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LEGAL IMPLICATIONS OF MOBILE COMMUNICATION SYSTEMS IN LOW EARTH ORBITS (LEOs)

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A thesis submitted to the Faculty of Graduate Studies and Research
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A mes chers parents,

sans lesquels rien de ceci n'aurait été possible.

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ABSTRACT

The world of telecommunications has dramatically evolved these last few years. With the wind of liberalization blowing, private companies are playing a new role in an area where monopolistic public entities had always imposed their rules. New technologies are now opening broad perspectives which were even not forecast a few years ago. In only ten years, mobile communication systems have witnessed three different technologies and are now integrating the latest concept, satellite mobile communications called S-PCS (Satellite Personal Communication Systems, which is the faculty of being contacted at anytime, anywhere).

New players are emerging from the United States and tend to impose their predominance to the world. With the award of a licence to operate by the Federal Communications Commission to them, three US companies have gained a headstart, which only one non-US company, Inmarsat ICO, seems capable to challenge. However, in order to achieve the global communications era of S-PCS, they will have to overcome implementation barriers such as the authorization to operate on a worldwide basis.

Countries are not ready yet to relinquish their sovereignty on telecommunications and each company will have to be licensed in each country to be able to provide their service.

If they can implement these new technologies, the new systems will definitely dominate the international mobile communication era for the next ten years.

RÉSUMÉ

Le monde des télécommunications a considérablement changé ces dernières années. Alors que les télécommunications ont longtemps été dominées par des entreprises publiques monopolistiques, un vent de libéralisation a soufflé et des entreprises privées commencent à jouer un rôle de plus en plus important. L'influence de la technologie ouvre aujourd'hui des portes à peine imaginées. En moins de dix ans, nous sommes passés de la première génération de systèmes mobiles à des systèmes de communications mobiles par satellite, appelés S-PCS (Systèmes de Communications Personnelles par Satellite permettant d'être contacté partout et à tout moment).

De nouveaux acteurs sont apparus aux Etats Unis et ont tendance à s'imposer mondialement. Suite à l'octroi d'une licence par la Commission Fédérale des Communications, ils ont pris une certaine avance, que seul semble pouvoir leur contester Inmarsat ICO. Cependant, pour pouvoir déployer leurs sytèmes et offrir des services à une échelle globale, ces compagnies devront obtenir des autorisations à un niveau mondial. Les Etats ne sont pas encore près à renoncer à leur souverainté sur les télécommunicatione et chacune des entreprises devra obtenir une licence dans chacun des Etats où elle veut opérer.

Si ces acteurs sont capables de déployer leurs systèmes, ceux-ci vont dominer le marché des télécommunications mobiles internationales durant les dix prochaines années.

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GLOSSARY

AMPS: Advanced Mobile Phone System: Analog technology used in North America for cellular systems.

ATM: Asynchronous Transfer Mode.

CDMA: Code Division Multiple Access is a form of digital modulation access technology which transmits numerous signals within the same frequency bandwith, all at the same time. Each signal is tagged with an unique code which allows the signals to be distinguished by the receiver and avoid mutual interference.

DECT: Digital European Cordless Telecommunications.

FDMA: Frequency Division Multiple Access is another digital modulation-access technology which shares a frequency bandwith among multiple users by allocating each user a smaller channel within the main bandwith.

Feederlink: It is a radio link (both uplink and downlink) between the satellite and an earth station which connects into the public switched telephone network. The service link is a radio link (both uplink and downlink) between the satellite and the satellite telephone.

Footprint: The satellite's area of coverage.

FPLMTS: Future Public Land Mobile Telecommunications Services. Generic name which encompasses Personal Communications Services

Gateway: Bridge doing the connection between phone lines and the satellite system.

GSM: Groupe Spécial Mobile or Global System for Mobile communications.

ISDN: Integrated Services Digital Network.

MSS: Mobile-Satellite Service is a demand-assigned communications service which is both distance and terrain insensitive.

MTSO: Mobile Telephone Switching Office.

NVNG: NonVoice NonGeostationary, a synonym for the Little LEO systems.

PCS (or **PCN**): Personal Communications Services (or Network), generic umbrella used for a variety of mobile services. They should permit high-capacity digital voice and data transmission through small, inexpensive, handheld, wireless telephones and computing devices.

PSTN: Public Switched Telephone Network.

RDSS: Radiodetermination satellite service, which can locate a mobile unit at any spot on the globe.

TDMA: Time Division Multiple Access is a digital modulation-access which divides a single frequency channel among multiple users by allocating unique time slots of roughly half a millisecond to each user. It is the technology mostly used within the European Union.

Transponder: A transponder is any device that takes an input signal, amplifies it, and outputs the same signal. Some transponders are designed to perform data processing, and might therefore output an intentionally modified signal. A typical transponder bandwidth is 36 MHz. Other bandwidths are also used.

UMTS: Universal Telecommunications Mobile System, another synonym for the FPMTLS.

I. Introduction

"Global satellite telecommunications is a growing market, with estimated revenues of about $ 3 billion. Satellites, however, constitute only a small component of the worldwide telecommunications service industry. Total worldwide telecommunications revenues currently approach $ 600 billion, with about 78 percent for services and 22 percent for equipment. Europe and the Americas contribute about 75 percent of these revenues and the Asia-Pacific region provides 20 percent. International services have been growing about 15 percent per year, fueled by growth in international trade, travel, and liberalization of telecommunication policies". [1]

The future of the telecommunications is one of the most important stake of the economy of tomorrow. Among all services offered to individuals, telecommunications, thus, will be more visual, more intelligent and more customized to the personal requirements of each of us. "Mobile communications, in particular, will become increasingly important to users on the move, who will need ubiquitous access to voice, images, text, and data to remain competitive. All those requirements will increase pressure to standardize norms and to realize economics [sic] of scale by international cooperation and joint ventures". [2]

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[1] I. Goldstein, "Intelsat: Transforming a Market Leader to Meet changing Global Telecommunications" (1994) 39 Fed. Com. L. J., 243 at 243.

[2] K. Grewlich, "Agenda for the 1990s", in *Global Telecommunications Policies: The Challenge of Change*, ed. by M. Jussawalla (London: Greenwood Press, 1993) at 232.

The current problem in the mobile communications environment is that the three main markets (Europe, North America and the Far East) have all adopted different radiotechnologies for their mobile phone systems.[3]

Handsets which work in Paris or London will not work in New York or Tokyo. One way around this is to promote one of the digital mobile phone technologies as a world standard. Another way, and this what will draw our attention, is to develop a truly global mobile phone system which bounces calls of orbiting satellites.[4]

Hence, this thesis will focus on the legal implications arising from the deployment of Low Earth Orbits Satellite systems aiming to offer PCS (Personal Communications Services) on a worldwide basis. After a brief description of the technologies involved, we will examine the proposed new systems before assessing the regulatory framework. We will not discuss issues such as terminal licensing, custom duties, type approvals or accounting problems but will try to assess questions relating to the system licensing. Regulatory aspects can be divided into five categories, which all must be implemented for the system to be operational[5]:

1. Frequency allocation: the first step is to ensure that frequencies are available for the services that need them and to avoid any interference with other services. We will see how the International Telecommunications Union dealt with this aspect on a global standpoint.

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[3] Europe uses the GSM, the US mainly the CDMA (code division multiple access) and Japan the PHS (Personal Handy System).

[4] R. Wilson, "Mobility" *Electronics Weekly* (6 December 1995) 26.

[5] " Satellite Personal Communications and their Consequences for European Telecommunications, Trade and Industry" Report to the European Commission by KPMG Peat Marwick, D. G. XIII/165/94-EN. Vol. I (March 1994) [hereinafter quoted as *KPMG*] 123.

2. System licensing: It is the process whereby satellite systems, operating at a particular frequency, come into service. This aspect focuses on the allocation of a certain frequency within a country for a system to operate. We will assess this question as we study the American Environment where 3 systems have been licensed.

3. Service licensing: It is the process whereby individual national regulatory authorities (NRAs) approve companies to operate services in their country. It is sometimes referred to as gateway licensing. SPCS Operators are currently negotiating with all concerned countries those licenses, either directly, either via National Service Operators with whom they are working (see infra).

This relates to obligations or restrictions imposed by a NRA on the provision and operation of gateways that interconnects a PCN to other networks.

4. Terminal approval: It refers both to permission to use an instrument to access a service and to safeguards that ensure it does not operate in a detrimental manner.

5. Standards: It relates to the interface, the functional specifications and protocol definitions. It is rather a technical question than a regulatory aspects, although it influences the regulatory questions.

The operation of satellite PCS systems is subject to two inter-related sets of issues:

- formal notification to the International Telecommunications Union for the purpose of technical frequency coordination. We will analyze this in our comment on the role of ITU.

- selection and authorization of the systems in nations where the ground segment capacity is to be used. We will deal with this aspect in our discussion of the United States and the European Community telecommunications environment.

Finally, we will try to see what are the consequences on existing satellite systems such as Intelsat. Unlike previous international satellite systems, these new "global satellite systems" are mostly privately owned. Instead of being regulated through international agreements between State Parties, they will be licensed and regulated by each and every country in which they want to operate and offer their services.

II. Basic Notions

As of today, satellite telecommunications systems rely heavily on satellites deployed in the geostationary orbit. Since recently, Low Earth Orbits satellites were mainly used for remote sensing or other less important applications[6]. At first, we will try to analyze the differences between telecommunication services using the GSO and the LEOs.

