



UNITED NATIONS
GENERAL
ASSEMBLY



U Distr.
GENERAL

A/AC.105/C.2/7

7 May 1970

ENGLISH

ORIGINAL: ENGLISH/FRENCH/
SPANISH

COMMITTEE ON THE PEACEFUL USES
OF OUTER SPACE
Legal Sub-Committee

THE QUESTION OF THE DEFINITION AND/OR THE DELIMITATION
OF OUTER SPACE

Background paper prepared by the Secretariat

TABLE OF CONTENTS

	<u>Paragraphs</u>	<u>Page</u>
Introduction	1 - 3	4
I. The question of the definition and/or delimitation of outer space in general	4 - 33	6
A. The question of the need to define and/or delimit outer space	6 - 12	6
B. Criteria for defining and/or delimiting outer space	13	8
C. Definition of outer space in relation to international instruments in other fields	14 - 21	9
D. Definition of outer space in relation to the Outer Space Treaty	22 - 27	11
E. Attitude of States and international practice in relation to the definition of outer space	28 - 33	12
II. Views expressed in United Nations organs	34 - 97	15
III. Spatial approach to the definition and/or delimitation of outer space	98 - 161	36
A. Demarcation based upon the equation of the upper limit of national sovereignty with the concept of "atmosphere"	99 - 104	36
B. Demarcation based on the division of atmosphere into layers	105 - 114	37
C. Demarcation based on the maximum altitude of aircraft flight (theory of navigable air space)	115 - 123	40
D. Demarcation based on aerodynamic characteristics of flight instrumentalities (von Karman Line)	124 - 129	43
E. Demarcation according to the lowest perigee of an orbiting satellite	130 - 135	45
F. Demarcation based upon the earth's gravitational effects	136 - 140	48
G. Demarcation based on effective control	141 - 150	49
H. Demarcation based upon the division of space into zones	151 - 155	52
I. Demarcation based on a combination of various spatial approaches and other proposals	156 - 160	54
J. The question in general of fixing a boundary between air space and outer space	161	56

/...

TABLE OF CONTENTS (continued)

	<u>Paragraphs</u>	<u>Page</u>
IV. Functional approach to the definition of outer space .	162 - 180	58
V. Conclusions	181 - 182	66
Annex - Replies by specialized agencies and other international organizations		

INTRODUCTION

1. This background paper has been prepared at the request of the Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space. This request was approved by the Committee and by the General Assembly. At its eighth session in June-July 1969, the Legal Sub-Committee adopted a resolution in which it, inter alia, requested the Committee on the Peaceful Uses of Outer Space to invite the Secretary-General to prepare:

"(a) a background paper for the next session of the Legal Sub-Committee on the question of the definition and/or the delimitation of outer space, taking into account both the data provided by the study carried out by the Legal Sub-Committee and the Scientific and Technical Sub-Committee, and also the contributions, studies, data and documents which may be obtained from the specialized agencies concerned and such other international and national organizations and institutions which are interested in the subject as may be determined by the Committee on the Peaceful Uses of Outer Space." 1/

2. At the first part of its twelfth session in September 1969 the Committee on the Peaceful Uses of Outer Space decided to endorse the resolution of the Legal Sub-Committee.^{2/} On 16 December 1969 the General Assembly adopted resolution 2601 A (XXIV) in which it, inter alia, endorsed the recommendations and decisions contained in the report of the Committee on the Peaceful Uses of Outer Space.^{3/}

3. In accordance with these decisions the Secretariat sent letters dated 18 November 1969 and 3 February 1970 [PO 141 (1-3-1)] requesting appropriate information to the following specialized agencies and other international organizations: International Civil Aviation Organization (ICAO), International Telecommunication Union (ITU), United Nations Educational, Scientific and Cultural Organization (UNESCO), World Meteorological Organization (WMO), World Health Organization (WHO), International Atomic Energy Agency (IAEA), Committee on Space Research of the International Council of Scientific Unions (COSPAR), European Conference on Satellite Telecommunications (CETS), European Space Vehicle Launcher Development Organization (ELDO), European Space Research Organization (ESRO),

1/ Official Records of the General Assembly, Twenty-fourth Session, Supplement No. 21 (A/7621), Annex III, para. 13B.

2/ Ibid., A/7621, para. 22.

3/ Resolution 2601 (XXIV), p. 1.

International Astronautical Federation (IAF), Inter-American Committee for Space Research (IACSR), International Telecommunications Satellite Consortium (INTELSAT) and Intersputnik. Their replies, in so far as they contain substantive information on the subject-matter of this paper, have been taken into account in the preparation of the paper. The contents of these replies are reproduced or summarized in the annex to the present paper.

I. THE QUESTION OF THE DEFINITION AND/OR DELIMITATION OF
OUTER SPACE IN GENERAL

4. Relatively little consideration was given to the problem of the legal aspects of activities in outer space until the successful orbiting of the first artificial satellite of the earth in 1957. Since then, international instruments have been concluded which are intended to establish a legal régime of outer space and to regulate the activities of States in the exploration and use of outer space. The legal problems arising from the activities of States in outer space have become subjects of scholarly research.

5. Although outer space activities of States have been carried on presumably above the air space of the underlying States, there is so far no agreed answer to the question from which altitude above the surface of the earth the activities of States should be considered as conducted in outer space, with a subjacent State having no right to claim a violation by such an activity of its sovereignty over air space. Similarly, in spite of the elaboration of legal rules regulating various questions of outer space activities and establishing the legal status of outer space, the sphere of application of these rules is not completely defined. In other words, there is no accepted definition of outer space and there is no agreement as to where outer space begins or air space ends.

A. The question of the need to define and/or delimit outer space

6. It has been pointed out that the need for definition or delimitation of outer space primarily results from the difference in the legal status of air space and that of outer space: while States have complete and exclusive sovereignty over air space above their territories (see paragraphs 14 and 15 below), national sovereignty cannot be extended to outer space which is free for exploration and use by all States.

7. The starting point of an overwhelming majority of approaches to and theories of the problem of definition of outer space is the existing law on national sovereignty in air space. It is indicated that at the time when this rule of international law was formulated and consolidated there was no practical need for establishing the upper limit of air space of subjacent States.

8. However, from the use of such words as "air", "air space", "atmosphere", "atmospheric space", "aircraft", "air navigation" employed in international conventions and national legislative acts, many writers have concluded that the rule of law establishing complete and exclusive sovereignty of States in the air space above their territories and territorial waters does not apply to outer space.

9. Initially, the main arguments advanced in scholarly writings in favour of the solution of the problem of defining and/or delimiting outer space proceeded from a premise that such a solution should precede the development of outer space activities of States. With the very advent of astronautics, the problem of delimitation of air space and outer space became for many commentators the central, even crucial, issue in the development of the legal régime of outer space. Fears were widely expressed that if this problem were not immediately solved, chaos and anarchy would inescapably follow. There were also fears that underlying States would protest overflights of foreign satellites, and thus the exploration and use of outer space would be hampered.

10. When these anticipations failed to materialize after the first orbiting of satellites, a view was expressed that the acquiescence of States might have been implicitly limited by the circumstances of the International Geophysical Year. This argument was dropped after the pattern of acquiescence continued well beyond the IGY, in spite of the launching of a wide variety of space objects. However, in raising the question of definition of outer space, many writers continued to believe that the adoption of such a definition should necessarily precede the elaboration of the law of outer space.

11. At present, some rules of the law of outer space having been elaborated, the question of definition of outer space is being examined in the context of establishing a precise sphere of application of these rules. It is argued that without a demarcation line between air space and outer space it would be difficult to apply the legally binding requirements of such international instruments regulating the activities of States in outer space as the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty) of 1967, and the Agreement on the Rescue of Astronauts, the Return of Astronauts

and the Return of Objects Launched into Outer Space of 1968, as well as other instruments to be concluded in the future, including a convention on liability for damage caused by objects launched into outer space.

12. There are two different attitudes towards the question of definition of outer space. On the one hand, it is argued that although the present activities of States in outer space do not seem to violate the sovereignty of States, some new types of outer space activities at lower altitudes are possible. For this reason, it would not be justified to postpone the solution of the definition problem. On the other hand, an argument is advanced that because of the lack of experience and the difficulty to assess how the interests of underlying States may be affected by "outer space activities", attempts to define outer space should be postponed until more experience has been gained and further clarification of the implications of various types of outer space activities has been provided.

B. Criteria for defining and/or delimiting outer space

13. Though a wide range of proposals based on various criteria had been advanced in regard to definition and/or delimitation of outer space, they can be grouped in two broad categories depending on their basic approach to the problem - the spatial approach and the functional approach. While the proposals falling within the first category are intended to fix an altitude boundary or boundaries between air space and outer space (see Part III below), those in the second category concentrate on defining outer space activities (see Part IV below).

C. Definition of outer space in relation to international instruments in other fields

14. It seems appropriate to examine more closely the relevance of some international instruments to the question of the definition of outer space. Reference has often been made to the Convention on the Regulation of Aerial Navigation signed in Paris on 13 October 1919. Article I of the Convention provides:

"The High Contracting Parties recognize that every Power has complete and exclusive sovereignty over the air space above its territory." ^{4/}

^{4/} League of Nations, Treaty Series, vol. XI (1922), p. 173, No. 291.

15. The Convention on International Civil Aviation signed in Chicago on 7 December 1944^{5/} establishes the same principle. Article 1 of the Convention reads:

"The Contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory." ^{6/}

Article 2 of the Convention provides:

"For the purpose of this Convention the territory of a State shall be deemed to be the land areas and territorial waters adjacent thereto under the sovereignty, suzerainty, protection or mandate of such State."

16. Both international agreements and national law on air space refer to the sovereignty over air space above the territory of a State, that is to "territorial air space". Continental territories to which national sovereignty applies account for about 29 per cent of the earth's surface while the rest of it is covered by sea. It has been noted that at least with respect to many legal issues the problem of delimitation of air space from outer space is actually the problem of delimitation of territorial air space from outer space since the legal régime of air space above the high seas is similar to that of outer space in so far as the principle of freedom of use or flight is concerned.

^{5/} United Nations, Treaty Series, vol. 15, 1948, pp. 297-298.

^{6/} The principles of "complete and exclusive" sovereignty of a State over the air space above its territory is established by national laws relating to air space. For example, the USSR Air Code of 1962 provides in article 1:

"The complete and exclusive sovereignty over the airspace of the USSR shall belong to the USSR. Airspace of the USSR shall be deemed to be the airspace above the land and water territory of the USSR including the space above the territorial waters as determined by the laws of the USSR and by international treaties concluded by the USSR".

^{7/} "Vedomosti Verkhovnogo Soveta SSR" (Gazette of the USSR Supreme Soviet), No. 52, Dec. 29, 1961, Item 538^{7/}

The 1958 Federal Aviation Act of the United States (Sec. 1103a) provides:

"The United States of America is hereby declared to possess and exercise complete and exclusive national sovereignty in the air space of the United States, including the air space above all inland waters and the air space above those portions of the adjacent marginal high seas, bays and lakes, over which by international law or treaty or convention the United States exercises national jurisdiction".

^{8/} United States Statutes at Large, vol. 72, Part I, p. 798^{8/}

17. Freedom to fly over the high seas has been recognized as one of the freedoms of the high seas in article 2 of the Convention on the High Seas done at Geneva on 29 April 1958:

"The high seas being open to all nations, no State may validly purport to subject any part of them to its sovereignty. Freedom of the high seas is exercised under the conditions laid down by these articles and by the other rules of international law. It comprises, inter alia, both for coastal and non-coastal States:

- (1) Freedom of navigation;
- (2) Freedom of fishing;
- (3) Freedom to lay submarine cables and pipelines;
- (4) Freedom to fly over the high seas.

These freedoms, and others which are recognized by the general principles of international law, shall be exercised by all States with reasonable regard to the interests of other States in their exercise of the freedom of the high seas. 7/

18. It has been suggested that the formulation "freedom to fly over the high seas" applies to space above the high seas in general, without any limitation to air space. 8/

19. Another major international instrument which has been referred to in connexion with the definition of outer space, is the Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water, signed at Moscow on 5 August 1953. Article I of the treaty provides, inter alia,

"1. Each of the Parties to this Treaty undertakes to prohibit, to prevent, and not to carry out any nuclear weapon test explosion or any other nuclear explosion, at any place under its jurisdiction or control:

(a) in the atmosphere; beyond its limits, including outer space; or under water, including territorial waters or high seas; ...". 9/

20. This provision does not call for delimitation of air space and outer space since the prohibition to carry out nuclear explosions applies both to atmosphere and to all space beyond it. Evidently, the formula used in the Moscow Treaty was drafted for the purposes of that treaty and could hardly be regarded as appropriate for the solution of the problem of the definition of outer space.

7/ United Nations Treaty Series, vol. 450, pp. 82, 84.

8/ N. Mateesco, Airspace Law, Toronto, 1969, p. 21.

9/ N. Mateesco, Airspace Law, Toronto, 1969, p. 21.

21. The question of the definition of outer space has been dealt with in relation to radio communications. In reply to the inquiry of the Secretariat (see para. 3 above) information was submitted by the International Telecommunications Union relating to the definitions of the terms "space service", "earth-space service", "space station", "earth station" and "deep space". (For details see Annex).

D. Definition of outer space in relation to the Outer Space Treaty

22. It has been repeatedly argued that definition of outer space is needed primarily in view of the conclusion of the Outer Space Treaty. It is true that while referring to "outer space" or "activities in outer space", the Outer Space Treaty contains no definitions of these expressions. Nevertheless, this Treaty is quoted by some in support of various theories suggested as a basis for defining outer space and by others as justifying the need for a definition of outer space.

23. Article II of the Outer Space Treaty which has established the no-sovereignty régime for outer space reads as follows:

"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." 10/

Consequently, it has put an end to certain broad interpretations of the air navigation conventions which would extend national sovereignty in air space ad infinitum.

24. Reference is often made to paragraph 1 of article IV of the Outer Space Treaty which reads:

"States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station weapons in outer space in any other manner." 11/

25. This provision has been interpreted by some commentators as establishing the lower limit of outer space with regard to the activities described in this paragraph, namely, stationing nuclear weapons or other weapons of mass destruction in outer space. The provision lists the placing in orbit around the Earth of

10/ Official Records of the General Assembly, Twenty-first Session, Supplement No. 16 (A/6316), p. 13.

11/ Ibid., P. 14.

objects carrying such weapons as a specific way of stationing them in outer space. A conclusion was made that the Treaty has thus established the rule that any object placed in orbit around the earth is regarded as being in outer space, and that, therefore its lowest possible perigee should be taken as the lower limit of outer space. This point of view, however, has been contested (see paragraphs 131 and 132 below).

26. Those articles of the Outer Space Treaty which deal with space activities of States have been cited to support specifically the functional approach.

27. Certain other provisions in the treaty, i.e. on jurisdiction, control, ownership and return of space objects, liability for damage, which relate to the scope of application of the treaty and can be interpreted as bearing on the question of the definition of outer space, have been relied on in support of the need for a definition of outer space; it is said that without such a definition those provisions of the treaty cannot be applied in practical cases.^{12/}

E. Attitude of States and international practice in relation to the definition of outer space

28. The attitude of States toward the definition of outer space can be characterized as one of considerable restraint as far as public pronouncements on the substance of the matter are concerned. In the majority of cases, when States have made pronouncements in United Nations organs^{13/} on this question they were usually limited to the taking of a position with regard to the appropriateness of a definition without commitments as to a specific height of the boundary or a method to be used for the definition of outer space. In some cases, however, the representatives of States indicated their preference either for the functional or for the spatial approach; some of them further suggested certain distances from the earth's surface at which a boundary should be fixed (see Part II below).

29. Apart from express pronouncements of States on the question of the definition of outer space, actual practice with regard to the activities of States in outer space appears to be significant for ascertaining States' attitudes towards this problem.

¹² Based on material supplied by the International Astronautical Federation.

¹³ It is to be pointed out that these positions have been set forth for the purpose of discussion and they should not be regarded as final commitments of the respective States on the question of the definition of outer space.

30. It may be recalled that first satellites were launched in connexion with the International Geophysical Year. On 15 April 1955, the USSR Academy of Sciences announced that it had established a commission to prepare the launching of a laboratory to orbit around the earth. On 29 July 1955, the United States made a similar announcement.

31. Neither at the time of these declarations, nor after the launching of the first Sputnik on 4 October 1957 and of Explorer-1 on 31 January 1958, nor even later when hundreds of space objects had been launched into orbit did any underlying State protest the passage of satellites as violating its sovereignty. Views have been expressed that this continuing silence has established a pattern of international practice.

32. The characteristic features of this practice have been described as follows:

(1) All States have tacitly acknowledged the flights of satellites launched into orbit both within the framework of the International Geophysical Year and afterwards. No State has ever protested against passing of such satellites over its territory or alleged that it violated its sovereignty.

(2) States seem to have recognized that such satellites should not be put in the same category as conventional aircraft. For example, they cannot be regarded as unmanned aircraft whose flight over the territory of a foreign State would require under article 8 of the Chicago Convention the consent of the underlying State.^{14/}

(3) No State has so far declared that it reserved its position concerning the passing over its territory of a space object of another State.

(4) No State has openly consented to limit its sovereign rights over air space to a certain height and thus unilaterally proclaim the upper limit of its air space.

^{14/} Article 8 of the Chicago Convention reads as follows:

"No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization by that State and in accordance with the terms of such authorization. Each contracting State undertakes to insure that the flight of such aircraft without a pilot in regions open to civil aircraft shall be so controlled as to obviate danger to civil aircraft." (United Nations Treaty Series, vol. 15, p. 300)

(5) No State has given indication of the reason for its attitude towards the passage of foreign space objects through the space above its territory.

(6) A launching State has never considered it necessary to seek permission from those States over whose territory its satellite was scheduled to pass.

33. Commenting on this practice some writers maintain that it offers full evidence of a real consensus omnium - a general consent of States - and that this practice and custom constitute a source of space law.^{15/} However, acquiescence as consent has been subject to certain qualifications. It is said that it does not imply consent to every type of activity or a recognition of the freedom of exploration and use of outer space at a specific altitude and that States retain their rights to protect their vital interests.^{16/}

^{15/} M. Lachs, The Law-Making Process for Outer Space, see New Frontiers in Space Law, 1969, p. 15.

