THE REGULATION OF ACTIVITIES IN EXTRA-AERONAUTICAL SPACE, AND SOME RELATED PROBLEMS

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Introduction

Space and pre-space law

The time has finally come to put an end to the interesting, but purposeless discussion of the question whether and in what manner existing legal rules, particularly those regarding sovereignty over airspace, apply or whether they may be construed in such a manner as to make them apply to the status and legal regime of extra-aeronautical space. It is gratifying to note that speakers at the Fourth Colloquium on the Law of Outer Space, held at Washington in October 1961, were less concerned with finding out where the outer limit of airspace lies under the present law, and concentrated instead on the more practical problem of where actually to draw the lower limit of extra-aeronautical space which, it seems now agreed, is not subject to the sovereignty or jurisdiction of the underlying State. On the other hand, it is urgent indeed to develop and to agree on the rules to govern the steadily expanding and increasingly daring space activities.[1]

Space activities have presented humanity with a "novel case". Hence, it is useless to attempt to base the legal regime of outer space on the traditional law of nations or on the existing rules of international air and maritime law.[2] Like any "case of first impression", a legal system for outer space, including its geographical scope, will be established by decisions of an essentially political character, even though some attempt will be made to vest these decisions with a semblance of legal respectability by the use of such juridical alibis as restrictive, extensive, literal or historic construction of existing rules, analogy

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[1]Writings on this subject have become so abundant that even a select bibliography becomes unwieldy. An important selection of papers and a comprehensive bibliography have been published in March 1961 by the Legislative Reference Service of the Library of Congress, Washington, under the title: "Legal Problems of Space Exploration — A Symposium," for the use of the Committee on Aeronautical and Space Sciences of the United States Senate — Senate Document No. 26, 87th Congress, 1st Session.

[2]The question of the bearing of article I of the Chicago Convention on the legal status of outer space has been authoritatively discussed in many publications and statements by J. C. Cooper. See in particular: "Legal Problems of Upper Space" (1956) Journal of Air Law and Commerce, p. 308; Proceedings of the American Society of International Law (1956), p. 84; "High Altitude Flight and National Sovereignty" (1951) International Law Quarterly, p. 411; Hearings of the Select Committee on Astronautics (Washington, 1958), p. 1277; *see* also my comments in Annuaire français de droit international (1959), p. 129 and p. 149 *et seq.*, and E. Pepin, "The Legal Status of the Air Space in the Light of Progress" in Aviation and Astronautics, (Publication No. 2 of the Institute of International Air Law, Montreal, 1957).

or *argumentum e contrario*.[3] No such decision has yet been taken, and the debate in the United Nations shows the great reluctance of States to venture in this field.

A functional approach to "space law"

It is suggested that there is no urgent need to take such political decisions forthwith.[4] It will indeed be sufficient to establish the regulations which will govern the operation and exploitation of space vehicles, *i.e.* the technical conditions of the day to day uses of extra-aeronautical space.[5] Moreover, an international agreement on that matter might probably be limited for the time being to providing the necessary machinery for the making and enforcement of these regulations, as was done to some extent at Chicago in 1944 for the regulation of international air navigation.

Once it is agreed that the use of outer space shall be confined to peaceful activities, there will be no need to take sides in the major dispute on whether sovereignty extends into space, and to what height, and whether space above

[3]E. Geny, *Science et technique en droit positif*, t. I, p. 109 and t. III, p. 175; J. Dickenson and L. L. Fuller in *Recueil Gény*, t. II, p. 118 and t. II, p. 158. L. E. Becker has very properly stated: "And we must recognize that the choice of rules in this area will represent a major policy decision for each of the various States . . ."; The JAG Journal (1959), p. 30.

[4]The debates in the United Nations show the great reluctance of States to venture in this field. See statements made at the 13th General Assembly of the United Nations: (UN) A/C.1/PV. 985 *et seq.* and A/AC-98/C.2/SR 1 *et seq.* For the views of the USA, see the statement of Senator Lyndon Johnson at the 1st Committee of the 13th UN Assembly: "Today outer space is free. It is unscarred by conflict. No Nation holds a concession there. It must remain this way"; (UN) A/C.1/PV. 986, p. 23.
See also P. W. Quigg, "Open Skies and Open Space" (1958) Foreign Affairs, p. 9559; and J. G. Fulton, "A Definitive Study of the Concept and Scientific Strategy of Outer Space", in First Colloquium on the Law of Outer Space (Vienna, 1959), p. 51. On the other hand, Mr. L. E. Becker, The JAG Journal (1959), p. 459, has stated: "The United States has never in fact recognized any top or upper limit to its sovereignty. Even if such international agreements as the Chicago Convention of 1944 be interpreted as conferring 'complete and exclusive' sovereignty only within some limit of 'air space' — a concept not defined either in the Convention, by lawyers, or by scientists — it should be noted that this does not of itself establish that the United States has no rights above these limits. Neither the United States nor any other nation has thus far taken any position as to whether it possesses such rights. . . . Thirdly, as a policy matter, undesirable implications might be drawn from any unilateral definition of 'air space' or even an attempt at definition, which might prejudice the United States in possible future negotiations with other nations for an appropriate regime for outer space. Thus, such a definition might be interpreted as a renunciation of existing sovereignty beyond such limits or as an indication that 'outer space' beyond the 'air space' is not capable of sovereign appropriation. While the United States may ultimately accede to such views or such limitations, it seems wise for the moment to remain flexible and preserve all rights that our activities may give us, so that we retain a bargaining position which we could use in order to eusure that any international arrangements relating to outer space are in full accordance with our security and other interests."