A. Orbit Positions in Satellite Systems

1. Geostationary Satellite Systems

Telecommunications satellites in geostationary orbit are placed at a distance of 35,900 kilometers (22,300 miles) above the earth's surface, in the plane that passes through the earth's equator. A satellite in geostationary orbit appears to remain stationary when viewed from the surface of the earth and thus any antenna on the ground can remain stationary while tracking the satellite. A satellite in geostationary orbit can transmit radio waves to 42.4 percent of the earth's surface under the satellite. Three satellites are therefore sufficient to cover the greatest surface of the earth. The area of coverage is referred to as a "footprint". To send and receive

[6] The main applications are remote sensing users (such as U.S. Landsat and the French SPOT image spacecraft), space materials processing interests and human spaceflight programs.

signals, the earth station (a dish-shaped satellite antenna) must be in the satellite's footprint.[7]

Similar to the beam of light from a flashlight, the radio signal from a satellite transponder can be focused to illuminate less than 42.4 percent of the earth's surface. "The earth station antenna is focused on and transmits radio signals to the satellite, and the satellite receives and retransmits the radio signals. If the signal were sufficiently strong, and if the earth station antenna were focused on the satellite, then an earth station could receive a transmission from the satellite. If the signal were not strong enough, the earth station would lose it in background noise, an effect similar to trying to see a flashlight from a far distance on a bright day. By increasing the radius of the earth station antenna, it is still possible to receive a weak signal (dish antenna 'gain', or magnification, increases linearly as a function of the surface area of the dish)".[8]

2. Low Earth Orbit Satellite Systems

The U.S. Federal Communications Commission defines "low-earth-orbiting satellite systems" as "any system that is not operating in geostationary orbit. This includes

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[7] C. Rourk, "Analysis of the Technical and Economic Issues Raised in the Consideration of International Telecommunications Satellites Systems Separate from INTELSAT" (1994) 46 Fed. Com. L. J., 329, at 333. He quotes the other limitations of a satellite in GSO at page 334: "Other limitations of using satellites for telecommunications include (1) the earth station antenna can only be focused on one satellite at a time, (2) the transmitting and receiving earth stations must have compatible radio transmission formats, and (3) the two earth stations must be illuminated by the same satellite to communicate directly with each other.

[8] Ibidem, at 334.

systems operating in lower-altitude orbits, medium-altitude orbits, and highly elliptical orbits".[9] Generally, LEO satellites orbit the earth at distances of 1,000 to 2,000 kilometers.

Because the closer the satellite is to the earth, the lower is the energy dispersion and less the power required to guarantee a link with portable terminals (LEO satellites can receive communications from smaller and weaker earth transmitters).[10] An orbit located at 1,100 km requires 1,000 times lesser energy than the geostationary orbit.[11]

Leo's attractiveness lies in its lower cost, smaller size and easier launch capability than the traditional GEO.[12] The altitude of satellites is very important for mobile phone services: whereas geostationary satellites present an unacceptable 360-390ms[13] delay on calls, low earth orbit satellites offer the shortest delay at around 150ms. Besides, medium earth orbits are also used (see Odyssey and ICO) because they present the advantage of having a delay at only 200ms and they require less satellites (about 10 are sufficient) to offer a global coverage.[14]

Whereas only three satellites are necessary to cover the surface of the earth in a GSO system, only constellations of satellites can assure a global coverage of the

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[9] T. Stevens, "Regulation and Licensing of Low Earth Orbits Satellites" (1994) 10 Computer & High Tech. L. J. 402.

[10] D. Rouffet, "Globalstar: A Transparent System" (1st Quarter 1993) *Alcatel Asthom Publications*, 84 at 84.

[11] A. Ducrocq, "Telstar Entre Deux Ages: Face à un Brevet Odyssey pour Detrôner l'Orbite Geostationnaire" (29 septembre 1995) *Air & Cosmos/Aviation International*, at 39.

[12] R. A. LaCroix, "Developments in International Satellite Communications in the International Space Year" (1993) 1 CommLaw Conspectus 99, at 104.

[13] Ms stands for milliseconds.

[14] R. Wilson, "TRW Files Patent on Satellites" *Electronics Weekly* (29 November 1995) 56.

earth: the LEO satellites being in constant motion relative to a fixed point on the earth, as one satellite passes out of range, another has to appear over the horizon. The main disadvantage of using LEO satellites in communications network seems to be that their operating lifetimes are about half those of geostationary satellites, due to stronger effect of gravity on low orbiting satellites.[15]

[15] T. Stevens, supra note 9, at 404.

3. Can we patent the LEO concept ?

a) Introduction

On the 18th of July 1995, the US patent office (PTO[16]) awarded TRW two patents for inventions at the heart of Odyssey. One protects the concept of medium earth orbits (MEO)[17] at altitudes from 10, 350 km to 18,500 km as the basis to provide mobile satellite communications via pocket-sized handsets. The second patent[18] covers additional aspects of the MEO spacecraft design, such as a method of directing the antennas to achieve uninterrupted coverage of the earth.[19] We will not discuss the technical concepts of the patent of the antenna but will focus our attention on the patent of the concept of using the medium circular orbit.

This overshadows the technical plans of ICO (Inmarsat) which intends to use the same orbital configuration (although ICO uses 2 orbital planes and Odyssey uses 3).

" Following the patent award by the U.S. Patent Office in 1995, there has been a very negative reaction in European quarters. According to press accounts, the patent approval was later withdrawn but the issue is obviously still contentious and under debate". [20]

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[16] The U.S. Patent and Trademark Office.

[17] US patent No. 5,433,726 protects TRW's invention of a global, medium-Earth-orbit-based satellite cellular phone system, including the low-power pocket telephones and terrestrial gateways.

[18] US patent No. 5,439,190.

[19] A. Gould, " The Race to Ring the World - World Telephone Exchange" *Engineer* (4 May 1995) 13.

[20] R. Shaw, *Satellite-Based Global Personal Communication Systems: An Analysis From Telecom 95* (International Telecommunication Union, Geneva), [unpublished], at 3.

Subsequently, it was announced on 29 November 1995 that TRW had its intermediate earth orbit satellite design patented in Germany.

"The issuing of three 'utility models'[21] by the German patent office is a significant move towards TRW's first full European patent".[22] The three aspects of TRW's design covered by the action include the use of three orbital planes below 10,000 nautical miles where at least one satellite is visible to the mobile phone at a minimum elevation angle of 10 degrees. TRW is now filing for patents in Japan, South Korea, Taiwan (where it was awarded in early January 1996) and China as well as Europe[23].[24]

b) The concept of patent

It is commonly believed that a patent gives the owner the affirmative and exclusive right to make, use or sell the patented invention. To the contrary, a patent owner

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[21] "The utility models are short of full patents, but nonetheless allow TRW to seek protection in court of its Odyssey technology." "Germany boosts TRW on Odyssey Program" *Aeropsace Daily* (28 November 1995) 321. The German Utility Models register three separate inventions:
- A satellite-based cellular telecommunications system having the satellites disposed in three orbital planes below 10,000 nautical miles with the orbits of the satellites being evenly spaced and inclined about the earth and where at least one satellite is visible to the mobile telephone at a minimum elevation angle of 10 degrees;
- A satellite-based cellular telecommunications system having the satellites placed in medium Earth orbit, where each satellite has its antenna foresight centered on the service region served by the satellite during the time the service region is visible to the satellite, where satellite coverage overlaps for some length of time, and where calls placed from a user located within the coverage overlap region are assigned to the arriving satellite;
- A satellite-based cellular telecommunications system where the satellites provide minimum 24-hour cellular-telephone communication coverage over a predetermined latitude range around the world which is less than full Earth coverage.

[22] R. Wilson, "TRW Files PATENT on Satellites" *Electronics Weekly* (29 November 1995) 56.

[23] ICO has opposed patent applications in the European Patent Office for Odyssey. "Patent Row Over Satellite System" *CommunicationsWeek International* (20 May 1996) 4.

[24] R. Wilson, supra note 22, at 56.

has the right to exclude others from making, using or selling the subject of the patent. The monopolistic rights granted to inventors, which are based on fundamental property rights, are offset by the required disclosure[25] of inventions to the public and by the time limitations[26] placed on those exclusive rights.

These monopolistic rights can be utilized for financial gain by the patentee.[27] Although the patent law grants the patent owner the right to prevent others from making, using or selling the invention, it may be in the best business interest of the patent owner to transfer to others at least partial access to the invention.[28]

c) Conditions to patent an invention

Generally, in order to be entitled to a utility patent, an invention must be:

(1) within the boundary of statutory subject matter ser forth in Section 101;

(2) new

(3) useful

(4) and unobvious to one ordinary skill in the art to which the subject matters pertains.[29]

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[25] The disclosure must be in the form of a detailed specification and any necessary drawings which would "enable any person skilled in the art to which it pertains... to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention." 35 U.S.C. section 112 (1989).

[26] 35 U.S.C. section 154 (1994) establishing a term of seventeen years.

[27] A patentee is the holder of a patent.

[28] R. W. Morris, "Another Pound of Flesh: Is There A Conflict Between The Patent Exhaustion Doctrine and Licensing Agreements ?" (1995) 47 Rutgers Law Review 1557, at 1564-1565 and 1574.

[29] M. A. Epstein, *Modern Intellectual Property*, 2nd ed. (New Jersey: Prentice Hall Law & Business, 1989) at 202.

1) Statutory Subject Matter

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.[30]

TRW has patented two aspects: the system of their antennas (which obviously may fall under this definition and will not draw our attention) and the use of the Medium Earth Orbit (MEO).

According to Epstein, the definitions of those terms is limited to the concept of machine[31], manufacture[32], or composition of matter[33]. Can the concept of MEO be considered as a 'process' ? According to the definition given in the code, " the term 'process' means process, art or method, and includes a new use of a known process[34], machine, manufacture, composition of matter, or material."[35] The Supreme Court in *Cochrane* v. *Deener* defined it:

> A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed or reduced to a different state or thing.[36]

After a first glance, it seems that this definition is rather far from the concept of Medium Earth Orbit.

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[30] 35 U.S.C. section 101 (1988).
[31] A machine is a device which has relatively moveable parts which performs a useful operation.
[32] An article of manufacture is generally defined as any tangible object, other than a machine or composition of matter, that is manmade and not found in substantially the same form in nature.
[33] A composition of matter includes the physical combination of two or more ingredients to produce a mixture or compound, which may be liquid, solid or gas.
[34] Such as the use of orbits for satellites ?
[35] 35 U.S.C. section 100 (1988).
[36] *Cochrane* v. *Deener*, 94 U.S. 780, 788 (1876).

2) Novelty

An applicant is denied a patent if the subject matter of the invention as claimed was known or used by someone other than the inventor in the United States before the inventor's date of invention (i.e., conception or reduction to practice), or if the subject matter was patented or described in a printed publication by someone other than the inventor anywhere before the inventor's date of invention.[37] There is a one-year grace period granted for an inventor to file a U.S. application from the date of the occurrence of any of the events enumerated in the section.[38]

This question is difficult to assess in the absence of relevant information regarding the declarations on the use of MEO of each of the players.