^{16/} M. Lachs, op. cit.; G.P. Zhukov; Law of Outer Space (in Russian), Moscow, 1966, p. 275.

II. VIEWS EXPRESSED IN UNITED NATIONS ORGANS

34. In the United Nations the question of the definition of outer space was first identified as a legal problem and considered in 1959. At that time the Ad Hoc Committee on the Peaceful Uses of Outer Space came to the conclusion that it was not a problem calling for a priority consideration. In explaining its position, the Committee pointed out among other things that it reviewed a number of possibilities in connexion with the determination of the limits of air space and outer space which do not necessarily coincide, including those based upon the physical characteristics of air and of aircraft. The difficulties involved were agreed to be great. An authoritative answer to the problem at that time would require an international agreement, and the opinion was expressed that such an agreement, based on current knowledge and experience, would be premature. It was considered that, in the absence of an express agreement, further experience might lead to the acceptance of precise limits through a rule of customary law. The Committee further noted that there was also discussion as to whether or not further experience might suggest a different approach, namely, the desirability of basing the legal régime governing outer space activities primarily on the nature and type of particular space activities.^{17/}

35. Somewhat similar attitude toward the question of the definition of outer space was taken at the early sessions of the Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space. For example, at the first session of the Sub-Committee in 1962 the representative of Australia favoured a postponement of any attempt to formulate a criterion of demarcation which might eventually turn out to be functional and not spatial at all.^{18/}

36. The representative of Romania felt that it was still unnecessary to determine the demarcation line of outer space, just as it had been found unnecessary in 1919 to establish the limits of the atmosphere in order to regulate air traffic, and that consideration of that question could therefore be postponed.^{19/}

^{17/} A/4141 (Official Records of the General Assembly, Twenty-fourth Session, Annexes), agenda item 25, p. 25.

^{18/} A/AC.105/C.2/SR.4, p. 4.

^{19/} A/AC.105/C.2/SR.4, p. 10.

37. The Legal Sub-Committee noted in its report that some representatives suggested that the Sub-Committee should examine at a later stage certain legal problems arising from the exploration and use of outer space, including "demarcation between outer space and atmospheric space".^{20/}

38. The question of the definition of outer space was raised again in connexion with the discussion in the Legal Sub-Committee of the draft treaty on outer space. At the Sub-Committee's fifth session in 1966 the representative of Mexico referred to the article of the draft which provided that outer space, including the moon and other celestial bodies, was not subject to national appropriation. He stated that, before negotiations were concluded, the limit of the air space over which a State could exercise its sovereignty should be clearly established and that, in order to prevent a repetition of what had happened in the case of territorial waters, it was essential to indicate exactly where outer space began.^{21/}

39. Further comments on the problem of the definition of outer space were made later in the year in the First Committee which considered the 1966 report of the Committee on the Peaceful Uses of Outer Space. Speaking in support of a study on the question of the definition of outer space, the representative of France stated that difficulties might arise in implementing the Outer Space Treaty unless the realm of outer space was distinguished as quickly as possible from that of atmospheric space, which pursuant to the Chicago Convention of 1944 and customary law, was subject to the sovereignty of the subjacent State. He believed that a list of acceptable definitions should be prepared which took account of the activities taking place above the surface of the earth and that a choice among these definitions would have to be made by jurists, scientists and technicians and then submitted to Governments for decision.^{22/}

40. The representative of Mexico said that article II of the Outer Space Treaty should contain a more precise definition of outer space, clearly delimiting it

^{20/} A/AC.105/6, p. 8.

^{21/} A/AC.105/C.2/SR.71 and Add.1, p. 20.

^{22/} Official Records of the General Assembly, Twenty-first Session, First Committee, 1492nd meeting, pp. 429-430.

from air space, so as to avoid difficulties of the kind which had often arisen over the extent of territorial waters. He believed that when the time came to amend the Treaty, as provided in article XV, this important omission should be remedied.^{23/}

41. On 19 December 1966 the General Assembly adopted resolution 2222 (XXI) in which it requested the Committee on the Peaceful Uses of Outer Space, among other things,

"to begin... the study of questions relative to the definition of outer space and the utilization of outer space and celestial bodies, including the various implications of space communications."^{24/}

42. The question of the definition of outer space was put on the agenda of the sixth session (19 June-14 July 1967, Geneva) of the Legal Sub-Committee of the Committee on Peaceful Uses of Outer Space in the following manner:

"4. Study of the questions relative to:

(a) the definition of outer space

(b) the utilization of outer space and celestial bodies, including the various implications of space communications".

43. During the general discussion of this item the representatives of Czechoslovakia and Romania^{25/} stressed that any definition of outer space should be based on the principle of the sovereignty of States. The representative of Bulgaria pointed out that such definition should take into account political, economic, social and cultural considerations as well as technical factors.^{26/}

44. The Australian representative said that while he doubted whether it would prove possible or even desirable to formulate a simple all-embracing definition of outer space, he did believe that there would be some advantage in having certain scientific and technical data relating to the definition of outer space and its utilization.^{27/}

^{23/} Ibid., First Committee, 1493rd meeting, p. 439.

^{24/} Ibid., Supplement No. 16 (A/6316), p. 13.

^{25/} A/AC.105/C.2/SR.80, p. 13; SR.82, p. 3.

^{26/} A/AC.105/C.2/SR.83, p. 5.

^{27/} A/AC.105/C.2/SR.82, p. 8.

45. The representative of Japan believed that outer space required a special definition, adapted to the uses envisaged; therefore, such a definition would only have value if the purpose it was to serve were clearly realized. From that point of view, he said, it would conceivably be possible to have as many definitions as there might be different types of outer space activity. It would therefore be wrong to try to define the régime of outer space in general terms, in other words, to seek a uniform definition applicable to any type of use, with all the legal consequences that would ensue. In that respect, he could not help sharing the Australian representative's scepticism.^{28/}

46. The representative of the United States stated that his delegation continued to hold that the Outer Space Treaty retained all its meaning, whatever might be thought of the need for a definition of outer space. He further said that in a sense, any object placed in orbit around the earth was in outer space.^{29/}

47. The representative of Canada noted that no delegation in the Sub-Committee advocated a demarcation line between air space and outer space that would be higher than the lowest perigee attainable by an orbiting space object. He spoke in favour of adopting the lowest possible altitude so as not to impede further progress in space exploration and utilization.^{30/}

48. The representative of India considered that in studying the question of definition of outer space, scientific, practical and theoretical aspects must be borne in mind. However, the crucial point was that the question of the delimitation of the point at which outer space began was closely connected to the utilization of outer space, especially the utilization for peaceful purposes.^{31/}

49. The representative of Poland stated that the primary task of lawyers was to define the legal nature of outer space and to determine the boundary between it and air space (see also paragraph 122 below).^{32/}

^{28/} A/AC.105/C.2/SR.83, p. 15.

^{29/} A/AC.105/C.2/SR.83, p. 13.

^{30/} A/AC.105/C.2/SR.82, p. 10.

^{31/} A/AC.105/C.2/SR.83, pp. 6-10.

^{32/} A/AC.105/C.2/SR.81, p. 6.

50. The representative of the USSR stated, with reference to the problem of defining outer space, that his delegation shared the general view that it was extremely complex. It was hardly surprising that the Outer Space Treaty failed to include a definition of outer space, given the serious objective difficulties that had baffled the lawyers of many countries. However, as the literature showed, specialists in international law had not been idle and considerable progress was being made. The main legal problem concerning outer space, he continued, had to do with the boundary between air space and outer space. A number of proposals had been made for the delineation of that borderline but their advocates differed considerably among themselves.^{33/}

51. On the initiative of France, the Legal Sub-Committee adopted a questionnaire in which it invited the Scientific and Technical Sub-Committee:

"I. (a) to draw up a list of scientific criteria that could be helpful to the Legal Sub-Committee in its study relative to a definition of outer space.

(b) to give its views on the selection of scientific and technical criteria that might be adopted by the Legal Sub-Committee, and to indicate, on scientific and technical grounds, the advantages and disadvantages of each of them in relation to the possibility of a definition which would be valid for the long-term future,

II. (a) to consider the summary records of the 80th to 83rd meetings of the Legal Sub-Committee, at which these matters were initially discussed, and to take into account the assumptions, suggestions and questions voiced by the various delegations,

(b) to examine the above matters during its 1967 session so as to enable the Legal Sub-Committee to continue its work at its next session."^{34/}

52. At its fifth session held in New York between 28 August and 6 September 1967, the Scientific and Technical Sub-Committee considered the

^{33/} A/AC.105/C.2/SR.82, p. 9.

^{34/} Official Records of the General Assembly, Twenty-second Session, Annexes, agenda item 32, p. 7; A/6804 and Add.1, annex III, para. 18.

questionnaire along with the working papers on the definition of outer space submitted by France^{35/} and Canada^{36/} as well as a reference paper drawn up by the Outer Space Affairs Group of the Secretariat. Introducing the working paper submitted by his delegation, the representative of France stated that if it was necessary to fix a limit for outer space, altitude would be the clearest and simplest criterion which would make it possible to establish a distinction between air space and outer space. He said that the limit should be as low as possible and that the French delegation would prefer to see it set at an altitude of fifty miles (80 km) above the earth. The representative of France went on to say that definition of "space activities" could be found more quickly than a definition of outer space since one generally had a clearer idea of what one meant by "space activities" (see paragraph 175 below). He also maintained that the definition of outer space and of space activities required immediate consideration. Since the number of space objects and launching States would undoubtedly increase very rapidly, it would be necessary to know exactly what the Outer Space Treaty meant by outer space, particularly as regards objects carrying weapons, the return of objects found beyond the limits of the launching State, possible damage and the allocation of frequencies.^{37/}

53. The Canadian working paper took note of the fact that few, if any, of scientific and technical criteria formed a useful, practical dividing line or surface between inner and outer space and were of little value in defining outer space for legal purposes. A definition useful for legal purposes would have to take into account the vehicles which travel or are located above or below the dividing surface and which may deliberately or inadvertently cross through the surface. The paper contained the proposal to consider 100 km, which is one one-hundredth of the distance from the equator to a pole measured along the earth's surface, or 64 km, which is one-hundredth of the radius of the earth, as starting points in a search for a practical limitation to national sovereignty in air space.^{38/}

^{35/} A/AC.105/C.1/WP.V.1.

^{36/} A/AC.105/C.1/WP.V.2.

^{37/} A/AC.105/C.1/SR.44, pp. 4-5, 9.

^{38/} A/AC.105/C.1/WP.V.2.

54. The representative of Sweden felt that if a definition were based on the purpose for which outer space was used it would be in danger of misinterpretation since it was possible to conceive of multiple-purpose space vehicles, such as commercial aircraft having partly ballistic trajectories. The Swedish delegation considered that it would be preferable to fix a certain altitude, as low as possible, as the lower limit of space. That should not present any greater difficulties than in the case of territorial waters. Nor should that method give rise to difficulties as far as the allocation of frequency bands was concerned; it could be done on the basis of the purposes of the space activities.^{39/}

55. Doubts concerning the usefulness of defining space activities were expressed by the representative of Czechoslovakia on the ground that their number would increase steadily, especially in the military, scientific and technical fields. He said that clearly no one criterion was sufficient to make possible a complete and satisfactory definition and that all the relevant elements must therefore be considered as a whole and not separately.^{40/}

56. The representative of Italy observed that the French proposal for a definition of "space activities" and of the "uses" of outer space made an interesting distinction between activities involving the movement of objects between different points and activities for the purpose of accomplishing a specific mission at high altitude, in orbit or on a planetary trajectory. However, in his opinion, the distinction required careful study in view of the many possible kinds of missions and types of vehicles envisaged today and for the future. The duration of missions might also have to be taken into consideration. The definition would not be needed for many years to come. If the members of the Committee on the Peaceful Uses of Outer Space, or more generally, the Members of the United Nations, deemed it absolutely necessary to have such a definition, the lower limit of outer space might as well be fixed arbitrarily at the 100 km altitude mark, which was the limit recognized by the International Aeronautical Federation for the purpose of confirming records.^{41/}

^{39/} A/AC.105/C.1/SR.44, p. 4.

^{40/} A/AC.105/C.1/SR.44, p. 9.

^{41/} A/AC.105/C.1/SR.44, p. 6.

57. The same altitude was favoured by the representative of Iran who said that it was materially simpler to define the atmosphere than to define space. The limit of the atmosphere could be defined as that height at which the composition of the air would be such that, if compressed to the standard pressure, it could support respiration and therefore sustain life. If, as the Canadian representative had suggested, that limit could be fixed at about 100 km, the concept was sufficiently precise to define the altitude at which the atmosphere ended and extra-atmospheric space began.^{42/}

58. The representative of the USSR noted that neither the approach based on scientific and technical criteria nor the proposal to fix an arbitrary limit of outer space as had been done in the case of territorial waters, seemed to provide a solution for the problem of defining outer space. It was equally difficult to define the lower limits of space in terms of the means or purposes of its exploration and use since new and unforeseeable types of space activities would undoubtedly arise and differences of views on the characteristics of particular types of activities falling under existing agreements could hardly be avoided. He supported the view that the consideration of the problem should be continued.^{43/}

59. The representatives of Argentina and the United States did not see any urgency in solving the problem of a definition of outer space. The United States representative said that at the most such definition was, perhaps, desirable, but only for strictly legal reasons. But those reasons hardly justified the risk of formulating an inadequate definition. A definition might just possibly be justified if it met a practical need, which was not the case; air space and outer space were separated by a buffer zone of about a hundred miles; whereas aircraft, apart from such experimental craft as the X-15, flew at much lower altitudes. There was therefore no problem of ambiguity for the time being. The United States representative also stated the opinion that neither the scientific and technical criteria nor the functional approach provided a solution of the problem of defining outer space, and that it should be studied further.^{44/}

^{42/} A/AC.105/C.1/SR.45, p. 5.

^{43/} A/AC.105/C.1/SR.45, pp. 3-4.

^{44/} A/AC.105/C.1/SR.44, pp. 7-8.

60. As a result of these discussions the Scientific and Technical Sub-Committee agreed as follows:

"(a) That there was consensus in the Scientific and Technical Sub-Committee that it is not possible at the present time to identify scientific or technical criteria which would permit a precise and lasting definition of outer space;

(b) That the working papers prepared by the delegations of Canada and France, as well as the background paper prepared by the Outer Space Affairs Group of the United Nations Secretariat, and the relevant summary records of the Scientific and Technical Sub-Committee's meeting would be made available to the Legal Sub-Committee to assist it in its deliberations;

(c) That a definition of outer space, on whatever basis recommended, is likely to have important implications for the operation and aspects of space research and exploration, and that it is therefore appropriate that the Scientific and Technical Sub-Committee continue its consideration of this matter at future sessions; and that Member States be invited to submit further relevant material for the study of the Sub-Committee." 45/

61. Further references to the problem of defining outer space were made at the tenth session of the Committee on the Peaceful Uses of Outer Space (13-15 September 1967, New York), which discussed the reports of its two Sub-Committees, and in the course of the subsequent discussion of the Committee's report in the First Committee and in the plenary meeting of the General Assembly.

62. Addressing the Committee on the Peaceful Uses of Outer Space the representative of India stated, inter alia, that the question of delimitation between outer space and air space was closely linked to the question of the utilization of outer space. He was of the view that if it were agreed that outer space should be used exclusively for peaceful purposes, it would facilitate an early and "liberal" definition of outer space. 46/ Other representatives expressed the hope that both the Scientific and Technical and Legal Sub-Committees would continue their co-operation in finding an acceptable definition of outer space.

45/ Official Records of the General Assembly, Twenty-second Session, Annexes, agenda item 32; A/6804, annex II, para. 36.

46/ A/AC.105/PV.51, p. 11.

63. In his statement in the First Committee on 17 October 1967, the representative of the Netherlands stressed his delegation's great interest in the endeavours of the Outer Space Committee to formulate a definition of outer space. He said that the lack of such definition should not be tolerated indefinitely in view of possible legal conflicts and suggested that a negative formula for defining outer space might be considered, such as the proposal that national sovereignty should not be extended to the lowest perigee of satellites actually in orbit.^{47/}

64. In resolution 2260 (XXII) unanimously adopted by the General Assembly on 3 November 1967 on the recommendation of the First Committee, the Assembly, inter alia, requested the Committee on the Peaceful Uses of Outer Space

"... to pursue actively its work on questions relative to the definition of outer space and the utilization of outer space and celestial bodies, including the various implications of space communications".^{48/}

65. Accordingly the consideration of the item was continued at the seventh session of the Legal Sub-Committee (4-28 June 1968, Geneva). Explaining his position in regard to the definition of outer space, the representative of France stated that he had in mind not a single definition but a system of definition uniting definitions of space activities with a definition of outer space proper. He also said that since the Scientific and Technical Sub-Committee had been unable to identify scientific and technical criteria for a definition of outer space as an environment, the Legal Sub-Committee could concern itself with the notion of "purpose" and try to define space activity. He further stated that space activity could be taken to mean "any activity involving the sending into space of an object designed to permit the exploration and utilization of outer space". As to the question of delimitation of outer space and air space, he suggested the altitude of 80 km which in his words, appeared practical for several reasons.^{49/}

^{47/} A/C.1/PV.1496, p. 7.

^{48/} Official Records of the General Assembly, Twentv-second Session, Supplement No. 16 (A/6716), p. 12.

^{49/} A/AC.105/C.2/SR.102-110, vol. II, pp. 1-2, 32.

66. The representative of Austria stressed that any attempt to delimit outer space should be conventional in nature. He favoured the functional approach to the problem of the definition of outer space and was not inclined to include a specific altitude in the definition.^{50/} The representative of Italy, on the other hand, welcomed the French proposal on the line of demarcation between outer space and air space, but indicated his preference for such a line to be fixed at 100 to 150 km.^{51/}

67. Many delegations were of the opinion that the Sub-Committee should avoid any haste in the solution of the problem and that it required further study. The Sub-Committee considered a French proposal to which amendments were suggested by the United States, the United Kingdom, Canada and the USSR, and adopted it as resolution II. The resolution reads as follows:

"The Legal Sub-Committee,

Desiring to continue its studies on the definition of outer space,

Noting that the Scientific and Technical Sub-Committee discussed the definition of outer space at its fifth session and decided to continue its consideration of the matter at future sessions,

Recommends to the Committee on the Peaceful Uses of Outer Space to place consideration of the study of questions relative to the definition of outer space on the agenda of the next session of the Legal Sub-Committee."^{52/}

68. The recommendation of the Legal Sub-Committee was approved by the Committee on the Peaceful Uses of Outer Space at its eleventh session held in New York between 15 and 22 October 1968. During the discussion of the report of the Legal Sub-Committee at this session and subsequent consideration of the Outer Space Committee's report in the First Committee, the representative of the United Kingdom stated that in view of the very rapid pace of space technology, it was neither possible nor desirable at this stage to attempt to define a

^{50/} A/AC.105/C.2/SR.102-110, vol. II, p. 13.

