COMERCIALIZATION OF SPACE ACTIVITIES AND APPLICATIONS OF THE SPACE TREATY.....GEOSTATIONARY ORBIT AND FREQUENCY SPECTRUM

Toshio KOSUGE
University of Electro-Communications
Tokyo, Japan

1.Introduction

More than 5,000 satellites have been launched into orbit since 1957. 496 satellites of those were on the geostationary earth orbit (GEO). 113 of those satellites were communication and broadcasting satellites on the orbit. It is clear that most of those communication and broadcasting satellites have been utilized for global, regional and domestic commercial communication network services in order to improve terrestrial network systems revolutionary and very rapidly since 1960's.

In the Asia-Pacific region more than 40 communication satellites were launched on the GEO by countries, like Australia, China (including Hong Kong), India, Indonesia, Japan, Korea, Malaysia, Thailand, Tonga. Within a few years several non-GEO communication satellites will be in service by using low earth orbit(LEO) and medium earth orbit(MEO). Demand for those commercial communication satellites for fixed and mobile services has been very strongly increased by not only developed but also developing countries.

In such circumstances it would be very important for critical issues of international cooperation and coordination to solve conflicts among nations for more efficient and equitable use of those limited natural resources, orbit and frequency spectrum on commercial bases under the Space Treaty and other international laws.

2. Commercial use of outer space and the Space Treaty

Since 1980, the commercial use of communication and broadcasting satellites has been rapidly increasing in both developed and developing countries. From the end of 1990's, many new projects for commercial communication and broadcasting services using GEO and non-GEO orbit will be introduced.

*Director, IISL; Professor, University of Electro-Communications, Chofu, Tokyo, Japan; Chairman, SOLAPSU.

The number of communication and broadcasting satellites to be launched in GEO from 1996 to 2006 is expected to reach approximately 300. The market size will be around 28 billion US$. In addition, many projects for mobile satellite communication services using LEO and MEO are planned; ICO, Iridium, Odyssey, Global Star, etc. There will be more than 242 such kind of satellites during ten years till 2006.

Commercial satellite markets in the world will grow largely in 1990's, because of the exploding demands of satellite communication and broadcasting services in the Asia-Pacific and other developing areas in the process of economic growth and also during the replacement period of previous generation satellites. Furthermore, many small non-GEO satellite projects will contribute quick development of the commercial satellite market.

Under the Space Treaty of 1967 there has been development of commercial satellite communication and broadcasting services using GEO. The question has not yet been raised on Article 1 of the Space Treaty for equitable access to the limited natural resources, GEO and radio spectrum. Before 1980, the demand for GEO and spectrum was not so high, and as a result such space resources were used by a few countries on the "first come, first served" basis. In the 1980's many countries, especially developing countries, joined International Telecommunication Union (ITU) and such allocation systems. As a result of both WARC-85 and WARC-88 on GSO, reflecting those developing countries' positions, it was decided that at least one orbit and one frequency band shall be allocated to all member countries for their domestic satellite communication.

Realizing the importance and the value of the space resources, each country tries to insure as many orbits and spectrum as possible in advance and there are overflowing applications for the orbit and spectrum as paper satellites. This situation resulted from the exploding demand for telecommunications services fueled by private sector enterprises; growing congestion in the use of those orbit and spectrum resources; the current ITU procedures that do not discourage hoarding of the orbit and spectrum resources and increased awareness of the economic value of orbit and spectrum resources.

Even though there is the flexibility in the ITU Plan for satellite communications, its technological obsolescence is clear. The standardized parameters used to develop the Plan were based on 1980's technology. The technological advances of the last 10 years since the Conference (WARC) already shows us the potential advances of the next 10 or even 5 years. Technology obsolescence, however, is an inherent danger of any planning approach. It would be quite appropriate for ITU to have WARC-97 Conference for many agenda, including satellite communication.

