LEGAL ISSUES CONCERNING THE RADIO FREQUENCY SPECTRUM AND GEOSTATIONARY SATELLITE ORBIT

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INTRODUCTION

The use of the radio frequency spectrum ("RFS") is not new and may be traced back to the late 1800s. On the other hand, the use of outer space is comparatively recent, and the first move into outer space was undertaken by an artificial satellite, Sputnik I, in 1957. This venture opened a new chapter in the history of telecommunications and paved the way for the development of telecommunication technology that was no longer land based. In 1963, another significant event followed this successful historic event when the first geostationary satellite, Syncom 2, was launched into the geostationary satellite orbit ("GSO").

The use of outer space has become an integral part of telecommunications policy and strategy worldwide, and the issue that has arisen is equal and fair access for all states to outer space for telecommunication purposes. In reality, this is a problem because space telecommunication is available to a small number of developed states only and the international community as a whole is incapable of producing their own satellites to launch into orbit. This technological imbalance has been addressed to some extent by the establishment of international telecommunications satellite organisations like Intelsat, Intersputnik and Inmarsat, and by the emergence of non-governmental entities involved in space telecommunications.[1]

Therefore, this article will first discuss the legal issues related to the exploitation and use of the RFS and GSO. Secondly, it will define the concepts of the RFS and GSO and will describe the legal regimes governing airspace and outer space. Thirdly, it will evaluate the legal status of the RFS and GSO as *res communis* because outer space and its resources belong to the entire community of states. Fourthly, it will analyse the 1976

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[1] 61 national, regional and international entities have been identified: refer Doyle, "International space plans and policies: future roles of international organizations" (1990) 18:2 Journal of Space Law 136-137.

Bogota Declaration. Finally, it will examine the role of the International Telecommunication Union ("ITU") in the management and distribution of the RSO and GSO, and it will also examine the role of international telecommunication satellite organisations in providing worldwide satellite communication services.

THE RFS

Radio waves travel with the speed of light and transit through a variety of means, namely, through the earth, along the earth's surface, and through the atmosphere, by reflection or scattering from the ionosphere or natural or artificial reflectors within or above the atmosphere, or through the ionosphere. The spread of radio waves is not limited to the earth and because of their electromagnetic nature, radio waves are able to travel to and from outer space. The waves fall within a spectrum, known as the RFS, which is an invisible resource that comprises the whole universe and, as such, is a natural phenomenon.

The RFS has been defined as "the range of frequencies of electromagnetic waves which can be generated for the purpose of providing communication between points without artificial guide."[2] It has been described as "an arbitrarily defined portion of the electro-magnetic spectrum with the dimensions of frequency, time, and physical space."[3] It is also been described as a limited natural resource and there are two main reasons for this. The first is that technology has not advanced enough to make use of the entire range of the radio spectrum. The second is the problem of interference that restricts the simultaneous use of radio frequencies by more than one operator.

The use of radio waves provides an effective and economical alternative to cable network. Technically, some frequencies of the spectrum are more desirable than others. The spectrum is a non-exhaustible resource and the range of usable frequencies in the spectrum is currently limited to a particular range of radio spectrum. However, the range may be extended by

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[2] Transport and Communications Indicators, "Management of the radio frequency spectrum" (1990) December Quarter 31 Bulletin 1.

[3] Ibid at 4.

advances in technology. At present, the technically usable range of the electromagnetic spectrum includes frequencies between 0 and 10^{25}Hz while the radio spectrum lies between 10,000Hz (10 KHz) and 3,000 billion Hz (3,000 GHz). The radio spectrum covers frequencies related to services like AM/FM radio and VHF/UHF television, the microwave, infrared, visible light, ultraviolet, x-ray, gamma ray, and cosmic ray portions of the electromagnetic spectrum.[4]

The effective use of a particular part of the spectrum (without interference) is subject to three factors that should be taken into account in the use of effective radio communications: (1) the frequency of use, (2) the time of use, and (3) the geographical coverage of use. Interference problems may be reduced by innovations in radio technology and the efficient use of the radio spectrum. However, "as radio technology advances...the upper limit of the RFS is extended and total amount of spectrum space available increases."[5] In spite of technological advancements in the extension of the range of usable radio spectrum, this spectrum is still considered to be a limited resource. This is because many radio services can only function through certain frequencies. While some services (such as submarine radio communication) require very low frequencies, others (such as air and maritime communication) require high frequencies to operate efficiently.

In a practical sense, it is impossible for two radio stations to simultaneously employ the same radio frequency in the same geographical area since they will interfere with one another. On the other hand, the problem will not occur if the stations are sufficiently removed from one another, radio signals are polarised to prevent interference,[6] or "guard bands" are used to avoid the problem of frequency overlapping. With advances in technology and extensions in use, it has become necessary to regulate and manage the use of the radio frequency at the international level. The nature of the RFS requires rules to govern it and the rules should be established according to scientific principles.

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[4] White note 4 at 5.

[5] Savage JG, The Politics of International Telecommunications Regulation (1989, Westview, Boulder) 61.

[6] White RL and anor, The Law and Regulation of International Space Communication (1995, Artech House, Boston) 8.

THE GSO

The GSO, also known as the synchronous satellite orbit, is a circular synchronous orbit above the earth's equator at an altitude of approximately 35,800 kilometers (22,3000 miles).[7] The GSO is a unique natural resource and a satellite launched into this orbit is able to complete a circle around the earth in approximately 24 hours. Accordingly, the orbital movement of the satellite is synchronous to the earth's rotation and the satellite becomes located in a fixed position in outer space, that is invaluable from a communication standpoint.[8]

A satellite that is launched into the GSO is called a geostationary or geosynchronous satellite. In 1971, the International Telecommunication Union ("ITU") held the World Administrative Radio Conference for Space Telecommunication ("WARC-ST"), where a "geostationary satellite" was defined as:

> [a] satellite, the circular orbit of which lies in the plane of the Earth's equator and which turns about the polar axis of the earth in the same direction and with the same period as those of the earth's rotation.[9]

In spite of its name, a geostationary satellite is not stationary at all. Its stationary position is a relative concept and it appears stationary to an observer on the earth's surface because it rotates with the same speed as the earth. Some commentators have observed that "the geostationary orbit is not a resource...but a functional position of an orbiting space object which maintains the same spot in outer space in relation to the earth and revolves round the earth with the same speed as our planet itself."[10] It is this unique nature that makes it an invaluable natural resource.

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[7] Efficient Use of the Geostationary Orbit, United Nations Doc A/CONF 101/BP/7, 16 January 1981 at 5.

[8] Since the length of the GSO is 265,000 kilometers, a satellite in this orbit would rotate at a speed of 3 kilometers per second or 11,000 kilometers per hour.

[9] Para 84BG, Annex 1, Revision of Article 1 of the Radio Regulation, 23 United States Treaty Series 1527.

[10] For example see Kopal, "The question of defining outer space" (1980) 8:2 Journal of Space Law 169.

Geostationary satellites are located in different orbits above the earth's equator. Their orbits may be circular, elliptical or parabolic.[11] It is technically difficult to launch a satellite into a perfect circular orbit and satellites mainly orbit in an elliptical course and reach two extreme points: the perigee (the nearest point to the earth) and the apogee (the furthest point from the earth). The perigee may be only 200 kilometers away while the apogee may be several hundred thousand kilometers away.[12] Due to their fixed positions in the sky, geostationary satellites become stationary antennas for transmission of signals between stations, whether on the earth's surface or in outer space. They have the ability to relay signals to ground stations within their arc of visibility. These satellites are used for services such as radio navigation, space research, satellite-to-home broadcasting and the provision of communications between fixed ground stations. It has been stated that "satellites travel at different speeds, altitudes and inclinations to the plane of the earth's equator."[13] Like low earth orbit ("LEO") satellites, geostationary satellites are deemed to be active satellites.[14]

SIGNIFICANCE OF THE GSO

LEO satellites are the first communication satellites, and they are able to transmit signals for a short time only.[15] Thus, a way had to be found for establishing a permanent satellite communications system. In 1945, Arthur C Clarke believed that a geostationary satellite could cover only 40 per

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[11] Christol CQ, The International Law of Outer Space (1966, US Government Printing Office, Washington) 57.