3) Utility

An invention must accomplish one of its intended purposes. Most machines, articles of manufacture and processes meet the utility requirement of Section 101 if they are minimally operable to perform as they were intended to perform.[39]

4) Unobviousness

Section 103 of the 1952 Patent Act precludes an inventor from obtaining a patent if the differences between the " subject matter sought to be patented and the prior art

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[37] 35 U.S.C. section 102 (a) (1988).
[38] 35 U.S.C. section 102 (b) (1988).
[39] M. A. Epstein, supra note 29, at 203.

are such that the subject matter as a whole would have been obvious to one ordinary skill in the art to which said subject matter pertains." [40]

The question to solve is: is the use of Medium Earth Orbit very different from the use of GSO or LEO ? Under the *Graham* test[41], three determinations must be made:

- the scope and content of the prior art (here of the GSO or LEO)
- the difference between the prior art and the claims at issue
- the level of ordinary skill in the art.

Besides, there is a fourth inquiry which includes the commercial success of the invention, unexpected synergism, long felt but unsolved need for the invention and the failure of others to develop the invention.[42] Those questions are rather a question of facts which are difficult to assess for us.

In conclusion, we cannot deny the fact that it was awarded a patent, albeit we can question the application of the conditions. Another question to assess is the fact that it is an invention based on a certain use of outer space, which *per se* cannot be appropriated.

d) Pantentability and the Outer Space Treaty ?

The very first Article of the Outer Space Treaty[43] enunciates the freedom of the use of outer space:

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[40] 35 U.S.C. section 103 (1988).
[41] *Graham* v. *John Deere*, 383 U.S. 1, 17 (1966).
[42] M. A. Epstein, supra note 29, at 210.
[43] Treaty on Principles Governing the Activities of states in the exploration and Use of outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T/ 2410, T.I.A.S.

> The exploration and use of outer space... shall be carried out for the benefit and in the interests of all countries... Outer space... shall be free for exploration and use by all States without discrimination of any kind...

And Article II states:

> Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.

The scope of these articles is to avoid " any appropriation" or " prohibition of use", not only by a nation but also by its nationals. It is difficult to assess the non-violation of these articles with the concept of patent when it is known that the Patent Statute indicates that " patents shall have the attributes of personal property". [44]

That means that TRW has the attributes of personal property over the use of MEO. If TRW is owner of the use this orbit, how can it be compatible with the provisions of the treaty on "non appropriation [45]" and "freedom of use".

According to Gardner's Dictionary of Modern Legal Usage, appropriation means " the bringing about of a transfer of title or of a nonpossessory interest in the property" and the word property implies the right to use a thing. We cannot deny

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No. 6347., 610 U.N.T.S. 205 (*entered into force* Oct. 10, 1967) [*hereinafter cited as* Outer Space Treaty].

[44] 35 U.S.C. section 261 (1988)

[45] According to Garner's Dictionary of Modern Legal Usage, appropriation means " the bringing about of a transfer of title or of a nonpossessory interest in the property". B. A. Garner, *A Dictionary of Modern Legal Usage*, 2nd ed. (New York: Oxford University Press, 1995) at 71. And property implies rights (of possession, use and enjoyment) over a thing, at 704.

that Medium Earth Orbits belong to Outer Space. Therefore, is the concept or patent really compatible with the Treaty on Outer Space ?

f) Conclusion: potential effects on Inmarsat ICO program

"A patentee [has] the right to exclude others from using... the invention." [46]

The Patent Act of 1952 establishes that " whoever without authority makes, uses or sells any patented invention, within the United States during the term of the patent thereof, infringes the patent." [47]TRW has filed a lawsuit seeking to block ICO Global Communication's $3-billion mobile satellite project.[48] In a filing with the U.S. District Court for the Central District of California, TRW claims that ICO infringes on U.S. patents TRW obtained for its competing $ 3-billion Odyssey system.[49] Odyssey's position is clear: it relies totally on its patent to try to prevent the deployment of ICO's system and avoid a supplementary competitor.

What could be the consequences: in case of court pleadings, ICO might invoke, as a defense, the fact that Outer Space is " extraterritorial" : as a consequence, no State can declare their domestic legislation applicable to this " non-territory" [50] and the patent is awarded only protection within the United States and not in Outer Space

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[46] 35 U.S.C. section 154 (1994).
[47] 35 U.S.C. section 271 (a) (1988).
[48] TRW is seeking an injunction to halt ICO's development of its own satellite communications system (TRW asked U.S. Dist. Court, L.A., to stop Hughes from building system for ICO and sought unspecified monetary damages). But because they will have to prove that without the injunction TRW will be irreparably damaged, to a point that a future lawsuit could not provide a remedy, it seems that TRW will have a tough time proving its case.
[49] "TRW Has Filed a Law Suit" *Aviation Week and Space Technology* (20 May 1996) 21.
[50] G. Lafferranderie, " The United States Proposed Patent in Space Legislation - An International Perspective" (1990) 18 J. of Space L. 1, at 1.

(" nor is the patentee given the right to exclude others from making, using, or selling the invention outside the United States".[51]) but Odyssey could argue that the consequence of its use are within the United States.

> As the principle of territoriality is a governing principle in patent law, patent protection can only be claimed in the territory of the State which granted the patent. The question of whether national laws extend protection to space objects is not governed by an international convention.[52]

" The scope of a U.S. patent is limited to the U.S., ... therefore if ICO builds all or part of its system outside the United States using parts made in this country, it can be found to have violated TRW's patent on the entire Odyssey concept, he said. But if the entire ICO system is built outside the United States, TRW might have trouble applying its American patent to ICO's actions. 'Each country has to be looked at separately. Each company has its own patent laws. That's one of the things you have to do when you're a global company', said McCubbrey, an attorney with Coudert Bros." [53]

Although a U.S. court could only enforce the patent in the United States, it effectively could stifle ICO or any other company seeking to use MEO satellites, because the systems would be unable to offer service in this country.[54]

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[51] *Deepsouth Packing Co., Inc.* v. *Laitram Corp.*, 406 U.S. 518, 513 (" Our patent system makes no claim to extraterritorial effect"), but why not arguing that the use in Outer Space produces territorial effects ?

[52] G. Lafferranderie, supra note 50, at 2: The intention of the United States is to protect inventions made on a space object or component thereof under the jurisdiction or control of the United States as if they had been made in the United States.

[53] " TRW's Suit Against ICO Likely to Face Stiff Tests" *Satellite News* (3 June 1996) IAC-ACC-NO:3205699.

[54] " TRW Files Lawsuit Against ICO to Protect its Odyssey Patents" *Satellite News* (20 May 1996) IAC-ACC-NO: 3187939.

An important element of the case is that in July 1991 TRW was invited by Inmarsat to participate in a study of mobile satellite communications systems and over a period of two years provided support to Inmarsat. TRW alleges that Inmarsat used privileged information, provided during the study, when it started developing its own system, following the establishment of its commercial affiliate ICO Global in 1995.

However, " the general feeling among several experts is that despite the ominous nature of TRW's accusations against ICO, the suit is not likely to hold up in court." [55]

B. Basic Functioning of Mobile Communications

1. Cellular Systems[56]

- A basic cellular system consists of three parts:
  - a mobile unit, which is the handheld terminal.
  - the base stations (or cell sites), which provides the interface between the mobile units and the MTSO. The connection between the mobile unit and the cell site is made via radio links, which carry the data (e.g. the call or the data) as well

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[55] " TRW Files Lawsuit Against ICO to Protect its Odyssey Patents", *supra* note 54. " At least one satellite industry insider familiar with the suit said it represents an attempt by TRW to stifle its competition because Odyssey lags technologically. "TRW is fighting because they're not far enough along in developing their system to fight in the marketplace forum," said a source. "It's not clear what they're after but they expect to gain some kind of advantage in the eyes of the public."

[56] M. Paetsch, *The evolution of Mobile Communications in the U.S. and Europe: Regulation, Technology, and Markets* (London: Artech House, 1993) at 25-27.

as signaling information (identification of the user). This allows in certain countries the use of the mobile unit only within metropolitan areas.

- the Mobile Telephone Switching Office (MTSO)[57], which is the central coordinating element for all cell sites within a system. It routes traffic and signaling within its own network, performs handoff (from one cell site to another one, see infra) and roaming and handles the signaling and traffic with other networks, such as PSTN, ISDN, and circuit and packet-switched data networks.[58]

- A caller may reach either a specific mobile unit or a unit on the public switched network, via the public switched network after a positive verification of the terminal identification number.
- The problem associated with the concept of cellular radio is that a call might not be completed if the cellular holder is not within the boundaries of a cell. Besides, the MSC has to monitor problems of "handoff", which is a process by which a call is transferred from one cell to another without disrupting or dropping the call in progress, if the mobile unit leaves the boundaries of a cell. This process requires a constant monitoring of the signal quality as well as other factors to determine when the handoff has to occur. A cellular system commonly comprises various cells in a specific area. To cover a larger territory and to be able to 'roam', the fact for a user to be able to operate his mobile unit outside his home

[57] Also called Mobile Switching Center, MSC.
[58] Paetsch, supra note 56, at 290.

market, several systems may have to be interconnected together, even between different service providers.

- To be able to operate a cellular network, the operator must implement an infrastructure: "Until only recently the private operators [of analogue cellular telephony] were restricted from providing their own infrastructure, that is the lines between the base station and the local switches. They were forced, therefore, to lease lines in France from France Telecom and in the United Kingdom from BT or Mercury. In addition, because most calls from mobile phones terminate on the fixed networks, mobile networks need to interconnect to the fixed networks... The same problems arise in the case of the new digital technologies, such as GSM, where more private mobile operators have been licensed but in many cases are required to use PTT fixed networks to connect between base stations and switches".[59] With the general trend of liberalization, those problems are generally disappearing.