^{51/} A/AC.105/C.2/SR.102-110, vol. II, p. 20.

^{52/} Official Records of the General Assembly, Twenty-third Session,
A/7285, p. 136.

lower limit of outer space. He added that in a few years it might be possible to determine with some certainty the lowest point in a satellite's orbit which probably could be lower than fifty miles. The representative of the United Kingdom favoured further study of the scientific and technical criteria.^{53/}

69. In resolution 2453 B (XXIII) of 20 December 1968 the General Assembly, among other things, requested the Committee on the Peaceful Uses of Outer Space

"... to continue to study questions relative to the definition of outer space and the utilization of outer space and celestial bodies including various implications of space communications." ^{54/}

70. In conformity with this resolution, this item was put on the agenda of and considered at the eighth session of the Legal Sub-Committee held in Geneva between 9 June and 4 July 1969. During the discussion of this item the representative of France reminded the Sub-Committee that at its 1968 session the French delegation suggested that the definition of outer space should be based on a conventional criterion. He felt that since space law would be applied mostly on earth, the idea of the environment in which space activities took place was basically less important than the purpose of such operations.^{55/}

71. Referring to the conclusion of the Scientific and Technical Sub-Committee that it was not possible at the present time to identify scientific and technical criteria which would permit a precise and lasting definition of outer space, the representative of the USSR stated that it in no way implied that the Legal Sub-Committee should not tackle the legal aspects of the problem.^{56/}

72. Stressing the urgency of delimiting air space and outer space for the purpose of the implementation of the Outer Space Treaty, and insisting that the matter should be given priority after the Sub-Committee's completion of the liability agreement, the representative of Italy spoke in favour of a legal solution of

^{53/} A/AC.105/PV.56, pp. 21-22; A/C.1/PV.1644, pp. 23-25.

^{54/} Official Records of the General Assembly, Twenty-third Session, Supplement No. 18 (A/7218), p. 10.

^{55/} A/AC.105/C.2/SR.111-131, p. 8.

^{56/} A/AC.105/C.2/SR.111-131, p. 9.

the problem. He doubted the advisability of seeking further scientific and technical data as a basis for a legal definition.^{57/}

73. The approach to the matter from a legal viewpoint was also shared by the representatives of Belgium and Argentina, but they stressed that scientific and technical criteria should also be taken into consideration. The Belgian representative felt that in view of the rapid development of space operations, the question might be asked whether the moment was opportune for drawing up a definition of space, even from the legal point of view. His delegation had certain difficulties in accepting the proposal that the horizontal limit of atmospheric space should be fixed at 80 km. From the technical standpoint, that limit might give rise to problems in view of the smallness of the territory of many sovereign States. The Belgian delegation believed that the idea of "purpose" put forward by the French representative was sound, but that any conclusion as to its intrinsic value would be difficult to reach in the absence of a draft text.^{58/}

74. The representative of Argentina said that there were three criteria for defining outer space: the physical criterion, which related to the environment; the technical criterion, which related to the vehicles; and a criterion which was neither physical nor technical and related to space activity. His delegation considered that it was the third criterion which should be used for demarcation. The definition suggested by the French delegation (see paragraph 65 above) provided a sound basis for discussion, but he would like to add the words "for exclusively pacific aims".^{59/}

75. With reference to the proposal that an altitude criterion (fixed at 80 km) should be selected for delimiting outer space, the representative of Bulgaria thought that the attempt to establish such a limit would be premature. The problem was not purely theoretical, since a delimitation of outer space would have the effect of determining the scope of national sovereignty on the one hand, and of the international régime of the freedom of outer space on the other.

^{57/} A/AC.105/C.2/SR.111-131, pp. 25-38.

^{58/} A/AC.105/C.2/SR.111-131, p. 16.

^{59/} A/AC.105/C.2/SR.111-131, pp. 18-19.

There was no means of foreseeing, however, all the possible effects of the exploration of outer space and of the extension of State sovereignty in that domain. Moreover, for the purposes of a convention on liability, a dividing line between the atmosphere and outer space did not seem necessary. In fact, once it was decided that liability for damage in outer space would be based on risk (absolute liability) and that it would apply irrespective of the place of damage, the question of the delimitation of outer space obviously lost some of its importance.^{60/}

76. The representative of Sweden favouring a rule-of-law approach in the absence of necessary scientific and technical criteria, suggested that further profound studies of the matter might lead to the adoption of two or three demarcation lines serving different purposes.^{61/}

77. Recognizing the complexity of the problem of defining outer space, the representative of Czechoslovakia expressed the view that many elements would have to be taken into consideration, including the sovereignty and security of States, the various physical aspects, the interests of civil aviation, the peaceful exploration and use of outer space, and the fact that man-made vehicles moved through the air as well as in outer space. Those elements would have to be considered jointly and not in isolation, and his delegation believed that no single criterion could lead to a definition which would be both comprehensive and satisfactory for each State. In view of those considerations and the rapid development of technology, his delegation considered that new technical studies should be made, that objective data should be compiled to enable the Sub-Committee to accomplish its task successfully and, in particular, that the advice of ICAO should be sought.^{62/}

78. Analysing the findings of the Scientific and Technical Sub-Committee on the question of the definition of outer space, the representative of Hungary stated that the Sub-Committee had expressed the view that since the different sciences each provided different criteria of definition, it was hardly of any

^{60/} A/AC.105/C.2/SR.111-131, p. 42.

^{61/} A/AC.105/C.2/SR.111-131, p. 27.

^{62/} A/AC.105/C.2/SR.111-131, p. 15.

use looking to them for help in defining outer space. A common notion seemed, however, to be emerging gradually, as was evinced by a host of texts: General Assembly resolution 1721 B (XVI); the definitions by the International Telecommunication Union in the field of telecommunications; the Convention for the establishment of a European Organization for the Development and Construction of Space Vehicle Launchers (ELDO), which gave a definition of "space vehicle"; the draft conventions on liability submitted by Belgium (A/AC.105/C.2/L.7/Rev.3) and Hungary (A/AC.105/C.2/L.10/Rev.1 and L.24); and lastly, and above all, the provisions of article IV of the Outer Space Treaty. Whereas the Treaty generally referred simply to "space", article IV referred to objects placed "in orbit around the earth". The representative of Hungary went on to say that if the Legal Sub-Committee did not succeed in finding scientific and objective criteria which would help it to define outer space, it would have to look around for clues of the kind he had mentioned in order to derive from them the constituents of an agreed definition. For the time being, at any rate, for the purposes of the convention on liability, the Legal Sub-Committee would have to achieve a definition of the "space object" itself. Thus, in a roundabout way, it would come nearer to a definition of outer space.^{63/}

79. The representative of Romania stated that in defining outer space no new attempt should be made to find new physical or technical elements and that the attention should be concentrated on the conditions and factors which had led to the definition of national sovereignty in the Paris Convention of 1919, in the Chicago Convention of 1944 and in the domestic law of the majority of States. To define outer space economic, political and strategic elements should be taken into consideration, primarily the concepts of strict respect for national sovereignty and of free access to outer space for the purposes of exploration and peaceful uses.^{64/}

80. The delegation of India stressed its previously expressed position on the definition or delimitation of outer space. The Indian representative said he

^{63/} A/AC.105/C.2/SR.111-131, pp. 35-36.

^{64/} A/AC.105/C.2/SR.111-131, pp. 31-32.

would not go into the technical arguments, which in any case would at the present stage do little more than permit arbitrary limits to be established; but he expressed regret that agreement had not yet been reached on the need to ban all activity of a military nature in outer space. The question of the delimitation of outer space was closely linked with that of its use. His delegation had spoken at the previous session of the imperative need for an agreement expressly reserving outer space for exclusively peaceful uses.^{65/}

81. The representative of the United Arab Republic joined the Indian delegation in expressing the opinion that the question of the definition of outer space was closely linked with the need to establish a rule clearly stipulating that outer space would be used for peaceful purposes only. He said that without a commitment of that kind the countries not engaged in space activity could not accept a delimitation which would jeopardize their security in zones next to their air space.^{66/}

82. The representative of Austria expressed his conviction that at the current stage in the evolution of space law it was essential to identify the scope of the rules precisely; in other words, sooner or later the atmosphere and outer space would have to be delimited. He further stated that it was a very important problem, however, which was both legal and technical and which required further thought. The time had not yet come for the Legal Sub-Committee to begin a detailed discussion of the matters involved; furthermore, it should have additional information at its disposal.^{67/}

83. The delegations of Canada,^{68/} the United States,^{69/} and the United Kingdom also pointed out that it would be premature for the Legal Sub-Committee to attempt to elaborate a definition of the lower limit of outer space. The United Kingdom

^{65/} A/AC.105/C.2/SR.111-131, p. 28.

^{66/} A/AC.105/C.2/SR.111-131, p. 40.

^{67/} A/AC.105/C.2/SR.111-131, p. 43.

^{68/} A/AC.105/C.2/SR.111-131, p. 24.

^{69/} A/AC.105/C.2/SR.111-131, p. 40.

representative believed that in view of the very rapid pace of development of space technology the time did not seem to be ripe for a definition; and furthermore, in the then current state of knowledge, there had been serious difficulties in the various approaches to a definition which had been suggested. He felt, nevertheless that the question merited further study, particularly of the scientific and technical criteria to be adopted.^{70/} The Canadian representative said that Canada was still not convinced that there was yet a compelling need for a linear definition of outer space. Moreover, in view of the rapid progress in the manufacture of heat-resistant materials and the need not to compromise a new and still unforeseen use of outer space, his delegation continued to believe that it would be premature for the Legal Sub-Committee to seek to do more than take the study of the matter a stage further.^{71/}

84. As a result of these discussions the Legal Sub-Committee adopted resolution B in which it referred to article II of the Outer Space Treaty, took cognizance of the results of the study of the question relative to the definition of outer space by the Scientific and Technical Sub-Committee and expressed the desire to continue its studies of the definition and/or the delimitation of outer space. The Legal Sub-Committee requested the Committee on the Peaceful Uses of Outer Space to invite the Secretary-General to prepare a background paper on the question of the definition and/or the delimitation of outer space.^{72/}

85. During the discussion of the report of the Legal Sub-Committee at the first part of the twelfth session of the Main Committee (8-17 September 1969) the representative of Belgium suggested in regard to the portion of the Legal Sub-Committee's report which dealt with certain specific subjects relative to the utilization of outer space and celestial bodies, the following system of priorities:

"... first, the definition and the delimitation of outer space; secondly, the registration of objects launched into outer space; thirdly, the rules

^{70/} A/AC.105/C.2/SR.111-131, p. 26.

^{71/} A/AC.105/C.2/SR.111-131, p. 24.

^{72/} A/AC.105/58, p. 4.

which should govern human activities on the moon and other celestial bodies; and fourthly, the legal régime applicable to materials coming from the moon and other celestial bodies." 73/

86. With regard to the discussion of the question of the definition of outer space at the eighth session of the Legal Sub-Committee the representative of Sweden stated that many countries, including his own, were of the opinion that this question had not yet been sufficiently studied and that the time had not yet come to establish a demarcation line between inner and outer space. The establishment of a line would have far-reaching consequences from political and military points of view. Owing to such problems, the 1969 discussion did not advance things significantly and it was felt that no breakthrough was to be expected unless, in considering this problem, the Sub-Committee sought consultations with other United Nations bodies, notably those dealing with disarmament. Pending such consultations the Swedish delegation would like to propose that further discussion of the subject in the Sub-Committee be postponed and that all attention be focused on more urgent questions. 74/

87. In its report to the General Assembly the Committee on the Peaceful Uses of Outer Space endorsed the decisions of the Legal Sub-Committee pertaining to the question of the definition of outer space. It also noted that

"with respect to the future work of the Legal Sub-Committee, the delegation of Belgium suggested that a system of priorities be established and made a formal proposal on a possible list of such priorities at the 63rd meeting of the Committee. This proposal was supported by several delegations. Because there was not sufficient time to consider the Belgian suggestion, the Committee decided to defer the discussion of this matter to its next session in 1970, to be held before the ninth session of the Legal Sub-Committee." 75/

88. In subsequent consideration of the Committee's report in the First Committee (10-12 December 1969) the representative of France observed that like other delegations he continued to think that work on the definition of outer space should be pursued. He expressed the hope that the study undertaken by the

73/ A/AC.105/PV.63, p. 16.

74/ A/AC.105/PV.64, pp. 47-48.

75/ Official Records of the General Assembly, Twenty-fourth Session, Supplement No. 21 (A/7621), p. 5.

Secretariat would make it possible to embark once again on an examination of this problem on a solid foundation.^{76/}

89. The representative of the United Arab Republic stated that his delegation, as other delegations from developing countries, attached special importance to the question of the definition of outer space. He said that a precise definition of that environment weighed heavily on the two most important issues: that of the use of outer space exclusively for peaceful purposes and that of the sovereignty of States. He expressed the hope that the decision of the outer space Committee, as mentioned in paragraph 22 of its report, inviting the Secretary-General "... to prepare... a background paper... on the question of the definition..." would assist the Committee in reaching a satisfactory and early solution.^{77/}

90. On 16 December 1969 the General Assembly adopted resolution 2601 A (XXIV) in which it requested the Committee on the Peaceful Uses of Outer Space, among other things, to continue to study questions relative to the definition of outer space.^{78/}

91. Further references to the question of the definition of outer space were made at the thirteenth session of the Committee on the Peaceful Uses of Outer Space (20-23 January 1970) which discussed the organization of work of the Committee and its subsidiary bodies.

92. The representative of Belgium reminded the Committee of the proposal of his delegation concerning a system of priorities which would put the question of the definition and delimitation of outer space at the top of the list of subjects relative to the utilization of outer space and celestial bodies.^{79/}
(see paragraph 85 above)

^{76/} A/C.1/PV.1719, p. 32.

^{77/} A/C.1/PV.1722, p. 25.

^{78/} Resolution 2601 A (XXIV), p. 2.

^{79/} A/AC.105/PV.79, p. 7; A/AC.105/PV.84, p. 21.

93. Having recalled that in 1969 the Legal Sub-Committee had not completed the study of questions relative to the definition of outer space and the utilization of outer space and celestial bodies, including the various implications of space communications, the representative of Canada said that during the seventh and eighth sessions of the Legal Sub-Committee, in 1968 and 1969, several delegations had made important interventions in the debate on this matter. It might be, he continued, that in present conditions of manifold activities in the field of outer space exploration it would not be useful to have an arbitrary delimitation at this time between air space and outer space. If it was generally agreed that that was the case, the item could be put aside, to be taken up again at some future date when the necessity of having a definition might be more generally recognized.^{80/}

94. The representative of Japan stated that it was the considered view of his delegation that on the question of the definition of outer space it could not be expected to bring about substantial progress at the present stage, especially in view of the fact that the work of the Scientific and Technical Sub-Committee on this question had not yet produced any concrete result.^{81/}

95. Another comment was made by the representative of Sierra Leone who speaking on the Belgian proposal concerning priorities, observed that questions of definition were not always clear-cut. For example, to the biologist, outer space meant one thing; to the legal expert, another; and to the astronomer, something different still. The lawyer, who was concerned with the question of where existing international agreements regarding aviation should be considered applicable, and where new agreements concerning astronautics should be developed, had an extremely difficult task when he attempted to develop a precise definition of space. It was therefore the view of the delegation of Sierra Leone that any deadlock that might arise by way of definition should not of necessity put off consideration of the other items.^{82/}

^{80/} A/AC.105/PV.79, pp. 21-22.

^{81/} A/AC.105/PV.80, pp. 14-15.

^{82/} A/AC.105/PV.82, pp. 37-38.

96. The deliberations in the Committee resulted in the consensus which was summed up in the statement by the Chairman. He said, inter alia, that after completion of the draft convention on liability, the Legal Sub-Committee "should continue to study questions relative to the definition of outer space and the utilization of outer space and celestial bodies, including the various implications of space communications. In this connexion, a number of questions were mentioned which appear of interest and, if time permits, could be discussed within the framework of this study."^{83/}

97. It might be noted that at its 1969 and 1970 sessions the Scientific and Technical Sub-Committee did not resume the consideration of the question of the definition of outer space.

^{83/} A/AC.105/PV.84, p. 3.

III. SPATIAL APPROACH TO DEFINITION AND/OR
DELIMITATION OF OUTER SPACE

98. The spatial approach to the definition and/or the delimitation of outer space is characterized by a wide range of proposals based on a variety of criteria. The criteria referred to most often are discussed in the subsequent paragraphs.

A. Demarcation based upon the equation of the upper limit of national sovereignty with the concept of "atmosphere"

99. This approach proceeds from the interpretation of the terminology of the existing international conventions especially the Paris and Chicago Conventions, and national legislation for the purpose of indicating the scope of the extension of national sovereignty above the surface of the earth. L. Lipson and N. Katzenbach noted in 1961 that the most frequent approach had been to relate the proposals in some way to the existing conventions. It could be and had been argued that under these conventions and laws the use of the term "air", "air space", "atmosphere" or "atmospheric space" or the expressed purpose of regulating "aircraft" afforded a criterion for measuring sovereignty.^{84/}

100. It is worth noting that the equivalent of the expression "air space" in the French text of the Paris Convention is "l'espace atmosphérique" while in the Chicago Convention the term "l'espace aérien" is used.

101. Referring to the frequent use of the expression "air space" the supporters of the approach in question maintain that national sovereignty is confined to the limit of the air space above the earth or of the earth's atmosphere. It is proposed to equate geophysical and legal limits of the atmosphere and in this way to establish the boundary between air space and outer space.

