forward in the protection of outer space environment was made in 1992 by the unanimous adoption of [UNGA Resolution 47/68 of 14 December 1992](#), containing 'Principles Relevant to the Use of Nuclear Power

Sources in Outer Space'. The principles, among other things, provide that the design and use of space objects with nuclear power sources 'shall ... ensure with high reliability that radioactive material does not cause a significant contamination of outer space' (Principle 3 (1) (a)). Principle 3 also directs that '[i]n order to minimize the quantity of radioactive material in space and the risks involved, the use of nuclear power sources in outer space shall be restricted to those space missions which cannot be operated by non-nuclear energy sources in a reasonable way'.

28 Conversely, a serious danger for the outer space environment arises from the development of space weapons, which are generally seen as the worst source of deliberate space debris production. The strict observance of the existing bans and limitations on military uses of outer space and the prevention of the arms race in outer space is of paramount importance for the protection of the space environment.

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