[5]For a comprehensive analysis of the political and other interests involved, see M. S. McDougal and L. Lipson, American Journal of International Law (1958), p. 407; E. Saenger, "Raumfahrt," in Aussenpolitik 1957, p. 310; and the speech by the Australian delegate before the 1st Committee of the 13th General Assembly of the UN; A/C.1/PV. 986, p. 42 *sq.*

a certain height is *res communis* or *res nullius*.[6] Before passing on to other problems, it is however worthwhile to note that the extension of sovereignty into outer space does not provide an efficient protection against hostile attack from space; nor is it a prerequisite for assuring national defence and for the safeguarding of public order and peace. For, in the present state of aeronautics and space sciences, aerial espionage and bombardments can be carried out by airplanes or space vehicles well outside the boundaries of the attacked State. On the other hand, it would be very dangerous to recognize sovereignty above the present airspace — whatever the height of the latter — because that would permit the underlying State to engage in space activities over its own territory, however harmful to others, *e.g.* exploding of nuclear bombs, interfering with telecommunications, spreading of disease, etc. It thus becomes evident that were sovereignty to reach into extra-aeronautical space, the exercise of that sovereignty would have to be limited by international agreement in order to protect the vital interests of humanity. For the same reasons, an agreement to restrict the free use of extra-aeronautical space is required if this part of space is considered to be outside the jurisdiction of any State.[7] That such agreement will be difficult to achieve is evidenced by the fact that the nations assembled at Geneva for the purpose of codifying the law of the high seas were unable to agree on the interdiction of polluting the high seas through radioactive materials.[8]

The foregoing leads us to conclude: first, whether legal theory or political expediency is to lead to freedom of outer space or to a system of outer space parcelled out amongst sovereign nations, there will still remain, in either case, the need to develop rules for the peaceful uses of space "by humanity, to serve humanity";[9] and second, once these latter rules have been established, the

[6]Westlake, Annuaire de l'Institut de Droit International (1906), p. 293; H. Zitelmann, Luftschiffahrtsrecht 1910. P. de La Pradelle, Recueil des Cours de la Haye (1954), t. II, p. 126; Schoenborn, "La notion juridique du territoire", Recueil des Cours de la Haye (1929), t. V, p. 158; A. Meyer, "Rechtliche Probleme des Weltraumfluges" 1953, Zeitschrift fur Luftrecht, p. 32; H. W. Prinz von Hanover, "Die Rechtsprobleme des Weltraumfluges", in Weltraumfahrt (Frankfurt, 1953), p. 116 and Grotius Stiftung, 28 Aug., 1958; J. C. Cooper in First Colloquium on the Law of Outer Space (Vienna, 1959), p. 38, and, more recently, in Astronautics, October 1961, p. 64, and Revue française de droit aérien, 1961, p. 220 *sq.*

[7]Those who advocate the recognition of "freedom of space" similar to the "freedom of the seas" are likely to forget that the latter was recognized internationally only at a time where a network of national laws and international customs had already produced a sufficiently vast body of "rules of the sea", to avoid anarchy.

[8]See Official Records of the UN Conference on the Laws of the Sea, vol. IV, Second Committee, 29th and 31st meetings, and vol. II, Report of the Second Committee, p. 94, Text of Art. 27 of the Convention, p. 135, and of Resolutions I and II, p. 143.

[9]From the message by President F. D. Roosevelt to the 1944 Chicago Conference: "I hope you will not dally with the thought of creating great blocks of closed air, thereby tracing in the sky the conditions of future wars . . . Rather, in full recognition of sovereignty and juridical equality of all nations, let us work together so that the air may be used by humanity, to serve humanity": Proceedings of the International Civil Aviation Conference, Washington (1948), t. I, p. 43.

regime of space will have been determined implicitly for all practical purposes, and its geographical frontiers will become irrelevant.[10] There will be no need to decide "Who owns the Universe"[11] when it has been agreed under what conditions it can be explored and be used by everybody's peaceful space vehicles.

The report of the United Nations *ad hoc* Committee on the peaceful uses of outer space provides valuable information with respect to the manifold technical problems for which the establishment of such legal rules is urgently needed in order to guarantee "the orderly and peaceful use of outer space".[12] This paper, however, will deal only with two major questions, namely:

I—The prevention of harmful uses of space vehicles, and

II—The need for, and jurisdiction of, an international agency.

The report of the United Nations Committee refers also to the many questions of substantive law, both public and private, which need to be reconsidered and which require new solutions not incompatible with, and based

[10]Similar views were expressed in the United Nations *ad hoc* Committee on the peaceful uses of outer space. See the Report, A/4141, No. 26, p. 68: "There was also discussion as to whether or not further experience might suggest a different approach, *i.e.* the desirability of basing the legal regime governing outer space activities primarily on the nature and type of particular space activities."

See also L. E. Becker, *supra*, note 4, at p. 29: ". . . Various international arrangements to deal with particular problems or activities might well be made, or the development of international law be encouraged, by passing as it were the question of sovereignty, but providing a firm foundation for cooperative activities of a peaceful, scientific and mutually beneficial nature . . .".

[11]O. Schachter, "Who Owns the Universe", in *Across the Space Frontier*, (New York, 1952).

[12]The *ad hoc* Committee on the Peaceful Uses of Outer Space was established by Resolution 1348 (XIII) of the 13th Session of the General Assembly of the United Nations. It was composed of representatives of Argentina, Australia, Belgium, Brazil, Canada, Czechoslovakia, France, India, Iran, Italy, Japan, Mexico, Poland, Sweden, U.S.S.R., United Arab Republic, United Kingdom and United States of America. However, the representatives of Czechoslovakia, India, Poland and the U.S.S.R. did not participate in the Committee's work. The Report of the *ad hoc* Committee, Doc (UN) A/4141, was submitted to the 14th Session of the United Nations General Assembly. On the recommendation of its First Committee, Doc (UN), A/4351, the 14th Session of the UN General Assembly adopted Resolution No. 1472 (XIV), which establishes in Part A a Committee on the Peaceful Uses of Outer Space, consisting of Albania, Argentina, Australia, Austria, Belgium, Brazil Bulgaria, Canada, Czechoslovakia, France, Hungary, India, Italy, Japan, Lebanon, Mexico, Poland, Roumania, Sweden, U.S.S.R., United Arab Republic, United Kingdom and United States of America, and requests that Committee: "(a) to review as appropriate the area of international cooperation, and to study practical and physical efforts for giving effect to problems in the peaceful uses of outer space which could appropriately be undertaken under the United Nations auspices . . . , and (b) to study the nature of legal problems which may arise from the exploration of outer space." Part B of the same Resolution requests the Committee on Peaceful Uses of Outer Space, in consultation with the Secretary General and in co-operation with the appropriate specialized agencies, to work out proposals for the convening in 1960 or 1961, under the auspices of the United Nations, of a Conference of interested Members of the United Nations and Members of the specialized agencies for the exchange of experience in their peaceful uses of outer space. The Committee set up by the 14th General Assembly has met for the first time in November 1961, during the 16th General Assembly.

on the novel fact of human activities extending into extra-aeronautical space. As an example of a possible approach to these problems, Section III of this paper will contain a discussion of liability arising out of the operation of the space vehicles.