102. A few examples of this approach can be given. Interpreting the Chicago Convention's reference to "air space" Aaronson wrote that air space might be defined as that space enclosed by the projection of the radii of the Earth passing through and above surface political boundaries, until such radii reached the national frontier, dividing the Earth's atmospheric envelope from the sparse

^{84/} Lipson and Katzenbach. Report to NASA on the Law of Outer Space, Chicago, 1961, p. 12.

interplanetary gas which was reputed to permeate interplanetary space. According to Aaronson, the upper boundary of thus-conceived "airspace" could extend as high up as 60,000 miles which was the scientifically agreed "outside limit" of the earth's atmosphere.^{85/}

103. W. Strauss noted that the top of the atmosphere had been estimated at anywhere from 10 to 650 miles above the earth's surface, depending upon the particular viewpoint and research interests of the scientist discoursing.^{86/}

104. The criterion described above does not seem realistic primarily since the atmosphere of the earth does not end abruptly but gradually transforms into outer space. Consequently, there is no agreement among scientists as to the altitude at which air space ceases. According to some estimates, it extends far beyond the parameters of an orbit of an artificial earth satellite which is generally considered to be in outer space.

B. Demarcation based on the division of atmosphere into layers

105. The atmosphere which surrounds the earth is divided by scientists into several layers. Each layer has different characteristics.

(i) The layer which is nearest to the surface of the earth is called troposphere, that is, the layer where weather phenomena take place. It is also the field of operation of conventional aviation. Its thickness varies from 14 to 17 km at the equator to 10 to 11 km at the poles. The troposphere contains three-fourths of all air surrounding the earth.

(ii) The major part of the rest of the air of the atmosphere is contained in the next layer called stratosphere which is beyond the weather phenomena and is used only by most advanced aircraft and research balloons. This layer's upper limit reaches the altitude of 40 km. The troposphere and the stratosphere hold 99.7 per cent of the air.

^{85/} M. Aaronson, Space Law. Legal Problems of Space Exploration - A Symposium, US Senate Committee on Aeronautical and Space Sciences, Washington, 1961 (1961 Symposium) p. 225.

^{86/} W. Strauss, Air Law and Space Law - An Analysis, paper presented at McGill University (March 1962). Quoted in A. Haley, Space Law and Government, New York, 1963, p. 96.

- (iii) The third layer called the mesosphere extends to 80 km above the surface of the earth.
- (iv) The atmosphere beyond the 80 km level forms the ionosphere which is only sparsely filled with gas particles (in fact, so sparsely that similar vacuum cannot be produced in a laboratory on the surface of the earth).

106. The density of the air at the altitude of 100 km is one-millionth and at 350 km one-hundred billionth of its density at the sea level. The ionosphere contains electrically charged air molecules and is essential for radio communications. The upper limit of ionosphere is not defined. According to different authors it ends anywhere between 20,000 and 100,000 km. Some scientists divide the ionosphere into thermosphere (30-375 km) and exosphere (beyond 375 km); others limit the ionosphere by the thermosphere and regard the exosphere as a separate layer. Still other scholars distinguish the ionosphere from the atmosphere and find a layer between them - "the chemosphere".

107. This physical characteristic of the atmosphere gave rise to a number of proposals. For example, W. Ley believed that 50 kilometers (31 miles) looked like a reasonable figure for the height of sovereign air space. There was still a difference between the highly attenuated atmosphere at, say, 60 miles and open space a million miles away. Pending more specific information, the legal border, he said, may be set at 250 km (155 miles).^{37/}

108. G. Reintanz in an investigation of the "natural properties of the atmosphere", examined the "gaseous consistency" of the atmosphere, counted its molecular density at various altitudes and arrived at the conclusion that the height of 100 kilometers (62 miles) represented not only the "upper limit of the stratosphere" but also a happy compromise between the natural, technological and security factors that must be considered.^{88/}

109. B. Cheng wrote that a frontier belt existed known as the exosphere which varied in width and in height according to the season and the region in the world,

^{37/} W. Ley, *Rockets, Missiles and Space Travel*, 1958, p. 360.

^{88/} G. Reintanz, *Air Space and Outer Space*, 1961 Symposium, pp. 1134, 1138.

but its base was estimated to be generally at about 300-500 miles above the surface of the earth. If the principle of air space sovereignty was taken literally, and States did not otherwise agree on a different delimitation, it might perhaps be said that that base of the exosphere constituted the upper limit of national air space.^{89/}

110. References to the approach under consideration were made in the working paper submitted by the Canadian delegation at the fifth session of the Scientific and Technical Sub-Committee.

"...2. Atmospheric Density - 150 km (altitude). At about this altitude the density of the earth's atmosphere drops to a value of one million millionth of a gram per cubic centimetre, a value typical of interplanetary space. Unfortunately it is not possible to state this altitude with precision as the density of material in interplanetary space is dependent on a variable solar activity.

"3. Atmospheric Limit - 20,000 to 30,000 km (radius) (3 to 5 earth's radii). The atmosphere of the earth may be considered to end at an as yet ill-defined distance within which the "atmosphere" shows significant tendencies to rotate with the earth.

"4. Atmospheric Constitution - 60 to 3,000 km (altitude). Many criteria are available, most are variable with solar activity, time of day and other causes, and some lead to more than one value of altitude. In this class of criteria are such items as relative abundance of various chemical substances such as hydrogen, helium and ozone, as contrasted with the normal lower atmosphere where nitrogen and oxygen predominate. Another similar class would be defined on the relative abundances of neutral and ionized particles, - molecules and atoms. It is in this altitude range that the ionosphere is found.^{90/}

111. An analysis of the relation of dynamic and kinetic processes in the upper layers of the atmosphere to the defining of the lower limit of outer space has been provided by the World Meteorological Organization in its reply to the enquiry of the Secretariat (for details, see annex).

112. To determine the upper boundary of the atmosphere other factors are also considered: (a) the duration of twilight, which depends on the scattering of the

^{89/} B. Cheng, From Air Law to Space Law, (13) Current Legal Problems, pp. 228-229 (1960).

^{90/} A/AC.105/C.1/WP.V.2, pp. 2-3.

sun's rays produced by cosmic particles at a very high altitude; (b) the height at which meteors become luminous; and (c) the observation of the rays of the aurora borealis.

113. As to the first factor, twilight has been observed until the sun was about 18 degrees below the horizon, which, at a latitude of 54 degrees, indicates the existence of sufficient atmospheric particles to scatter the sun's light at a height of over 600 kilometres. As far as the second factor is concerned, meteors become luminous at about 300 kilometres. In regard to the third factor, according to F. Stormer, a mathematician, the rays of aurora borealis extend up to a height of 1,100 kilometres.^{91/}

114. A major difficulty in applying the atmosphere theory to the delimitation of air space and outer space is the lack of uniform and agreed scientific criteria which could be used as appropriate bases. As M. Seara Vazquez observes:

"The real problem is that of determining the limits of the atmosphere which seems impossible. If they depend on the physical characteristics of atmosphere, it would be necessary, first of all, to come to an agreement on one point - the characteristics upon which those limits should be determined,

1. The composition of the gas that the atmosphere contains;
2. Its density;
3. Its temperature;
4. How far classic airships can obtain support from air friction.

No two agree on the acceptance of a definite criterion and, even if one should be accepted it would still be impossible to determine the limits of the atmosphere in accordance with its physical properties because these properties are not uniform at a certain altitude."^{92/}

C. Demarcation based on the maximum altitude of aircraft flight
(theory of navigable air space)

115. This approach stems from the definition of aircraft as contained in annexes to the 1919 Paris Convention and in the 1944 Chicago Convention. Annex D of the Paris Convention provided:

^{91/} F. Stormer in Encyclopedia Americana, Montreal, 1959, vol. 2, p. 509.

^{92/} M. Seara Vazquez, Cosmic International Law, Detroit, 1965, pp. 33-34.

"The word 'aircraft' comprises all balloons, whether fixed or free, kites, airships, and flying machines.

"The word 'balloon', either fixed or free, shall mean an aircraft using gas lighter than air as a means of support, and having no means of propulsion.

"The word 'airship' shall mean an aircraft using gas lighter than air as a means of support, and having means of propulsion.

"The words 'flying machine' shall mean all aeroplanes, seaplanes, flying boats, or other aircraft heavier than air, and having means of propulsion." 93/

116. As explained in the comment received by the United Nations Secretariat from the secretariat of ICAO:

"... from the point of view only of aviation, airspace is only that space in which an aircraft, as such, can operate. The definition of an aircraft is: 'Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface' (Annex 7 to the Convention on International Civil Aviation, as adopted by the Council of ICAO). 94/ The maximum altitude, that is, distance from the earth's surface, at which a machine can derive support from the reactions of the air is, according to present estimates, approximately 35 km; however, technological changes could possibly enable an aircraft to fly as such, namely, by deriving support from the reactions of the air, at an even greater altitude."
(For details, see Annex.)

117. The notion of the support of the reactions of the air has been employed both for describing an aircraft and for making a distinction between an aircraft and a space object. For example, it is used as a basis for the definition of a space object or a space device in the Belgian and Hungarian draft conventions on liability for damage caused by the launching of objects into outer space:

Belgian draft (article 2):

"...

"'Space device' shall be understood to mean any device intended to move in space and sustained there by means other than the reaction of air, as well as any constituent element of such device or of the equipment used for its launching or propulsion." 95/

Hungarian draft (article I):

"...

93/ League of Nations Treaty Series, volume XI (1922), pp. 248-249.

94/ "Aircraft Nationality and Registration Marks", Annex 7 to the Convention on International Civil Aviation, ICAO publication, Third Edition, May 1969, p. 5.

95/ Official Records of the General Assembly, Twenty-fourth session, Supplement No. 21 (A/7621), p. 34.

"3. For the purpose of this Convention "Space Object" means space ships, satellites, orbital laboratories, containers and any other devices designed for movement in outer space and sustained there otherwise than by the reaction of air, as well as the means of delivery of such objects and any parts thereof." 96/

118. When the above quoted definitions of aircraft in the Annexes to the Paris Convention and the Chicago Convention are read in conjunction with the opening articles of both Conventions (see paragraphs 14 and 15 above), the inference is drawn to the effect that the sovereign or "territorial" air space is limited by the maximum altitude of an aircraft flight, which is approximately 35-40 km. 97/

119. Comparing this approach with the atmosphere theory P. Jessup and H. Taubenfeld wrote,

"One approach calls for the definition of airspace in terms of the 'atmosphere' which is in turn defined in terms of gaseous content or of aerodynamic lift. The former would extend it perhaps to 13,000 miles or so, the limit of the exosphere, though some scientists calculate the 'atmosphere' at no more than 500 miles and some commentators expressly equate the exosphere with outer space. The latter is the limit to which it is possible to fly instrumentalities deriving their support from movement of air (or gas) molecules for example balloons and traditional aircraft. Such a limit might extend no more than 25 miles above the earth". 98/

120. C. Schachter expressed the view that "airspace" was intended to refer to such areas in the atmosphere as would support flight by aircraft (including balloons). Whatever the precise boundary might be, it was clear that when one went beyond it he was legally in a no man's world. 99/

121. Some authors, however, maintain that the Paris Convention and the Chicago Convention cannot be used as a point of departure for delimiting air space from outer space. For example, J. Cooper stated that Article 1 of the Chicago Convention was nothing more than an international determination that the legal

96/ Ibid., p. 44.

97/ For a discussion of this approach see Lipson and Katzenbach, op. cit., p. 12.

98/ P. Jessup and H. Taubenfeld, Controls for Outer Space and the Antarctic Analogy, New York, 1959, pp. 207-208.

99/ C. Schachter "Legal Aspects of Space Travel", Journal of British Interplanetary Society, 1952, p. 14.

status of a part of usable space had been settled. No international decision had yet been made as to the legal status of those areas of space above this airspace.^{100/} M. McDougal, H. Lasswell and I. Vlasic deemed it evident that the framers of the Chicago Convention, and a fortiori those of the Paris Convention, had no thought of regulating the régime of either space or spacecraft. They were of course concerned with aircraft.^{101/}

122. At the sixth session of the Legal Sub-Committee the representative of Poland referred to the difficulty of defining outer space which might arise from the terminology used in international conventions and national legislation. Thus, he said that although the annexes to the Chicago Convention defined an aircraft as a machine deriving support from the reaction of the air, that criterion was not included in the legislation of some countries, such as the United States of America, the Federal Republic of Germany and the German Democratic Republic. The new Polish air law defined "aircraft" as meaning any machine moving anywhere in space. As a space object could thus be regarded as an "aircraft", it became difficult to distinguish precisely between the two types of space by means of definition of the devices which moved in them.^{102/}

123. Another criticism of this method of delimitation is that it does not seem to provide a reasonably fixed boundary, since its location will shift with improved types of aircraft (see paragraph 127 below).

D. Demarcation based on aerodynamic characteristics of flight instrumentalities (von Karman line)

124. According to this approach, the boundary between air space and outer space would be established at the altitude where aerodynamic lift yields to centrifugal force. This phenomenon serves as a basis for one of the most widely discussed demarcation theories - the so-called von Karman primary jurisdiction line or the von Karman line.

^{100/} J. Cooper, Air Law, a Field of International Thinking, 4 Transport and Communications Rev. 3 (1951).

^{101/} M. McDougal, H. Lasswell and I. Vlasic, Law and Public Order in Space, Yale University Press, N.H., 1963, p. 329.

^{102/} A/AC.105/C.2/SR.81, p. 6.

125. The theory of von Karman line has been developed by A. Haley whose point of departure for defining the upper limit of the atmosphere was neither its geophysical concept nor aerodynamical effects. A. Haley explained that his theory combined the physical, thermodynamical, aerodynamical, exobiological, physiological and mechanical points of view of aviation with those of astronautics. He wrote that to establish sound bases for demarcation of air and space jurisdiction it was necessary to consider that the conditions for accomplishing aerial flight, that is to circle at constant altitude, were: weight equals aerodynamic lift plus centrifugal force. The aerodynamic lift decreases with altitude because of the decreasing density of the air and in order to maintain continued flight beyond zero air lift, centrifugal force must take over. In the corridor of continuous flight when an object reaches 275,000 feet (83 km) and is travelling at 25,000 feet per second (7 km/sec.) the Kepler force takes over and aerodynamic lift is gone. This is a critical jurisdictional boundary.^{103/}

126. In his paper presented to the 1968 United Nations Conference on the Exploration and Peaceful Uses of Outer Space, A. Meyer maintained that the most appropriate limit would seem to be the von Karman line in an altitude of about 275,000 feet.^{104/}

127. The disadvantages of the von Karman line approach lie, among other things, in the fact that this theoretical limit of the height of air flight may vary as a result of changes in the atmospheric conditions, design of objects and other factors.^{105/}

128. G. Gal notes that the weakest point of Haley's theory is that in the course of technical development, the equation taken as a basis may result, owing to the correlation of new altitudes and velocities, in a considerable shift of the von Karman line. Haley himself reckons with this when by inference he says:

"The von Karman primary jurisdictional line may eventually remain as presented above, or, as a result of such developments as improved techniques of cooling and more heat-resistant materials, it may be significantly changed."

^{103/} A. Haley, op. cit., pp. 78-79, 98.

^{104/} Space Exploration and Application, United Nations Publication, Sales No. 69.I.16, vol. II, p. 1136.

^{105/} P. Quigg, Open Skies and Open Space, 37 Foreign Affairs (Oct. 1958), pp. 95-106.

According to Gal, even supposing that the technical data will remain constant, it has to be inferred that Haley's formula gives not an unequivocal line, but a rather broad range within which, in keeping the flying objects aloft, the Kepler force takes over the role of the aerodynamical force, depending on the character and speed of the object. This is why the criticism expressed by F.N. Kovalev and I.I. Cheprov can be shared. They have pointed out that if the von Karman formula is adopted, it will have to be applied once to the jurisdiction of air space, next time to that of the outer space for the same point in space, depending on the character of the different flying objects.^{106/}

129. At the fifth session of the Scientific and Technical Sub-Committee the representative of the USSR stated that it had been proposed that outer space should be defined as the space beyond which aerodynamic forces had no further effect on moving objects dependent on air. But aerodynamic forces, he continued, had been determined not only by atmospheric density but also by the properties of the moving objects themselves. Moreover, the density of the atmosphere was subject to periodic and accidental fluctuations, and the aerodynamic properties of that great variety of artificial satellites and space stations that had so far been launched varied widely. Accordingly, that concept was an inadequate basis for a precise definition.^{107/}

E. Demarcation according to the lowest perigee of an orbiting satellite

130. This method of delimitation is based on the fact that at a certain altitude the earth's atmosphere is too dense for an artificial satellite to keep in orbit. The density of the atmosphere beyond the stratosphere (40 km) is very low. But even in the near-vacuum particles of matter have a strong braking effect on an object and no satellite regardless of its speed can keep constantly in orbit. It has been observed that at the altitude of 85-105 km naturally occurring meteorites burn up in most cases. All but the most dense of heavy space craft suffer high drag and heating effects and rapidly spiral in.^{108/} At the present

^{106/} G. Gal, Space Law, Dobbs Ferry, New York, 1969, pp. 89-90.

^{107/} A/AC.105/C.1/SR.45, p. 3.

^{108/} A/AC.105/C.1/WP.V.2, p. 3.

time the perigee of a durable satellite orbit amounts to about 140-160 km, and objects descending below this altitude do not live long.

131. The advantages of the lowest-perigee approach are that if taken as a basis for the fixing of the boundary between air space and outer space, it would find support in the existing practice of orbiting artificial satellites and the attitude of States towards the launching of objects into orbit around the earth. In fact, some writers have maintained that there is at present a rule of international customary law to the effect that the boundary between air space and outer space lies at the point where a space flight can actually take place, that is, the lowest perigee of orbiting satellites.^{109/} Others, however, do not consider that a rule of customary law has developed.^{110/}

132. In the opinion of V. Kopal, with regard to the present and expected practice of space flights, the lowest perigee approach might be qualified as natural, convenient, and self-evident. He believes that should the limits of outer space be fixed higher, it would mean the exclusion of a significant part of the present activities, including those bringing practical results (such as establishment and operation of meteorological, telecommunication and navigational satellites systems) from the realm of principles and norms of space law. The lowest perigee is also relevant from the viewpoint of denuclearization of outer space: the specific stipulation of the Outer Space Treaty (article IV) "not to place nuclear weapons or other weapons of mass destruction in orbit around the Earth" anticipated in fact a more general interpretation of the lower limits of outer space.^{111/}

133. V. Kopal further states that:

"In the present practice the lowest limit of satellite orbits is approximately at 95-100 miles (150-160 km) height. It is expected, however, that further improvements in space flight technology will enable to move the lowest effective perigee to 70-75 miles (110-120 km). As it seems now such a goal cannot be achieved by usual satellites whose orbiting is based on a balance between the excentric and gravitational force, but rather by the so-called satelloids, i.e., such objects which require during their orbiting

^{109/} P. - M. Sontag, *Der Weltraum in der Raumordnung des Völkerrechts*, 1966, p. 204.

