REGULATING THE GEOSTATIONARY ORBIT: ITU'S WARC-ORB - '85-'88*

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Introduction - Statement of a Problem

Satellite communication is the primary commercial exploitation of space. In 1986, it was a more than $1 Billion annual business. Communication satellites (comsats) are providing telephone, telegraph, facsimile, data, or television relay services in more than 140 countries.[1] These satellites are used and owned nationally, regionally and globally. Growth in comsat use is now limited primarily by the extent of telecommunication infrastructure on the ground and the emergence of new, low cost, high capacity, terrestrial trunking technologies for high density communication routes.

National use of satellites, especially in developing countries, has increased rapidly in recent years.[2] With global availability of services from the International Telecommunication Satellite Organization

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1. CCIR, *Technical Bases of the WARC-ORB (1) CCIR CONFERENCE PREPARATORY MEETING REPORT* 45 (ITU 1984). Intelsat alone provides extensive service on a global basis. In addition, systems such as Intersputnik, Palapa, Arabsat and Eutelsat offer regional or global services, some limited to specialized space services. "At the end of 1983, the space segment (of Intelsat) consisted of a total of 750 antennas at 601 earth station sites in 149 countries providing more than 30,000 full-time voice and data circuits and over 26,000 hours of television transmissions." *Id.*

2. ITU WARC-ORB 85 Second Advisory Comm. Rep., Second Rep. of the Advisory Comm. for the ITU WARC-ORB-1 (January 1985), *submitted in* FCC Doc. GEN 80-741 (January 31, 1985) (hereinafter Second Advisory Comm. Rep.). "Gradually, more countries are using satellites for domestic or regional services. By 1985, 26 countries, of which 18 are developing countries, will lease INTELSAT capacity for domestic use and 23 countries will participate in regional satellite system. Brazil and Mexico will have joined Indonesia and India in owning their own domestic systems." *Id.* at 2.

(Intelsat), there has been rapid expansion of use of satellites by even the least economically developed nations. Today some of the world's smallest nations are considering how to use this technology to foster more effective economic development. Some are even considering establishment of dedicated national systems.[3] This nearly global interest in comsats has produced a major political and institutional problem. *How shall the world community efficiently and equitably regulate access to and use of the geostationary satellite orbit (GSO) on which cost effective communication satellites operate?*

This paper deals with the identities and roles of: (1) the International Telecommunication Union (ITU),[4] (2) the geostationary satellite orbit (GSO), (3) the national, regional and global communication satellite systems in use and planned, (4) the ITU-WARC-ORB-'85-'88, and (5) the currently contemplated regime for regulation of the use of the GSO.

1. The International Telecommunication Union (ITU)

The ITU is a specialized agency of the United Nations providing global coordination and regulation of international telecommunication system operation. The ITU originated as the International Telegraph Union, established in Paris, France in 1865, and has had an important continual functional role in regulating and coordinating international communications for more than a century. At year-end 1986, about 160 nations were members of the ITU.

The organization's headquarters are located in Geneva, Switzerland, where there are: a permanent Secretariat staff, headed by an internationally elected Secretary General; a coordinating staff and Director for the International Consultative Committtee on Telegraph and Telephone (CCITT); a coordinating staff and Director for the International Consultative Committee for Radio (CCIR); and the staff and member offices

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3. For a list of national transponder leases on the Intelsat space segment between 1974 and 1986, see ITU WARC-ORB-85 First Advisory Comm. Rep., First Rep. of the FCC Advisory Comm. for the WARC-ORB-1 (December 1983), ***submitted in*** FCC Doc. GEN 80-741 at 4-15 (December 22, 1983) [hereinafter First Advisory Comm. Rep.] A later list may be available from the Intelsat Secretariat, Washington, DC.

For details of current national programs, actions and plans, see ITU, Twenty-fourth Report by the International Telecommunication Union on Telecommunication and the Peaceful Uses of Outer Space (Booklet No. 33, Geneva, 1985). This report is prepared for and submitted to the United Nations Committee on the Peaceful Uses of Outer Space.