[12] Department of Economic and Social Affairs (1973, United Nations, New York) 1.

[13] Gehrig, "Geostationary orbit – technology and the law" Proceedings of the (1977) Nineteenth Colloquium on the Law of Outer Space at 268; also see notes 48 and 53.

[14] Perek, "Interaction between space technology and space law" (1990) 18:1 Journal of Space Law 23.

[15] The ITU Radio Regulations define an active satellite as "[a]n earth satellite carrying a station intended to transmit or re-transmit radiocommunication signals". A passive satellite is defined as "[a]n earth satellite intended to transmit radiocommunication signals by reflection."

cent of the earth's surface[16] and it was not until the 1960s when geostationary satellites could be launched. A geostationary satellite has many advantages "since it can continually observe a given region of the earth or the satellite can be tracked continuously from a stationary platform."[17] The advantage of using the GSO instead of other orbits is attributed to the fact that three such satellites would be adequate to cover the entire surface of the globe, with the exception of high altitude regions, hence making the GSO the most desirable orbit for telecommunication surfaces. As pointed out by Malcolm Shaw, the GSO "is the only orbit capable of providing continuous contact with ground station via a single satellite."[18]

At present, the most common use of outer space is by satellites. There is a wide range of satellites, and they have different sizes, weight, life expectancy and functional purposes. Space objects, and particularly satellites, have many applications. In communications, the applications include point-to-point communications over long distances, voice and television broadcasts over a vast area, facsimile transmission, and data relay and collection. Satellites may also be used in the navigation of aircraft and ships.[19]

Satellites are positioned in different orbits around the earth, but it is the unique GSO that has drawn particular attention. Besides telecommunication satellites, other satellite systems such as meteorological satellites, and earth and space research satellites, have been placed into the GSO. However, most of them are used for communication. In fact, telecommunication is deemed to be "the nervous system" of all activities in outer space. As stated by Scott Ervin, the C6/4 GHz and Ku (14/11-12GHz) bands are the most favorable orbit for telecommunication satellites:

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[16] Clarke, "Extraterrestrial relays" [October 1945] Wireless World 305.

[17] Department of Economic and Social Affairs note 12 at 1.

[18] Shaw M, International Law (1991, Cambridge University Press, Cambridge) 335.

[19] Department of Economic and Social Affairs note 12 at 11.

> Communication satellites in particular are most useful when placed in this orbit, and the future holds promise of even greater benefits from the orbit.[20]

Like the RFS, the GSO is considered a limited natural resource[21] and two factors contribute to this: the risk of collision and the problem of radio interference. This becomes particularly noticeable as more and more satellites are placed into the GSO.[22] Although the GSO may have the capacity to accept a large number of satellites without a high risk of collision, "the number of satellites that can operate in the GSO on a certain frequency without consequent radio interference is much more limited."[23] Satellites are of use only if their communications systems are not disturbed and they are useless without communication techniques. The issue of radio interference prevention has been crucial to the efficient operation of satellites in the GSO, especially with the increase in the number of geostationary satellites enhancing the possibility of the two factors occurring.

If radio interference is to be avoided between satellites, particularly communication satellites, they should be positioned "at least four degrees of arc from one another, thus limiting the number of 'slots' for such satellites to ninety."[24] So far, technological advances have made the placement of more satellites into the GSO possible without the problem of

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[20] Ervin, "Law in a vacuum: the common heritage doctrine in outer space law" (1984) 7:2 Boston College International and Comparative Law Review 416-417.

[21] On the limited capacity of the GSO, see generally ITU documents. In particular, note the Study on the Feasibility of Closer Spacing of Satellites in the Geostationary Orbit, United Nations Doc A/AC 195/340 (1985); United Nations Doc A/AC 105/428 Add 1, 16 January 1990. The issues related to the use of the GSO, including its limited capacity, are discussed in Abdurrasyid, "The Outer Space Treaty and the geostationary orbit" (1987) XII Annals of Air and Space Law 131-139.

[22] Between 1963 (when the first geostationary satellite was launched) and 1981, the rate of increase in the number of satellites being placed into the GSO was 18 per cent: United Nations, Efficient Use of the Geostationary Orbit, United Nations Doc A/CONF 101/ BP/7, 16 January 1981 at 18.

[23] Ibid at 11-16.

[24] Reynolds and anor, "The role of commercial development in preventing war in outer space" (1985) 25:2 Jurimetrics Journal 140.

interference. In general, there exists a variety of views on the number of satellites that may be placed into the GSO with efficient operation. The number ranges from 180-1,800.[25] However, in 1977, the United Nations Secretariat stated that there was no definite figure for the maximum number of satellites that could be launched into the GSO[26] and this uncertain position continues today.

In spite of technological improvements, the GSO remains a limited natural resource. Besides regulatory techniques to provide for the more efficient use of the GSO and RFS, new techniques and technology have been developed to respond to the issues related to their use. These techniques and technology have included clustering, cross-polarisation, cross-beam geometry, paired service areas, frequency interleaving, minimum space station spacings, space station antenna discrimination, earth station antenna discrimination, minimising equivalent isotropically radiated power ("e.i.r.p.")[27] differences, and realistic quality and reliability objectives.[28]

LEGAL REGIME OF AIRSPACE

Airspace and outer space have their own distinctive legal regimes. It is important to clarify the legal regimes of these two domains. Depending on whether an object is considered to be in airspace or outer space, different

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[25] For example, in its submission to the predecessor of the United Nations Committee on the Peaceful Uses of Outer Space ("UNCOPUOS"), namely, the Ad Hoc Committee, which was established following United Nations General Assembly Resolution 1348(XIII), Colombia maintained that the maximum number of satellites which may be launched into the GSO was 180: see the document submitted by the Colombian delegate to the Legal Subcommittee of UNCOPOUS on 31 March 1977, United Nations Doc 105/C2/SR 277, 5 April 1977 at 3; also refer to note 43. On the other hand, Hinchman maintains that the minimum number of satellites that can be put into the GSO without the risk of collision is 1,800: Hinchman, "Issues in spectrum resource management" in The Future of Satellite Communications, Resource Management and the Needs of Nations (1970, Twentieth Century Fund, New York) 52.

[26] United Nations Doc A/AC 105/203, 29 August 1977 at 8.

[27] E.i.r.p. is the product of the power of emission as supplied to an antenna gain in a given direction relative to an isotropic antenna.

[28] Final Acts of the World Administrative Radio Conference for the Planning of the Broadcasting Satellite Service in Frequency Bands 11.7-12.2 GHz (in Regions 2 and 3) and 11.7-12.5 GHz (in Region 1) [WARC-BS], 1977, ITU, Geneva, Annex 7.

rules govern the activity. It is also relevant to radio frequencies when used within the national domain or beyond it.

It is a fundamental principle of international law that airspace constitutes part of the territory of a state and is subject to the state's complete and exclusive sovereignty. The early doctrine on the nature of the rights of states over their airspace was derived from the Roman maxim *qui diminus est soli dominus est coeli et infernorum.*[29] A similar maxim *cujus est solum, ejus est usque ad coelum*[30] is used in common law. Generally the maxims mean that subjacent states have the right of ownership over airspace above their land and maritime territory. Some authors, such as Fauchille, were of the view that airspace should be open to all states, although it was accepted that states had the right of conservation *(driot de conservation)* to a particular altitude.[31] This approach had not been favoured in state practice and the doctrine of "closed sky" was preferred to the doctrine of "open sky". Another view was that national airspace was subject to the regime of *res communis* in relation to subjacent states.[32]

It was in the context of the 1919 Peace Conference that the issue of the legal nature of the right of states over their airspace was resolved. The Conference resulted in the 1919 International Convention for the Regulation of Air Navigation ("1919 Convention") which, *inter alia,* introduced the concept of sovereignty over the airspace of land and the territorial sea. Article 1 provides:

> The High Contracting Parties recognise that every power has complete and exclusive sovereignty over the airspace above its territory.[33]

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[29] O'Connell note 29 at 518.

[30] It means that he who possesses land also possesses that which is above it.

[31] O'Connell note 29 at 519.