^{110/} G.P. Zhukov, *op. cit.*, p. 275, Gal, *op. cit.*, p. 66.

^{111/} V. Kopal, *What is "Outer Space" in Astronautics and Space Law?*, Proceedings of the Tenth Colloquium on the Law of Outer Space (1967) sponsored by the International Institute of the I.A.F. (Tenth Colloquium), pp. 277-278.

a continuing rocket thrust in order to equalize the aerodynamic resistance. Therefore, it is to examine whether the lowest effective perigee of usual satellites, or that of satelloids should be considered a decisive criterion for the beginning of outer space. For the time being, there is not yet enough scientific data and practical experience to answer this question without further doubts. 112/

134. J. Rivoire proposed to the First Colloquium on the Law of Outer Space to fix the satellite orbit at 300 km. For satellites with a lower perigee the rules of space law would be still applicable (satellized spacecraft). He would change the definition of aircraft contained in Annex VII of the Chicago Convention (see paragraph 116 above) in the following manner:

"An aircraft will be any machine capable of keeping itself aloft in air space. Such a machine, however will automatically cease to be considered an aircraft when it rises above the 300 km limit, or when it begins to move on a continuous orbit. 113/

135. At the eighth session of the Legal Sub-Committee the representative of Argentina referred to the definition of outer space adopted in August 1968 by the fifty-third Conference of the International Law Association. Under that definition, outer space was the space beyond the lowest perigee reached by any satellite placed in orbit before 27 January 1967, the date on which the Outer Space Treaty was opened for signature by States, without prejudice to the possibility of including later any part of the space below that perigee. His delegation considered that the only legal justification for such a definition was that it would uphold the Chicago Convention and that it did not recognize the possibility of the violation of air space before the date of the Treaty. Its main fault was its vagueness, for the question arose, who was to determine the lowest perigee of a satellite placed in orbit before the date mentioned, and to say whether it was still an active satellite or a piece of space debris. The definition, moreover, had an element of legal uncertainty, since the criterion might change later on. 114/

112/ Ibid., p. 278.

113/ J. Rivoire, Design for a Law of Space, Proceedings of the First Colloquium on the Law of Outer Space (1958) sponsored by the International Institute of the IAF (First Colloquium) pp. 97-102.

114/ A/AC.105/C.2/SR.111-131, pp. 17-18.

F. Demarcation based upon the earth's gravitational effects

136. Proposals have been made to set the boundary between air space and outer space at a point where gravitational pull of the earth ceases. A. Ambrosini maintained that "since new flying machines reach great altitudes, we believe it useful to fix a limit of national sovereignty in the air, as otherwise foreign territories would be violated without interruption. In this sense, we think that the criteria based on the strength of earth's gravity, as an indication of sovereignty, is the most objective, the most rational and the surest".^{115/}

137. J. Kroell believed that State sovereignty extends to the point where the gravitational attraction of the earth is balanced by that of another celestial body.^{116/}

138. The gravitation theory proceeds from the need to safeguard the security of States, the basic assumption being that state sovereignty should extend beyond any altitude from which an object can be dropped.

139. The criteria used for such proposals have been termed untenable from the viewpoint of the data of geophysics, because gravity extinguishes gradually at places very remote from the surface of the earth, and it is impossible to indicate a meaningful, exact altitude whereby the boundary based on the criteria of the earth's attraction should be drawn. According to one calculation the attraction of the earth in relation to the moon is dominant up to 327,000 km while in relation to the sun up to 1,870,000 km. In the opposite direction the cumulated gravitational effect of the sun and the earth equals several light-years' distance, up to the attraction sphere of the nearest fixed star.^{117/} The gravitational effect of the earth also depends on the escape velocity of the object.

140. Another gravitational approach is described in the following manner in the Canadian working paper submitted at the fifth session of the Scientific and Technical Sub-Committee:

^{115/} A. Ambrosini, Introduction to P. Costadoat, El espacio aereo, Buenos Aires, 1955; quoted in N. Mateesco, op. cit., p. 31.

^{116/} J. Kroell, "Eléments créateurs d'un droit astronautique", Revue générale de l'air, 1953, p. 233.

^{117/} See G. Gal, op. cit., p. 72. Also XIX Congress of IAF (October 1968), material provided by IAF.

"Gravitational Effects - 26,000 km (radius). At this distance from earth, the gravitational attraction of the earth is equal to that of the sun. This and similar criteria based on the moon or on other ratios of gravitational effects are well defined but suffer because they lack any simply recognizable characteristics. When the ratio is unity in either the solar or lunar case, there is an analogy with a height of land." 118/

G. Demarcation based on effective control

141. According to this theory, the exclusive sovereignty of the underlying State should extend as high as it has the capacity effectively to apply its authority, and consequently, a boundary between air space and outer space should be fixed at an altitude where States cannot assure their effective control. This approach is similar to suggestions made at the very beginning of aviation. As far back as 1898 the German jurist Ullmann suggested that national sovereignty should be limited to the altitude which could be reached by man. 119/

142. H. Kelsen stated in connexion with the Paris Convention, that it stood to reason that a State could enforce the provisions of the convention or of its own legal order against the aircraft of another State only within that part of the air space over which it had effective control. The validity of any legal order could not extend beyond that sphere. 120/

143. Referring to the Chicago Convention, A. Verdross wrote:

"It is disputed whether the airspace of the state has any boundaries. The convention in question does not know any such limit. Nevertheless, we must suppose the existence of such a limit, because the exclusive dominion of State cannot extend beyond its jurisdiction. (Principle of effectivity.) This limit, however, will shift with the development of techniques so that the entire air column capable of being ruled (beherrschbar) above the state territory, will become part of the state territory (Staatsraum)." 121/

J. Cooper stated:

"...if the rule of effectiveness is to be applied to determine the limit of state territory in space, then the rule should be that every state, no matter how small or how weak, as a state or equal sovereign with every

118/ A/AC.105/C.1/WP.V.2, p. 2.

119/ von Ullmann, Völkerrecht, Tübingen, 1898, p. 180.

120/ H. Kelsen, General Theory of Law and State, Cambridge, 1946, p. 217.

121/ A. Verdross, Völkerrecht, Wein, 1955, pp. 198-199.

other state, has and should be admitted to have territorial right upward above its surface territories as high as the rights of every other state no matter how powerful." 122/

144. A. Dean believed that territorial sovereignty ended where the power of arms ended. Saying that this principle had served to establish the concept of free sea as much as it would serve to render space free, he therefore concluded that "sovereignty is limited to the altitudes at which the state can 'effectively control events'". 123/

145. At the eighth session of the Legal Sub-Committee the representative of Austria made the following observation:

"The idea of fixing an altitude criterion for the delimitation of outer space should be studied with reference to the question of the effective exercise of sovereignty, which was linked to the progress of certain aviation techniques, and to the development of new categories of aircraft and weapons intended to protect the air space of a State. In fact, where the effective exercise of sovereignty was no longer possible, the question arose whether outer space had been reached or merely an intermediary layer which might, or might not, be subject to the sovereignty of the territorial State. Moreover, space objects, including particularly satellites, might be placed under the authority of an international organization for activities carried out in the interests of all mankind (reconnaissance, establishment of meteorological stations, and so on) and would have to fly over the earth at a fairly low altitude below the proposed 80-km limit; a legal system should therefore be provided whereby such objects could fly around the earth without being charged with a violation of sovereignty, even if they flew at an altitude below 80 km." 124/

146. The principle of effective control was embodied in article 1 of the Bolivian Decree of 24 October 1930 (Regulating Air Services) which read as follows:

"There shall be established as property of the nation, the vertical airspace which covers the surface of the national territory within its frontiers, and this sovereignty shall extend to the altitude to which the defensive weapons of the country are able to rise." 125/

122/ J. Cooper, High Altitude Flight and National Sovereignty. International and Comparative Law Quarterly, 1951, pp. 414 and 417.

123/ The New York Times, October 25, 1960, p. 34.

124/ A/AC.105/C.2/SR.111-131, p. 43.

125/ Air Law and Treaties of the World - Vol. I: 1965 (US Senate Committee Print, 89th Congress, 1st session), p. 261.

147. The doctrine of effectiveness as a ground for the fixing of the boundary between air space and outer space is contested by many writers dealing with the legal questions of outer space. McDougal, Lasswell and Vlasic note in regard to the doctrine of effective control, that

"the application of such a doctrine with respect to any problem of legal order in the contemporary world community would no doubt be highly dangerous; it would be certainly disastrous in the domain of space. If every state were allowed to project its sovereignty upward and sideward in accordance with its effective power, there would inevitably arise countless conflicting claims with no criteria for their accommodation other than naked power". 126/

148. Criticizing this theory Yu. Kolossov points out that the recognition of the principle of effective control would amount to the recognition of instability of the State sovereignty limits which would vary with the development of technology as well as of inequality of States since they are at different levels of scientific and technical development. Thus, he finds that this theory is at variance with the established principle of the equality of nations contained in a number of international instruments, i.e., in the Convention on Rights and Duties of States signed at Montevideo on 26 December 1933. 127/ Article 4 of the Convention provides:

"States are juridically equal, enjoy the same rights, and have equal capacity in their exercise. The rights of each one do not depend upon the power which it possesses to assure its exercise, but upon the simple fact of its existence as a person under international law." 128/

149. The effective-control theory has also been criticized by N. Mateesco, who writes that inasmuch as the States are not all at the same degree of technical development, and as most probably they will never be, the question arises as to how some of them will be able to control the space above their territory as effectively as others. One of the important shortcomings of this theory is that it would result in the abnormal situation where some States would have higher columns of air (or space) under their jurisdiction than other States, depending

126/ McDougal, Lasswell and Vlasic, op. cit., p. 342.

127/ Yu. Kolossov, Struggle for Peaceful Cosmos (in Russian), Moscow, 1968, p. 76.

128/ Hudson, International Legislation, Vol. VI (1932-1934), Washington, 1937, p. 623.

on the technical perfection of their weapons. Moreover, the boundary between the air and the rest of space would be continually changing as a result of technical developments.^{129/}

150. At the sixth session of the Legal Sub-Committee, the representative of India stated that he could not accept the principle of "effective control" in the delimitation of outer space since, if that principle were admitted, it would follow that outer space would begin at varying heights for various States.^{130/}

H. Demarcation based upon the division of space into zones

151. There are a number of proposals which would solve the definition problem through establishing certain zones between air space and outer space with different legal régimes. In principle this approach is not new. As far back as 1878 J. Bluntschli proposed a zone theory for air space.^{131/} In 1914 Merignac advocated a three-zone division for air space - the exclusive sovereignty "national zone" (up to 200 m), the "international zone" (between 200 and 400 m) in which only offensive noxious flights would be prohibited, and the third zone of free air (above 400 m).^{132/}

152. In 1956 J. Cooper proposed an international convention which would:

"(a) reaffirm Article I of the Chicago Convention giving the subjacent state full sovereignty in the areas of atmospheric space above it, up to the height where 'aircraft' as now defined may be operated, such areas to be designated 'territorial space';

(b) extend the sovereignty of the subjacent state upward to 300 miles above the earth's surface, designating this second area as 'contiguous space' and provide for a right of transit through this zone for all non-military flight instrumentalities when ascending or descending;

(c) accept the principle that all space above 'contiguous space' is free for the passage of all instrumentalities."^{133/}

^{129/} H. Mateesco, op. cit., p. 33.

^{130/} A/AC.105/C.2/SR.35, p. 9.

^{131/} J. Bluntschli, Das moderne Volkerrecht der zivilisierten Staaten, Nordlingen, 2nd ed. 1878, p. 354.

^{132/} See G. Gal, op. cit., p. 53

^{133/} J. Cooper, Legal Problems of Upper Space, Proceedings of American Society of International Law, 1956, p. 91.

He suggested that the space above a State territory should be divided in three zones: territorial space, contiguous space and free space. In his later proposals, J. Cooper modified his initial suggestion but maintained the zone approach.^{134/}

153. In principle the same approach seems to have been employed by W. Hyman who proposed to establish "Neutralia" - a neutral zone with the right of free passage embracing the upper limits of air space and the lower limits of outer space.^{135/}

154. A zone approach is also apparent in the following proposal made by the representative of Sweden at the fifth session of the Scientific and Technical Sub-Committee. He suggested that the following text should be added to the Technical Sub-Committee's reply to the inquiry of the Legal Sub-Committee:

"From a practical and operational point of view there exists at present a buffer zone between, on the one hand, the highest altitudes which can be reached by balloons and aircraft and, on the other hand, the lowest altitude at which satellites can remain in orbit without any means of propulsion. From a scientific point of view the buffer zone contains particularly interesting layers, e.g. the lower parts of the ionosphere which are also of considerable practical value for long-distance radio communications.

"For the future development of space science and of the peaceful uses of outer space it would therefore be desirable to guarantee freedom for all countries to study and make use of these layers. Consequently, the lower limit of outer space should be put as low as possible within the buffer zone.

"The Legal Sub-Committee may consider the fact that the buffer zone is expected to disappear within the foreseeable future with the development of new types of hybrid aircraft-space vehicles."^{136/}

155. The zone theory has been opposed by a number of writers. For example, noting that the zone approach in the law of the sea served the purpose of safeguarding the security of States, as well as their economic, trade, scientific, cultural and other interests, Yu. Kolossov does not believe that the same approach

^{134/} Cf. Gal, op. cit., p. 96.

^{135/} W. Hyman, the Magna Carta of Space, Proceedings of the Fifth Colloquium on the Law of Outer Space (1962) sponsored by the International Institute of Space Law of the IAF (Fifth Colloquium), p. 7.

^{136/} A/AC.105/C.1/SR.47, p. 7. The proposed text was to be added at the end of paragraph (a) of the Technical Sub-Committee's reply. See para. 57 above.

with regard to outer space would serve the same purpose since a zone between the surface of the earth and outer space actually forms a part of air space governed by the full sovereignty rule.^{137/}

I. Demarcation based on a combination of various spatial approaches and other proposals

156. In many cases, as in fact is apparent from a number of proposals described in the preceding paragraphs, suggestions as to the delimitation of air space and outer space are based on a combination of various spatial approaches. One of the examples is a 1965 commentary by a Study Group of the David Davies Memorial Institute of International Studies in London which defined "air space" as "the volume of space between the surface of the earth at sea level and an altitude of 80,000 metres above it". The commentary says, in part:

"What seems reasonable is that any régime for outer space should cover the movement of space craft, orbiting the earth, even though its perigee may be within the atmosphere of the earth. Thus a satellite, having its perigee at an altitude where the atmosphere is dense enough to impose a 'braking' effect on its flight, or a satellite designed to make a controlled return to the earth's surface, should both while in orbit be deemed to be space craft.

"At the present time the lower effective limit of perigee is in the region of the altitude of one hundred miles, since below that the life of the satellite is too short to be useful and it is possible that an altitude of about seventy miles would be the limit for effective orbiting, since below that friction would become too great. The notion of effectiveness here is to be understood in terms of the scientific uses of space craft.

"The principle that each State has sovereignty over the airspace above its territory is now an established rule. Although the Soviet Union is not a party to the Chicago Convention, it has adopted the rule in substance in its own legislation.

"Neither the Paris Convention in 1919, nor the Chicago Convention defined the altitude of the airspace, for the purpose of sovereignty, nor has it been authoritatively defined elsewhere.

"As far as the performance of existing conventional aircraft is a guide to the definition of airspace, the ramjet which makes more efficient use of such air as is available, can 'breathe' at greater heights than jet - or piston engined - aircraft, but twenty-five miles is probably the outside limit of effective aerodynamic lift.

^{137/} Yu M. Kolossov, op. cit., pp. 79-80.

"There are, however, three considerations which favour a definition of airspace yielding a more extended sovereignty than twenty-five miles; the fact that airspace begins to lose its character of a continuous medium only when a height of fifty to fifty-five miles is reached; the likely range of effective control of objects from the ground; and the logic of treating the frontier between airspace or outerspace as being at or near orbiting altitude.

"The first consideration suggests that craft may yet be designed to operate at altitudes nearer this limit than now seems possible.

"The X-15 is a rocket-driven winged machine which flies as an aircraft while aerodynamic lift is available but which can be operated as if it were a space craft, under a different system of controls, when aerodynamic lift fails. The X-15 has already attained an altitude of forty-seven miles, and its descendants will certainly go higher. It is believed that such hybrid craft should be subject to the régime of that portion of space in which it is at any time operating, and that its existence does not call for any modification of the area of sovereignty.

"It is now likely that control over space craft passing over the territory of a State, may be effectively in the hands of that State to far greater heights than was once supposed; in other words, while it was thought a few years ago that interference with, or destruction of, space craft from the territory over which they were passing would at best be possible only with the greatest difficulty, diversion, destruction or even capture of space craft is probably now, or may soon become, quite practicable.

"While seventy miles is indicated as the present limit of effective orbiting, and there is a case of raising the altitude of sovereignty accordingly to perhaps seventy-five miles, orbiting effective for some purpose may yet be achieved at lower limits.

"Any particular altitude chosen as the limit of sovereignty over the airspace may appear arbitrary and be controversial; but, for the avoidance of excessive claims and by the other foregoing considerations, the relatively low altitude of about fifty miles is suggested here as the limit of sovereignty and the beginning of outer space." 138/

157. One of the criteria referred to in connexion with the question of the delimitation of outer space has been the magnetic effect of the earth. It has been estimated that at a distance of 80,000 km from the centre of the earth towards the sun, the presence of the earth and its magnetic field produces effects on the interplanetary medium (the solar wind) analogous to bow wave of a ship or the shock front of a projectile. This distance is not yet well defined and is believed to be variable. 139/

138/ 29 Journal of Air Law and Commerce, 1963, pp. 141, 143, 144.