Section I

The Prevention of Harmful Uses of Space Vehicles

We can dispense with a detailed analysis of the potential dangers of non-military space activities for life on earth. Indeed, it is sufficient to recall the statement of Senator Lyndon Johnson (now the Vice-President of the United States of America) before the First Committee of the Thirteenth United Nations General Assembly: "From Outer Space the masters of the boundless space can control the weather on the globe, give rise to drought or floods, change tides, raise the level of sea waters, divert the Gulf Stream, and change moderate climates and weather to cold climates."[13] Hence, to limit the access of outer space to "civil" space vehicles is not sufficient to guarantee its peaceful use. Moreover it is all but impossible to draw a perfect distinction between civil and military spacecraft, since the experts agree that "all types of space vehicles have potential capabilities of military value, and these capabilities cannot be physically or functionally severed from a type of space vehicle honestly intended for civilian or purely scientific use."[14] It is, therefore, essential that international legislation be adopted with a view to defining permissible space activities and to provide machinery capable of ensuring that "civil" space vehicles will not be used for harmful activities.

While a multilateral agreement can establish a definition of illicit space activities, it will be impossible in such a treaty to describe in detail all prohibited activities and to make detailed rules governing the peaceful uses of space, for the question of whether a space activity is permissible is determined "by reference not only to altitude and position, but also to trajectory, flight mission, known or referred instrumentation, and other functional characteristics of the vehicles or objects in question."[15] In other words, detailed technical rules for ensuring the peaceful nature of a given space activity, including the rules regarding satellite instrumentation, orbits, etc., can be adopted only on an *ad hoc* basis. Also, since our present knowledge of space techniques and

[13](UN) A/C. 1/PV. 982, p. 6.

[14]Chester Ward (Rear Admiral, Judge Advocate General of the Navy), "Space Law as a Way to World Peace" The JAG Journal (1959), p. 10, at p. 21. It appears also that it is relatively easy for space vehicles, even when engaged in peaceful uses, to operate clandestinely, at least for some time. Thus, it was reported by the New York Times Service on November 3, 1959, that American scientists discovered after one year that a certain space probe had produced a second radioactive shield. Actually, that shield had produced northern lines which Russian scientists had reported and studied without knowing that they were due to a US space probe; see D. Dubaric, in *Signes du temps* (Paris, 1959).

[15]Report of the UN *ad hoc* Committee, p. 68, No. 27 *in fine*.

space potentialities is rather fragmentary, it would be most impracticable to write such technical rules into a treaty which would require frequent amendments in the light of experience gained.[16] For all these reasons it is believed necessary to create an international organization for the development of the technical regulations for peaceful space activities, which would in this regard exercise functions similar to those of ICAO in the field of international civil aviation.

A further question is the enforcement of the various general and specific rules for the prevention of harmful space activities and for the orderly operation of "peaceful" space vehicles. This question raises particular problems having regard to the present world situation. Under traditional international law the mere pledge of a State to refrain from a specific activity, and consequently, to make laws prohibiting its nationals from engaging in such activity, is considered sufficient to ensure the fulfilment of the relevant treaty obligation. For example, the 1944 Chicago Convention on international civil aviation prohibits the carriage of "munitions of war or implements of war in or above the territory of a State in aircraft engaged in international navigation" and authorizes each Contracting State to "prohibit or regulate the use of photographic apparatus in aircraft over its territory".[17] However, it does not require international pre-flight inspection, nor does it provide any specific sanction in case any of these provisions are violated.

Thus, in the traditional view, the prospects of retaliatory action, ranging from economic sanctions to declarations of war, were believed to be good enough to guarantee the respect of treaty obligations. However, this is no longer so in the cold war. Having regard to the enormous and irreparable damage likely to be caused by the misuse of space vehicles, and taking into account the ease and promptness with which peaceful space craft can be turned to uses which are dangerous for whole regions of the earth or prejudicial to public order and safety, it will be necessary to set up some international agency to inspect space vehicles before they are launched. Clearly, the space vehicles and space probes launched since 1957 by the U.S.A. and U.S.S.R. have not been subject to a pre-launching international inspection. However, these launchings occurred while there was still no international agreement on the control and peaceful use of outer space; and, although the peaceful purpose of some of these

[16]"The *ad hoc* Committee considered that a comprehensive code was not practical or desirable at the present stage of knowledge and development. Despite the progress already made, it was emphasized that relatively little is so far known about the actual prospective uses of outer space in all their possible varieties of technical significance, political context and economical utility"; Report of the *ad hoc* Committee, No. 7, p. 63. With regard to the determination of the legal lower limit of outer space the Committee equally found that "an authorative answer to the problem at this time would require an international agreement, and the opinion was expressed that such an agreement now, based on current knowledge and experience, would be premature": Report, p. 68, No. 24. Also, L. E. Becker, *supra* note 4, at p. 30:"Once again sensible solutions cannot be evolved to future problems whose nature and context cannot be accurately foreseen."

[17]Articles 35 and 36 of the Convention on International Civil Aviation.

space probes has occasionally been questioned, no space vehicle has yet been used to attack a foreign State. This self-restraint may be attributable to the fear of retaliation, or, more hopefully, it might be the first evidence of a common desire for peaceful coexistence which is essential for the orderly and peaceful use of outer space.

As space vehicles become more versatile and since their paths and activities can be changed by remote control, some method of international inspection and control of space vehicles will be an essential prerequisite to any agreement on the peaceful uses of extra-aeronautical space. Indeed, a system of inspection and control is essential to meet the legitimate apprehensions of the people of the world. Further, it may well become the cornerstone of the future regime of outer space. In fact, several delegates to the United Nations have strongly recommended that the exploration and peaceful uses of space be brought under the vigilant control of an international body which, according to some States, should have exclusive jurisdiction, if not true sovereignty, over outer space. Thus, while a formal treaty is required to make such preliminary international inspection of space vehicles compulsory and to lay down the principles and procedure of such inspection, the actual carrying out of the inspection should be entrusted to international commissions, or preferably to an international space agency.