4. International Telecommunication Convention, Nairobi, 1982 (ITU 1982) [hereinafter Nairobi Convention]. This convention is the current constitutional instrument of the ITU. The Union's Convention is reviewed periodically for revisions to take into account changing circumstances in the conduct of world telecommunications.

of the International Frequency Registration Board (IFRB). The work of the Union is done through a variety of mechanisms and forums including: international study groups, plenary assemblies of the CCI's, the Administrative Council that meets annually; specialized, extra-ordinary, regional and global administrative conferences; and the supreme organ, the Plenipotentiary Conference of the Union, convened once every eight to ten years.

Summarizing the International Telecommunication Convention (Nairobi, 1982, Art. 4), the purposes of the Union are to:

(1) maintain an extend cooperation for improvement and rational use of telecommunication;
(2) promote development of facilities and their efficient operation to improve services, increase their usefulness, and make them, so far as possible, generally available to the public; and
(3) harmonize actions of nations in attaining these ends.[5]

During the periodic constitutional Plenipotentiary Conference held by the ITU in Nairobi in 1982, the Union membership modified Ariticle 33 of the Union's convention dealing with "Rational Use of the Radio Frequency Spectrum and the Geostationary Satellite Orbit." As adopted at Nairobi, Article 33 now reads in part:

2. In using frequency bands for space radio services Members shall bear in mind that radio frequencies and the geostationary satellite orbit are *limited natural resources* and that they must be used efficiently and economically, in conformity with the Radio Regulations, so that countries or groups of countries may have equitable access to both, taking into account the special needs of the developing countries and the geographical situation of particular countries.[6]

In 1973 seeds of discontent concerning the GSO were sown in Article 33 in Malaga-Torremolinos, Spain when Article 33 was first introduced, and the phrase "limited natural resources" was first used to officially describe the radio spectrum and the GSO.[7] This phrase is the primary driver of developing country interest in the GSO. It likens the

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5. *Id.*

6. *Id.*

7 International Telecommunication Convention, Malaga-Torremolinos, 1973 (ITU 1974), T.I.A.S. No. 8572.

GSO to the mineral resources of the seabed, the natural resources of the high seas, and the resources on the moon. In doing so, all of the quasi-legal, but primarily socio-political arguments that surround the Treaty on the Law of the Sea and the 1979 Treaty on the Moon, are dredged up or extracted from our imagination. The arguments are immediately applied to the GSO, making it another *cause celebre* in the continuing north/south debate over what constitutes "the common heritage of mankind."

Consideration of the radio frequency spectrum and the GSO as *"limited"* natural resources is a fundamental misconception stimulating a great deal of current GSO debate. The radio frequency spectrum and GSO are:

- physical phenomena existing in perpetuity with quantifiable characteristics that make them useful.
- inexhaustible, nonconsumable resources that cannot be "used up," and
- commonly shared natural phenomena like oceans, air or sunlight, the use of which requires common sense, cooperation and mutual accommodations.

But the radio frequency spectrum and the GSO are not subject to elimination, diminution or control by any sovereign to the exclusion of any other.[8]

In the past 25 years we have learned a great deal about the use of radio spectrum and the GSO. We will undoubtedly learn a great deal more in the next 25 years. However, if we were collectively to agree, and to behave as though the radio frequency spectrum and the GSO are limited natural resources that must be partitioned among nations, preserved for future use, and subjected to sovereignty, we would fly in the face of logic, deny ouselves use of an extraordinary productive tool, and constrain technological development to our universal discredit and disadvantage.

2. *Understanding the Geostationary Satellite Orbit (GSO)*

A satellite moving at a fixed rate from west to east in a circle lying on the plane of the equator at an altitude of 22,300 miles above the earth has an orbital period of approximately 24 hours. Under these conditions, a satellite will orbit the earth in synchronization with a point below it on the earth's equator, so that it remains always above that point. The satellite thus appears to stand still in the sky. We call such satellites "geostationary." Because the satellite orbit is synchronized with the rotation of the earth it is also called "geosynchronous." (All

8. *See* Doyle, *Legal and Policy Implications of Treating Natural Resources as the Common Heritage of Mankind,* PROC. 29TH COLLOQ. L. OUTER SPACE 31 (1986).

geostationary satellites are geosynchronous, but not all geosynchronous satellites are geostationary).