139/ A/AC.105/C.1/WP.V.2, p.3

158. Another approach called "biological theory" stems from the assumption that air space is the layer of the atmosphere where human life is possible.^{140/} A reference to a modification of this theory seems to have been made by the representative of Iran at the fifth session of the Scientific and Technical Sub-Committee. Discussing the definition of the atmosphere he said that it could be taken to extend to an altitude at which the air, if compressed to the standard pressure, could still support respiration and therefore sustain life (see paragraph 57 above).

159. In this connexion the representative of Canada commented that while it was true that the tenuous atmosphere existing at 100 kilometres could sustain life if compressed, its density and composition were subject to such periodic and random variations that it would be difficult to define "atmosphere".^{141/}

160. After an examination of the question of compatibility of space activities with the sovereignty of States over their air space, the secretariats of ESRO and ELDO set forth the arguments for fixing the upper limit of air space as low as possible in order to ensure the freedom of exploration and use of outer space and to effectively safeguard the sovereignty of States. (For details, see annex).

J. The question in general of fixing a boundary between air space and outer space

161. The arguments for and against the fixing of a boundary are summarized by Lipson and Katzenbach as follows.^{142/}

(a) Arguments for determining with precision the boundary between air space and outer space:

- (1) That formal agreement would help to preclude states from making unjustified claims in the future to sovereignty in large regions of space "above" their territory on the contention that it is "air space".
- (2) That given certain possible interpretations of existing conventions, there is always the possibility that some States will protest space activities as violative of their sovereignty.

^{140/} M. Le Goff, Traité théorique et pratique de droit aérien, Paris, 1934, p. 20.

^{141/} A/AC.105/C.1/SR.45, p. 5.

^{142/} Lipson and Katzenbach, op. cit., pp. 16-17; see also G.P. Zhukov, op. cit., pp. 271-272.

- (3) That disputes as to the extent of air space could lead to international tensions and serious controversy.
- (4) That the resolution of this fundamental legal question would help to induce co-operative attitudes toward building law in regard to space and that these attitudes could help to shape desirable technological trends.

(b) Arguments against efforts to resolve the problem by fixing the boundary at an agreed altitude:

- (1) That the absence of explicit agreement has not yet led to international tensions and does not appear likely to do so.
- (2) That an attempt to reach explicit agreement on establishment of an altitude boundary would invite many States to make claims to sovereignty which, in analogous cases such as the high seas, have led to immoderate demands.
- (3) That any boundary set might have to be set too high, which would seriously hamper some space activity. On the other hand, future activities at lower altitudes may be acceptable if there is no explicit agreement on the extent of air space.
- (4) That an agreed altitude once achieved will be next to impossible to reduce. States will not gladly give up sovereignty over territory.
- (5) That an agreement reached later is likely to fix on a lower altitude than an agreement reached sooner, and that the lower figure would be in the general interest.
- (6) That an arbitrary line, even if low enough to permit more space activity, might encourage rather than avert disputes because it might provoke technical complaints about violations which at high altitudes would be difficult to verify.

IV. FUNCTIONAL APPROACH TO THE DEFINITION OF OUTER SPACE

162. Difficulties in finding reliable physical or technological criteria for the solution of the problem of an upper limit of state sovereignty have been often cited to substantiate a functional approach to the regulation of activities in the space above the earth. According to this approach, a distinction is made between aeronautical and astronautical activities, the latter activities being subjected to one and the same legal regulation irrespective of an altitude at which they are carried out.

163. Making a distinction between the two types of activities, the proponents of this approach generally deny the need for demarcation between air space and outer space. Instead, the question is raised concerning the definition of outer space activity or outer space flight, and the determination of the difference between aeronautics and astronautics, and between aircraft and space craft. The advocates of the functional approach argue that since a legal definition is usually intended for permitting certain activities and prohibiting others it is preferable, in regard to outer space activities, to attain this objective not by a legal definition of boundaries but rather by defining objectives and missions for space vehicles, which would correspond to the established practice. They refer to the Outer Space Treaty which provides, inter alia, that space exploration and uses should be for peaceful purposes and for the benefit of mankind. It has also been argued that at the present time no space problem can be identified or anticipated which would require for its solution a demarcation of air space and outer space.

164. M. Lemoine is considered to be one of the first authors to advance a functional approach. In 1947 he wrote that air law was the field of law which determined and studied the laws and legal norms that regulated the traffic and use of aircraft as well as the relations which they brought about and that cosmic law was oriented towards navigation in space.^{143/}

165. J. Kroell expressed the opinion that astrocraft and cosmocraft should be subject to different legal status according to whether their destination is

^{143/} M. Lemoine, Traité de Droit Aérien, Paris, 1947, pp. 3 and 79 and seq.

terrestrial or spatial. Cosmic law would be applicable to cosmocraft because of their extra-terrestrial objective. It would apply to them the moment they leave the earth to avoid complicated determination of their passing from one legal status to another. Kroell advocated the unity of status as a preferable if not a more rational solution.^{144/}

166. Comparing air law to maritime law R. Hombourg wrote that air law was applicable to air navigation and not to space navigation as maritime law applied only to merchant vessels and not, say, to warships. He rejected the spatial approach to the definition of outer space, asserting that even if some boundaries could be established they would be illusory and without practical value. Hombourg defined air law as "the totality of legal rules applying to air navigation between different points of the surface of the earth", and stated that cosmic law was applicable to space navigation, between the earth and another point of the universe.^{145/}

167. Elaborating on the functional theory R. Quadri explained that it was based on the cosmic activities and maintained that air and space represent an inseparable whole, continuous, without distinction or separation of zones. He was also of the view that all jurisdiction over a space craft was vested in the launching State and that the territorial State had no authority with regard to overflying space vehicles of other States.^{146/}

168. C. Chaumont also opposed the establishing of boundaries between air space and outer space based on scientific criteria, as they did not serve practical needs and were not sufficiently evident. He believed it was absurd that two legal statutes could be given to one missile since it would be difficult to determine at what moment a rocket passed from the rules of air law to those of cosmic law. He conditioned the acceptance of the functional theory by the need to define and enumerate the activities of air and outer space which should form a part of each legal status.^{147/}

^{144/} Joseph Kroell, Eléments créateurs d'un droit astronautique, XVI RGA 222, 228 and seq. (1953).

^{145/} R. Hombourg, Etendues et limites du droit aérien, XIX RGA 140, 144 (1956); and Droit astronautique et droit aérien, XXI RGA 15 (1958).

^{146/} R. Quadri, Droit international cosmique, 98 Recueil des Cours de l'Académie de Droit International de La Haye 510, 553 and seq. (1959).

^{147/} Charles Chaumont, Problèmes de droit international de l'espace extra-atmosphérique, lectures given at the Institut des Hautes Etudes Internationales in Paris, 1958-1959, p. 10 and seq.

169. Favouring the functional theory M. Markov suggested that space law should apply to all space ships, even those which were to return to earth, provided space activities were peaceful. In such cases the air medium should not be submitted to national sovereignty. All missiles and interplanetary stations would have the right of innocent passage and the right of flight over state territories.^{148/}

170. The functional theory has been supported by N. Mateesco who finds the boundaries proposed for air space and outer space unacceptable for scientific as well as for legal reasons, and believes that the functional approach appears adequate for an efficient co-operation between States. He summarizes this approach in the following manner:

1. The starting-point of the functional approach is the obliteration of all division between air and space, first because nobody knows the limits of one or the other, and second, because these concepts have only an accessory value in this theory. In the light of this theory, there exists one medium, the coelum which encircles the globe and loses itself in the universe.

2. The concepts of freedom of space and state sovereignty must be understood as indicating a functional freedom and a functional sovereignty, that is the concept of sovereignty can be conceived only in regard to concrete functions rather than in its abstract sense.

3. The functional theory does not reject the rights recognized as belonging to the States, such as their functional sovereignty over the air traffic over their territory or over the activities of their citizens. Thus understood, functional sovereignty will take into account all interests of the States in military security. On the other hand, for the purposes of navigation, air should be as free as space.

4. Functional freedom of space does not mean the right to do anything one wishes. It should be understood as liberty given only in view of certain functions such as humanitarian, scientific, exploratory etc.

5. The right of self-defence (or right to security) and the right of access or right of mobility between two points of the universe are recognized as natural rights and as such must be considered as basic for the study of the functional theory.

^{148/} M. Markov, Liberté de l'espace extra-atmosphérique, 14 Revue générale de l'air, pp. 327 and seq., n. 7 (1951).

6. Finally, by virtue of the functional approach air (or aeronautical) law is that field of the law which applies to the activities of aircraft: planes, balloons and any device requiring air support.^{149/}

171. Elaborating further on this summary, N. Mateesco points out that the natural right of access to outer space stems from the principle that outer space is open to all States and can be compared to the right of all countries including the landlocked ones, to have access to the high seas. It further means that all innocent and harmless techniques to escape terrestrial attraction are good, valid and acceptable by all States. Such techniques may require that the space craft incidentally fly over the territory of some States. If the craft should cause damage to the State flown over, reparation will be owed the latter. If the territorial State has good reason to believe that the cosmocraft will cause damages or is used for aggressive purposes, it has the right to defend itself with appropriate means, proportionate to the danger. Not to be subject to jurisdiction of the territorial State, the craft will have to have a cosmic, spatial or astronomical objective. By the cosmic or astronomical travel of a craft should be understood a trajectory along which at least one stop-over will be elsewhere than on the earth's surface, this stop-over being for peaceful, scientific or humanitarian reasons. To regulate such objectives and trajectories as well as launching a body of rules - space law - should be developed. Eventually it would lead to an aerospace law which

"... would result in the establishment of a real and well-determined functional jurisdiction. This would facilitate international navigation, even inter-astral, as well as harmony and peaceful co-operation between States which will finally open the way to an aerospace law of navigation".^{150/}

172. Another proponent of the functional theory, G. Gal, advances the following arguments to support it. The synthesis of territorial air space and free outer space can only be assured by an international agreement which can break away from the conventional forms, and encompass the activity element of rockets, artificial satellites and planets launched by the States. Space law cannot be associated

^{149/} N. Mateesco, op. cit., pp. 62-64.

^{150/} Ibid., pp. 70-74.

with any limited space (area, zone), but only with the character of activity under regulation. Before the space age, international law regulated rights relevant to territory in such a manner that each legal fact could be accurately localized. In space law a risk to security and the possibility of averting it are no longer linked with a geographical point closely involving some part of the state territory. Space law in its wider meaning also includes national legal norms relating to the entirety of activities in space. With the gradual extension of the scope of international space law, international regulation will gradually approach the launching pads. The only way to preserve the logical unity of legal regulation is by dispensing with the demarcation in space, and adopting the functional basis. Even if demarcation is adopted, it must be concomitant with the functional system. The correctness of the functional theory is further supported by the fact that 71 per cent of the surface of the earth is covered by sea. In the space above the high seas only a regulation based on the nature of space activity will afford a restriction capable of protecting the security of States. In the opposite case, no matter how high the limit of sovereignty should be drawn above the continental territories totalling only 29 per cent of the earth's surface, it would not protect the States from harmful interference through activities carried out above the seas.^{151/}

173. J. Sztucki expressed the following opinion on the validity of the functional approach:

"If the legal status of outer space is to be finally regulated together with the problem of the sovereignty and scope of jurisdiction of States, such regulation must be accompanied by the provision on an international scale of some remedies in the sphere of the protection of States from outer space. In other words, a regulation based on the criterion of the place of activity (distance from the earth) must be accompanied by a regulation based on the criterion of the type of activities, with the elimination of such activities as endanger the security of the States."^{152/}

^{151/} G. Gal, *op. cit.*, pp. 106-109.

^{152/} J. Sztucki, Security of Nations and Cosmic Space. 1961 Symposium, pp. 1175-6. Similarly, V. Kopal: Two Problems of Outer Space Control: The Delimitation of Outer Space and the Legal Ground for Outer Space Flights. Third Colloquium (1960), p. 111.

Rejecting the spatial approach to the definition of outer space and maintaining that space law will develop probably without a delimitation between air space and outer space, without an upper limit of national sovereignty, J. Sztucki concludes that the most important legitimate interests of States can be protected in the most effective manner not by putting territorial limits to State sovereignty but by legal prohibition of such action in the course of space activities, which are likely to endanger these rights and legitimate interests. This includes first of all prohibition of use of space flights for purposes other than peaceful ones. This should be the principal direction and aim of the development of legal rules for astronautics.^{153/}

174. In the United Nations the functional approach to the definition of outer space has been developed by the representatives of France. For example, in the working paper submitted by the French delegation at the fifth session of the Scientific and Technical Sub-Committee it has been stated that a satisfactory definition of outer space as such, based on scientific criteria, i.e. using easily measurable parameters, is impossible and that it is necessary to try other approaches. Noting that the Outer Space Treaty not only used the expression "outer space" but also referred to activities in outer space the French delegation suggested that "space activities" should be defined. It expressed preference for arriving at such a definition on the basis of the purpose of such activities rather than of the means to carry them out.^{154/}

175. At the eighth session of the Legal Sub-Committee the French representative proposed that space activity should be taken to mean "any activity involving the sending into space of an object designed to permit the exploration and utilization of outer space". He explained that the definition had the advantage of using three complementary and inseparable notions: action, place and purpose. The notion of action eliminated other activities (astronomy and radio-astronomy) which it was unnecessary to subject to space law. From the point of view of place, launchings into space would include both satellites orbiting in outer space and

^{153/} J. Sztucki, On the So-Called Upper Limit of National Sovereignty, Fifth Colloquium (1962), p. 11.

^{154/} A/AC.105/C.1/WP.V.1, pp. 3-4.

- (3) That disputes as to the extent of air space could lead to international tensions and serious controversy.
- (4) That the resolution of this fundamental legal question would help to induce co-operative attitudes toward building law in regard to space and that these attitudes could help to shape desirable technological trends.

(b) Arguments against efforts to resolve the problem by fixing the boundary at an agreed altitude:

- (1) That the absence of explicit agreement has not yet led to international tensions and does not appear likely to do so.
- (2) That an attempt to reach explicit agreement on establishment of an altitude boundary would invite many States to make claims to sovereignty which, in analogous cases such as the high seas, have led to immoderate demands.
- (3) That any boundary set might have to be set too high, which would seriously hamper some space activity. On the other hand, future activities at lower altitudes may be acceptable if there is no explicit agreement on the extent of air space.
- (4) That an agreed altitude once achieved will be next to impossible to reduce. States will not gladly give up sovereignty over territory.
- (5) That an agreement reached later is likely to fix on a lower altitude than an agreement reached sooner, and that the lower figure would be in the general interest.
- (6) That an arbitrary line, even if low enough to permit more space activity, might encourage rather than avert disputes because it might provoke technical complaints about violations which at high altitudes would be difficult to verify.

IV. FUNCTIONAL APPROACH TO THE DEFINITION OF OUTER SPACE

162. Difficulties in finding reliable physical or technological criteria for the solution of the problem of an upper limit of state sovereignty have been often cited to substantiate a functional approach to the regulation of activities in the space above the earth. According to this approach, a distinction is made between aeronautical and astronautical activities, the latter activities being subjected to one and the same legal regulation irrespective of an altitude at which they are carried out.

163. Making a distinction between the two types of activities, the proponents of this approach generally deny the need for demarcation between air space and outer space. Instead, the question is raised concerning the definition of outer space activity or outer space flight, and the determination of the difference between aeronautics and astronautics, and between aircraft and space craft. The advocates of the functional approach argue that since a legal definition is usually intended for permitting certain activities and prohibiting others it is preferable, in regard to outer space activities, to attain this objective not by a legal definition of boundaries but rather by defining objectives and missions for space vehicles, which would correspond to the established practice. They refer to the Outer Space Treaty which provides, inter alia, that space exploration and uses should be for peaceful purposes and for the benefit of mankind. It has also been argued that at the present time no space problem can be identified or anticipated which would require for its solution a demarcation of air space and outer space.

164. M. Lemoine is considered to be one of the first authors to advance a functional approach. In 1947 he wrote that air law was the field of law which determined and studied the laws and legal norms that regulated the traffic and use of aircraft as well as the relations which they brought about and that cosmic law was oriented towards navigation in space.^{143/}

165. J. Kroell expressed the opinion that astrocraft and cosmocraft should be subject to different legal status according to whether their destination is

^{143/} M. Lemoine, Traité de Droit Aérien, Paris, 1947, pp. 3 and 79 and seq.

terrestrial or spatial. Cosmic law would be applicable to cosmocraft because of their extra-terrestrial objective. It would apply to them the moment they leave the earth to avoid complicated determination of their passing from one legal status to another. Kroell advocated the unity of status as a preferable if not a more rational solution.^{144/}

166. Comparing air law to maritime law R. Hombourg wrote that air law was applicable to air navigation and not to space navigation as maritime law applied only to merchant vessels and not, say, to warships. He rejected the spatial approach to the definition of outer space, asserting that even if some boundaries could be established they would be illusory and without practical value. Hombourg defined air law as "the totality of legal rules applying to air navigation between different points of the surface of the earth", and stated that cosmic law was applicable to space navigation, between the earth and another point of the universe.^{145/}

167. Elaborating on the functional theory R. Quadri explained that it was based on the cosmic activities and maintained that air and space represent an inseparable whole, continuous, without distinction or separation of zones. He was also of the view that all jurisdiction over a space craft was vested in the launching State and that the territorial State had no authority with regard to overflying space vehicles of other States.^{146/}

168. C. Chaumont also opposed the establishing of boundaries between air space and outer space based on scientific criteria, as they did not serve practical needs and were not sufficiently evident. He believed it was absurd that two legal statutes could be given to one missile since it would be difficult to determine at what moment a rocket passed from the rules of air law to those of cosmic law. He conditioned the acceptance of the functional theory by the need to define and enumerate the activities of air and outer space which should form a part of each legal status.^{147/}

^{144/} Joseph Kroell, Eléments créateurs d'un droit astronautique, XVI RGA 222, 228 and seq. (1953).

^{145/} R. Hombourg, Etendues et limites du droit aérien, XIX RGA 140, 144 (1956); and Droit astronautique et droit aérien, XXI RGA 15 (1958).