There are additional reasons for recommending the establishment of an international agency. Such body would not only control, but could actually foster the conquest of space for the benefit and progress of all mankind. It could do so by making rules and regulations with respect to space flights and activities, and by direct participation in such activities. The following chapter deals in some detail with the jurisdiction and functions which might be given to that agency.

Section II

Need for, and Jurisdiction of an International Space Agency

A problem to be solved

Space traffic has already gained momentum. At the present there are approximately 60 man-made objects travelling through extra-aeronautical space. The tremendous increase of that traffic expected in the next few years makes it necessary to adopt basic regulations without any further delay in order to ensure the "open and orderly conduct of space activities" and to avoid space accidents.[18] In particular, measures must be taken to prevent certain legitimate space activities from interfering with each other, *e.g.* collisions between space vehicles, interference with radio-communications, etc., and to ensure that space activities will not impede navigation in the airspace, nor be harmful to life and property on the earth.

At the present stage of knowledge and development it would be premature if not impossible to draft final rules guaranteeing the peaceful use of outer

[18] See Report of UN *ad hoc* Committee, p. 29, No. 11.

space because, "despite the progress already made . . . , relatively little is so far known about the actual and prospective uses of outer space in all their possible varieties of technical significance, political context, and economic utility".[19] Moreover, in view of the urgency of the matter it would be quite unrealistic to suggest that the necessary rules could be drawn up in one or several basic international agreements, for the negotiation, conclusion and final ratification of such agreements are spread normally over several years; in addition, the subsequent adoption of any amendments thereto would also be a very cumbersome affair. The precedent established successfully in the field of international civil aviation by the International Civil Aviation Organization (ICAO) proves clearly that it is relatively easy for an international agency to develop the required technical regulations and to amend them if necessary by a procedure which does not involve lengthy delays.[20] It is therefore suggested that an international agency be given regulatory powers to promulgate and enforce the rules required for the conduct of peaceful activities in space. This agency should also be granted additional powers for the purpose of promoting the peaceful development of space operations and explorations, and to ensure the safe and orderly growth of space activities.[21]

The following is but an outline of the desirable scope of the jurisdiction of such an agency.

1. *Regulatory powers to promulgate and enforce rules required for the conduct of peaceful activities in space.* These rules fall into two categories: rules for the prevention of dangerous and damaging activities, and rules which will ensure the "orderly and open exploitation of outer space" and the safe operation of space vehicles. As already mentioned, the former group of rules must define and list the characteristics of prohibited activities, making "appropriate provisions respecting the permissibility of a given activity by reference not only to the altitude and 'vertical' position but also to the trajectory, flight mission, known or referred instrumentation, and other functional characteristics of the

[19] *Ibid.*, No. 7, p. 63.

[20] International standards and recommended practices for the safe operation of civil aircraft engaged in international flights are established by the Council of ICAO and are known as "Annexes" to the Chicago Convention; (see hereafter Note 23 for the list of technical Annexes). The drafts of such Annexes are developed by Divisional Meetings, dealing with one subject, at which all Contracting States may be represented. The draft is then submitted to the Air Navigation Committee, an auxiliary organ of the ICAO Council, which may modify the draft. The draft annex prepared by the Commission is communicated to all Contracting States for comments and, thereafter, reviewed and, if appropriate, modified by the Council. The adoption of an Annex by the Council requires the vote of two-thirds of the Council and becomes effective within three months after its submission to Contracting States unless in the meantime a majority of the Contracting States register their disapproval with the Council (Art. 90 of the Chicago Convention). The same procedure is followed for the amendment of an annex. No annex or amendment thereto adopted by the Council has been disapproved by a majority of Contracting States.

[21] "The *ad hoc* Committee feels strongly that the conduct of space activities must be effectively open and orderly"; Report, p. 29, No. 11.

vehicle".[22] The rules governing the use and operation of space vehicles must deal, for instance, with the identification and registration of space vehicles; coordination between space vehicles and conventional aircraft; trajectories on the way to and from outer space; "re-entry" and landing; allocation of radio frequencies; equipment ensuring remote control; and "space-worthiness". These rules and regulations will eventually constitute a complete code of the law relating to the peaceful use of outer space, establishing thereby the legal status of outer space for all practical purposes.

The following is a first list of the main matters of substance for rules relating to the use of outer space. It reflects in part the experience of ICAO in the development of standards and recommended practices in the so-called Annexes to the Chicago Convention (A)[23] and in part the appearance of new problems peculiar to space flights and activities (B).

A—Matters arising out of the experiences of ICAO: Registration and nationality of space vehicles[24]—Uniform dimensional units[25]—Minimum requirements for space vehicles and embarked tracking apparatus[26]—Cosmic charts[27]—Allocation of trajectories[28]—Tracking of space vehicles[29]—Space communications[30]—Launching pad requirements[31]—Accident investigation[32].

B—New Space Problems: Registration of orbiting elements[33]—Prevention of dangerous activities—Control of orbiting space vehicles—Destruction of "wild"

[22]Report of the UN *ad hoc* Committee, p. 68, No. 27.

[23]ICAO has promulgated the following 15 technical Annexes which constitute a comprehensive international civil aviation code: Annex 1—Personnel Licensing; Annex 2—Rules of the Air; Annex 3—Meteorology; Annex 4—Aeronautical charts; Annex 5—Dimensional units to be used in air-ground communications; Annex 6—Operation of aircraft—International commercial air transport; Annex 7—Aircraft nationality and registration marks; Annex 8—Air-worthiness of aircraft; Annex 9—International Standards and Recommended Practices; Annex 10—Aeronautical telecommunications; Annex 11—Air Traffic Services; Annex 12—Search and rescue; Annex 13—Aircraft accident inquiry; Annex 14—Aerodromes; Annex 15—Aeronautical Information Services.

[24]It is essential that space vehicles, their origin, use and eventual destination be readily identified; *see* Report of the UN *ad hoc* Committee, p. 45, No. 70; McDougal, "Artificial Satellites", American Journal of International Law, 1957, p. 77.

[25]Same Report, p. 41, No. 60 and p. 49, No. 86 and 87.—See ICAO Annex 5.

[26]It is necessary to define the minimum requirements of "space-worthy" vehicles and to prescribe the instrumentation required to guarantee the control and, if necessary, the destruction of the vehicle while above the Earth.—See ICAO Annex 8, and Art. 30 and 33 of the Chicago Convention.