[32] Wassenbergh, "Parallels and differences in the development of airspace and space law in the light of Grotius' heritage" (1984) IX Annals of Air and Space Law 170.

[33] 1919 International Convention for the Regulation of Air Navigation, Paris (1922) 11 League of Nations Treaty Series 173.

The 1944 Convention on International Civil Aviation which was signed in Chicago ("Chicago Convention")[34] confirmed the principle of sovereignty over territorial airspace and Article 1 provided that flight over the territory of states was subject to the principle of territorial sovereignty.[35] This meant that subjacent states could allow foreign aircraft to fly over their land territory and territorial sea, subject to the states' prior consent. It was the subjacent state that was the competent authority to regulate air traffic above its territory, and today, state sovereignty over airspace has become an established principle in international law.[36] On the other hand, flight over the high seas was set free as maritime spaces were not subject to the sovereignty of any state.

Therefore, foreign aircraft have no right of overflight in the airspace of other states. The mechanism by which foreign aircraft may enjoy the right is a treaty between states. The main multilateral treaties are the Chicago Convention,[37] the 1944 International Air Services Transit Agreement[38] and the 1944 International Air Transport Agreement.[39] Most of the rights that exist today are found in bilateral treaties, usually for commercial purposes.

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[34] 15 United Nations Treaty Series 295.

[35] Article 1 deals with sovereignty and provides the following: "The Contracting States recognise that every State has complete and exclusive sovereignty over the airspace above its territory." Article 2 also provides that: "The territory of a state shall be deemed to be the land areas and territorial waters adjacent thereto under the sovereignty...of such State."

[36] For example, see Article 2 of the 1958 Geneva Convention on the Territorial Sea and Contiguous Zone, (1964) 516 United Nations Treaty Series 205 and Article 2(2) of the 1982 Convention on the Law of the Sea (1982) 21 International Legal Materials 1261.

[37] For a discussion on various aspects of the 1944 Chicago Convention, the International Civil Aviation Organisation ("ICAO"), the International Air Transport Association ("IATA") and related issues, see (1994) XIX:1-2 Annals of Air and Space Law and (1995) XX:1 Annals of Air and Space Law.

[38] 84 United Nations Treaty Series 389, more commonly known as "the Two Freedoms Agreement".

[39] 171 United Nations Treaty Series 387, more commonly known as "the Five Freedoms Agreement".

Even though the juridical status of airspace was defined in the 1919 Convention and the Chicago Convention, the upper limit of airspace was not addressed by them. The expression "aircraft" was also not dealt with but it was later defined by the Council of ICAO to mean any "machine that can derive support in the atmosphere from the reactions of the air."[40] Further, the 1963 Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water ("Nuclear Test Ban Treaty")[41] did not refer to airspace in Article I(a) although nuclear explosions "in the atmosphere; beyond its limits, including outer space; or under water, including territorial waters or high seas" were prohibited. In practice, disagreement resulted among states on the upper limit of airspace because demarcation had been left to national legislation.[42] Thus, the question of whether the sovereignty of states extends over air territory *ad infinitum* or whether it is limited to a particular altitude remains today.

LEGAL REGIME OF OUTER SPACE

When Sputnik I was launched into outer space in 1957, it created the need for a set of legal principles to govern the activities of states in this totally new frontier. To this end, the *ad hoc* UNCOPUOS was established pursuant to United Nations General Assembly Resolution 1348 on 13 December 1958.[43] This resolution recognised "the common interest of mankind in outer space" and stressed that outer space should be explored and exploited for the benefit of mankind. On 12 December 1959, UNCOPUOS became a permanent committee pursuant to United Nations General Assembly Resolution 1472(XIV) on "International Co-operation in the Peaceful Uses of Outer Space".[44] This resolution recognised the common interest of mankind as a whole in furthering the peaceful uses of

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[40] See Chicago Convention Annex 7.

[41] This Treaty became effective on 10 October 1963: 480 United Nations Treaty Series 43.

[42] The same applies to outer space since there is no internationally agreed line establishing its lower limit: Kopal note 10 at 168.

[43] Resolution 1348(XIII) on "Questions on the Peaceful uses of Outer Space", 13 United Nations GAOR, Supp No 10, United Nations Doc A/5414, 1958; see note 25.

[44] Yearbook of the United Nations (1958, United Nations Office of Public Information, New York) 27-28.

outer space. It emphasised that the exploration and use of outer space should be "for the betterment of mankind and to the benefit of States, irrespective of the stage of their economic or scientific development." It provided for "the development of Science and the improvement of the well-being of peoples." It soon became clear that outer space as a legal regime should differ from that of airspace and that it should not be subject to the national sovereignty of states.

On 20 December 1961, the United Nations General Assembly passed another important resolution, Resolution 1721(XVI).[45] For the first time, basic principles on outer space and its resources were established. The Resolution declared three principles, namely, (1) international law and the Charter of the United Nations applied to outer space and celestial bodies; (2) outer space and celestial bodies were free for exploration and use by all states, consistent with international law; and (3) outer space and celestial bodies were not subject to national appropriation. Part D of the resolution particularly concerns respect for telecommunications. *Inter alia*, it provided that "communication by means of satellites should be available to the nations of the world...on a global and non-discriminatory basis." The Resolution later provided the foundation for global telecommunications satellite systems like Intelsat, Intersputnik and Inmarsat.

A major development in the definition of the legal regime of outer space occurred when Resolution 1962(XVIII) on the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space was adopted on 13 December 1963.[46] This development was significant in international relations because it took only six years from the launch of Sputnik I into orbit for the international community to agree on fundamental legal principles. The Resolution confirmed the concepts and principles incorporated in earlier resolutions and expanded their ambit.

Resolution 1962(XVIII) enumerates nine principles that govern the exploration and use of outer space. The more important principles are those that deal with the following:

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[45] "International Co-operation in the Peaceful Uses of Outer Space" United Nations GAOR, Sixteenth Session, Supp No 17, United Nations Doc A/5100, 1962 at 238-239.

[46] United Nations GAOR, Eighteenth Session, Supp No 15, United Nations Doc A/5515, 1964 at 205-206.

1. the exploration and use of outer space for the benefit and interests of all mankind (Principle 1);

2. the freedom of exploration and use of outer space and celestial bodies on the basis of equality and in conformity with international law (Principle 2); and

3. the exclusion of outer space and celestial bodies from national appropriation by claim of sovereignty, by means of use or occupation, or by any other means (Principle 3).

Later, in United Nations Resolution 2222(XXI) of 19 December 1966, the expression "the province of all mankind" was extended to outer space.[47] *Inter alia*, Resolution 2222(XXI) provided that:

> The exploration and use of outer space...shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development, and shall be in the province of all mankind.

It has been argued that the above resolutions were declaratory of customary international law, particularly Resolutions 1962(XVIII) and 1721(XVI) since they were unanimously adopted.[48]

The first international treaty on outer space is the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies ("1969 Outer Space

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[47] United Nations GAOR, Twenty-second Session, Supp No 16, United Nations Doc A/6316, 1966 at 13.

[48] In 1974, the Sixth Committee of the United Nations General Assembly stated that although the resolutions were not a source of international law, they have the capacity to be "evidence of custom": Harris DJ, Cases and Materials on International Law (fourth edition, 1991, Sweet and Maxwell, London) 63. See dissenting opinion of Tanaka J in the South West Africa Cases [1966] International Court of Justice Reports 292; Talaie, "Developing countries and the legal regime of outer space", Proceedings of the First Conference on Space Technology and Developing Countries, Iranian Research Organisation for Science and Technology, Tehran, 23-27 May 1995, STC-95-116 at 5.

Treaty").[49] The Preamble recalled resolutions like Resolution 1962(XVIII) and reiterated that resolution. The effect was the extension of the concept of *res communis* to outer space and its resources as seen in Articles 1 and 2. Accordingly, the RFS and GSO[50] became included in the extension which meant that they could not be appropriated by any state; neither was there a right of ownership over them by means of use or any other means.