^{146/} R. Quadri, Droit international cosmique, 9⁸ Recueil des Cours de l'Académie de Droit International de La Haye 510, 553 and seq. (1959).

^{147/} Charles Chaumont, Problèmes de droit international de l'espace extra-atmosphérique, lectures given at the Institut des Hautes Etudes Internationales in Paris, 1958-1959, p. 10 and seq.

169. Favouring the functional theory M. Markov suggested that space law should apply to all space ships, even those which were to return to earth, provided space activities were peaceful. In such cases the air medium should not be submitted to national sovereignty. All missiles and interplanetary stations would have the right of innocent passage and the right of flight over state territories.^{148/}

170. The functional theory has been supported by N. Mateesco who finds the boundaries proposed for air space and outer space unacceptable for scientific as well as for legal reasons, and believes that the functional approach appears adequate for an efficient co-operation between States. He summarizes this approach in the following manner:

1. The starting-point of the functional approach is the obliteration of all division between air and space, first because nobody knows the limits of one or the other, and second, because these concepts have only an accessory value in this theory. In the light of this theory, there exists one medium, the coelum which encircles the globe and loses itself in the universe.

2. The concepts of freedom of space and state sovereignty must be understood as indicating a functional freedom and a functional sovereignty, that is the concept of sovereignty can be conceived only in regard to concrete functions rather than in its abstract sense.

3. The functional theory does not reject the rights recognized as belonging to the States, such as their functional sovereignty over the air traffic over their territory or over the activities of their citizens. Thus understood, functional sovereignty will take into account all interests of the States in military security. On the other hand, for the purposes of navigation, air should be as free as space.

4. Functional freedom of space does not mean the right to do anything one wishes. It should be understood as liberty given only in view of certain functions such as humanitarian, scientific, exploratory etc.

5. The right of self-defence (or right to security) and the right of access or right of mobility between two points of the universe are recognized as natural rights and as such must be considered as basic for the study of the functional theory.

^{148/} M. Markov, Liberté de l'espace extra-atmosphérique, 14 Revue générale de l'air, pp. 327 and seq., n. 7 (1951).

6. Finally, by virtue of the functional approach air (or aeronautical) law is that field of the law which applies to the activities of aircraft: planes, balloons and any device requiring air support.^{149/}

171. Elaborating further on this summary, N. Mateesco points out that the natural right of access to outer space stems from the principle that outer space is open to all States and can be compared to the right of all countries including the landlocked ones, to have access to the high seas. It further means that all innocent and harmless techniques to escape terrestrial attraction are good, valid and acceptable by all States. Such techniques may require that the space craft incidentally fly over the territory of some States. If the craft should cause damage to the State flown over, reparation will be owed the latter. If the territorial State has good reason to believe that the cosmocraft will cause damages or is used for aggressive purposes, it has the right to defend itself with appropriate means, proportionate to the danger. Not to be subject to jurisdiction of the territorial State, the craft will have to have a cosmic, spatial or astronomical objective. By the cosmic or astronomical travel of a craft should be understood a trajectory along which at least one stop-over will be elsewhere than on the earth's surface, this stop-over being for peaceful, scientific or humanitarian reasons. To regulate such objectives and trajectories as well as launching a body of rules - space law - should be developed. Eventually it would lead to an aerospace law which

"... would result in the establishment of a real and well-determined functional jurisdiction. This would facilitate international navigation, even inter-astral, as well as harmony and peaceful co-operation between States which will finally open the way to an aerospace law of navigation".^{150/}

172. Another proponent of the functional theory, G. Gal, advances the following arguments to support it. The synthesis of territorial air space and free outer space can only be assured by an international agreement which can break away from the conventional forms, and encompass the activity element of rockets, artificial satellites and planets launched by the States. Space law cannot be associated

^{149/} N. Mateesco, op. cit., pp. 62-64.

^{150/} Ibid., pp. 70-74.

with any limited space (area, zone), but only with the character of activity under regulation. Before the space age, international law regulated rights relevant to territory in such a manner that each legal fact could be accurately localized. In space law a risk to security and the possibility of averting it are no longer linked with a geographical point closely involving some part of the state territory. Space law in its wider meaning also includes national legal norms relating to the entirety of activities in space. With the gradual extension of the scope of international space law, international regulation will gradually approach the launching pads. The only way to preserve the logical unity of legal regulation is by dispensing with the demarcation in space, and adopting the functional basis. Even if demarcation is adopted, it must be concomitant with the functional system. The correctness of the functional theory is further supported by the fact that 71 per cent of the surface of the earth is covered by sea. In the space above the high seas only a regulation based on the nature of space activity will afford a restriction capable of protecting the security of States. In the opposite case, no matter how high the limit of sovereignty should be drawn above the continental territories totalling only 29 per cent of the earth's surface, it would not protect the States from harmful interference through activities carried out above the seas.^{151/}

173. J. Sztucki expressed the following opinion on the validity of the functional approach:

"If the legal status of outer space is to be finally regulated together with the problem of the sovereignty and scope of jurisdiction of States, such regulation must be accompanied by the provision on an international scale of some remedies in the sphere of the protection of States from outer space. In other words, a regulation based on the criterion of the place of activity (distance from the earth) must be accompanied by a regulation based on the criterion of the type of activities, with the elimination of such activities as endanger the security of the States."^{152/}

^{151/} G. Gal, op. cit., pp. 106-109.

^{152/} J. Sztucki, Security of Nations and Cosmic Space. 1961 Symposium, pp. 1175-6. Similarly, V. Kopal: Two Problems of Outer Space Control: The Delimitation of Outer Space and the Legal Ground for Outer Space Flights. Third Colloquium (1960), p. 111.

- (3) That disputes as to the extent of air space could lead to international tensions and serious controversy.
- (4) That the resolution of this fundamental legal question would help to induce co-operative attitudes toward building law in regard to space and that these attitudes could help to shape desirable technological trends.

(b) Arguments against efforts to resolve the problem by fixing the boundary at an agreed altitude:

- (1) That the absence of explicit agreement has not yet led to international tensions and does not appear likely to do so.
- (2) That an attempt to reach explicit agreement on establishment of an altitude boundary would invite many States to make claims to sovereignty which, in analogous cases such as the high seas, have led to immoderate demands.
- (3) That any boundary set might have to be set too high, which would seriously hamper some space activity. On the other hand, future activities at lower altitudes may be acceptable if there is no explicit agreement on the extent of air space.
- (4) That an agreed altitude once achieved will be next to impossible to reduce. States will not gladly give up sovereignty over territory.
- (5) That an agreement reached later is likely to fix on a lower altitude than an agreement reached sooner, and that the lower figure would be in the general interest.
- (6) That an arbitrary line, even if low enough to permit more space activity, might encourage rather than avert disputes because it might provoke technical complaints about violations which at high altitudes would be difficult to verify.

IV. FUNCTIONAL APPROACH TO THE DEFINITION OF OUTER SPACE

162. Difficulties in finding reliable physical or technological criteria for the solution of the problem of an upper limit of state sovereignty have been often cited to substantiate a functional approach to the regulation of activities in the space above the earth. According to this approach, a distinction is made between aeronautical and astronautical activities, the latter activities being subjected to one and the same legal regulation irrespective of an altitude at which they are carried out.

163. Making a distinction between the two types of activities, the proponents of this approach generally deny the need for demarcation between air space and outer space. Instead, the question is raised concerning the definition of outer space activity or outer space flight, and the determination of the difference between aeronautics and astronautics, and between aircraft and space craft. The advocates of the functional approach argue that since a legal definition is usually intended for permitting certain activities and prohibiting others it is preferable, in regard to outer space activities, to attain this objective not by a legal definition of boundaries but rather by defining objectives and missions for space vehicles, which would correspond to the established practice. They refer to the Outer Space Treaty which provides, inter alia, that space exploration and uses should be for peaceful purposes and for the benefit of mankind. It has also been argued that at the present time no space problem can be identified or anticipated which would require for its solution a demarcation of air space and outer space.

164. M. Lemoine is considered to be one of the first authors to advance a functional approach. In 1947 he wrote that air law was the field of law which determined and studied the laws and legal norms that regulated the traffic and use of aircraft as well as the relations which they brought about and that cosmic law was oriented towards navigation in space.^{143/}

165. J. Kroell expressed the opinion that astrocraft and cosmocraft should be subject to different legal status according to whether their destination is

^{143/} M. Lemoine, Traité de Droit Aérien, Paris, 1947, pp. 3 and 79 and seq.

terrestrial or spatial. Cosmic law would be applicable to cosmocraft because of their extra-terrestrial objective. It would apply to them the moment they leave the earth to avoid complicated determination of their passing from one legal status to another. Kroell advocated the unity of status as a preferable if not a more rational solution.^{144/}

166. Comparing air law to maritime law R. Hombourg wrote that air law was applicable to air navigation and not to space navigation as maritime law applied only to merchant vessels and not, say, to warships. He rejected the spatial approach to the definition of outer space, asserting that even if some boundaries could be established they would be illusory and without practical value. Hombourg defined air law as "the totality of legal rules applying to air navigation between different points of the surface of the earth", and stated that cosmic law was applicable to space navigation, between the earth and another point of the universe.^{145/}

167. Elaborating on the functional theory R. Quadri explained that it was based on the cosmic activities and maintained that air and space represent an inseparable whole, continuous, without distinction or separation of zones. He was also of the view that all jurisdiction over a space craft was vested in the launching State and that the territorial State had no authority with regard to overflying space vehicles of other States.^{146/}

168. C. Chaumont also opposed the establishing of boundaries between air space and outer space based on scientific criteria, as they did not serve practical needs and were not sufficiently evident. He believed it was absurd that two legal statutes could be given to one missile since it would be difficult to determine at what moment a rocket passed from the rules of air law to those of cosmic law. He conditioned the acceptance of the functional theory by the need to define and enumerate the activities of air and outer space which should form a part of each legal status.^{147/}

^{144/} Joseph Kroell, Eléments créateurs d'un droit astronautique, XVI RGA 222, 228 and seq. (1953).

^{145/} R. Hombourg, Etendues et limites du droit aérien, XIX RGA 140, 144 (1956); and Droit astronautique et droit aérien, XXI RGA 15 (1958).

^{146/} R. Quadri, Droit international cosmique, 98 Recueil des Cours de l'Académie de Droit International de La Haye 510, 553 and seq. (1959).

^{147/} Charles Chaumont, Problèmes de droit international de l'espace extra-atmosphérique, lectures given at the Institut des Hautes Etudes Internationales in Paris, 1958-1959, p. 10 and seq.

169. Favouring the functional theory M. Markov suggested that space law should apply to all space ships, even those which were to return to earth, provided space activities were peaceful. In such cases the air medium should not be submitted to national sovereignty. All missiles and interplanetary stations would have the right of innocent passage and the right of flight over state territories.^{148/}

170. The functional theory has been supported by N. Mateesco who finds the boundaries proposed for air space and outer space unacceptable for scientific as well as for legal reasons, and believes that the functional approach appears adequate for an efficient co-operation between States. He summarizes this approach in the following manner:

1. The starting-point of the functional approach is the obliteration of all division between air and space, first because nobody knows the limits of one or the other, and second, because these concepts have only an accessory value in this theory. In the light of this theory, there exists one medium, the coelum which encircles the globe and loses itself in the universe.

2. The concepts of freedom of space and state sovereignty must be understood as indicating a functional freedom and a functional sovereignty, that is the concept of sovereignty can be conceived only in regard to concrete functions rather than in its abstract sense.

3. The functional theory does not reject the rights recognized as belonging to the States, such as their functional sovereignty over the air traffic over their territory or over the activities of their citizens. Thus understood, functional sovereignty will take into account all interests of the States in military security. On the other hand, for the purposes of navigation, air should be as free as space.

4. Functional freedom of space does not mean the right to do anything one wishes. It should be understood as liberty given only in view of certain functions such as humanitarian, scientific, exploratory etc.

5. The right of self-defence (or right to security) and the right of access or right of mobility between two points of the universe are recognized as natural rights and as such must be considered as basic for the study of the functional theory.

^{148/} M. Markov, Liberté de l'espace extra-atmosphérique, 14 Revue générale de l'air, pp. 327 and seq., n. 7 (1951).

6. Finally, by virtue of the functional approach air (or aeronautical) law is that field of the law which applies to the activities of aircraft: planes, balloons and any device requiring air support.^{149/}

171. Elaborating further on this summary, N. Mateesco points out that the natural right of access to outer space stems from the principle that outer space is open to all States and can be compared to the right of all countries including the landlocked ones, to have access to the high seas. It further means that all innocent and harmless techniques to escape terrestrial attraction are good, valid and acceptable by all States. Such techniques may require that the space craft incidentally fly over the territory of some States. If the craft should cause damage to the State flown over, reparation will be owed the latter. If the territorial State has good reason to believe that the cosmocraft will cause damages or is used for aggressive purposes, it has the right to defend itself with appropriate means, proportionate to the danger. Not to be subject to jurisdiction of the territorial State, the craft will have to have a cosmic, spatial or astronomical objective. By the cosmic or astronomical travel of a craft should be understood a trajectory along which at least one stop-over will be elsewhere than on the earth's surface, this stop-over being for peaceful, scientific or humanitarian reasons. To regulate such objectives and trajectories as well as launching a body of rules - space law - should be developed. Eventually it would lead to an aerospace law which

"... would result in the establishment of a real and well-determined functional jurisdiction. This would facilitate international navigation, even inter-astral, as well as harmony and peaceful co-operation between States which will finally open the way to an aerospace law of navigation".^{150/}

172. Another proponent of the functional theory, G. Gal, advances the following arguments to support it. The synthesis of territorial air space and free outer space can only be assured by an international agreement which can break away from the conventional forms, and encompass the activity element of rockets, artificial satellites and planets launched by the States. Space law cannot be associated

^{149/} N. Mateesco, op. cit., pp. 62-64.

^{150/} Ibid., pp. 70-74.

with any limited space (area, zone), but only with the character of activity under regulation. Before the space age, international law regulated rights relevant to territory in such a manner that each legal fact could be accurately localized. In space law a risk to security and the possibility of averting it are no longer linked with a geographical point closely involving some part of the state territory. Space law in its wider meaning also includes national legal norms relating to the entirety of activities in space. With the gradual extension of the scope of international space law, international regulation will gradually approach the launching pads. The only way to preserve the logical unity of legal regulation is by dispensing with the demarcation in space, and adopting the functional basis. Even if demarcation is adopted, it must be concomitant with the functional system. The correctness of the functional theory is further supported by the fact that 71 per cent of the surface of the earth is covered by sea. In the space above the high seas only a regulation based on the nature of space activity will afford a restriction capable of protecting the security of States. In the opposite case, no matter how high the limit of sovereignty should be drawn above the continental territories totalling only 29 per cent of the earth's surface, it would not protect the States from harmful interference through activities carried out above the seas.^{151/}

173. J. Sztucki expressed the following opinion on the validity of the functional approach:

"If the legal status of outer space is to be finally regulated together with the problem of the sovereignty and scope of jurisdiction of States, such regulation must be accompanied by the provision on an international scale of some remedies in the sphere of the protection of States from outer space. In other words, a regulation based on the criterion of the place of activity (distance from the earth) must be accompanied by a regulation based on the criterion of the type of activities, with the elimination of such activities as endanger the security of the States."^{152/}

^{151/} G. Gal, op. cit., pp. 106-109.

^{152/} J. Sztucki, Security of Nations and Cosmic Space. 1961 Symposium, pp. 1175-6. Similarly, V. Kopal: Two Problems of Outer Space Control: The Delimitation of Outer Space and the Legal Ground for Outer Space Flights. Third Colloquium (1960), p. 111.

Rejecting the spatial approach to the definition of outer space and maintaining that space law will develop probably without a delimitation between air space and outer space, without an upper limit of national sovereignty, J. Sztucki concludes that the most important legitimate interests of States can be protected in the most effective manner not by putting territorial limits to State sovereignty but by legal prohibition of such action in the course of space activities, which are likely to endanger these rights and legitimate interests. This includes first of all prohibition of use of space flights for purposes other than peaceful ones. This should be the principal direction and aim of the development of legal rules for astronautics.^{153/}

174. In the United Nations the functional approach to the definition of outer space has been developed by the representatives of France. For example, in the working paper submitted by the French delegation at the fifth session of the Scientific and Technical Sub-Committee it has been stated that a satisfactory definition of outer space as such, based on scientific criteria, i.e. using easily measurable parameters, is impossible and that it is necessary to try other approaches. Noting that the Outer Space Treaty not only used the expression "outer space" but also referred to activities in outer space the French delegation suggested that "space activities" should be defined. It expressed preference for arriving at such a definition on the basis of the purpose of such activities rather than of the means to carry them out.^{154/}

175. At the eighth session of the Legal Sub-Committee the French representative proposed that space activity should be taken to mean "any activity involving the sending into space of an object designed to permit the exploration and utilization of outer space". He explained that the definition had the advantage of using three complementary and inseparable notions: action, place and purpose. The notion of action eliminated other activities (astronomy and radio-astronomy) which it was unnecessary to subject to space law. From the point of view of place, launchings into space would include both satellites orbiting in outer space and

^{153/} J. Sztucki, On the So-Called Upper Limit of National Sovereignty, Fifth Colloquium (1962), p. 11.

^{154/} A/AC.105/C.1/WP.V.1, pp. 3-4.

exploratory balloons or rockets which did not rise above atmospheric space. As to purpose, the definition would cover all activities connected with the exploration or utilization of outer space, including exploratory balloons and rockets, but not including aircraft, even if they entered outer space, since, being intended to link one point on earth with another, they had no space purpose.^{155/}

176. The representative of Argentina said in this connexion that the French delegation's suggestion that the Sub-Committee might begin by defining "space activity" under the 1967 Treaty should not be neglected. He furthermore stated that at the meeting on definition of outer space held by the Scientific and Legal Liaison Committee of the International Academy of Astronautics and the International Institute of Space Law in October 1968, Professor Brun, the Scientific Vice-Chairman of the Liaison Committee had pointed out that the definition of objectives in the French proposal was perfectly compatible with the definitions used by ITU for "space stations" and "space service".^{156/}

177. In the paper received by the United Nations Secretariat from the secretariats of ESRO and ELDO, it is stated in regard to the functional approach, that a definition of space activities should take into account the aim pursued, namely, the exploration and use of outer space, and the means used, namely, the device which is sustained in space by means other than the reactions of the air (for details, see annex).