2. Future LEO Systems

The signals issued from the handheld units are retransmitted through a satellite to a so-called gateway, a fixed earth station of which routes the signals into the public switched networks to its final destination (or to another handheld). These gateways will contain switching and networking functions for the purpose. Limited numbers of gateways are foreseen (two or three for an area as big as Europe for example)

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[59] E. Paul, "Regulatory Liberalisation of Mobile Communications in the European Union" (1995) 2 Telecommunications and Space J. 351, at 353.

and these numbers are different for each systems.[60] For example, gateways for Iridium system will cost about $ 15m, and the one located in Thailand (the first gateway of the satellite network in the world[61]) will provide service to Burma, Laos, Vietnam, Malaysia, Cambodia, Singapore and Thailand[62]. Their complexity will also vary from one system to the other.

In the architecture of the proposed Satellite Systems, we must clearly distinguish the two functions: satellite functions and gateway functions. The satellite consortia will use national (National Service Operators [NSO]) or regional operators to perform gateway functions. The satellite functions include the uplink, the satellite, the downlink and the earth stations, as well as earth based satellite control systems (TTC). These resources will be provided by the satellite consortia, such as Iridium or Odyssey, or their national operators.

Gateway functions include the infrastructure elements needed to establish the connection across Personal Communications Network (PCN) to a network termination point where interconnection to another network is realized. A fundamental feature of satellite PCNs is that infrastructure resources (either satellite or gateway) need not be provided in a country to provide service in that country.[63]

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[60] Proposal for a European Parliament and Council Decision on an Action at a Union Level in the Field of Satellite Personal Communications Services in the European Union [hereinafter quoted as *Proposal for an European Action*], 08.11.1995, COM(95) 529 final, at 13.

[61] A. Ashayagachat, "Thai Satellite Telecommunications in Deal with Telekom Malaysia on Satellite Link" *The Bangkok Post* (10 February 1995) 19.

[62] Ch. Nivatpumin, "Iridium Project Ahead of Schedule" *The Bangkok Post* (7 August 1995) 19.

[63] KPMG, at 156.

In contrast with traditional cellular systems, LEOs systems are simpler in the sense that they could require only two parts: the mobile unit and the satellite system. Two people could communicate with two handhelds via the satellite if they are in the same satellite's footprint.

Due to different designs, the proposed systems will not allow roaming of handheld equipment between the different satellite systems. Use of a handheld is limited to the geographical coverage of a specific satellite constellation,[64] but this is foreseen to be most of the earth's surface.

With the use of dual-handset by all the players, the new systems will allow the companies to route their calls via local country cellular networks around the world, thus cutting costs and avoiding the need to apply for local country licensing as a telecom service in several countries.[65]

3. Conclusion

a) Technical Considerations

Progress in technology (development of micro-electronics) have made possible to introduce the equivalent of a satellite earth station in hand-held phone device.

The use of LEOs and the systems we will discuss below are technically feasible, although those projects might encounter considerable risks (especially with the use of intersatellite cross-links like in Iridium).[66]

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[64] In the case of the use of dual-mode satellite/terrestrial equipment, roaming is obtained via the terrestrial cellular systems e.g. the GSM network.

[65] S. Gold, "Satellite Technology Comes Down to Earth" *Sydney Morning Herald* (6 September 1994) 36.

[66] R. Shaw, supra note 20, at 4.

The greatest advantage of LEO systems is that they will offer a full mobility allowing users to roam virtually everywhere in the world, whereas in cellular networks, national implementations have to cooperate (standardization) to allow users to roam across national boundaries.

b) Economic Considerations

It is quite difficult to assess the exact market for those new systems. From the conclusions reached at the Forum on Telecommunications (Telecom 95), it seems that three major segments are intended: international business travelers, regions of low density (for which it is uneconomic to build a fixed network, the system being a substitute for fixed service) and countries under-equiped in infrastructure (China, India...) or where the cellular network has failed to penetrate, thus being a substitute for cellular mobile telephony (i.e. rural parts of the developed world and both urban and rural parts of lower income countries). The size of the segments varies very much and presents different economic aspects. Only the first one is really linked to mobility, the two others are rather related to the idea of global coverage than having a handset phone. It results that those services are deeply influenced by equipment and services costs and might have to face the competition of new technologies, like the WLL (Wireless Local Loop), capable of covering large zones which lack of infrastructures.[67]

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[67] P.Condom, "Place Pour Deux ou Trois Systèmes Mobiles" *Air & Cosmos/Aviation International* (13 octobre 1995) 38.

"PCS is a long term vision of the telecommunications industry, which will provide subscribers with an important service i.e. global roaming, mobility, single numbering and interface with any network at any location in all environments (e.g. home, office, and outdoors). PCS will also liberate the subscribers from their terminals, thus it provides personal mobility as opposed to simple terminal portability."[68]

[68] KPMG, at 151.

III. The New Players

The LEO systems (which range in altitude from approximately 100 to 1,000 miles above the earth's surface) have been divided into three categories: " Little LEOs", "Big LEOs" and "Ka Band Services". [69]

- Little LEO systems will operate at frequencies below one Gigahertz (around 100-400 MHz) and are capable of transmitting data only (such as fax messages, e-mails and position-finding services to any point on the globe).[70]

- Big LEOs will operate at frequencies above 1 GHz (around 1600-2500 Mhz) and will offer a full range of both voice and data services (are intended for cellular phone global communication networks). In fact they can be subdivided into two categories: Low Earth Orbit Systems (LEOs) and Medium Earth Orbit Systems (MEOs).

- Ka Band Services will operate within the gigahertz region (around 20,000-30,000 Mhz (or 20-30 Ghz) and are intended to be used for all manner of " information superhighway" communications (such as videophone and world wide web).[71] They will provide broadband services and what has sometimes been called "Internet in the sky" services.

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[69] M. Rothblatt, "Lex Americana: The New International Legal Regime for Low Earth Orbit Satellite Communications Systems" (1995) 23 J. of Space L. 123, at 125. Rothblatt names them Giga LEOs, other authors use the term Mega LEOs.
[70] J. P. Schulz, "Little LEOs and their Launchers" (1995) 3 CommLaw Conspectus, 185, at 186.
[71] Rothblatt, supra note 69, at 126.

A. Actors in Little LEOs

1. ORBCOMM

The Orbital Communications Corporation, a wholly-owned of the US Company, Orbital Sciences Corporation, initially proposed a system of a constellation of 20 satellites, than amended it to 36 satellites, placed in orbit at 775 km. In 1993, Orbcomm entered into an eighty-million dollar joint venture with the Canadian firm Teleglobe (structuring the relationship as a joint venture to avoid the issue of foreign ownership).[72] The FCC authorized it to operate in the 137-138 MHz band. It will provide data messages and location systems.[73]

2. STARSYS

STARSYS Global Positioning, Inc, based in Lanham, Maryland, plans a constellation of 24 satellites orbiting at about 1,300 km. Starsys's ninety-five percent majority equity holder is a company called Stargos, S.A., which is owned in part by CNES (the French Space Agency) and other representatives.

It has been authorized by the FCC to occupy the 148-150 MHZ bands. STARSYS plans to use CDMA technology to provide commercial two-way messaging and position determination.[74]

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[72] Schulz, supra note 70, at 188.
[73] Ch. Lardier, "Définition Achevée des Globalstar" *Air & Cosmos/Aviation International* (27 janvier 1995) 38.
[74] T. Stevens, supra note 9, at 422.

3. VITA

Volunteers in Technical Assistance is a non-profit medical information service based in Arlington, VA, initially proposed to offer electronic packets of medical information (disaster prevention and response communication), transmitted via two low-earth orbiting satellites, to remote locations around the world and than amended its application when it entered into a construction agreement with Rockville, Maryland-based CTA Space Systems.[75] It was awarded by the FCC the 400-401 MHz band. VITA4s system can incorporate either FDMA or CDMA technology for transmission.

There are other proposed systems such as Faisat of Final Analysis, the German Safir and Elekon, the Belgian IRIS, which still need to be developed.

B. Actors in Big LEOs

On the 31 January 1995, the FCC has granted conditional licenses to operate to the free ventures it felt had the most clout: the Loral-led Globalstar, the Motorola-led Iridium and TRW-led Odyssey projects[76] and denied two licenses because they failed to make the financial showing required by the Commission's rules[77] ("Ellipso", a 24 satellite system placed in an intermediate-range elliptical orbit at 1,250 km above the earth, owned by Mobile Communications Holdings, Inc. and "Aries", a

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[75] Schulz, supra note 70, at 187-188.
[76] Joseph C. Alemo, "Big LEO Competitors Racing Toward Launch" *Aviation Week & Space Technology* (17 July 1995) 61.
[77] "FCC Backs Bureau's rejection of 'Big LEO' Applicants" *Telecommunications Reports* (1 July 1996) 29.

system of 48 satellites orbiting at 845 km, proposed by Constellation Communication[78]).[79] Two systems are to be deployed in Low Earth Orbits (Globalstar and Iridium), the two other ones in Medium Earth Orbits (Odyssey and ICO)

1. GLOBALSTAR

Globalstar is a project developed by Space Systems/Loral and Qualcomm.

a) Globalstar: Technical Characteristics

Number of Satellites	48
Orbital Altitude	1,414 km (LEO)
Orbital Planes	8
Orbital Inclination	52°
Subscriber Link	CDMA
Lifetime	7.5 years
Earth Stations	Around 240
Mobile Links emission reception	 L Band (1.610-1.616 GHz) S Band (2.483-2.500 GHz)
Feeder Links uplinks downlinks	 C Band (5.091-5.250 GHz) ?[80]
First Launch	1997
Full Service	1999

[78] T. Stevens, supra note 9, at 423.
[79] Washington Post, Feb. 1, 1995, at 3.
[80] Data not available.

The Globalstar system will consist of 48 satellites on 8 orbital planes (plus eight in reserve). The call from a Globalstar user is forwarded by the satellite (the system uses the satellite to "reflect" the radio call back down to the nearest earth ground station) to an earth station connected to the PSTN, than carried to the correspondent via terrestrial links. This system is simpler as it does not use intersatellite communication (known as cross-links), like the Iridium project. But the terrestrial segment is more complex: around 240 earth stations are needed to process the telephone call between the end-user to its correspondent.