[27]The Report of the *ad hoc* Committee mentions repeatedly the need for the overall collection, cataloguing and dissemination of data and results obtained from space activities, "if the world is to benefit fully from and to contribute to the advancement of the space era", *e.g.* No. 19, p. 50, and No. 122, p. 58.

[28]See ICAO Annexes 2 and 11.

[29]See ICAO Annexes 2 and 11.

[30]Report of the UN *ad hoc* Committee, No. 59, p. 41, and No. 69, p. 45.—ICAO Annex 10.

[31]ICAO Annex 14.

[32]Art. 28 of the Chicago Convention, ICAO Annexes 12 and 13.

[33]Report of the *ad hoc* Committee, No. 70, p. 45.

space vehicles—Destruction of spent, useless or interfering satellites[34]—Prevention of contamination—Co-ordination of the activities of space vehicles—Co-ordination of space flights and civil aviation.

2. *Jurisdiction over space vehicles.*—Apart from these regulatory powers, the international space authority should also be vested with jurisdiction to control the operation of space vehicles and their equipment. Thus it would be in a position to ensure that these vehicles would not be used by some States as a means of intimidating and subjugating others, nor put to uses likely to endanger national survival or the life of human beings. This control should be organized in different ways at various stages of operation, *i.e.* the methods of control would vary with respect to inspection of engines and instruments before launching, monitoring of trajectories and space communications, control of messages sent and of orders given to the vehicle, observation and remote control, monitoring of space stations, and administration and inspection of space installations for common use.

3. *Promotion of joint operations in space.* The third main objective of an international space authority should be the *promotion of joint space activities.* States actively conducting space explorations already derive substantial advantages therefrom. New and precious benefits are expected from further advances in the use of outer space. In the twentieth century, however, it is inadmissible that these advantages should remain the monopoly of a few "privileged" nations. Therefore, provisions must be made for them to share these benefits with other countries or, alternatively, for reserving to an international body all space activities which are for the common good of mankind.[35] On the latter alternative more will be said in a later paragraph.

[34]Report of the *ad hoc* Committee, No. 71, p. 46.—For a detailed analysis of the need for, and the substance of rules concerning activities in space, see our study "Legal Regime and Conditions for the Use of Space-Vehicles", Review of Contemporary Law (1960), p. 25 *et seq.*

[35]"The Committee recognizes that the great forward surge of space activities may also tend to widen the gap between the technologically advanced nations actively launching vehicles into space and other nations watching and wishing to take part in space activities, but feeling unable to do so. The problem is to make available and to exploit the possibilities that exist for participation by nations at all levels of development, from supporting research or operation of tracking stations to launching small vehicles or joining with others in more advanced undertakings", Report of the *ad hoc* Committee, No. 10, p. 29. Particularly, it is inconceivable that meteorological and communication satellites could be used only by the launching States, with the resulting multiplication of such satellites by all States interested in their use and capable of producing them. In this respect it is noted that the United States has already taken the initiative of inviting other States, including the U.S.S.R., to participate in the common exploration of space. See the statement by T. Keith, Director of N.A.S.A., on December 7, 1959: Department of State Bulletin, January 11, 1960, p. 58, and also the resolution passed by unanimous vote of the Congress of the United States, which declares *inter alia*: "That it is the sense of Congress . . . that the United States should seek through the United Nations by all means as may be most appropriate an international agreement providing for joint exploration of outer space . . . (And) that the United States should press for an international agreement providing for joint cooperation in the advancement of scientific developments which can be expected to flow from the exploration of outer space such as the improvement of communications, the betterment of weather forecasting, and other benefits . . .", House Concurrent Resolution 332, United States House of Representatives, June 2, 1958; United States Senate, July 23, 1958.

Under the first alternative, however, the agency would be given the right to decide whether a space vehicle of one State can be used by other States, and, where appropriate, to prescribe the conditions and terms under which a nation would be permitted to make use of the existence or activities of a space vehicle belonging to another country.

Similarly, the competence of the agency would encompass the many space activities which, by their very nature, require, and to ensure their successful operation, need a combined international effort, as, for example, the joint operation of certain space vehicles and ground stations. With respect thereto the United Nations *ad hoc* Committee noted the following instances: simultaneous launchings of sounding rockets for the investigation of the upper atmosphere and for rocket astronomy experiments; international use of launching ranges and creation of an international rocket range for scientific experiments; co-operation in tracking and telemetering, since orderly and successful tracking and telemetering normally require the establishment of the appropriate stations on territories outside the jurisdiction of the launching State; and international co-operation programmes for the processing of tracking and telemetering data.[36]

Moreover, since the space vehicles in orbit may soon outnumber the ground tracking stations, it might become necessary to provide for the specialization of the various ground stations and to co-ordinate the timing of communications to and from space vehicles. Also, in view of the high cost of satellites and space vehicles, there may be definite advantages in the co-ordination of the space projects of the various nations.[37] It is submitted that the proposed

[36]Report of the UN *ad hoc* Committee, No. 95, p. 51: ". . . it might be desirable on occasion for a single nation to undertake to launch a scientific satellite or space probe under the auspices of the International Council of Scientific Unions or the United Nations. In such international project the scientific payload would be instrumented as a cooperative endeavour . . .". *Ibid.*, No. 59, p. 41 *et seq.* See also the statement of the Australian delegate at the First Committee of the 13th UN General Assembly (A/C.1/SR 86, p. 8): "International cooperation is also necessary because of the fact that geographical position on the face of the globe would be a highly important factor in the development of space research; if it were to be confined to the northern hemisphere, such research would labour under great disabilities. The need for international cooperation would become even more evident as soon as it became important to solve the problem of bringing space vehicles back to Earth, for cooperation of distant countries with extensive land areas might be needed to permit the tracking and guidance of the vehicles at an early stage of their descent."

[37]Report of the *ad hoc* Committee, No. 59, p. 41: "The problem is to make available and to exploit the possibilities that exist for participation by nations at all levels of development, for supporting research or operation of tracking stations, launching small vehicles or joining with others in more advanced undertakings". See Report of the *ad hoc* Committee, No. 10, p. 29. The Committee also notes (Report No. 77, p. 47), that "in the use of sounding rockets to investigate the upper atmosphere and to conduct rocket astronomy experiments, there are several fields of investigation which would be promoted more efficiently if simultaneous launchings were made in many countries." According to the *ad hoc* Committee (Report No. 35, p. 36), three satellites spaced 120 degrees apart in 35000 km altitude orbits at the equator would establish a worldwide system for the re-broadcasting to the Earth of radio signals directed to these satellites. It would be a waste of effort and money to install more than three satellites of that kind, for the reason only that, being launched by one individual State, they could not be used by other States.