In the late 1950's and 1960's, when satellites such as SCORE, ECHO, TELSTAR and RELAY were being flown experimentally, communication satellites were not geostationary. They rose over the horizon, moved across the sky and set in various periods of time, and with various ground tracks, depending upon their altitudes and angles of inclination to the plane of the equator. In 1962-1963, with the flight of SYNCOM satellites, by NASA, geostationary satellite concepts were first practically demonstrated.[9] With the launch of the Early Bird satellite, in April 1965, the world's first commercial communication geostationary satellite was established. Originally designed and constructed under contract to the U.S. Comsat Corporation, the Early Bird satellite was later subrogated to Intelsat as the first internationally owned commercial communication satellite.

At year-end 1986, there were more than 80 operating communication satellites in the geostationary satellite orbit. About one half of them were U.S. satellites.[10] The attractiveness of this orbit is based on the absence of satellite motion. Static earth stations do not have to track satellites moving across the sky and that fact has significant economic and operational implications. With a few antennas, nations can communicate across oceans or continents, into mountains, jungles, dessert or tundra regions, making geostationary satellites attractive to all nations, large or small, developed or developing.

2.A. *How the GSO Problem Arose*

The ITU has in place a regulatory regime for management of the GSO and spectrum use. The current regulatory process (most recently amended by the World Administrative Radio Conference of 1979) is controlled in ITU Radio Regulations, Articles 11 and 13, and associated Appendices 3, 4, 28 and 29. The process provided for in the regulations involves three basic steps: (1) advance publication of a proposed satellite system through the IFRB, (2) coordination of any identified problems involving other countries, and (3) notification of registry of the system in the International Frequency Register.

A national Advisory Committee to the Federal Communications Commission published a report in 1983 in which the ITU's performance

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9. For an initial state-of-the-art statement defining alternative early communication satellite systems, see *Space Satellite Communications: Hearing Before the Subcomm. on Monopoly of Senate Comm. on Small Business*, 87th Cong., 1st Sess. 120-37 (1961) (testimony of Dr. Elmer W. Engstrom).

10. *See* Second Advisory Comm. Rep., *supra* note 2, at 2-6 (detailed statistics set forth).

record for facilitating geostationary orbit access was reviewed.[11] The following material is drawn substantially from that report.

The current registration procedure provides flexibility in use of the orbit and affords flexibility to Administrations in the choice of system parameters. The current space registration procedures are based on the traditional approach used by the ITU in terrestrial radio services registration. The coordination regulations are a first-come, first-served regime.

The regulations require that a proposed system successfully coordinate with any radio system with a potential interference problem which has an earlier IFRB notification receipt date. However, another provision of the Radio Regulations assures registration of any system. Any Administration can submit a system's characteristics for notificaion and be placed in the Master Register with a designating mark indicating its sequential filing status. The mark can be removed if the system operates for four months without causing interference. Moreover, the regulations require prior users to "consider" adjustments to later arriving users' requirements.[12]

Another provision of the Radio Regulations, Section 1053, titled "Resolution of Difficulties" reads: "...Administrations concerned shall together make every effort to resolve...difficulties by means of *mutually acceptable adjustments* " (emphasis added). Similarily, Resolution 2 of the 1979 WARC provides that first registration and use do not provide "permanent priority" and "should not create an obstacle to the establishment of [other] space systems."[13]

There are provisions also in the Radio Regulations, Appendix 3 (Notification Data) and Appendix 4 (Advance Publicaition Data) which require Administrations to specify "visible arc" and "service arc." Administrations must specify the portion of the geostationary arc over which the space station is visible from the service area on Earth at a minimum elevation of 10° (visible arc), and the portion of the arc over which the space station could provide the required service (service arc), and reasons for any discrepancy between the size of the two arcs. This information is intended to provide flexibility to accommodate future users; satellites could be moved within their service arc, if necessary, to accommodate users entering at a later time.

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11. *Id.* at 57-60.

12. I.T.U. Radio Reg. 1051 (1982).

13. *See Id.* at Resolution 2. For discussion of Resolution 2 of the 1979 WARC and other related provisions, see Smith, *Space WARC 1985: The Quest for Equitable Access*, 3 B.U. INT'L L.J. 229, 238-39 (1985).

2.B. *Coordination Experience Precipitated a Challenge to the System*

According to the Annex to IFRB circular 1555, dated May 24, 1983, some 85 geostationary satellites were notified worldwide and 95 were then in the coordination process. An estimated 20-30 satellites have been notified since inception of the current system, in addition to those which are currently in the International Frequency List. Well over 100 satellites have been coordinated and notified to date, and more than 90 are in the process. No country has ever been denied acess to the GSO. While a large number of satellites have been sucessfully registered, at times difficulties have arisen during the intersatellite coordination portion of the regulatory process.