178. At the fifth session of the Scientific and Technical Sub-Committee the representative of the United States expressed doubt that space activities could be defined in terms of the purposes they were intended to serve. He asked whether that would mean, in practice, that a manned space vehicle could transit a country's air space without permission on the basis that it was conducting a mission in outer space, or that an aircraft equipped with scientific instruments, e.g. for the observation of an eclipse, could be considered to be conducting a space mission and therefore be exempt from normal air space controls. He said the reply should be negative in both cases. The same problem, he added, would arise in the case of balloons and the frequencies to be allotted to them.^{157/}

^{155/} A/AC.105/C.2/SR.111-131, p. 8.

^{156/} Ibid., p. 17.

^{157/} A/AC.105/C.1/SR.44, p. 8.

179. Those authors who do not share the functional theory argue that its basic point of departure - the definition of space activities - is vulnerable since it is not always possible to make a distinction between space activities and other activities. They further argue that the functional theory fails to take into account the prospects of scientific and technical progress in the field of the development of aircraft and space vehicles since this progress makes the problem of distinguishing aircraft from space craft ever more complicated. It is anticipated that in the not too distant future instrumentalities capable of flying along a ballistic trajectory will orbit the earth, fly in outer space and air space, and make soft landings on the earth. The use of such vehicles, it is argued, will require the determination of the altitude limit of the application of state sovereignty.

180. It has also been stated that the functional theory does not harmonize with the concept of state sovereignty in air space. Under this theory States would exercise sovereignty over activities typical to air navigation, even if they are carried out at the altitudes higher than a satellite orbit. On the other hand, the sovereignty of a territorial state would not apply to "space activities" at any, even low altitudes. This situation could lead to an impairment of some activities in outer space and to violations of air space sovereignty.^{158/}

^{158/} G. Zhukov, op. cit., p. 284.

V. CONCLUSIONS

181. The foregoing survey shows that the problem of the definition and/or delimitation of outer space is of great complexity. While it may be said that there are two basic approaches - spatial and functional - to the problem, a variety of criteria under the one or the other approach have been proposed both in and outside the United Nations. However, neither the two basic approaches nor any combination of the criteria seem to have gained general support. Various proposals for an arbitrary delimitation of air space and outer space have also failed to achieve that purpose.

182. Apart from the question of the possibility of defining outer space, consideration has also been given to the question of the need to define outer space. On the one hand, it has been maintained that a definition of outer space is urgently needed for the proper implementation of the existing and future international instruments. On the other hand, it has been observed that the absence of such a definition has not caused any controversy among States or adversely affected the implementation of the international instruments concluded so far in the field of outer space. The view has also been expressed that while a definition of outer space is needed, there should be no haste in working it out since it requires further study.

ANNEX

Replies by specialized agencies and other
international organizations

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO)

In transmitting the following comments in its letter of 9 January 1970, the Secretariat of ICAO observed:

"that they appertain to the Secretariat of ICAO and that the question of the outer limit of airspace has not yet been considered in ICAO by any of the representative bodies.

"First, the principle that every State has complete and exclusive sovereignty over the airspace above its territory, which is recognized in Article 1 of the Convention on International Civil Aviation, is fundamental in law and exists independently of the said Convention. In its historical evolution, certain aspects of aviation played a considerable part, but other factors, including military and political considerations, also underlie that principle.

"Secondly, the International Civil Aviation Organization, as a body, is concerned with the question of national sovereignty in airspace only in relation to the operation of aircraft. The Governments which are parties to the Convention must necessarily take into account non-aviation factors as well, in deciding on the outer limit of airspace, for example, communications satellites, world weather watch for meteorological purposes, and military and political aspects.

"Thirdly, from the point of view only of aviation, airspace is only that space in which an aircraft, as such, can operate. The definition of an aircraft is: 'Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface' (Annex 7 to the Convention on International Civil Aviation, as adopted by the Council of ICAO).

"Fourthly, the maximum altitude, that is, distance from the earth's surface, at which a machine can derive support from the reactions of the air is, according to present estimates, approximately 35 km.; however, technological changes could possibly enable an aircraft to fly as such, namely, by deriving support from the reactions of the air, at an even greater altitude."

INTERNATIONAL TELECOMMUNICATION UNION (ITU)

The following paper on the delimitation of outer space in relation to radiocommunications was enclosed in the letter of 19 December 1969 from the Secretary-General of ITU.

1. Definitions relating to space radiocommunications were included for the first time in the Radio Regulations by the Administrative Radio Conference, Geneva, 1959.

They read as follows:

Space Service: A radiocommunication service between space stations.*

Earth-Space Service: A radiocommunication service between earth stations and space stations.

Space Station: A station in the earth-space service or the space service located on an object which is beyond, or intended to go beyond, the major portion of the earth's atmosphere and which is not intended for flight between points on the earth's surface.

Earth Station: A station in the earth-space service located either on the earth's surface or on an object which is limited to flight between points on the earth's surface.

2. In 1963, the Extraordinary Administrative Radio Conference to allocate frequency bands for space radiocommunication purposes added a number of definitions and replaced those mentioned above by the following:

Space Service: A radiocommunication service:

- between earth stations and space stations,
- or between space stations,
- or between earth stations when the signals are re-transmitted by space stations, or transmitted by reflection from objects in space, excluding reflection or scattering by the ionosphere or within the earth's atmosphere.

* In the context of the Radio Regulations a "station" implies "one or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service".

Earth Station: A station in the space service located either on the earth's surface, including on board a ship, or on board an aircraft.

Space Station: A station in the space service located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the earth's atmosphere.

The reasons for including the words "or has been beyond" in the definition of "Space Station" were "to permit a station to retain its identity in the space service after re-entry into the earth's atmosphere".

3. Thus, while no definition of "outer space" appears in the Radio Regulations, the expression "the major portion of the earth's atmosphere" has so far been the factor used to provide a distinction between space and terrestrial radio services.

A somewhat more precise expression was, however, adopted by the 1963 Conference to define "deep space", i.e.:

"Space at distances from the earth equal to or greater than the distance between the earth and the moon".

4. It is probable that, in the light of experience, further amendments to the definitions in the Radio Regulations will be made by the ITU World Administrative Radio Conference for Space Telecommunications to be convened in June 1971.

UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION (UNESCO)

In its letter of 12 January 1970, the Secretariat of UNESCO transmitted a copy of the report of the Group of Experts on International Arrangements in the Space Communications Field held from 2 to 9 December 1969 in Paris, and stated that this report was relevant to resolution B adopted by the Legal Sub-Committee at its eighth session.

WORLD METEOROLOGICAL ORGANIZATION (WMO)

The following comments were made in the letter of 2 February 1970 from the Secretary-General of WMO:

When speaking from a scientific point of view about the lower limit of outer space, one associates this with the upper limit of the atmosphere, and for

the basis of this discussion these limits will be considered as one and the same. For defining various layers in the structure of the atmosphere, a number of criteria can be used. Temperature distribution is one common criterion, and another is the distribution of various physio-chemical processes (ozonosphere, neutrosphere, chemosphere, etc.).

For defining the upper limit of the atmosphere, however, dynamic and kinetic processes seem to be more useful. As one goes higher and higher above the surface of the earth, the distance between particles in the atmosphere becomes very great and the direction of their movement greatly influences their future. Because of this, a particle at these high levels travelling upward will climb much further than a particle moving downward and a large fraction of very fast particles moving upward will experience no collision as they go into infinitely greater heights and disappear into space. Some slow upward-moving particles will however turn about under the influence of gravity and will fall down into denser layers again. Thus we gradually reach the region of the earth's atmosphere where collisions are negligible. This region is called the "outermost atmosphere" or more briefly the "exosphere". For reasons mentioned above it is also called the "critical level of escape". The height of this critical level is variable within a considerable range but is generally recognized as lying somewhere between 500 and 1,000 km.

WORLD HEALTH ORGANIZATION (WHO)

In its letter of 12 January 1970, WHO stated that while it had an interest in the technical aspects of outer space questions there was no legal connexion or relation between the work of WHO and the definition and/or delimitation of outer space.

INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)

In its letter of 15 December 1969, IAEA indicated the question of the definition and/or delimitation of outer space was somewhat outside the scope of the IAEA's activities and that IAEA could not be helpful in this regard.

COMMITTEE ON SPACE RESEARCH OF THE INTERNATIONAL COUNCIL
OF SCIENTIFIC UNIONS (COSPAR)

Referring to the question of the definition and/or delimitation of outer space COSPAR informed the Secretariat in its letter of 4 December 1969 that it had never considered a legal question of this kind and that therefore it was not competent to express any suggestion at that time.

EUROPEAN SPACE VEHICLE LAUNCHER DEVELOPMENT ORGANISATION (ELDO) AND
EUROPEAN SPACE RESEARCH ORGANISATION (ESRO)

The following communication was transmitted to the Secretariat by a letter of 30 April 1970 from ESRO as a contribution from the Secretariats of ESRO and ELDO:

PAPER BY THE ESRO AND ELDO LEGAL STAFFS

Defining the limits of outer space

1. The work so far done by the Committee on the Peaceful Uses of Outer Space - and by its Legal and Scientific Sub-Committees - has revealed the complexity of the whole problem of defining the limits of outer space. As inter-governmental organizations that have now been engaged in space activities for a period of several years, the European Space Research Organisation (ESRO) and the European Space Vehicle Launcher Development Organisation (ELDO) obviously have a vital interest in this problem. They are therefore delighted to have this opportunity, given to them by the Legal Sub-Committee, of making known their views on the subject.

It needs, however, to be emphasized that the opinions that will be expressed in this paper are those of the executive staffs of the two European organizations, but not necessarily those of their Councils. These opinions represent, moreover, only a first approach to the problem and may be modified or amplified later. They have been formulated jointly by the two secretariats, as part of the co-ordination of their activities within the European Space Conference, and they are based mainly on practical and operational considerations stemming from the activities undertaken by ESRO and ELDO.

/...

2. Whatever may be the political or legal arguments in favour of elaborating a definition of outer space, the main justification for such a definition lies in the existence of two categories of rules of international law, the one relating to air space and the other to outer space. This duality results from historical circumstances and above all from the fact that so-called air law has developed - by analogy with maritime law - around the concept of national sovereignty over air space; whereas so-called space law is, on the contrary, based on the absence of national sovereignty over outer space.

Thus, apart from a few exceptions and nuances, aeronautical activities and space activities are subject to two categories of regulation, each of which is entirely different from the other as regards freedom to conduct the activities concerned, how the activities are regulated, and what liabilities arise from them.

Hence the interest, and even the need, to find a criterion that will make it possible to distinguish the area of application of air law from that of space law. Several theories have been elaborated to this end.

3. The first attempt sought to establish a physical limitation of the field of application of these sectors of the law: air law applies in atmospheric space, and space law beyond. This theory presupposes a definition of atmospheric space making it possible to trace a limit and to distinguish it without ambiguity from outer space. It would seem that the scientific authorities have not been able to reach agreement on a precise scientific definition of such a limit.

Nor does the idea of setting this limit at a pre-agreed altitude seem to have secured agreement.

4. Even at the time that the difficulties of defining the limits of outer space revealed themselves, the very need for such a limitation was contested, and certain authors propounded the thesis that the field of application of space law was not confined to outer space but that its provisions were capable of being applied to atmospheric space and even to the surface of the earth. This argument was buttressed by the positive rules of space law currently in force, as well as by the conventions presently being drafted. For example, the provisions of the convention on assistance to astronauts are envisaged as being applicable not only in outer space but also on the surface of the earth.

/...

5. A second attempt to determine the field of application of space law has been made: this is the material theory which - after being subjected to further elaboration - has become a functional theory. This theory starts from the distinction that is made between craft intended to operate in atmospheric space and those intended to operate in outer space, and it endeavours to define the "space activities" to which the criteria of space law apply, as opposed to those activities that are governed by air law.

It has not so far been possible to secure unanimous agreement to any definition of space activities. However, it would seem that this definition should take account of the aim sought, namely the exploration or exploitation of space, and of the means used, i.e. craft that maintain their flight otherwise than by the reaction of the air. Definition of space activities on the basis of these two elements makes it possible to narrow down the field of application of space law, but does not cover the problems that will shortly arise with the introduction of space transporter systems having a space-oriented aim but using manned means of navigation similar to those of aircraft. The definition includes sounding rockets without any requirement to specify the maximum altitude, or the aim sought in launching them, and it excludes aircraft capable of reaching outer space altitudes (X-15).

6. Definition of the field of application of space law in accordance with the functional theory thus avoids the setting of a limit to atmospheric space, but it poses two problems that need to be examined:

- (a) Compatibility of the rules of space law and air law;
- (b) Compatibility of space activities with the sovereignty of States over their atmospheric space.

(a) Compatibility of the rules of space law with those of air law

Since the rules of air law and of space law apply concurrently in atmospheric space it is necessary to ensure uniform regulation of the use of space generally, in order to avoid sources of conflict between aeronautical activities and space activities. It would seem that the solution of this problem should be found in harmonizing the legal provisions applicable to space activities with those that are applicable to air activities.

/...

Space law should retain the fundamental principles on which it is based but should incorporate to the full extent necessary - but only to this extent - a certain number of the present rules of air law. To take an example, a craft such as the space shuttle should, while passing through the atmosphere, conform to the air traffic rules, but should be subject to the rules of space law as regards liability, assistance and return, etc.

(b) Compatibility of space activities with sovereignty over air space

The Paris (1919) and Chicago (1944) Conventions on air navigation recognize the sovereignty of States over the air space above their territories. Moreover, for twelve years now satellites have been over-flying the countries of the world at minimum altitudes of the order of 100 km without any protest having been recorded claiming that they violated State sovereignty. It is thus accepted that the sovereignty of States over space is limited, the problem being to determine what the limits of this sovereignty are.

It is in connexion with this limitation of the sovereignty of States that the real need appears to fix the limits of atmospheric space. Many authors have regretted that the Paris and Chicago Conventions affirmed the principle of the sovereignty of States over their atmospheric space rather than simply regulating the use of this space.

Also, there are projects for satellites whose orbit would be very low (80 km).

Lastly, the future of supersonic aviation, as at present envisaged, does not seem likely to involve the use of layers of the atmosphere above 30 km.

These various considerations constitute pertinent arguments for fixing the limits of atmospheric space at as low an altitude as possible. No valid objection seems to have been made to a strict limitation of atmospheric space, and it must also be noted that whatever this limit may be it cannot in any case protect the State against the activities of the spy satellite and against radio and television broadcasts by satellites. It is by means of international regulation and the establishment of a code of sound practice in the field of the use of space that it should be possible to find a solution to these problems.

7. In conclusion, the most important problem in the development of space law seems to consist in the provision of a satisfactory definition of space activities. Fixing the limit between atmospheric space and outer space appears to be a matter of only secondary importance; the arguments put forward above show that it should be done arbitrarily, selecting as low a threshold as possible so as to ensure liberty to explore and exploit space while at the same time effectively protecting the sovereignty of States.

In proposing the pragmatic solution suggested above, the ESRO and ELDO secretariats are well aware of the numerous and important problems that it raises. If the solution is considered worthy of further examination, they will naturally be glad to offer their assistance in a more detailed study of it.

The responsible executives of the two inter-governmental European organizations whose activities are exclusively confined to the space field must in any case advocate that as precise rules as possible be elaborated to provide total regulation of space activities, so as to complement the general principles enunciated by the Space Treaty and by the Agreements reached for its execution.

INTERNATIONAL ASTRONAUTICAL FEDERATION (IAF)

In its letter of 2 March 1970 IAF transmitted to the Secretariat a reprint of an addendum to the Proceedings of the Xth Colloquium on the Law of Outer Space, containing three papers which served as a basis of a discussion on the definition of Outer Space at a meeting of the Scientific-Legal Liaison Committee of the International Academy of Astronautics on 26 September 1967. It was stated in the letter that on 15 October 1968 the Academy, through its Scientific-Legal Liaison Committee, organized a Round Table on the "Determination of the scientific factors for defining outer space", which was held at New York during the XIXth International Astronautical Congress, and that the report of the Round Table was published in the Proceedings of the XIth Colloquium on the Law of Outer Space of the International Institute of Space Law (pp. 371-395; Editor: M. Schwartz).

INTER-AMERICAN COMMITTEE FOR SPACE RESEARCH (IACSR)

The following comments were transmitted to the Secretariat on behalf of IACSR by the National Space Research Commission of Argentina in its letter of 6 March 1970:

FUNDAMENTAL POINTS TO CONSIDER IN REGARD TO
THE DELIMITATION OF OUTER SPACE

1. The boundary between air space and outer space must be established before the latter can be defined.
2. States must decide on such delimitation soon, for at present there are different juridical régimes governing the two areas.
3. The boundary must be established by agreement for, in addition to the fact that there are no definite scientific criteria for fixing a boundary precisely, air space and outer space are both juridical concepts divorced from physical reality.
4. Consequently, establishing the boundary between air space and outer space - which is important only in that it will enable States to determine how far their respective sovereignty extends - is a task for legal experts.
5. As States have formally renounced the exercise of sovereignty over outer space, it is obviously within their power to determine the point from which that renunciation is to be effective.
6. The fact that many vehicles were in orbit when the 1967 Outer Space Treaty was opened for signature makes it possible to establish the boundary with relative accuracy.
7. Since the positive law of States at that time established a régime - which is still in effect today - prohibiting free passage through air space, it stands to reason that the limit to be fixed cannot be lower than that of satellite orbits.
8. The aforementioned criterion is less likely to impede determination of the law to be applied than that based on the activities to be carried out, since it is States themselves which determine the type of space activities to be undertaken in the area under their jurisdiction and only those of an international nature are determined by agreement.

9. The foregoing would suggest that at the present time a boundary fixed at 100 kilometres above the earth's surface would be the most reasonable one. This boundary is only conventional and as such is valid for the immediate future.

INTERNATIONAL TELECOMMUNICATIONS SATELLITE CONSORTIUM (INTELSAT)

In its letter of 10 February 1970, INTELSAT informed the Secretariat that it would not be possible to provide the information within the time limit due to the fact that the Interim Communications Satellite Committee would not meet again until April.