Globalstar plans to offer CDMA-based voice (the capacity should be of 28,000 simultaneous telephone circuits on each satellite[81]), data (up to 9600 bps), fax, e-mail and position location services (accurate to 300 meters) in compact handsets. Interconnectivity with other mobile networks is provided via dual-mode handsets capable of using either the local cellular system (e.g. GSM) or the Globalstar network when out of local cellular range. Orbitel mobile Communications will manufacture handsets for Globalstar: the intention is to combine Orbitel's GSM mobile phone knowhow with Qualcomm's CDMA technology in the single dual-mode handset which can be used with both radio protocols.[82]

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[81] Ch. Lardier, "Définition Achevée des Globalstar", *Air & Cosmos/Aviation International* (27 janvier 1995) 38.

[82] "Orbitel to Enter Satellite-Based Phone Market" *Electronics Weekly* (24 January 1996) 2.

b) Globalstar: Economic Aspects

Estimated Cost	$2.2 billion
Current equity	$1.8 billion
Handset cost	$700-750
Service Costs	$0.35-$0.53 cost to service providers
Cost of the earth station	$5-$6 million

The fact that Globalstar does not use satellite cross-links and relies on interconnection with terrestrial networks simplifies the system: the service costs will be from $0.35 to $0.53 a minute for use of the system by service providers with retail price charged by resellers obviously higher[83]. Globalstar expects this to be under the $1 per minute which MSS-based mobile system surveys have shown to be a break point where customer demand will drop off.[84] Prices will be adapted to local calls but for international calls, the cost of an international call will have to added.[85] The earth station should be built by the local operator (private or public).

A spokesman for Loral's Globalstar system indicated that global partnerships are the only viable alternative for LEO service because of multiple billing concerns and resulting consumer confusion.[86] It is therefore not surprising to know that Globalstar has investment, service and industrial partners in over 73 countries,

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[83] Globalstar will sell access to its system to regional and local teleommunications service providers, including its strategic partners. It is therefore the service providers that will pay Globalstar $0.35 to $0.53 per minute for the access to the satellite network.

[84] R. Shaw, supra note 20, at 5.

[85] Ch. Lardier, "Le Telephone Mobile par Satellite en 2000" *Air & Cosmos/Aviation International* (15 mars 1996) 39.

[86] R. A. LaCroix, "Developments in International Satellite Communications in the International Space Year" (1993) 1 CommLaw Conspectus 99, at 105.

including inter alia: Space Systems Loral, Loral, Qualcomm, Alcatel, Aerospatiale, Airtouch Communications, Alenia Spazio, Daimler-Benz Aerospace, Dacom, Finmeccanica, France Telecom, Hyundai, Vodafone. Satellites will be built by the Alliance of Loral, Aerospatiale, Alcatel, Alenia, Dasa and Hyundai.

By March 25, 1996, Globalstar had arranged about $1.8 billion of its estimated $2.2 billion needed, which represents more than 80% of the financing needed to fund the system fully.[87]

Launching will be done by Delta-2 of McDonnel Douglas (by four), Zenith of Ukraine (by twelve) and LM-2E/TS of China (by twelve).

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[87] "Globalstar Lines Up 80% of Needed Financing" *Telecommunications Reports* (25 March 1996) 28.

2. IRIDUM

Iridium Inc., is an international consortium headed by Motorola.

a) Iridum: Technical Characteristics

Number of Satellites	66
Orbital Altitude	780 km (LEO)
Orbital Planes	6 (11operational satellites, 1 spare)
Orbital Inclination	86.4°
Subscriber Link	FDMA/TDMA
Lifetime	5 to 8 years
Earth Stations	25 and use of Satellite Cross-Links
Mobile Links	L Band (1.616-1.626 GHz)
Feeder Links uplinks/downlinks	Ka Band (19.3-19.6 GHz)
First Launch	1996
Full Service	1998

Iridium' s system is the most technically complex, using 66 satellites on 6 orbital planes at an altitude of 780 km (the lowest orbit). The great difference with other systems is the use of intersatellite connections (cross-links at 23.18-23.38 GHz[88]) which would allow it in theory to work independently from terrestrial networks. A call between two different points will travel directly from the handset to the satellite and then will be transferred to another satellite whose footprint covers the telephone correspondent (without having passed by the earth).

[88] "FCC Backs Bureau's rejection of 'Big LEO' Applicants" *TR* supra note 77, 29.

Technically it will use dual-mode handsets, which will permit use of a local cellular system (practically, the Iridium system should be activated only if the customer could not reach a cellular signal) or the Iridium network, providing FDMA/TDMA-based voice and data (up to 2400bps) and using the GSM protocol.

b) Iridium: Economic Aspects

Estimated Cost	$3.844 billion
Current equity	$2 billion
Handset cost	$2,500
Service Costs	$3 per minute
Cost of the earth station	$256 million for the 25 stations

The project seeks the market of international communications for business men, with $2,500 handsets and $3 a minute service costs.[89] The rate is rather more expensive than the competition, but for Iridium, the $3 per minute already includes a $.90 per minute fee paid to the Iridium service provider at the gateway.[90] The advantage of the system is that it will relay calls between satellites until the call reaches a satellite over an earth station close to the call destination and then downlinked, which allows to reduce some long distance charges on PSTN.[91]

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[89] P. Condom, "Place Pour Deux ou Trois Systèmes Mobiles" *Air & Cosmos/Aviation International* (13 octobre 1995, No 1535) 38.
[90] K. P. Corbley, "Accessing Satellite and Cellular Systems: Dual-Mode Handsets Provide the Option" *Via Satellite* (February 1996) 76, at 80.
[91] Ibidem, at 82.

" Iridium estimates the marketplace for cellular subscribers in the year 2000 to reach 142 million, along with 147 million pager subscribers. They claim they need 650,000 voice subscribers and 350,000 paging subscribers worldwide to make Iridium economically valid. This represents only 0.45 percent and 0.25 percent of those markets, respectively". [92]

Financing of the Iridium Inc. is not complete yet but Chase Securities and BZW, the investment division of Barclays Bank Plc. will jointly arrange the $2.4 billion loan package needed to complete the project.[93]

Their partners include Motorola (which holds about 20% of the capital), Lockheed Martin, Raytheon, STET (The Italian state holding company, majority owner of Telecom Italia), Sprint, Thai Satellite Telecommunications CO. Ltd, Vebacom (subsidiary of the major German telecom corporation Veba AG), Pacific Electric Wire & Cable Co. Ltd, China Great Wall Industry Corporation, Korea mobile Telecom, Krunichev State Research and Production Space Center, Iridium Africa Corporation, Iridium Canada, Inc., Iridium India Telecom Private Ltd., Iridium Middle East Corporation, Iridium Sud America Corporation, Nippon Iridium Corporation (consortium of Japanese companies). In February 1996, Iridium signed to sell the last available Iridium gateway service territory, which covers Australia, New Zealand and the neighbouring archipelagos, to an investor group made up of

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[92] R. Shaw, supra note 20, at 7.

[93] W. B. Scott, " Iridium on Track for Summer Launch" *Aviation Week & Space Technology* (13 May 1996) 27, at 30.

Vebacom GmbH, joint venture of Veba AG and Cable & Wireless Plc, Nippon Iridium Corp. and Pacific Communications Co Ltd of Taiwan.[94]

The launching will be done by Delta-2 (by five), Proton of Russia (by seven) and LM-2C of China (by pairs).

3. ODYSSEY (Odyssey Telecommunications International [OTI])

Heade by TRW, Teleglobe/Canada is one of the major prticipant in the project.

a) Odyssey: Technical Characteristics

Number of Satellites	12
Orbital Altitude	10,354 km (MEO)
Orbital Planes	3
Orbital Inclination	50°
Subscriber Link	CDMA
Lifetime	10 years
Earth stations	7
Mobile Links emission reception	 L Band (1.610-1.626 GHz) L Band (2.483-2.500 GHz)
Feeder Links uplinks downlinks	 Ka Band (29.1-29.4 GHz) ?
First Launch	1999
Full Service	?

[94] "Thwarted in its Attempt at a Bond Issue, Iridium Passes Hat Round Again" *Computergram* (22 February 1996) 6.

Odyssey will consist of 12 satellites in MEO, but in contrast with Inmarsat-P, will use fewer beams (37) and CDMA modulation. This system is intended to complement the existing networks, in amercican areas uncovered by actual cellular systems (50% of the territory) or in countries were the telephone is less developed. The processing of phone calls will be identical as in the Globalstar system and it will also use dual-mode handsets.

Odyssey claims that using a medium earth orbit offers many advantage that other systems do not have: the satellites will be higher in the sky for more of the time and consequently there is less chance of topographical or building obstruction, it will take 1 to 2 hours for an the satellite to cross from horizon to horizon meaning there is less need for hand-offs, therefore most calls are handled by a single satellite and there are less risks to lose a call during the hand-off.[95]

Consumers will access the Odyssey system through national service operators who will operate the national or regional gateways connecting the Odyssey system to the public switched telephone network. The Odyssey gateways are simple telephone switches.[96]

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[95] R. Shaw, supra note 20, at 4.
[96] K. P. Corbley, supra note 90, at 86.

b) Odyssey: Economic Aspects

Estimated Cost	$2.9 billion
Current equity	~$ 300 million
Handset cost	$700
Service Costs	$1 per minute
Cost of the earth station	?

For the moment, Odyssey is the least financed of the four MSS-based projects, it has only reached about 10% of the amount necessary. With the cost of handset of around $700, it has the cheapest equipment. Odyssey estimates its retail service price will be less than $1 per minute on average, worldwide, plus a monthly service operator charge and any long distance charges for the ground portion of calls. With TRW and Teleglobe Canada are the main supporters, it is the project with the less strategic alliances. Strategic partners should however be announced soon.

The launching should be done by Ariane 5 or Proton (by pairs), Soyouz (Russia) or Long March (simple launch).