"No single country extends over sufficient range of latitude and longitude to be able to track Earth satellites adequately from its own stations. Earth satellite experiments have been wholly dependent upon international cooperation": Report of the *ad hoc* Committee, No. 63, p. 42. See also statement of the Australian Delegate to the 1st Committee of the 13th UN General Assembly (UN) A/C.1/986, p. 9.

agency could play a most useful part in this field both by programming and scheduling the different projects and by providing the necessary tracking and information centres.

4. *Right to own and operate space vehicles and ground installations.*—Finally, the agency could be *authorized to operate*, in the common interest, *its own launching pads and tracking stations* and, possibly, *its own space vehicles.*

Precedents developed in international aerial navigation. In all these fields the experience of the International Civil Aviation Organization (ICAO) in the field of aerial navigation, and several basic provisions of the 1944 Chicago Convention on International Civil Aviation might serve as useful guides.

First, the Chicago Convention has already established a precedent for the common, international use of installations maintained by a single nation. Thus, air navigation facilities provided by a Contracting State may be used by any aircraft registered in an ICAO State.[38]

Secondly, in order to ensure the provision of the facilities and services which are necessary in a given region for the safe operation of aircraft, ICAO has developed a particular procedure which may be copied by an international space agency in providing ground facilities and services for space explorations. Under that procedure, ICAO calls a meeting of all States whose aircraft fly in a certain region. This "Regional Air Navigation Meeting" establishes a "Regional Plan" which lists and describes the installations and facilities needed. The plan is examined and, if necessary, altered by the ICAO Air Navigation Commission, which is composed of twelve persons with suitable qualifications and experience in the science and practice of aeronautics, appointed by the Council from among individuals nominated by Contracting States. The Council of ICAO then studies the plan and approves it with the necessary amendments. Contracting States are requested to implement the plan, and special machinery has been developed to induce them to fulfil their obligations.[39]

Finally ICAO has developed several schemes for the joint financing of necessary air navigation facilities and services which a single State is unwilling to provide at its own expense. These schemes are also used when the establishment and operation of a given service by more than one State would be too expensive or be a useless duplication of effort. Thus, under Articles 69 *et seq.* of the Chicago Convention, ICAO has promoted the establishment in Greenland, the Faroes, and Iceland of air navigation facilities which the Danish and the Icelandic Governments were reluctant to finance themselves. Similarly, several

[38]Art. 15 and 28 of the Chicago Convention.

[39]The latest resolutions of the I.C.A.O. Assembly on this subject are Resolutions A 12-14 and A 12-15 (ICAO) Doc 7998, A 12-P/3. For background information regarding these resolutions and details of the machinery for the implementation of regional plans, see (ICAO) A 12-WP/13 and A 12-WP/111.

members of ICAO have agreed to the joint establishment, operation, and financing of ocean weather stations under the control of the ICAO Council.[40]

With regard to the possibility of empowering an authority for space activities to establish and operate its own launching pads and control stations, an important precedent is also found in Articles 69 *et seq.* of the Chicago Convention, referred to above, authorizing the Council to provide for "all or a portion of the costs" of the installation and/or operation of airports or other air navigation facilities, including radio and meteorological services of a Contracting State, if in the opinion of the Council these airports, facilities, and services are "not reasonably adequate for the safe, regular, efficient, and economic operation of international air services, present or contemplated", and if the State concerned does not wish to bear all the costs involved. Moreover, Article 72 permits the acquisition and use of land by the Council of ICAO in the following terms: "Where land is needed for facilities financed in whole or in part by the Council at the request of a Contracting State, that State shall either provide the land itself, retaining title if it wishes, or facilitate the use of the land by the Council on just and reasonable terms and in accordance with the laws of the State concerned." However, it should be noted that ICAO has not yet taken over or operated air navigation services and facilities, except under the Expanded Programme for Technical Assistance, and has limited its efforts to the promotion of joint financing schemes instead.

International jurisdiction over celestial bodies. It is finally submitted that the much debated question of the *legal status of celestial bodies* could be solved in what might be considered the most satisfactory manner by giving to the international space authority exclusive jurisdiction over these bodies, including the exclusive right of their occupation, administration and exploitation.

Many learned papers have recently dealt with the question of whether celestial bodies are *res nullius* or *res communis* and whether the present rules of international law apply to the acquisition of sovereignty thereon. In his report to the 4th Colloquium on the Law of Outer Space Mr. Fasan,[41] speaking for the study group established by the International Institute of Space Law, expressed the view that "objects with no firm surface like the sun" are *res communis*. "The sun being a natural *conditio sine qua non* for life on earth, sovereignty of any nation over it would legally enable the latter to exclude all other States and peoples from its rays and warmth . . . Therefore sovereignty over the sun is illegal under natural law . . . It belongs to all mankind and is therefore *naturali iure res communis*".

Mr. Fasan suggests, however, that "objects with a firm surface like the moon" are not indispensable for life on earth and therefore should be considered

[40]R. H. Mankiewicz, "Le rôle du Conseil de l'OACI comme administration des services de navigation aérienne", Revue française de droit aérien, 1954.

[41]The Colloquium was held at Washington in October, 1961. The reports have not yet been published in printed form.

as *res nullius* over which a State could acquire sovereignty in accordance with the traditional law of nations.

As Mr. Menter has pointed out in his communication to the 4th Colloquium on the Law of Outer Space[42], there are likely to arise practical difficulties in applying those rules because they make the acquisition of sovereign rights dependent on occupation of, and effective control over the celestial body and these may be difficult to achieve. Still, according to Mr. Menter, occupation and effective control may not be altogether impossible for the following reasons:

"What was difficult and time-consuming in exploring the interiors of unknown continents in Columbus' day, while not less difficult, may be more quickly accomplished on the moon and perhaps on other celestial land masses with the unfolding scientific developments of this age. If we develop the capability to disembark on land masses in outer space, our explorations, unlike those of the past on Earth, will not start at a shoreline and work towards the interior. In fact, the natural perimeters of past explorations will be different. We shall probably disembark on "land" of our choosing on the land masses concerned. Our area of effective occupation, however, will be sharply limited to the state of our developed ability for space survival and exploration. This will be due to lack of oxygen, food, water, atmosphere, the variations of temperature, radiation hazards, and other dangers encountered in travel to, and sojourn on, the land masses concerned. Assuming the application of past "earth-law" principles, initial visits would create but inchoate rights which, because of the natural perils to success of any occupation, could not effectively ripen into "effective occupation" until demonstrated success of the colony over a substantial period of time."