The next important international treaty is the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies ("1979 Moon Treaty").[51] Article 4 of this Treaty put into effect Article 1 of the 1967 Outer Space Treaty by providing that the "exploration and use of the moon shall be the province of all mankind". Article 11(1) of the 1979 Moon Treaty acknowledged that the moon was the common heritage of mankind[52] and this principle was extended to the moon's resources.[53] To implement this provision, Article 11(5) suggested an international regime of exploitation that is yet to be established. Article 11(2) applied the principle of non-appropriation to all celestial bodies.

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[49] Adopted on 19 December 1966, opened for signature on 27 January 1967 and entered into force on 10 October 1967: 610 United Nations Treaty Series 205.

[50] For an examination of the GSO as res internationalis, see Wiessner, "Access to a res publica internationalis: the case of the geostationary orbit", Proceedings of the Twenty-ninth Colloquium on the Law of Outer Space, 4-11 October 1986, Innsbruck, Austria at 147-153. Wiessner argues "the idea of res publicarefers to patterns of shared inclusive competence reaching beyond res communis": ibid at 150.

[51] United Nations General Assembly Resolution 34/68, Annex, adopted on 5 December 1979, opened for signature on 18 December 1979 and entered into force on 11 July 1984: (1979) 18 International Legal Materials 1434.

[52] Talaie, "Developing countries and the legal regime of outer space", Proceedings of the First Conference on Space Technology and Developing Countries, Iranian Research Organisation for Science and Technology, Tehran, 23-27 May 1995, STC-95-116 at 3.

[53] For an examination of the common heritage of mankind as a political and legal concept, see Ervin, "Law in a vacuum: the common heritage doctrine in outer space law" (Summer 1984) 7 Boston College International and Comparative Law 403-431; Cocca, "The common heritage of mankind: doctrine and principle of space law", Proceedings of the Twenty-ninth Colloquium on the Law of Outer Space, 4-11 October 1986, Innsbruck, Austria at 17-24; Jasentuliyana, "The role of developing countries in the formulation of space law" (1995) XX:II Annals of Air and Space Law 95, 104-110; Tatsuzawa, "Political and legal meaning of the common heritage of mankind", Proceedings of the Twenty-ninth Colloquium on the Law of Outer Space, 4-11 October 1986, Innsbruck, Austria at 84-89.

Two instruments that were more specific in nature were later adopted by the United Nations General Assembly. The first was Resolution 27/92 of 10 December 1982 on the Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting; the second was Resolution 41/65 of 3 December 1986 on the Principles Relating to Remote Sensing of the Earth from Space.

Principle C of Resolution 27/92 provides:

> Every State has an equal right to conduct activities in the field of direct television broadcasting by satellite and should enjoy the benefits from such activities.

Principle IV of Resolution 41/65 provides that remote sensing activities were subject to Article 1 of the 1967 Outer Space Treaty. This means that the exploration and use of outer space should be conducted for the benefit and interest of all states, and that the principle of freedom of exploration and use of outer space on the basis of equality should be respected.

Since the space age began in 1957 and in spite of the regulation of outer space, state sovereignty has not been extended to outer space.[54] Therefore, outer space and its resources are *res communis* and not *res nullius.* As a consequence, they belong to all states who must collectively cooperate to properly manage the exploitation of these resources. Where the RFS and GSO are concerned, this cooperation and management are, for instance, the responsibility of ITU, which will be discussed below.

DELIMITATION OF OUTER SPACE

As shown above, there is no upper delimitation of airspace that arguably could provide the lower limit of outer space.[55] State practice at present is of little assistance because it evidences a divergence of views. However, delimitation is important and as pointed out by John Cobb Cooper:

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[54] According to Shaw, it "became soon apparent that the usque ad coelum [usque ad infinitum] rule, providing for state sovereignty over territorial airspace to an unrestricted extent, was not viable where space exploration was concerned: Shaw note 18 at 328.

[55] For a detailed analysis of the issue of boundary see Goedhart RFA, The Never Ending Dispute: Delimitation of Airspace and Outer Space (1966, Editions Frontières, Gif-sur-Yvette, France).

> the Rule of Law can[not] be established with certainty as to outer space, a finite geographical area, unless the boundaries of that area are known and understood.[56]

It was also pointed out at the 1977 Meeting of the Legal Subcommittee of UNCOPUOS that "a legal system whose scope of activity was not defined, was inconceivable."[57]

A novel proposition has emerged in this discussion which theorises that the demarcation line may not necessarily be the immediate separating line between airspace and outer space, and it is possible an area exists between the two spaces that is similar to a contiguous zone. In the Report by the *Ad Hoc* UNCOPUOS to the United Nations General Assembly on 14 July 1959,[58] it was noted that the upper boundary of airspace and the lower boundary of outer space did not necessarily coincide. Further, Cooper had proposed the establishment of three zones (airspace, contiguous zone and outer space) that were to be governed by distinctive legal rules.[59]

Since its establishment, UNCOPUOS has been grappling with the issue of delimitation, an item that still remains on the agenda.[60] A related issue is

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[56] Cooper, "Fundamental questions of outer space law" in Vlasic IA (ed), Exploration in Aerospace Law (1968, McGill University Press, Montreal) 169.

[57] Perek, "Scientific criteria for the delimitation of outer space" (1977) 5:1-2 Journal of Space Law 112.

[58] Fourteenth Session, United Nations Doc A/4141, 1959.

[59] O'Connell note 29 at 537.

[60] For recent reports of the Legal Subcommittee, see UNCOPUOS, Report of the Legal Subcommittee on the Work of its Thirty-fourth Session, 27 March-7 April 1995, United Nations Doc A/AC 105/607 (1995); UNCOPUOS, Report of the Legal Subcommittee on the Work of its Thirty-fifth Session, 18-28 March 1996, United Nations Doc A/AC 105/635 (1996). Referring to the 1995 Report, Benkö states that discussion on the issues of definition and delimitation of outer space has remained static: "The UN Committee on the Peaceful Uses of Outer Space: progress on 'space benefits' and other recent development" (January 1995) 44 Zeistschrift für Luft-und Weltraumrecht 291, 293. For discussion which includes the status of the GSO in the same Report, see Thaker, "Latest developments in the work of the Committee on the Peaceful Uses of Outer Space" (1995) XX:II Annals of Air and Space Law 357, 366-369.

whether a real need exists for delimitating airspace and outer space, based on the argument that the international community has managed to cope without delimitation to date. Unfortunately, the inability to establish a demarcation line has political and economic implications, and has resulted in scientific and technical uncertainties.[61] Consequently, any discussion and "any agreement on such a demarcation altitude has to be based not only on scientific and technical information, but also on legal, political, economic, and military considerations."[62]

In 1967, the Legal Subcommittee of UNCOPUOS asked the Scientific and Technical Subcommittee "to draw up a host of scientific criteria that could be helpful to the Legal Subcommittee in its study relative to a definition of outer space."[63] In response, the Scientific and Technical Subcommittee stated that "it [was] not possible to identify scientific or technical criteria which would permit a precise and lasting definition of outer space"[64] and to date, no agreed scientific or technical criteria are used for the definition of outer space.

A number of arguments have been raised regarding the necessity for creating a demarcation line between airspace and outer space.[65] The main arguments in favour of establishing a boundary line are linked to state sovereignty and its limitations. As discussed above, the distinctive legal regimes applicable to airspace and outer space require delimitation between the two of them. On the other hand, it was also noted that the lack of a boundary line has not impeded the exploitation and use of outer space, and more importantly, the lack of the line has not caused practical problems for outer space activities so far.

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[61] Benkö and ors, Space Law in the United Nations (1985, Martinus Nijhoff Publishers, Dordrecht) 130.

[62] Ibid at 136.

[63] Report of the Legal Subcommittee on the Work of its Sixth Session, 19 June-14 July 1967, United Nations Doc A/AC 105/37, 1967 at 8.

[64] United Nations GAOR Annexes, Agenda Item No 32 at para 36, United Nations Doc A/6804, 1967.

[65] For the arguments see Benkö and ors, note 61 at 130-136.

There are two main approaches to delimitation. The first approach draws a physical boundary line; the second is based on the nature of activities in outer space. While some theories primarily relate to airspace delimitation, others focus on the nature of outer space for delimitation purposes. Whichever approach is adopted, the same result is achieved unless a new zone (or zones) is created to separate airspace and outer space. There is a third approach that argues that what is important is the regulation of activities regardless of the location of activities. In practice, although the lack of a delimitation line has not prevented states from performing outer space activities, it remains true that the determination of the boundaries within which activities are undertaken will create certainty to the performance of those activities.