4. INMARSAT-P (ICO)

Also called Project 21, it is a commercial spin-off of the International Maritime Satellite Organization (Inmarsat).

a) Inmarsat: Technical Characteristics

Number of Satellites	10 (and 2 spares)
Orbital Altitude	10,300 km (MEO)
Orbital Planes	2
Orbital Inclination	45°
Subscriber Link	TDMA
Lifetime	10 years
Earth Stations	12
Mobile Links emission reception	 S Band (1.980-2.010 GHz) S Band (2.170-2.200 GHz)
Feeder Links uplinks downlinks	 ? C Band (6.700-7075 GHz)
First Launch	1998
Full Service	2000 (service of 6 satellites in 1999)

The system developed by Inmarsat will use 10 active satellites in medium earth orbits, called by Inmarsat as Intermediate-Circular Orbits (ICO), in two orbital planes (5 each) with 1 spare in each orbit. Each satellite will have a capacity of 4,500 telephone calls. On the ground, the network P-Net will be completed by a control center and access stations (SAN) which will be interconnected to terrestrial

networks of cellular telephony (GSM, etc.) and PSTN[97]. The system will also use the satellite to "reflect" the radio calls back down to the nearest earth station, where calls will be routed through gateways using existing terrestrial networks. Besides, dual-mode handsets should also be used.

Inmarsat plans to provide TDMA-based voice and simple message capabilities, either with a dual-mode or satellite-only handset equipment.

In this system, satellites use multiple beams (163) and earth stations (called satellite access nodes [SAN]) are limited to 12. The medium orbit gives the satellite a better cover with an imperceptible propagation time.

It plans to operate in the 2 GHz band spectrum, which was not available for mobile service operations until 2005. However, the decision was made at the WRC-95 conference in Geneva to open spectrum in 2000, the year ICO expects to be in business, and to make available specific 5/7 GHz frequencies for the feederlinks used by MSS.[98]

"It is an excellent system whose handicap is to arrive two years after Iridium and Globalstar". [99]

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[97] P. Langereux, "Inmarsat dans la Telephonie Mobile Mondiale" *Air & Cosmos/Aviation International* (27 janvier 1995) 15.
[98] K. P. Corbley, supra note 90, at 88.
[99] Ch. Lardier, "Le Telephone Mobile", supra note 85, 39.

b) Inmarsat-P: Economic Aspects

Estimated Cost	$2.6 billion
Current equity	$1.4 billion
Handset cost	$1,000-1,500
Service Costs	$1-$2 per minute
Cost of the earth station	$350 million for the 12 earth stations

Despite its late arrival in the MSS-game, ICO has already raised more than the half (54%) of its estimated cost. "And strategic investors are even ready to pay a complement of $600 million", declared its CEO, Olof Lundberg.[100] ICO has almost covered its financial needs. ICO projects that their dual-mode handset (satellite and local cellular standard) will cost between $1,000 and $1,500, which is higher than the estimated costs for Globalstar and Odyssey but still cheaper than Iridium. The services costs are average.

Whereas the three other actors are private consortia, ICO, through its association with Inmarsat, is connected to more than 60 governments and has gained advantage of this position. The fact that Inmarsat is the largest shareholder in ICO renders all the national signatories indirect shareholder in the new venture (this could have important consequences for the licensing process of ICO, see infra).[101] Inmarsat and its signatories have the control of more than 70% of the company.[102] Besides it has also direct shareholders from 41 countries including Hughes ($94 million), Bahrain

[100] P. Langereux, supra note 97, 15.
[101] R. Shaw, supra note 20, at 6.
[102] P. Langereux, supra note 97, 15.

Telecommunications Company, Beijing Marine Communication and Navigation Company, Bureau of Maritime Affairs (Liberia), Companhia Portuguesa Radio Marconi Sa, COMSAT Argentina SA, COMSAT Corporation (USA), CS Communications Company Ltd (Thailand), PT INDOSAT (Indonesia), Kuwait Investment Authority, Morsviazsputnik (Russia), Telecom Finland, OTE, PTT Telecom BV (Netherlands), Singapore Telecommunications Ltd., Swiss Telecom PTT, Telefonica de Espana SA (Spain), Telstra (Australia), Detemobil (a German GSM service provider).

In terms of fees, ICO expects to charge an average of $2 per minute including long distance charges and international interconnect. ICO says its advertised rate already includes surcharges and average long distance costs.[103]

The launching has been awarded to the spacecrafts Atlas-2A (United States), Delta-3 (United States), Proton (Russia) and Zenith (Ukraine, Sea Launch)[104] and Hughues Space and Communications International signed a contract in October 1995 to build the satellites.

The question to assess is, by the time the Inmarsat-P service is finally operational, will there still be any market left for it to share ?

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[103] K. P. Corbley, supra note 90, at 88.

[104] Ch. Lardier, "ICO-Hugues Font l'Impasse sur Ariane" *Air & Cosmos/Aviation International* (22 décembre 1995) 42.

C. Ka-Band Actors

Under this title are the proposed Ka-band broadband systems such as Teledesic or Sativod and Spaceway, CyberStar and KaStar, for which we unfortunately lack information.

1. TELEDESIC

In November 1995, the International Telecommunications Union allocated frequencies to Teledesic to operate its system. This allocation is subject to Resolution 46 (see infra) but Radio Regulations 2613 does not apply to it (RR 2613 states that non-GSO networks cannot cause interference to GSO networks).

a) Teledesic: Technical Characteristics

Number of Satellites	840 (84 spares)
Orbital Altitude	700 km (LEO)
Orbital Planes	21 (40 on each, plus 4 spares)
Orbital Inclination	98.2°
Subscriber Link	?
Lifetime	?
Earth Stations	?
Mobile Links emission reception	 Ka Band (18.9-19.3 GHz) Ka Band (28.7-29.1 GHz)
Feeder Links uplinks downlinks	 ? ?
First Launch	?
Full Service	?

The system consists of 840 satellites, located on 21 orbital planes (there will be 40 satellites on each, plus 4 spares), which in fact makes 924 satellites, at an altitude of 700 km (which is as close as they can go without burning up in the earth's atmosphere). It will use the same technology as Iridium of intersatellite cross-links. The flow will be in Mbits rather than Kbits in the other constellations, which will permit any multimedia application (high speed data transfer and video for handheld terminals).

Teledesic, although also promising seamless global broadband data communications at a low cost (but as an enhanced service, offering multimedia), uses a different technology: it is a Fixed Satellite Service non-Geostationary Orbit (FSS non-GSO) system.

b) Teledesic: Economic Aspects

Estimated Cost	$9 billion
Current equity	?
Handset cost	?
Service Costs	?
Cost of the earth station	?

Teledesic is a corporation formed by Microsoft and McCaw Cellular (which is now also 24% owned by AT&T after the latter's acquisition of McCaw[105]). On the $9

[105] "Telecommunications: 1995 World Radiocommunications Conference Makes Good Progress" *Tech Europe* (1 December 1995). No. 110.

billion estimated budget, $1.5 billion will be devoted to research, $4.8 for the production and $2.5 for the launching and the operation of it.

2. SATIVOD

Project of Alcatel Espace, it stands for " Satellite de Vidéo Interactive à la Demande" (Satellite of Interactive Video On Demand). Unfortunately, we only have little information on this project.

Number of Satellites	48
Orbital Altitude	1,600 km (LEO)
Orbital Planes	?
Orbital Inclination	55°
Subscriber Link	ATM ?
Lifetime	?
Earth Stations	?
Mobile Links emission reception	 Ka Band (? GHz) Ka Band (? GHz)
First Launch	?
Full Service	?

The finalization of the project should consist of 48 satellites in intermediate low earth orbit, between Teledesic and geostationary satellites. It will start with 24 satellites which enables to cover temperate latitudes. Than with a supplementary satellite each year, equatorial latitudes will be open to service. Finally with 40 satellites, all the latitudes up to 80° will be covered by at least one satellite and two

satellites will be almost always visible in latitudes inferior to 60°. Satellites will use the Asynchron Transfer Method (ATM) to transfer Video On Demand (VOD) to subscribers terminals or earth stations.[106]

Giga LEOs can provide the same services as Big LEOs and Big LEOs the same services as Little LEOs, but not vice versa. Therefore we will focus our study on Big and Giga LEOs projects.

D. Conclusion

According to the four competitors, there is room in the world market only for two or three MSS, the market being to small to accommodate all of them.[107]

Other figures predict that the four Big LEOs will be profitable, with at the top Inmarsat's ICO, followed by Iridium, Odyssey and Globalstar.[108] "The Inmarsat P Affiliate Company [ICO] shows a strong profitability given its larger projected market share, intermediate pricing plan and longer lifetime". [109]

Their ability to survive or even to win in this business will depend on many factors:

- the quality of the service offered, according to the need of the customer.

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[106] Interview de Jean-Claude Husson, Pdg d'Alcatel-Espace, par Pierre Langereux et Christian Lardier, *Air & Cosmos/Aviation International* (3 novembre 1995) 40.
[107] P. Condom, supra note 89, 38.
[108] K. P. Corbley, supra note 90, at 78, quoting a market study done by C.A. Ingley & Co. "Big LEO Market and Financial Review".
[109] Ibidem. Ph. L. Spector even doubts that all these mobile satellie systems will be launched. "Great as the public's appetite may be for mobile services, the financial community's appetite for writing cheques to finance these proposals is likely to be somewhat more limited... Even the most optimistic of mobile service advocates may have difficulty justifying several competing mobile satellite systems, each using different handsets and different technical standards." Ph. L. Spector, "Wireless communications and personal freedom" (1993) 17 Telecommunications Policy 403, at 404.

- the equipment and the services costs. Providers of the LEO mobile satellite services claim that LEO services must be priced in close proximity to cellular services, otherwise it would be impossible to be competitive.[110] " With all handsets probably being equal on the market and monthly service fees averaging $25-$50, a customer's choice will almost certainly be based on cost per minute, which will vary from system to system and the type of call being placed." [111]
- the ability of the operators to finance their project. Potential investors have showed much prudence: Globalstar and Iridium both had to withdraw approximately $700 million in debt offerings after investors demanded too-high returns and guarantees. Although it seems that Iridium has the strongest financial backing, the game is not over. Will TRW and Teleglobe find the necessary financing[112] ?