The following issue could be a potential key element in the WARC-97. It will address international satellite network coordination. Substantive preparatory work has been done in

this area and for good reason. It implicitly touches on key elements in frequency coordination, which in general have been carefully elaborated in an evolutionary manner, trying to cope with the ever-accelerating telecommunication developments, without neglecting the principles of economic use of, and equitable access to the spectrum.

Whilst it can be claimed that this intent has been reflected faithfully and in great detail in the current relevant ITU Radio Regulations), a certain uneasiness is building up. The Regulations are considered to be increasingly complex, complicated and non-transparent, except for some respectable specialists. The dispersion of related provisions in the various Regulations and their overlapping different timing schemes with regard to advance publication coordination and notification of satellite systems, leads to confusion and conflicting interpretations.

The classic approach to reliable frequency assignments is careful planning, provided that the necessary parameters are agreed and supported by users, technology and timing requirements. With a streamlined approach such as this, an economic use of the spectrum can be achieved and equitable access guaranteed, at best, with a priori plans.

In the case of implementation of satellite systems over an unspecified period of time, some of these parameters may change in the meantime. The more rigid a plan is, the more critical its value, benefit and justification. Medium and especially long term planning therefore call for appropriate attention and may be confined only to the respective allocation provisions of Article 8 of the Radio Regulations. This would avoid the inherent drawbacks of planned, but not used, parts of the spectrum.

The alternative approach would be to rely on regulations, rules and procedures providing timely, qualified case-by-case coordination with guaranteed access. This brings us to the coordination procedures in general, be they in the core of the Radio Regulations or in annexes. Every effort should be made to consolidate these procedures into basic, transparent, and truly relevant stable instruments, favoring a better general understanding, this would save time and resources. Specific additions for different services should be kept to the minimum necessary. Special attention should also be given to the associated overlapping time-schemes mentioned earlier often a source of controversy.

The specific orbital aspects with respect, for example, to the GEO and the non-GEO also call for careful examination. The physical properties of these orbits and the operational requirements for satellite systems must be reconciled while avoiding inappropriate preferences. Orbital and spectrum economy are closely related issues and conflicts could be rendered less harsh by making suitable separate allocations for GEO and non-GEO--- this would require some adjustments. A timely review of the allocation table and service definitions is recommended.

The technical fundamentals assembled and

condensed in the ITU Radio Communication Sector, form the basis and starting point for a realistic and orderly use of the spectrum. Their proper development and application would not only make it possible to accommodate the ever-increasing requirements but would also open the door to fair burden-sharing in cases of bottlenecks when assigning frequencies.

Numerous are the factors determining fair and reliable spectrum usage. The misuse of only a few of them leads to inefficient, one-sided applications to the detriment of others. "First come---first served" should not be followed by "next come---maybe served".

In the changing environments of the more commercial and private sectors participation into the satellite communications and broadcasting services under the 1967 Space Treaty, the now more frequent possibilities of revising the Radio Regulations of ITU bring with them the most welcome advantage of aligning Regulations with evolving requirements, provided no complications, duplications and implicit hesitations are perpetuated based on over caution, mistrust prevailing fear. Continuous cosmetics and fine-tuning of existing Regulations in their old framework may no longer suffice to overcome present problems and should be complemented by courageous new decisive steps, in the area of satellite networks in particular. Already, the acceptance and implementation of a new concept with guaranteed access when required, replacing, where appropriate, the abstract value of an immediate plan entry may ease the situation.

3. Optimizing the spectrum for satellite communications

In exploding demands for commercial satellite communications and broadcasting services, it would be more important and critical for each country and also ITU to elaborate the optimizing the orbit and spectrum within the framework of limited natural resources for mankind.

It could be useful for development of future implementation of Article 1 of the Space Treaty in the changing environment of more commercial utilization of space resources.