Although there are several theories on delimitation, seven main ones have been identified, namely, (1) the atmosphere theory; (2) theory of effective control; (3) multi-zone theory; (4) theory of "karman jurisdiction line"; (5) gravitation theory; (6) numerical definition of the boundary theory; and (7) theory of the satellite orbit.[66] However, the doctrine of the lowest possible perigee of satellite is the most desirable and practical. An analysis of the provisions of the 1976 Convention on Registration of Objects Launched into Outer Space ("1976 Registration Convention") and other United Nations instruments on the registration of space objects, the use of satellites for remote sensing of the earth and direct television broadcasting, support the lowest perigee of satellite orbits as the basis for the delimitation of outer space. The lowest altitude of satellites, being a natural criterion, is consistently used in practice. Consequently, it may be argued that such consistent state practice may evidence the creation of custom with respect to the delimitation of outer space.[67]

A major question concerning the perigee criterion is whether it is technically possible to provide a decisive height as the lowest altitude of satellites. There is no doubt that advances in satellite technology may lead to the production of new satellites that are able to rotate the earth in an

[66] Gal G, Space Law (1969, AW Sijthoff, Leyden) 70-98; McMahon, "Legal aspects of outer space" (1962) 38 British Yearbook of International Law 339.

[67] Refer to Kopal note 10 at 169, 173.

be an internationally agreed altitude for the lowest perigee of satellite. This would oblige states to launch their satellites into orbit where the criterion of the lowest perigee is respected. While it is maintained that science and technology now enjoy the ability to determine the lowest perigee, this view is not favored by some authors.[68] The latter view may have resulted from the suggestion of a number of altitudes as the lowest perigee, mainly between 90 and 110 kilometers.[69]

At present, some findings demonstrate the ability of the current state of technology to define the lowest possible perigee with reasonable accuracy. Since the launch of the first satellite in 1957, science and technology are now in a position to present a reliable geometrical criterion with an accuracy of approximately ten kilometers.[70] According to a paper entitled *Study on Altitudes of Artificial Earth Satellites* which was prepared by Working Group No 1 of the Committee on Space Research ("COSPAR"), the lowest possible perigee "is with good precision the height of 90 km."[71] The International Aeronautical Federation has considered the altitude of 100 kilometers as the final limit of airspace beyond which outer space begins.[72] According to Perek:

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[68] For instance, see Matte's view which is referred to in Perek note 57.

[69] See United Nations Secretariat Background Papers on the subject: United Nations Doc A/AC 105/C 2/7 (1976) and United Nations Doc A/AC 105/C 2/27/Add.1 (1976).

[70] Perek note 57 at 112.

[71] United Nations Doc A/AC 105/164 and Annex 1, 1976 at 20.

[72] Winkler, "Legal aspects of astronomy" (1990) 54:8 Griffith Observer 2-9. The issue of aerospace objects should also be considered in conjunction with the issue of the delimitation of outer space. Aerospace objects are capable of flying in airspace and outer space. These objects are not like aircraft and satellites which are subject to the legal regimes of airspace and outer space respectively. Accordingly, the status of aerospace objects and the legal regime applicable to them should be defined in order to prevent any practical problems. UNCOPUOS has prepared a questionnaire on the issue of aerospace objects as a step towards the creation of law that is applicable to these objects: Benkö, "The UN Committee on the Peaceful Uses of Outer Space: progress on 'space benefits' and other recent developments", (January 1995) 44 Zeistschrift für Luft-und Weltraumrecht 291, 293. Also refer to the Questionnaire Concerning Possible Legal Issues with Regard to Aerospace Objects, Annex II(1): ibid at 303-304.

> [I]f a definition of an exact limit of outer space within the above regions (90-110 Km) is adopted, it would be possible to determine the relative position of any object with regard to such a limit with an accuracy of 3 m.[73]

If outer space is to be properly defined and delimited, any conclusive definition should consist of the following characteristics, namely, (1) it should be as technically precise as possible; (2) it should be based on a physical criterion, preferably the lowest possible perigee of man-made satellites; and (3) it should be internationally accepted.

LEGAL STATUS OF GSO AND RFS

The concept of the GSO has to be considered in the context of outer space only. By using this approach, the legal regime of outer space as a whole would extend to the GSO. Since one of the fundamental legal principles governing outer space is the *res communis* principle, the GSO is considered a *res communis* resource. Therefore, it falls within the province of all mankind and its use should be managed on the basis of universal equity, equality and efficiency. Further, since the GSO is an inseparable part of outer space, all legal principles governing the activities of states in outer space would be similarly applicable to the GSO.

The RFS is both a national and international asset. When the geographical area of the RFS is limited to national boundaries, it is subject to national regulation. This means that each state has the right to manage the radio spectrum within the range of its territory because the regulation of national telecommunications is a *domaine reserve* of the state.[74] It is also the responsibility of individual states to manage the use of this common resource on an equal basis and for the benefit of its citizens. Conversely, there is also a valid argument that although the RFS may be used within the national domain, it is subject to the *res communis* concept. Although a state has the sovereign right to regulate its telecommunications,[75] some bands of

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[73] Perek note 14 at 23.

[74] Fawcett JES, Outer Space: New Challenges to Law and Policy (1984, Clarendon Press, Oxford) 54.

[75] See Preamble to the 1992 Constitution of the ITU ("ITU Constitution").

the RFS, although within the national domain, are and should be reserved for international use and for the common use of all states. This is particularly true with regard to frequencies internationally allocated for purposes such as the safety of aerial and maritime navigation and for distress conditions.

According to the ITU's Radio Regulations, states are not required to notify the ITU of assignments of radio frequencies to radio stations within their territory unless the following applies: (1) the frequency interferes with the radio station of another state, (2) the frequency is used for international radiocommunication purposes, or (3) international recognition is sought for the use of the frequency. The process of frequency registration is therefore required if there is an international concern and the range of the frequency is not national, but supranational, in nature.

Generally, states manage and regulate the RFS within their territories to ensure that the resource is used efficiently and that radio stations are not interfered with. The principal purpose of radio frequency management, whether nationwide or worldwide, is to maximise the use of the radio spectrum, to minimise interference in the use of the radio spectrum, and to maximise the flow of information through a channel per unit of time.[76] Further, there usually exists in every state an authority that is competent to issue a licence for the use of assigned bands of frequencies. For example, the Australian Telecommunication Authority ("Austral") regulates the use of the RFS while the Australian Spectrum Management Agency manages the spectrum to ensure the RFS is used efficiently.

It is a general principle of telecommunications law that no one can acquire radio waves or exclusive rights to use a particular frequency band in outer space.[77] This is because the radio spectrum that is located in outer space and in any area on the earth beyond national sovereignty is part of *res communis*. The radio spectrum is a resource that is common to all states and Article 14(3)(1) of the ITU Constitution provides that the members of

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[76] Levin HJ, The Invisible Resource: Use and Regulation of the Radio Spectrum (1971, John Hopkins Press, Baltimore) 65.

[77] For example see 1963 Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space; Office for Outer Space Affairs, Vienna, United Nations Treaties and Principles on Outer Space (1997, United Nations, New York) 37.

the Radio Regulations Board ("RRB") have duties "as custodians for international public trust". The successful launch of Sputnik I in 1957 and the use of radio frequencies for satellites had resulted in the need to manage two resources that are closely inter-related, the RFS and the GSO.

Notification to the ITU of the use of a particular radio frequency results in the operation of the principle, *prior tempore potior jure,* which relies on the "first come, first served" regime. If used as a legal regime, it has important consequences because it determines primacy of claim. At the 1927 Washington Conference, the United States opposed this regime, arguing that there should not be any exclusive control regarding the use of particular frequencies.[78] At the 1932 Madrid Conference, it similarly rejected the principle that notification by states to the ITU created priority rights.[79] This was contrary to the position taken by the Soviet Union which argued that the Berne Frequency List guaranteed legal rights for first users. Since the ITU's position was not to attach legal title to frequencies whether by use, occupation or other means, the 1947 Atlantic City Conference established the International Frequency Registration Board ("IFRB") to allocate frequencies and coordinate activities concerning the use of radio frequencies.