Besides new geostationary (such as HS-601, built by Hughes) satellites, dedicated to mobile communications are being launched and thus competing with LEOs systems: the satellite MSAT-2 of American Mobile Satellite Corp (AMSC) and MSAT-1 of TMI Communications (Canada), covering North America. Garuda, a regional system using those new satellites, will be deployed by Asian Cellular Satellite System (ACeS) over Asia in 1998[113]. Another system (referred to as

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[110] R. A. LaCroix, supra note 86, at 106.
[111] K. P. Corbley, supra note 90, at 80.
[112] Nevertheless, Charles Sirois, CEO of Teleglobe, contends that his company (which has made profits of $91million in 1994) has the means to achieve its goals. Ch. Lardier, " Place Pour Deux Systèmes", *Air & Cosmos /Aviation International* (3 Novembre 1995) 40.
[113] Other systems, such as Agrani and Asia Pacific Mobile Telecommunications are also announced.

Agrani) will be deployed by Afro-Asian Satellite Communications (ASC) in 1998, and they will have a capacity of 16,000 telephone calls shared by two satellites over 54 countries in Africa and Asia.[114] Although these systems present technological constraints such a long transmission factor, the existence of an echo,[115] the cellular terminal's limited battery and emission power and some have only a regional scope of activity, they have to be envisaged as serious competitors.

[114] Ch. Lardier, " Pléthore de Systèmes de Liaisons Mobiles" *Air & Cosmos/Aviation International* (6 octobre 1995) 36.

[115] Although it is said that the audible effects of the one-quarter second delay seem to be effectively masked by the distortion and processing delay inherently introduced by the low rate (4.15 kbps) codecs used in handsets. This conclusion is based on the results of delay perception tests conducted by Comsat Labs in 1988 using human objects: J. F. Purchase, "The New Space Race: Satellite and Terrestrial Mobile service Providers Battle for Market Share" *Via Satellite* (November 1995) 34.

IV. Role of the International Telecommunication Union (ITU)

In our debate on the ITU's role, we will intent to assess one of the most important regulatory issue facing MSS systems: the question of the global frequency spectrum allocation in order to enable those systems to operate.

A. Introduction

Like all satellites systems, new Satellite Personal Communications Systems need a certain amount of radio spectrum which is limited and subject to considerable constraints. Radio spectrum is required for use between handhelds and the satellites, between gateways and the satellites, for inter-satellite links and for operational control of the satellites.[116]

The spectrum management is the result of a three-step process of allocation, allotment, and assignment of frequencies:

- the allocation[117] refers to the task of setting aside frequency bands or blocks for the use of certain radio services, either on a primary or secondary basis.[118] This is done at the level of the ITU.

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[116] Proposal for a European Parliament and Council Decision on an Action at a Union Level in the Field of Satellite Personal Communications Services in the European Union, 08.11.1995, COM (95) 529 final [hereinafter quoted as *Proposal for a European Action*] at 13.

[117] The Radio Regulations adopted by the World Administrative Radio Conference, Geneva, 1979 [*hereinafter quoted* RR] give the following definition:
Allocation (of a frequency band): Entry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more terrestrial or space radiocommunication services or the radio astronomy service under specified conditions. This term shall also be applied to the frequency band concerned (RR, art. 1-para. 2.1).

[118] Services operating on primary frequency allocations have priority over secondary ones. Thus, secondary services are not allowed to cause interference to primary services and are, furthermore, not entitled to claim protection from interference caused by primary services, 47 C.F.R. Ch.I (10-1-91), sect. 2.104, at 300.

- once allocated, they may be further divided into service allotments[119] for particular user groups[120].

- the assignment[121] entails the process of selecting and licensing the operation of radiocommunication systems at discrete frequencies within the appropriate spectrum bands (which has been allocated) and is done at the national level by the competent administrative authority (see infra).

Before starting operations, a formal notification to the ITU for the purpose of technical coordination is required.

B. The Radio Regulations

Allocations of particular frequencies to particular services is carried out through the adoption of international agreements worked out at international conferences organized by the Union and which are called Radio Conferences[122] (formerly named Administrative Radio Conferences). The resultant agreements have the legal status of treaties between the ITU members.[123] The cumulative body of these agreements form the content of the Radio Regulations.

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[119] *Allotment* (of a radio frequency or radio frequency channel): Entry of a designated frequency channel in an agreed plan, adopted by a competent conference, for use by one or more administrations for a terrestrial or space radiocommunication service in one more identified countries or geographical areas and under specified conditions (RR, art. 1, para. 2.2).

[120] For example, allocations made to land-mobile services are sometimes divided between business user, public safety, etc.

[121] *Assignment* (of a radio frequency or radio frequency channel): Authorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions (RR, art. 1, para. 2.3).

[122] There are two types of conferences: the ones organized on world basis (WRCs) which provide allocations for services through out the world and the ones organized on a regional basis (RRCs), in one of the three regions.

[123] F. Lyall, *Law and Space Telecommunications* (Aldershot: Dartmouth, 1989) at 346.

The Radio Regulations prescribe two types of right vesting procedures for obtaining rights to interference-free[124] use of radio frequencies and orbital positions[125]:

- the rule of the "first come, first served ".

- the system of "a priori plans ", which was developed later.

1. First Come, First Served

Under this principle, the priority of use is recognized as affording a degree of protection from interference by later established stations.[126] Stations needing this protection have to follow a certain procedure described under Articles 11 and 13 of the Radio Regulations[127]. The basic steps are the following:

1. notification: The telecommunication administration wishing to bring an assignment into service (notifying administration) submits all the relevant information, including at least the basic characteristics of the assignment to the Radiocommunication of the ITU. [128]

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[124] *Interference*: The effect of unwanted energy due to one or a combination of emissions, radiations or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy (RR art.1, para. 7.1).

[125] Those procedures apply to systems operating in GSO.

[126] Lyall, supra note 123, at 351.

[127] S. D. White, "International Regulation of the Radio frequency Spectrum and Orbital Positions" (1995) 2 Telecommunications and Space J. at 335. It is a four step procedure (advance publication, co-ordination, notification and registration).

[128] Article 13 of the RR provides that all frequency assignments must be notified to the RB for examination in the following circumstances:
a) if they could cause harmful interference to any service of another country
b) if the assignments are to be used for international communications
c) if it is desired to obtain international recognition of the assignments.

2. *advance publication*: The Radiocommunication Bureau (RB) publishes the information in its Weekly Circular to inform and allow them to react.

3. *examination*: The RB examines the proposed assignments from the point of view of conformity with the Regulations (regulatory examination[129]) and to determine whether it can operate without causing or suffering interference (technical examination). The conclusions of the RB's study will take the form of a finding, which may be favourable or unfavourable (and therefore the notification must be amended).

4. *coordination*: in the case where it would create incompatibilities or difficulties with existing systems. The successful registration of an assignment passes by a coordination with other countries whose recorded spectrum may be affected by the new assignment.

5. *registration*: once everything is successfully completed, the RB records the assignment in a database called the Master International Frequency Register (MIFR). Registration by the RB in the Master Register provides the country which has followed the prescribed international coordination procedure with the right to use the frequency and with the international protection from interference.

A country may file an assignment of radio spectrum as early as six years before the intended first use of the assignment and then has an additional three years after the registration to implement the new system. The applicant has therefore a period of

[129] Conformity with the International Frequency Table and other planned or existing assignments.

nine years to bring the system into use. Besides, the applicant need not implementing the whole system to maintain its protection: a partial implementation suffices. The protection lasts as long as the "slot" is used in conformity with the technical parameters forming the base of the assignment.

> Under applicable ITU Radio Regulations, a country is free to coordinate an assignment of spectrum for implementation of a satellite system operating from the GEO and making use of as much as the entire allocated band from a particular orbital location or set of locations. The only serious constraint on registering such an assignment is successful coordination with other countries whose recorded spectrum uses might be affected by the new assignment.[130]

2. A Priori Planning

The basic idea is to adopt a system of agreeing a comprehensive plan for various of the allocation bands in order to avoid harmful interference and damaging disputes by the prior coordination of frequencies used by particular stations.[131]

The result has been the planning of certain frequencies both as to their use and as to which station shall use particular bands and at what power.

The procedure to follow is simpler: a notification and examination of the conformity is sufficient to obtain the registration.

C. Radio Conferences

Radio Conferences are the forum where allocations of spectrum frequencies are made, which are then contained in the Table of Frequency Allocations in the Radio

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[130] KPMG, at 191.
[131] Lyall, supra note 123, at 351.

Regulations. Allocations are listed in an order and may be either worldwide (worldwide allocation) or restricted to an area (regional allocation[132]) as indicated in the Table.[133] Each band may be allocated to one or more services, with equal or different rights. There are three categories of services, namely primary, secondary and permitted. For the purpose of our study, we will focus on WARC-92 and WRC-95[134] which are the two conferences dealing with Mobile Satellite Service (MSS).[135]

1. WARC-92

The conference was divided into two camps: the USA and Europe.[136] The USA pushed for an allocation for satellite-based mobile systems (MSS) while the Europeans favoured land-based systems (FPLMTS, the Future Public Land Mobile Telecommunication Systems)[137].

Global LEO bands for voice communication were finally allocated after last-minute backroom manoeuvering, but the agreement was achieved only because LEO

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[132] The world is divided into three Regions: Region 1 comprises basically Europe, Africa and Russia (the former lands of USSR are included); Region 2 is America and Greenland and Region 3 includes the territory comprising Iran, China and the rest of Asia.

[133] Lyall, supra note..., at 353.

[134] Since the reform of the ITU (1989-1992), World Administrative Radio Conferences are now called World Radiocommunication Conferences.

[135] Article 8 of the Radio Regulations.

[136] L. Sung, "WARC-92: Setting the Agenda for the Future" (1992) 16 Telecommunications Policy, 624.

[137] The FPLMTS will link pocket telephones, laptop computers and fax machines through antennas scattered through urban areas. The use of FPLMTS is favoured because Europe's densely populated landmass can be effectively covered by terrestrial systems, making satellite systems superfluous. But satellite-based telephone services may mean more to Eastern European countries than to their Western counterparts. Unlike the West, which is already well covered by landline telephone systems, Eastern Europe has minimal telephone penetration and thus may benefit more from satellite systems which are less costly and quicker to install, L. Sung, ibidem at 631.

allocations were a major bargaining chip that Europeans could use to obtain other concessions from the USA.[138]

Hence, the World Administrative Radioconference held in Malaga-Torremolinos in 1992 was the first to achieve an agreement on frequency allocations[139] and coordination procedure for non GSO systems operating on a worldwide basis[140], setting the date of their use as 1 January 2005 for the world (and 1 January 1996 in the United States).