In the case of national level, price-based allocations of the spectrum might be interesting. Allocating spectrum to the user who values it most is a particularly acute problem where demand exceeds supply (probably most evident in the allocation of spectrum for new telecommunications services). Conventional spectrum allocation methods cannot deal adequately with this problem. Over the counter and lottery allocations provide windfall gains to those lucky enough to be allocated scarce licenses, at the cost of the community as a whole. There is, moreover, no guarantee that the most valued and efficient uses will be accommodated. A comparative selection process needs considerable time and resources to work properly, and there is no guarantee that the most economically efficient use will be rewarded.

In these circumstances, some countries like Australia, have used a system of price-based

allocations to distribute licenses among competing users. While we have three means of price-based allocations available to us: auction, tender or negotiated price; in practice Australia has only used the auction mechanism. Australia's Spectrum Management Agency (SMA). The SMA conducted during 1994-1996 three auction styles, and they have been extremely successful, with a total of over 550 licenses allocated. The process worked smoothly, was widely regarded as successful in allocating the spectrum to those who valued it most, and contrasted to previous much less successful attempts in Australia to allocate communications licenses by tender.

The simultaneous auction has significant advantages over sequential auctions where a number of related licenses are offered for sale. Because all licenses are on sale at the same time, buyers can adjust their strategies as the auction develops. In a traditional auction, when bidding for a particular lot, buyers have to guess what prices will be paid for later lots. In a simultaneous auction a buyer can much more easily switch to other lots during the course of an auction if outbid on their preferred lots. All lots are on sale until bidding activity ceases on all lots.

This kind of philosophy is that, wherever possible, planning and management decisions are best left to the marketplace. Maximum freedom for licensees to use spectrum in the way they wish is likely to produce the greatest overall efficiency, because the least obstacles will be placed in the way of the highest value use.

Spectrum pricing and market allocations are not the only way to introduce market force into spectrum management. A crucial factor is what licensees can do with spectrum once they have access to it. Traditionally, particular bands are licensed for specific services, with tight operating requirements constraining its use. This has long been thought necessary to minimize interference and maximize spectrum efficiency.

However, there are growing difficulties with this approach. For a start, different technologies increasingly compete to use the same bands, with differing standards for the same basic service developed in Europe, the US and Japan competing for a share in the marketplace. Secondly, technology and use are changing rapidly. And, finally, there is recognition that in a deregulated world, as much freedom as possible should be given to users to make basic planning and management decisions by themselves.

Recognizing this, Australia has provided for a new, more market-oriented form of radio communications license, called a spectrum license. It introduces an access right, akin to a property right, over the spectrum.

Instead of focusing on particular pieces of equipment and its uses, spectrum licensing authorizes the use of spectrum. It entrusts the spectrum to the care of licensees. Licensees will have considerable flexibility to use the spectrum as they wish, provided

they comply with the core technical conditions of the license. In other words, the SMA will not determine the use to which the spectrum is put.

Spectrum licenses are fully tradable in the market place, further increasing flexibility for users. They will be allocated using a price-based process, and the SMA intends that this would normally be through an auction. There are of course some major coordination and interference issues to be addressed. Because of the considerable freedom available to licensees to choose their own services and technologies, core conditions have to be developed which minimize the risk of interference regardless of the technology used.

Domestic and international challenges

In order to respond to the great demand to the orbit and spectrum, space resources, at domestic level, a lighter touch, market-oriented approach is the only effective way to deal with challenges facing spectrum managers in a time of rapid technological change, deregulation and competition, and internationalization of communications.

But considerable challenges remain. Traditional planning and licensing techniques have difficulty keeping up with the pace of technological and commercial change, and this is compounded where international planning is required. Domestically we believe that providing maximum flexibility to licensees is the best way of allowing the market to adapt to change. Internationally this is more difficult. Inevitably, the licensing of global mobile satellite services in the countries will be heavily influenced by licensing and spectrum allocation decisions taken by the FCC of the US. While it may be argued, for example, that countries should be able to auction spectrum for such services, such an approach adopted by every country would almost certainly make these systems impossible to implement. This is an area where increased international cooperation may be desirable. One example of such cooperation came early this year when prospective mobile satellite competitors (Iridium, Odyssey and Globalstar) agreed to abide by a spectrum-sharing plan.