In practice, the ITU continued to allocate radio frequencies on the "first come, first served" basis, but the allocations did not confer any exclusive proprietary rights to first users. Discussions in ITU forums over the past few decades show a trend towards the elimination or modification of the "first come, first served" regime, but this has not been without resistance from some developed countries. The present discussion between developed and developing states revolves around the issue of the nature of the rights given to first users and whether the rights are protected by any legal or moral regime. The same discussion is taking place on issues involving the GSO where communication satellites are parked. The view of Professor Carl Q Christol is that the "first come, first served" regime should not be the basis for the granting of exclusive rights to first users; rather, it presented the opportunity for use of the frequency that depended on a state

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[78] Alexandrowicz CH, The Law of Global Communication (1971, Columbia University Press, New York) 31.

[79] Ibid.

being the first user. Neither did it grant exclusive use to a state in any sovereign sense.[80]

Developing states have been concerned that certain developed states have monopolised the use of the RFS and GSO and since these resources are limited, the ever increasing use of spectrum/orbit resources would be detrimental to the principle of equitable access.[81] Developing states therefore prefer the *a priori* allotment plan which would ensure that there would be a share of the resources on the basis that the resources are deemed the common property of the international community. In contrast, developed states, the dominant users of spectrum/orbital resources at present, prefer the *a posteriori* allotment plan and argue that the *a priori* plan would not allow the efficient and optimal use of these resources.[82]

Although the 1959 World Administrative Radio Conference ("WARC") was the first ITU Conference that considered the allocation of the radio spectrum for space activities, the issue of distribution was not raised until the early 1960s. At the Extraordinary WARC held in Geneva in October-November 1963, developing states expressed their concern about the then existing regulatory policy of *a posteriori* allocation in respect of the RFS and GSO. In the end, the Conference established the principle of the equitable and rational use of the radio spectrum in Recommendation 10A.

The Recommendation reflected the main objective of the Conference and provided that all members of the ITU "have an interest in, and the right to an equitable and rational use of the frequency bands allocated for space communication." For the first time, the Recommendation recognised that

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[80] Christol, "Developments in the international law of telecommunications" in Gorove KA, Report on Events of Interest, Annual Meeting of the American Society of International Law, 7 April 1989, Chicago: (1989) 17:1 Journal of Space Law 47, 52.

[81] For the concerns of the developing states see Jasentuliyana, "The role of developing countries in the formulation of space law" (1995) XX:II Annals of Air and Space Law 95, 117-122.

[82] Christol describes "the a priori plan as allowing for the granting of opportunities for exploitation even though the beneficiary of the grant is not immediately capable of using the resource and a posteriori plan as calling for the utilization of the resource as such time as a nation is able to and does make effective use of the resource": see note 80. Since 1957, some ITU Conferences have centered discussion on a just and fair distribution of spectrum/orbit resources among states.

the RFS was *res communis* with a limited capacity. The Conference also recommended that "the utilization and exploitation of the frequency spectrum for space communications [was] to be subject to international agreements based on principles of justice and equity permitting the use and sharing of allocated frequency bands in the mutual interest of all nations."[83]

The principle of equitable and non-discriminatory access to spectrum/orbit resources was reiterated in the 1965 ITU Plenipotentiary Conference held in Montreux.[84] The next step in the recognition of the close relationship between the RFS and GSO as limited natural resources in an area that was considered *res communis* is seen in the 1971 WARC-ST in Geneva for space telecommunications. Of note is Resolution SPA 2-1 of the Conference, which, on the one hand, stated that the use of the spectrum/orbit resource should be based on efficient and economic principles. On the other hand, the Resolution provided that all states had equal rights to exploit that resource. The Resolution also pointed out that a state could not claim a permanent priority over a particular radio frequency.[85] Consequently, Resolution SPA 2-2 called for the *a priori* planning of broadcasting satellite services ("BSS") that ensured the equitable use of the GSO and related frequencies with respect to BSS.

In 1973, the Malaga-Torremolinos Conference was held and the Convention that resulted from it was the first ITU basic instrument to incorporate principles of non-discrimination, equitable access to the spectrum/orbit resource, efficiency, and the economical use of the resource. Article 33 provided:

> [I]n using frequency bands for space radio services Members shall bear in mind that radio frequencies and the geostationary satellite orbit are limited natural resources, that they must be used efficiently and economically so that countries or groups of countries may have equitable access to both in conformity with the provisions of the radio regulations according to their needs and the technical facilities at their disposal.

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[83] Final Act of the Extraordinary WARC, ITU, held in Geneva, October-November 1963.

[84] Resolution 24 of the Conference.

[85] Final Acts of WARC-ST ITU held in Geneva, June-July 1971.

This provision recognised the inter-relation between the position of a satellite in the GSO and its use of a particular radio frequency.[86] It was at the 1977 WARC for the Planning of the Broadcasting Satellite Service ("WARC-BSS") that the *a priori* plan for the BSS in certain regions was adopted for the first time.

The 1979 WARC had issued Resolution 2 which stressed that registration of frequency assignments did not confer permanent priority.[87] *Inter alia*, it provided that registration of a satellite and its related radio frequency with the ITU "should not provide any permanent priority...and should not create an obstacle to the establishment of space systems by other countries." In addition, Resolution BP of the 1979 WARC[88] provided that a forum should be convened to guarantee equitable access of the spectrum/orbit resource to all countries. Resolution 1 of the 1982 Plenipotentiary Conference held in Nairobi also called for a number of conferences to be held to discuss the issues.[89]

The WARC on the Geostationary-Satellite Orbit and Planning of the Space Activities Utilising was held in two sessions, WARC-ORB-85 and WARC-ORB-88. At the first session, a series of eleven planning principles was adopted, which included the following: "(a) guarantee of access and equability; (b) efficiency in orbit and spectrum use, and (c) sharing with other services."[90] The adoption of these principles paved the way for the second session of the Conference in 1988 to reach agreement on the *a priori* allotment plan.

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[86] The 1982 Plenipotentiary Conference held in Nairobi changed the phrase "according to their needs and the technical facilities at their disposal" to "taking into account the special needs of the developing countries and the geographical situation of particular countries."

[87] Resolution 2 replaced Resolution SPA 2-1 of 1971 WARC-21.

[88] This Resolution was also referred to as Resolution 3.

[89] This resulted in conferences like WARC-ORB-85 and WARC-ORB-88.

[90] For other principles, see Document 324 (Rev 1) WARC-ORB-88, 15 September 1985; Doyle, "Space law and the geostationary orbit: the ITU's WARC-ORB 85-88 concluded" (1989) 17:1 Journal of Space Law 15. For an assessment of the recommendations made at the 1985 Conference see Ospina, "The GSO and services utilizing it: an independent assessment of the 1985 WARC-ORB recommendations" Proceedings of the Twenty-ninth Colloquium on the Law of Outer Space, October 1996 at 122-127.

At the WARB-ORB-88 the planning was limited to the BSS and fixed satellite services ("FSS"). The Conference adopted the *a priori* approach regarding the FSS. According to this approach, at least one slot in the geostationary orbit and certain frequency bands were to be guaranteed for each state, irrespective of its current or future technical ability to launch a satellite into the GSO.[91] Although the WARC-ORB-88 was a success for developing countries, some observers said that its success was not broad enough. This was because "the plan adopted in 1988 is limited to only one service out of seventeen space services and the planned portion covers less than one percent of the total spectrum allocated to the space services."[92]

Although the *a priori* plan was accepted by the WARC-ORB-88 for the FSS, reservation of a slot in the GSO and allocation of its related frequencies did not grant any proprietary rights to states. In other words, the legal regime of outer space and its resources, which included the RFS and GSO, prevented any right of ownership and national appropriation. States did not own the spectrum/orbit resource but they could use it. Therefore, what was allowed was the free use of outer space and its resources on a fair and just sharing system.[93]

Finally, reference should be made to Article 44 of the ITU Constitution which *inter alia* provided that since radio frequencies and the geostationary satellite orbit are limited natural resources:

> [they] must be used rationally, efficiently and economically, in accordance with the Radio Regulations, so that countries or groups may have equitable access to both, taking into account the special needs of the developing countries and the geographical situation of particular countries.