In 1974 and 1975, difficulties arose in coordinations involving India, Indonesia, the USSR and Intelsat. Registration difficulties were experienced by India for Insat and by Indonesia for Palapa. Both systems were finally successfully coordinated after a number of operational concessions were made by the later arriving satellite system owners, *viz.* India and Indonesia. The problems which arose in these cases grew out of the coordination process, but were created by factors separate from the ITU regulatory procedure.

Wide differences in system operating characteristics, usually called "inhomogeneity," result from different coverage and service requirements. In addition, constraints emerge resulting from multi-purpose use of space segments. Occasionally, low cost implementations involve restrictions; and difficulties can be created by conservatism of those already in orbit seeking to protect their operations from interference.

Lack of consistent use of ITU (CCIR) interference criteria also can lead to difficulty. Most of the difficulties in the Indian and Indonesian cases were associated with the Intelsat Article XIV process,[14] not the ITU regulations. Also the bilateral nature of the process itself leads to some difficulties. An agreement between two Administrations may negate or impact an earlier agreement with a third party by either or both parties to a new bilateral negotiation.

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14. 1971 Intelsat Agreement, Art. XIV. Article XIV provides in part as follows: (c) To the extent that any Party or Signatory or person within the jurisdiction of a Party intends to establish, acquire or utilize space segment facilities separate from the INTELSAT space segment facilities to meet its domestic public telecommunications service requirements, such Party or Signatory, prior to the establishment, acquisition or utilization of such facilities, shall consult the Board of Governors, which shall express, in the form of recommendations, its findings regarding the technical compatibility of such facilities and their operation with the use of the radio frequency spectrum and orbital space by the existing and planned INTELSAT space segment.
Space Law: Selected Basic Documents, Senate Comm. on Commerce, Science and Transportation, Comm. Print 175, 215-16 (1987).

As a member of Intelsat, India was obligated under Article XIV of the Intelsat Agreement, to coordinate with Intelsat using Intelsat's coordination guidelines derived from CCIR Recommendations. This coordination resulted in a number of restrictions on the Indian system to accommodate the Intelsat protection criteria, including: (1) shifting India's preferred orbital position by 5°; (2) restrictions on satellite power with resultant increases in earth station costs; and (3) some restrictions on India's TV operations. The orbit location had been based on India's multipurpose satellite requirements, in particular the meteorological payload, and no study had been made of the orbit problems which might arise with other satellites. Better advance study by India might have prevented some of these problems.

Similar to the problems created for India, Intelsat required operational concessions by Indonesia (under Intelsat Article XIV procedures) despite a 14° orbital separation. Indonesia also experienced difficulties with the USSR in obtaining detailed system information. An active role by the IFRB (at Indonesia's request) was required to resolve the USSR/Indonesian problem. Intelsat has since modified its coordination criteria and has generally relaxed its required protection ratios.[15]

According to the FCC, U.S. commercial coordination experiences have been, in general, positive. In a late 1970s trilateral coordination involving Canada, Mexico and the U.S., the emphasis was on mutual accommodation and an equal distribution of concessions. The U.S. generally takes the approach of coordinating early and informally as soon as system requirements are decided. At the appropriate time, these informal agreements are followed by official ITU paperwork.[16]

The experiences of India and Indonesia with the first-come status of the Intelsat and USSR space segements led them to bring the issue of coordination requiring concessions by latecomers to the entire ITU membership. At the General World Adminstrative Radio Conference of the ITU in 1979, a decision was made to formally address the GSO access problems at a world conference. That subsequent conference is the WARC-ORB-'85-'88.

3. The Satellite Systems in Being

The year-end 1984 population of operating communication satellites on geostationary orbit was 80.[17] These were operating in the

15. First Advisory Comm. Rep., *supra* note 3, at 4-24.

16. First Rep. of the Advisory Comm. for the ITU WARC on the Use of the Geostationary Satellite Orbit and the Planning of the Space Services Utilizing It, 4-22 - 4-24 (December 1983), *filed in* FCC Docket No. GEN 80-741.