Another challenge is that of providing quick and fair means of clearing spectrum which is required for new services. In the case of Australia, the government is providing a mechanism by which spectrum can be sold while still encumbered, with clearance proceeding after sale according to a pre-defined timetable. A similar type of system has operated in the US in the Personal Communication Service bands, but with new purchasers being required to meet the costs of moving incumbents elsewhere. Both systems have been the subject of controversy, but finding the best way to meet both the expectations of new purchasers and incumbents will be a growing challenge for spectrum mangers throughout the world.

4. Conclusion

Since the orbital space and frequency spectrum have been used and also secured by both developed and developing countries, it is quite important for us to optimize the spectrum for further development of commercial satellite communications and broadcasting services. As mentioned in the case of some countries, domestic management of the spectrum could be feasible for implementing more efficient, effective and economical use of limited natural resources like orbit and spectrum at the international level. It would be important for the future development of commercial use of satellite communications and broadcasting services for all countries under the scheme of Articles of the Space Treaty., to improve rules and regulations for the procedures of ITU and other international regimes in order to optimize those resources.

Selected Bibliography

*Arnopoulos, *The International Politics of the Orbit Spectrum Issues*,7 Annals Air & Space Law,215(1982)

*Butler, *The International Telecommunication Regulatory Framework For Satellite Communications.* Proc. 28th Colloq. On the Law of Outer Space 295(1985)

*Cheng, *The Legal Regime of Air and Outer Space: The Boundary Problem, Functionalism versus Spatialism: the Major premises.* Annals Air & Space L.(1980)

*Christol, The Modern International Law of Outer Space (1982)

*Christol, Space Law: Past, Present and Future (1991)

*Codding & Rutkowski, The International Telecommunication Union In a Changing World (1982)

Constitution of International Telecommunication Union,(1994) Kyoto

*Doyle, *Regulating the Geostationary Orbit:ITU's WARC-ORB-85-88*,15 J. Space L.1(1987)

**Final Acts adopted by the First Session of the WARC-ORB-85* (Geneva,1985)

**Final Acts adopted by the Second Session of the WARC-ORB-88* (Geneva, 1988)

*Gobriel, International Space Law Miscellanea, 1995

*Gorove, *Geostationary Orbit: Issues of Law and Policy*, 73 Am. J. Int'l L. 144(1979)

*Jassentuliyanna, *The Developing Countries and the Geostationary Orbit* (paper presented at the 13the Annual Friedman conference on the Global Telecommunications Revolution, Columbia Univ., March 29,1985

*Kosuge, *Legal Problems of Geostationary Orbit*, Law and Outer Space (1990)

*Leive, International Telecommunications and

International Law: The Regulation of The Radio Spectrum (1970)

*Matte, Aerospace Law, Telecommunications Satellites (1982)

*Papp & McIntyre, International Space Policy (1985)

*Rothblatt, *Satellite Communication and Spectrum Allocation,* Am. J. Int'l. L. (1982)

*Smith, D., International Telecommunication Control (1969)

*Smith, D., Communication via Satellite (1976)

*Smith, M., International Regulation of Satellite Communication (1990)

*Zwaan, ed., Space Law: Views of the Future (1988)

*Weiss, *Maximizing Access to the Geostationary-Satellite Orbit,* 53 Telecommunication J. 469 (1986)

*White, R. & White, H., The Law and the Regulation of International Space Communication (1988)

*Williams, *The Exploitation and Use of Natural Resources in the New Law of the Sea and the Law of Outer Space,* 29th Collq. On the L. of Outer Space, 198 (1986)