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[91] See Appendix 30B of Final Acts, WARC-ORB-88, ITU, Geneva, 1988.

[92] See Jakhu's view which is referred to in Gorove KA, Report on Events of Interest, Annual Meeting of the American Society of International Law, 7 April 1989, Chicago: (1989) 17:1 Journal of Space Law 47, 49.

[93] See Summary of Discussion of Planning, Doc 324 (Rev 1) WARC-ORB-88, 15 September 1985; Working Paper submitted by the Soviet Union to UNCOPUOS entitled "Considerations on the Legal Status of Geostationary Orbits". This paper inter alia stated that the launching of a satellite does not create any right of ownership over orbital positions and that states have an equal right to use the GSO: United Nations Doc A/AC105/L 94, 21 June 1077; United Nations Doc A/32/20, Annex IV at 29.

The inclusion of the words "equitable access" to the RFS and GSO by states results from the recognition that these resources are *res communis*. In fact, on closer scrutiny, it is now apparent that it was never recognised that there could be any proprietary or priority rights over the RFS and GSO. This brings us now to the attempt by equatorial states to lay national claims to certain segments of the GSO.

1976 BOGOTA DECLARATION

In 1976, representatives from eight developing equatorial states ("the equatorial states")[94] met in Bogota, Colombia and challenged the principle that the GSO is a *res communis* resource. At the conclusion of their meeting on 3 December 1976, the Bogota Declaration recognised that the GSO was a scarce natural resource that was a circular orbit on the equatorial plane and proclaimed that equatorial states had a claim over those segments of the GSO that were located above their territories. The Declaration recognised the significance of the GSO for telecommunication purposes and stated that the value of the GSO would be enhanced by developments in space technology, particularly for telecommunication purposes.

The equatorial states used the principle on the permanent sovereignty of states over their natural resources to support their claims to the GSO, referring specifically to two General Assembly Resolutions, namely, the Resolution on Permanent Sovereignty over the Natural Resources of Developing Countries and Expansion of Domestic Sources of Accumulation for Economic Development[95] and the Resolution on the Charter of Economic Rights and Duties of States.[96] They also referred to Article 2(1) of the Charter of the United Nations and concluded that "the synchronous geostationary orbit, being a natural resource, is under the sovereignty of the equatorial states (as an integral part of their territories)."

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[94] The states were Brazil, Colombia, Congo, Ecuador, Indonesia, Kenya, Uganda and Zaire.

[95] Resolution 2692(XXV) of 11 December 1970.

[96] Resolution 3281(XXIX) of 12 December 1974.

Accordingly, and as a corollary to the sovereignty principle, the launch of geostationary satellites into the GSO over the territories of the equatorial states would require prior authorisation from them and the launch should comply with the national laws of the equatorial states.

In addition, the equatorial states relied on a scientific justification for their claim, based on the gravitational power of the earth. In the Declaration, they stated:

> the geostationary orbit is a physical fact linked to the reality of our planet because its existence depends exclusively on its relation to gravitational phenomena generated by the earth, and that is why it must not be considered part of the outer space. Therefore, the segments of geostationary synchronous orbit are part of the territory over which Equatorial states exercise their sovereignty.

The equatorial states took the view that the principle of non-national appropriation of outer space that was incorporated in the 1967 Outer Space Treaty did not extend to the GSO because the GSO was *sui generis* and not part of outer space. This view was expressed because there was no universally agreed definition of outer space that explicitly considered the GSO as an integral part of outer space.[97] The states declared those segments of the GSO that were above the high seas as "common heritage of mankind" and stated that their use should be regulated by international organisations "for the benefit of mankind."

The equatorial states expressed concern that if the current rate of increase in the number of satellites being placed into the GSO continued, it would not take long for the GSO to be fully exploited by only a few technologically developed sates, thereby further strengthening their claims to the GSO and ensuring their rights over this natural resource. They felt that the policies of the ITU had not resulted in an equitable and efficient use of the GSO in practice, and that industrialised states had overwhelmingly benefited from the use of the GSO owing to their superior

[97] The issue of national claims of the equatorial states over certain segments of the GSO has been discussed in UNCOPUOS and its Subcommittees. For example, see Report of UNCOPUOS, United Nations GAOR, Thirty-third Session, Supp No 20, United Nations Doc A/33/20 (1978) and Report of the Legal Subcommittee of UNCOPUOS Meeting of March-April 1983.

financial position and advanced knowledge in space technology. The imbalance in the use of the GSO by developing and developed countries had therefore motivated them to make their claim to the GSO, to compensate them for what they considered to be a considerable loss over the past few decades.[98] In their opinion, "both the geostationary orbit and the frequencies have been used in a way that does not allow the equitable process of the developing countries that do not have the technical and financial means that the great powers have."[99]

Two main reasons have been forwarded to refute the national claims of the equatorial states over the GSO. The first is scientific in nature which argues that the satellite's path through space is affected by a variety of factors, one of which is the gravitational pull of the earth.[100] The second argues that state practice and international treaties on outer space indicate that the GSO has always been an integral part of outer space and no protest by states had been made over the location of geostationary satellites.

Although the GSO is not clearly defined as part of outer space in international instruments or documents on the subject, there are indications that the GSO is considered part of outer space. For example, the United Nations took this position in General Assembly Resolution 1721(XVI) on international cooperation in the peaceful uses of outer space, which *inter alia*, called upon "States launching objects into orbit or beyond to furnish promptly to the Committee on the Peaceful Uses of Outer Space, through

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[98] The equatorial states inter alia argued in the Legal Subcommittee of UNCOPUOS that "geostationary orbit must be used in priority for the benefit of developing countries in order to help to narrow the gap between the developing countries and the industrialized countries on an equitable basis": see Report of the Legal Subcommittee on the Work of its Seventeenth Session, 13 March to 7 April 1978, United Nations Doc A/AC 105/218 (1978) at 10 para 40.

[99] Ibid. For the Bogota Declaration, see Christol CQ, International Space Law and the Use of Natural Resources (1991, Kluwer Law and Taxation Publishers, Deventer) 178-181, especially 179.

[100] According to one view, these factors include "the energy imparted by the launch of the vehicle, the mass of the spacecraft, the altitude at which it moves above the earth, the moon and the sun, and the radiation pressure of the sun": Rosenfield, "Where airspace ends and outer space begins" (1979) 7:2 Journal of Space Law 142; also see the position of the United States in United Nations Doc A/AC 105/C 1/SR199, 28 February 1978 at 9.

the Secretary-General, for the registration of launchings."[101] In addition, statements by the United States and the USSR have adopted the same position, as seen in their innumerable statements on space objects and outer space.

In Article 1(b) of the 1976 Registration Convention, space objects are defined as "component parts of a space object as well as its launch vehicle and parts thereof.[102] Article 4(d) refers to the basic orbital parameters for space objects, namely, nodal period, inclination, apogee and perigee. These parameters are related to the position of space objects in the earth's orbit and since the 1976 Registration Convention is an instrument on outer space, it may be concluded that artificial satellites circle in orbits that form part of outer space.

Although the concerns of the equatorial states are understandable, the GSO and the related RFS should not be subject to national sovereignty and appropriated. Neither should proprietary rights attach to them. Moreover, national claims over the GSO are impracticable since the GSO is located 36,000 kilometers above the earth's surface and inseparable from outer space. On the contrary, as a common resource, it should be managed by competent international bodies to achieve a more equitable and efficient system for its use and distribution among states.

ITU MANAGEMENT OF THE GSO AND RFS

There are two reasons why the GSO and RFS should be used in an efficient and equitable manner. First, the number of stilettos that are launched into the GSO and the number of frequency bands that are allocated to the RFS are increasing. Secondly, the GSO and RFS are finite resources. These facts necessitate the coordination and organisation of activities at the international level, especially through the ITU.[103] UNCOPUOS also plays

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[101] See Article 4 of the 1976 Registration Convention.

[102] Also see Articles 2, 5-6 of the Registration Convention where the term "space object", when used in the context of objects in orbit and beyond, is considered to be in outer space.