17. Second Advisory Comm. Rep., *supra* note 2, at 2.

6/4 GHz band and in the 14/11-12 GHz band. About 48 of these, substantially more than half, were launched since 1979. The greater number (55) were operating exclusively in the 6/4 GHz band. Hybrid satellites (using both 6/4 and 14/11-12 GHz) numbered 10. There were 15 operating exclusively in the 14/11-12 GHz band. Of the 10 hybrid satellites, Intelsat operated 8. Intelsat also had 7 Intelsat IV/IV-A satellites oper-ating exclusively in the 6/4 GHz band. Summarized by regional location:

	6/4GHz	14/11-12GHz	Hybrid	
North/South America (30 W - 180 W)	16	11	5	32
Europe/Africa/Mid-East (30 W - 66 E)	17	3	4	24
Asia/Far East (67 E - 180 E)	22	1	1	24
Total	55	15	10	80

This table reflects communication satellites in the GSO in December 1984, derived from the IFRB's Master Register and other sources.[18] There were a total of 138 satellites of all types confirmed to be in the GSO at the year-end 1984.

In mid-1985, 26 countries, of which 18 are developing countries, were leasing Intelsat capacity for domestic communication use and 23 countries were participating in Regional systems. Australia, Brazil and Mexico joined the community of nations with domestic satellite systems in 1985. (See Table 1 at end of article).

In terms of accommodation of further growth, the FCC Advisory Committee, mentioned above, concluded in its First Report, in 1983, and reconfirmed in its Second Report in January 1985, that:

> "There is a great deal of available radio spectrum, particularly above 10 GHz, that can be used to satisfy communication satellite demand well into the next century. The technology for exploiting these higher frequencies is in early development, and

18. The IFRB Master Register is maintained in Geneva, Switzerland at ITU Headquarters by the staff of the International Frequency Registration Board. Copies of the Register are avilable from the ITU Secretariat on electromagnetic tape. The information presented here was compiled at the Comsat Corporation, Washington, DC, for use by the FCC's Public Advisory Committe. See Second Advisory Comm. Rep., *supra* note 2, at 2-4.

the present cost of implementing systems at these frequencies is greater than the cost of well-established systems."[19]

However, since January 1985, further market research and study of the cost issues has been completed. At the WARC-ORB-85, the United States Delegation introduced Doc. No 141, which explained that the cost of technologies for use of frequencies in the expansion bands and in areas above 10 GHz has been reduced significantly recently, as use of these technologies has been expanding.

4. The WARC-ORB-'85 and '88

The following material is drawn substantially from the report to the Second Session of the Conference.[20]

The World Administrative Radio Conference (Geneva, 1979), in Resolution No. 3, invited the Administrative Council to take all necessary steps to convene a world space administrative radio conference with the objective to guarantee in practice for all countries equitable access to the geostationary satellite orbit and the frequency bands allocated to space services. It also resolved that the Conference should be held in two sessions.

The Plenipotentiary Conference (Nairobi, 1982) in its Resolution No. 1, stated that the agenda of the first session should contain formal adoption for inclusion in the Radio Regulations, of the relevant decisions of the 1983 Regional Administrative Radio Conference for the planning of the Broadcasting Satellite Service in Region 2. In its Resolution No. 8, the Nairobi conference instructed the Administrative Council to consider the question of feeder links, with a view to include in the agenda of the first session, later scheduled for 1985, the planning of the bands allocated to the fixed-satellite service (FSS) and reserved exclusively for feeder links for the broadcasting-satellite service.

The Administrative Council, at its 38th session (1983), following consultation with the Members of the Union, adopted Resolution No. 895. This Resolution, as approved by a majority of the Members, decided that the first session of this Conference should be convened in Geneva on 8 August 1985, for a duration of five and a half weeks; it also drew up an agenda for the first session. In conformity with the terms of reference contained in its agenda, the first session decided:

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19. Second Rep. of the Advisory Comm. for the ITU WARC on the Use of the Geostationary Satellite Orbit and the Planning of the Space Services Utilizing It, 3 (January 1985), *filed in* FCC Docket GEN 80-741.

20. *See* ITU WARC-ORB 85 Rep. to the Second Session of the Conference, Chapter 1 (ITU 1985); *see also* ITU WARC-ORB 85 First Session, Doc. No. 328 (Rev. 2)-E 1-2 (September 15, 1985) [hereinafter ITU WARC-ORB Rep.].