Both Messrs. Fasan and Menter agree that the application of present international law to jurisdiction over celestial bodies leads to undesirable consequences and that, therefore, a special agreement on the legal status of celestial bodies is required. Even more so "as there is no certainty that the law of extension of sovereignty to *terra nullius* on earth would not apply to occupation of land masses in outer space."

It is suggested that this approach to the problem of the legal status of celestial bodies is impaired by a basic misconception. For none of the rules relating to *res nullius* and *res communis* nor any other traditional rule of international law can apply with respect to these bodies, neither directly nor by analogy. Legal rules are developed with reference to precise facts and experiences. They grow in and for a given milieu when they provide a legal order based on the balancing of the various interests involved. It is a matter of record that each change in the "facts of life" has entailed a modification or refinement of previous legal rules. Thus, when Roman lawyers proclaimed the principle *cujus terra* they were concerned only with rights in that part of space which they could reach. When that part expanded in modern times through the

[42]See preceding note.

invention of powered flight, the scope of the rule *cujus terra* has been scaled down and land owners were deprived of their right to oppose or interfere with the overflight of aircraft over their land. Thus, it is obvious that the present rules of international law, since they were not molded by the realities of extra-aeronautical space, cannot apply in or to that space. Indeed, the exploration of outer space is an event so unprecedented that all pre-existing legal rules become irrelevant. The material law of that space, including rules with respect to the legal status of celestial bodies must be framed anew, in the light of the novel facts which confront mankind in this revolutionary venture.

Those new rules should ensure that celestial bodies will not fall under the exclusive jurisdiction of any nation and that they are only to be used for the benefit of mankind. This principle has already met with a large degree of agreement. It could be implemented at once if the nations of the Earth would agree that the right to explore, to occupy, and to exploit celestial bodies be vested in an international space agency. It would then become the function of that agency to make rules on the participation and share of States or State controlled agencies in the activities leading to the exploitation of celestial bodies.

Section III

Civil liability for damage caused in connection with space activities

Regulations dealing with the technical aspects of space activities will solve some questions of the substantive law of extra-aeronautical space by implication, *viz.* the legal status of extra-aeronautical space and conditions under which it can be used. Still, these regulations are but a part of the entire space law, and there remain many questions, both of public and private space law, which require the development of new legal rules, *e.g.* rights with respect to space vehicles which have landed or fallen on foreign territory, civil liability for space vehicles and space activities, etc.[43]

Here again situations arise which have been unknown previously. Therefore none of the existing "earth-bound" rules can provide an adequate answer. Since the very essence of a legal rule is the adjustment of a given set of conflicting interests it is obvious that when a new fact arises, the established rule must be re-examined and eventually modified in the light of the newly created situation. This is why the emergence of the "space factor" makes all traditional legal rules obsolete.

The following paragraphs on civil liability for space activities are intended to provide an example of the approach which this writer feels should be followed in framing the new rules of the law of space. The topic of civil liability is chosen as an example because it has been discussed at the recent Colloquium on the Law of Outer Space, on the basis of a preliminary report by Working Group IX of the International Institute of Space Law.

[43]For a summary of the legal questions likely to arise, see our studies in the Review of Contemporary Law, note 34 above, and in Annuaire Français de Droit International, 1959.

Civil liability for space activities may arise from damages caused by space vehicles or space activities in extra-aeronautical space, in airspace or on the surface of the earth; damage may be done to persons or individuals or groups of persons, *e.g.* a nation, or to goods on the earth, to space craft in orbit and to aircraft in airspace, etc. The question is: what rule applies to the indemnification of the victims.

Under traditional law, liability for damage is linked to negligence. Only the person whose negligence has resulted in damage is required to indemnify the victim. In recent times, various refinements of that basic rule have been adopted in the light of changing social conditions. Thus, where the damage is caused by a dangerous thing its owner or user is held liable without proof of his fault. This, however, amounts only to a presumption of negligence, based on the idea that a dangerous thing should not be used or made available without appropriate safeguards. With the further development of our technological society, the mere presumption of negligence was transformed in certain cases into an irrebuttable presumption of law, with the effect of making civil liability absolute. In many countries this principle has formally been embodied in statutory law relating to damages caused by railroads and other mechanical means of transportation.[44] Elsewhere, case law has developed along similar lines by using such devices as *res ipsa loquitur*, implied conditions of safe transportation, etc. A further departure from the principle of liability based on negligence was achieved in the United States of America in *MacPherson v. Buick Motor Co.*[45]—a case which became a persuasive precedent in other common law countries.[46] Under the MacPherson rule the manufacturer of a thing, whether dangerous in itself or not, is liable, without proof of negligence, for damage caused by that thing to any third person.[47]

Another trend of the modern law of liability is illustrated by the nearly universally adopted Workmen's Compensation Acts. Fundamentally these acts are based on the following reasoning: since it is rather difficult to decide whether an industrial accident is attributable to the negligent behaviour of the worker or whether it must be charged to the employer who required the worker to use a potentially dangerous machine, the criterion of negligence is abolished as a good basis for the right of recovery as well as for the obligation to indemnify the victim; instead, Workmen's Compensation Acts establish an insurance scheme which guarantees that, wherever the fault may lie, the worker will obtain appropriate indemnity.

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[44]For a partial survey of aviarion laws which provide for absolute liability in case of damage to third parties at the surface, see (ICAO) Doc 7379 LC/34, Vol. 2, p. 63.

[45]217 N.Y. 382.

[46]For instance, it has been referred to by Lord Atkin and Lord MacMillan, in the House of Lords, in *Donoghue (McAlister) v. Stevenson* [1932] A.C. 562.

[47]See for instance, "La responsabilité du fabricant à l'égard de l'usager ou consommateur de ses produits d'après le common law canadien", Revue internationale de Droit comparé, 1956, No. 2.