[103] On the aspects of the ITU, see Talaie, "The International Telecommunication Union: origins, legal status, legal structure and functions" in Proceedings of the International Conference on Telecommunications, Istanbul, 14-17 April 1996, Volume 2 at 775-782.

an important role in identifying the legal status of the GSO and its efficient use.[104] Although these organisations have questioned their respective roles and raised the issue of overlapping competence, they cooperate with each other in order to avoid problems regarding jurisdiction. In practice, the ITU is acknowledged as the main body that regulates space communications and space telecommunications by satellites, including the regulation of the GSO and RFS. The ITU also keeps UNCOPUOS informed of its regulatory functions and submits an annual report to the latter.[105]

In its 1983 study, UNCOPUOS recognised the ITU as "the authority responsible within the United Nations family for establishing in a timely manner technical and operational standards for all forms of the radio frequency spectrum and of the geostationary satellite orbit".[106] ITU's role was examined at the Second United Nations Conference on the Peaceful Uses of Outer Space held in Vienna in 1982 ("Unispace-82 Conference"). The Conference recommended that ITU members should:

> continue to evolve some criteria for the equitable and efficient use of the GSO (geostationary orbital position) and RF (radio frequency) spectrum and develop planning methods and/or arrangements that are based on the genuine needs, both present and future identified by each country. Such planning method should take account of the specific needs of the developing countries, as well as the special geographical situation of the particular countries.[107]

The ITU's Constitution and Convention contain the regulatory bases for the allocation of the orbit/spectrum resource. Under the Constitution,

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[104] For example, UNCOPUOS has attached importance to the identification of the most efficient and most economical ways of using the GSO in order to broaden its use, particularly by developing states: see United Nations Doc A/34/20, 1979 at 10.

[105] The Thirty-fourth Report was submitted in 1995 and inter alia noted that in 1994, 242 new satellite networks were submitted to ITU's Radiocommunication Bureau by telecommunication administrators.

[106] United Nations Doc A/AC 105/327, 19 October 1983.

[107] Refer "List of Conclusions and Recommendations" of Unispace-82, United Nations Doc A/CONF 101/11, 18 October 1982 at para 284.

Article 44 incorporates the principle of efficient and equitable use of the GSO and RFS. According to Article 1(1-a), one of the purposes of the ITU is "to maintain and extend international cooperation between all Members of the Union for the improvement and rational use of telecommunications of all kinds." The expression, "telecommunications of all kinds" includes telecommunications through the use of the GSO and RFS and requires their rational use with a view to improving such use. This is confirmed by Article 1(2-b) which stipulates that the ITU should coordinate efforts "to eliminate interference between radio stations of different countries and to improve the use made of the radio-frequency spectrum and of the geostationary-satellite orbit for radiocommunication services."

It is also useful to refer to the 1995 submission of the ITU Representative to UNCOPUOS, who stated that the international management of the spectrum/orbit stood on four pillars: (1) the Table of Frequency Allocations and Related Provisions of the Radio Regulations; (2) the coordination procedures for obtaining the agreement of other administrations concerning frequency and orbit usage; (3) the procedures associated with world frequency and orbital position plans; and (4) the notification, publication and recording of frequency assignments in the master International Register.[108]

One of the main responsibilities of ITU's plenipotentiary conferences is the achievement of ITU goals through the introduction of proper strategies and policies, as found in Article 1 of its Constitution. The Radiocommunication Sector of ITU, including the World and Regional Radiocommunication Conferences and Radio Regulations Board, play a central role in the equal distribution of the RFS and equal use of the GSO. For example, under Article 1(2-a), the ITU, through the Radiocommunication Sector, allocates bands of the radio-frequency spectrum to a range of services on the basis of geographical regions, allots radio frequencies to states, and registers radio frequency assignments and any associated orbital positions in the GSO. These processes are undertaken "to avoid harmful interference between radio stations of different countries."

The ITU Radio Regulations also contain provisions on space communications, particularly with respect to the use of the RFS and GSO.

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[108] Statement of the ITU Representative to the Thirty-eighth Session of UNCOPUOUS, 1995 at 2.

For example, the Regulations include specific provisions for satellite broadcasting. So far, ITU members have complied with the Regulations and have facilitated international telecommunications based on the principle of freedom from interference.

The role of international telecommunication satellite organisations should be considered as they provide satellite telecommunication services world wide. The practice in a number of international agreements that deal with communication satellites should also be noted. In particular, reference should be made to the three international organisations working in the realm of satellite telecommunications, namely, Intelsat, Intersputnik and Inmarsat. Their constituent documents refer to United Nations General Assembly Resolution 1721(XVI) on the global use of communication satellites.

Intelsat is the most representative international telecommunications satellite organisation.[109] It works thorough its main organs, namely the Assembly of Parties, the Meeting of Signatories, and the Board of Governors, its executive organ. It was established on a permanent basis by the 1971 Agreement Relating to the International Telecommunications Satellite Organisation ("Intelsat Agreement").[110] The Preamble recognises the principles that are found in Resolution 1721(XVI) and provides for access to communication satellites on "a global and non-discriminatory basis." The Preamble recalls Article 1 of the 1967 Outer Space Treaty which provides that outer space shall be used for the "benefit and in the interest of all countries". The Preamble also provides for the best and most equitable use of the RFS and of orbital space through the application of shared satellites.[111]

As suggested by the name, it was the 1971 Agreement on the Establishment of the "Intersputnik" International System and Organisation

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[109] On 7 May 1997, Intelsat had 141 member states.

[110] (1971) 10 International Legal Materials 909.

[111] For an outline on the principal features of Intelsat, see Department of State Bulletin, 3 May 1971 at 569-572.

of Space Communications ("Intersputnik Agreement")[112] that created Intersputnik.[113] Like in the Intelsat Agreement, the Preamble to the Intersputnik Agreement refers to Resolution 1721(XVI) and the 1967 Outer Space Treaty. Article 7 provides that Intersputnik "shall coordinate its activities with the International Telecommunication Union and cooperate with other organisations concerned with the use of communication satellites both in technology and the use of the frequency spectrum".

According to Article 11 of the Intersputnik Agreement, Intersputnik is composed of a Board (consisting of Representatives from the Parties), a Directorate (the permanent and executive and administrative organ), and an Auditing Commission (which has the financial responsibility). In 1997, 22 states, mainly socialist states, were members of Intersputnik.

Inmarsat was established in 1978 by the Convention on the International Maritime Satellite Organisation ("Inmarsat Convention")[114] and specialises in maritime satellite telecommunications. According to Article 9 of the Inmarsat Convention three main organs provide the structural framework of the organisation: the Assembly, the Council and the Director-General, and at present, Imnarsat has 80 member states. The Preamble also recalls Resolution 1721(XVI) and the 1967 Outer Space Treaty. The objective of Inmarsat is found in Article 3 as follows:

> To make provision for the space segment necessary for improving maritime communication, thereby assisting in improving distress and safety of life at sea communications, efficiency and management of ships, maritime public correspondence services and radio determination capabilities.

CONCLUSION

The above discussion shows that the GSO and RFS need protection. To ensure their efficient and equitable use, international cooperation is

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[112] (1977) 16 International Legal Materials 1.

[113] Since 1976, it has also been known as the Intercosmos Program.

[114] (1976) 15 International Legal Materials 219 as amended in (1988) 27 International Legal Materials 691.

necessary and international organisations like the ITU have an important regulatory role. Since the GSO and RFS are *res communis* and do not belong to the national domain of states, their proper and effective management is important. Such management should promote and result in equal access to these resources and it should prevent interference with their legitimate use. In this context, cooperation at the international level is imperative and the activities of existing international telecommunications satellite organisations should be expanded on the basis of global and equal access to the RFS and GSO.

At present, there are many space objects and satellites in the earth's orbit that are not operational.[115] Known as space debris, they are dangerous and a universal problem. Consequently, there should be international efforts to retrieve or eradicate them as an example of a step towards the efficient use and protection of these unique and limited natural resources.

[115] See Jakhu, "Space debris in the geostationary orbit: a major challenge for space law" (1992) XVII:I Annals of Air and Space Law 313.