In the light of the foregoing one might conclude that in modern society, having regard to the steadily increasing role of technology in everyday life, the obligation to indemnify the victim of an accident is no longer apportioned on the basis of negligence but is allocated according to principles of social policy in order to ensure adequate reparation of the damage even in those cases where negligence on one side or the other cannot clearly be established. The owner or user of the instrument or of the "going concern" which has caused the damage, must indemnify the victim, his liability arising from the mere fact that the damage has occurred (absolute liability). In contemporary society where world-embracing insurance companies are willing to underwrite practically any risk at reasonable rates, this principle of absolute liability appears to be an equitable one since the potential debtor of the indemnity is now in a position to cancel out his own liability by making appropriate insurance arrangements, the cost of which is part of his overhead.

The rules governing liability for space vehicles or space activities should be developed in the light of the modern trend of the law of civil liability as outlined in the foregoing paragraphs. Still, account must be taken of the special features of space activities, two of which are of special importance, namely, the uncertainty of the cause of a space accident and the high amount of possible damage resulting therefrom.

Notwithstanding our increased technical knowledge and control of space activities, any such activity and any space vehicle is liable to cause damage to persons and goods in extra-aeronautical space, in airspace and on the surface of the earth. Such damages may result from the malfunctioning of the vehicle even though all necessary precautions were taken before the launching. What is more, the proximate cause of the accident may never be known. In fact, the damage may result from *force majeure*. There also remains the possibility — even though the space vehicle itself functions properly — of a space activity producing unexpected and unforeseen effects in space or on the earth, entailing damage to persons or whole nations, as in the case where such activity would produce meteorological disturbances and thereby cause the flooding of a whole region. Indeed, it must not be forgotten that for many years to come each activity in space is a new and unprecedented experience, the consequences and effects of which cannot be predetermined precisely. Any of these activities may result in great damages in spite of the fact that all precautionary measures have been taken in accordance with the most advanced standards of present day scientific and technological knowledge.

Under these conditions it is submitted that liability must be absolute and rest with those who control the launching of the space vehicle or the activities for which it is used. The aforementioned working group of the International Institute of Space Law has advocated this very solution for damages caused by space craft to goods and persons on the earth only. It is submitted that the

same principle should apply to whatever damage is caused by a space vehicle or a space activity, irrespective of the kind of the damage and the place where it occurs.[48]

The difficulty in the implementation of such a system of absolute liability raises, however, special problems where the damage is caused by more than one space vehicle or by conflicting space activities, for the question then arises how to allocate liability amongst the vehicles and activities involved.

No practical or legal difficulty arises as regards the indemnification of the victims because they may pursue any or all of the owners or users of the space vehicles, as well as those responsible for the damaging space activities. The situation is different with respect to the relationship between those liable for the damage. One may think of applying thereto the principles recently developed by a sub-committee of the ICAO Legal Committee in the Draft Convention on Aerial Collisions.[49] This Draft Convention provides as follows: if the cause of collision is unknown the damage rests where it lies; if the collision is attributable to the negligence of one of the parties, this party only will bear all the damage; where all concerned were negligent, the damage will be apportioned amongst them according to the degree in which the negligence of each party contributed to the damage sustained. Still, it is submitted that that system cannot be adopted in the case of damage resulting from space activities. The reasons for this are manifold. First, space experiences and technical knowledge have not yet developed to a point where one could establish with certainty that negligence was the proximate cause of the damage. Moreover, in the case where that cause can be isolated it would always be possible to show that the accident could have been avoided by the application of an improved technique or by a more exact evaluation of the consequences of the space activity concerned.[50] Thus there could always be proof or presumption of a certain degree of theoretical negligence, provided, indeed, the exact cause of the accident were known. This, again, would apply to all concerned. Therefore, there would be little justification to apply the principles of the Draft Convention on Aerial Collisions to accidents caused by colliding space vehicles or space activities. It would be more in line with the facts of space operations that the principles of absolute liability apply generally whatever the real or supposed cause of the space damage.

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[48]For a precedent along these lines which has just been established in another "new" field of human activity, namely the peaceful use of atomic energy, see OEEC and IAEA Conventions on Liability for Nuclear Accidents; M. J. L. Hardy, "International Protection against Nuclear Risks", The International and Comparative Law Quarterly (1961), p. 739.

[49](ICAO) LC/SC Aerial Collisions Nos. 69, 71 and 72.

[50]It will be recalled that manufacturers of goods which have caused damage to third persons have often invoked the defence that all technically possible measures had been taken to prevent the goods from causing damage; but the courts have always rejected that defence. See our study referred to in note 47.

Another major element to be considered in framing the law of liability is the enormous amount of the damage likely to be caused in many instances.[51] Whole cities or regions may be affected, and such incidents as space communications interfering with telecommunications on the earth may result in extensive damages to persons and goods. The virtual danger inherent in space vehicles and space activities is so great that it is most unlikely that any insurance concern will be willing to underwrite it. Therefore, effective protection of the victims will require that liability for damages resulting from the use of space rest with the governments engaging in such activities. This solution would be the logical consequence of an agreement under which space activities could be undertaken by governments only. There are many reasons why such an agreement would, indeed, be highly desirable. If States alone were permitted to engage in such activities, only then would it be possible to co-ordinate these activities in an appropriate manner so as to prevent space activities from overlapping or interfering with each other. It would also provide safeguards against the possibility of a certain space activity being preempted or made impossible by the unco-ordinated launching of space vehicles by private persons or institutions. On the other hand, if the right to space activities were vested only in States, they still would remain liable for any damage caused by any private or public authority to which a given state had delegated the exercise of its right.[52]

As will be seen from what has been said previously with respect to the jurisdiction and functions of an international space agency, the best solution would still be to give such agency the monopoly of space activities, with the result that liability for damage caused by these activities would lie with the agency itself.

The foregoing analysis of some problems of the law of extra-aeronautical space, while rather summary, may still reveal the urgency of taking immediate steps to bring space vehicles and the operation of activities above the airspace under a comprehensive legal order.

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[51]For the estimates of the damage caused by the malfunctioning of one nuclear reactor only, see Hardy in the study quoted in note 48 above.

[52]Needless to say that, in order to be of practical value, the convention on liability arising out of space activities should stipulate that governments can be sued by private persons (nationals and foreigners), in the law courts or administrative courts, as the case may be.