The results of the Conference were the following:

a) Frequency Allocations

Several new frequency bands were allocated to MSS on a worldwide or regional and primary or secondary basis, the range 1610 - 1626.5/2483.5 - 2500 MHz, 1980 - 2010/2170 - 2200 MHz and 2500 - 2520/2670 - 2690 MHz being the most highly coveted by national administrations.[141] Those bands being already heavily crowded, successful coordination of the new systems may take several years to achieve.

> The lower frequencies were preferred for both financial and technical reasons: (1) in order to operate compatibility with cellular services, which currently utilize low frequencies and (2) to allow the manufacture of dual capacity mobile telephones at a reasonable price.[142]

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[138] Ibidem.
[139] Albeit that specific footnotes often constrain the use of these new allocations.
[140] Before WARC-92 there were no specific procedures in place governing coordination of non-GSO systems, which seriously clouded their operational viability, KPMG, at 192.
[141] Satellite Personal Communication Services (S-PCS): Final Report, European Radiocommunications Office, 1995, at 11.
[142] R. A. LaCroix, supra note 86, at 105.

b) Resolution 46

Prior to WARC-92, non-GSO systems had a secondary status since they could not claim protection from or cause interference to both existing as well as future GSO systems. Resolution 46, implementing an interim coordination and notification procedure, modified these principles by putting on an equal footing non-GSO networks and GSO networks in the newly allocated bands and certain other bands.[143] Resolution 46 decided to apply the basic principle of 'first come, first served' (see above) to non-GSO systems.

With the application of this resolution, an administration intending to bring into service a station operating in the allocated bands, has to follow the steps similar to those applicable to GSO systems.

"In addition to its interim procedures, Resolution 46 provides a recognition of the sovereign right of countries to decide how or whether to participate in non-GEO systems, and to determine the terms and conditions of access to such systems from their territory."[144] It stipulates the obligation for entities and organizations providing international or national telecommunication services by non-GSO satellite networks to operate at the point of delivery under the legal, financial and regulatory requirements of the Member States of the Union in whose territory these services are authorized. This could mean that a S-PCN operator could be subject to the

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[143] J. Christensen, "WRC-95: Results Related to Satellite Communications" *Via Satellite* (February 1996) 28, at 34-35.

[144] KPMG, at 202-203. The expression '*from* the country' seems to emphasize every country's sovereign right in respect of satellite uplinks (so even the handheld's transmission) originating within domestic country.

concurrent jurisdiction of the country licensing the S-PCN system and each country served.[145]

c) Resolution 70: Establishment of Standards for the Operation of Low-Orbit Satellite Systems

Recalling that the radio-frequency spectrum is a limited natural resource and recognizing that only a very limited number of low-orbit satellite systems offering worldwide coverage could coexist in any given frequency band, the Resolution 70 urges ITU organs

> to carry out, as a matter of priority, technical, regulatory and operational studies to permit the establishment of standards governing the operation of low-orbit satellite systems so as to ensure equitable and standard conditions of access for all countries and to guarantee proper worldwide protection for existing services and systems...

Is the concept of *equitable access* the will of the ITU to suggest an a priori planning of the spectrum in respect of non-GSO systems ? We may doubt it because of the failure of former allotment plans (underutilization of pre-assigned spectrum), the necessary spectrum is already very limited in that range and because there is almost no logic to global assignment of MSS spectrum for strictly domestic use.[146]

As a consequence of this resolution, the ITU has convened its first World Telecommunication Policy Forum on the policy and regulatory issues surrounding

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[145] Ibidem, at 203. As a general matter, Article 24 of the RR requires a national licence in order to authorize the use of spectrum: No transmitting station may be established or operated by a private person or by any enterprise without a licence issued in an appropriate format by the government of the country to which the station is subject.

[146] Ibidem, at 205.

Global Mobile Personal Communications by Satellite (GMPCS) for the 20st-23rd October 1996.

d) Conclusion

The MSS band allocations came into effect on 12 October 1993, but the Resolution 46 coordination procedures came into effect 4 March 1992. " A nation could thus advance publish a system 18 months before the frequencies were allocated." [147]

As a result, the Radiocommunication Bureau received on 13 October 1992 from the US a request for coordination, including coordination information, of a HIBLEO-2 (corresponding to the Iridium system), which resulted in a favourable mention. Other systems were also subjected to advance publications[148] and in the two years following the Conference, some 150 satellite networks have been published under the Resolution 46 procedures.[149]

> The WARC'92 regime for introducing S-PCNs recognizes the right of each country to decide the extent and terms of its participation in such systems, as well as a need to make such systems accessible on a global basis, and on equitable and standard terms. Each country must take into account, based on its own interests, the impacts of prospective global MSS systems operating in highly scarce and highly versatile bands.[150]

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[147] Ibidem, at 210.
[148] Ibidem, at 208-210.
[149] Final Report of the European Radiocommunications Office, supra note 141, at 85.
[150] KPMG, at 210.

2. WRC-95

The major outcomes[151] of the conference were:

- allocation of additional spectrum to the MSS operating below 1 GHz (Little LEOs).

- the change in the date for the entry into operation of those new 'big LEO' systems using the 2 GHz band to 1 January 2000. The conference witnessed the victory of the new operators who are eager to develop the new market as soon as possible. The fixed services operating in these bands (mainly used in less-developed countries) will therefore have to be modified to allow the new services.

- 400 MHz of spectrum has been allocated to MSS feederlinks, which provide uplinks to satellite services. To provide these links, spectrum had to be shared with Fixed Satellite Services.

A compromise was arrived at, putting non-GSO use on an equal footing with GSO use, thus allowing for sharing of spectrum. As of November 18, 1995, RR 2613[152] does not apply anymore to feederlinks of non-GSO MSS networks with respect to GSO FSS networks in these bands.[153]

- 400 MHz of spectrum were allocated in the 19 GHz and 29 GHz bands. This is mainly to cover the needs for the Teledesic system. "The very fact that an allocation was made at all to non-GSO FSS systems is very remarkable since the

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[151] ITU Press Release, ITU/95-34, 18 November 1995.

[152] RR 2613 limits non-GSO systems as to non-interference with GSO space stations operating in the FSS by requiring non-GSO systems and their associated earth stations to switch off whenever there is unsufficient angular separation between non-GSO and GSO satellites and unacceptable interference to GSO space stations operating in the FSS.

[153] J. Christensen, supra note 143, at 34.

subject of allocations to the FSS was not on the original agenda of WRC-95, this conference being concerned mainly with MSS issues".[154]

D. The United States' decision to license Satellite Systems

a) Introduction

Following the decisions of WARC-92, the Federal Communications Commission proposed frequency allocations for MSS, including LEOs " which would implement decisions made at the 1992 World Administrative Radio Conference..."[155] and adopted its MSS report and Order authorizing U.S. licensing of global S-PCS in October 1994. Consequently, five applications were filed and three projects were licensed under conditional terms in January 1995.

Article VI of the Outer Space Treaty provides that " activities of non-governmental entities in outer space, (...), shall require authorization and continuing supervision by the appropriate State Party to the Treaty".[156] Therefore, the LEO systems require national authorization.

Since nearly all of the LEO systems have arisen in the United States, and there was very little pre-existing law in this area, that country has had a unique opportunity to establish a *Lex Americana* for low earth orbit satellite communications.[157]

b) Analysis of The Lex Americana[158]

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[154] Ibidem, at 30.
[155] FCC, Spectrum Allocation Proposed for Low Earth Orbit Satellites, No Pioneer Preference Awarded, Rpt. No. DC-2000, Action in Docket Case 92-28 (Aug. 5, 1992), at No. DC-2200.
[156] Outer Space Treaty, supra note 43.
[157] M. Rothblatt, supra note 69, at 127.

b) Analysis of The Lex Americana[158]

"Under the *Lex Americana*, the first country to notify the International telecommunication Union of its intention to launch one or more LEO systems, and to subsequently implement that intention, has a qualified exclusive right to the frequency bands those LEO systems employ."[159] And the United States of America were the first to do that at the 1992 World Administrative Radio Conference and to arrogate unto itself all of the available Little LEO spectrum.[160]

> It is for a state, in exercise of its sovereign power, to assign the use of a frequency to a particular... station. In so doing, the state should have regard to the Table of Allocations and the existing assignments which have been reported to the IFRB[161], the organ of the ITU which has that function... The Radio Regulations (and occasionally other World and Regional Plans adopted by the ITU and modifying the basic Regulations) provide a framework within which the proposed assignment must fit if it is to receive protection from harmful interference from other stations and, *mutatis mutandis*, is not itself to cause interference.[162]

In conclusion, an administration cannot do as it wishes but as at least this power within the framework established by the Plans as long as no other system is registered (or notified) by the ITU. In other words, within the A Priori Planning Procedure, we fall back to a First Come, First Served principle.[163]

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[158] This is a term used by M. Rothblatt, ibidem at 127.
[159] Ibidemat 128-129.
[160] Ibidem, at 129: At the World Administrative Radio Conference, a detailed protocol was adopted for notifying to the International Telecommunications union (ITU) all relevant technical parameters of Little and Big LEO systems, and for coordinating technical interference potentials among such systems and other occupants of the frequency bands.
[161] Read now the RRB, the Radio Regulations Board.
[162] Lyall, supra note 123, at 356-357.
[163] Whether or not users can access a LEO system from any particular country is left up to each country's sovereign discretion (see infra), but countries can neither prevent the LEO systems from operating over their territory, nor can they operate their own LEO systems in the same frequency band. This an application of the first come, first served principle.

Although we could agree with this principle for the licences the FCC has issued to the three companies (Motorola's *Iridium*, Loral's *Globalstar*, TRW's *Odyssey*) and as long as it has followed the ITU procedures, the FCC has decided to issue a licence for the last remaining sub-segment[164] on an auction basis, but the auction price being attributed to the FCC (i.e. the United States). It is not fair that a scarce natural resource, being a res communes should be should for the benefit of one country !

c) Does the Lex Americana lead to a certain Privatization of Outer Space by a few U.S. Companies ?

As we pointed out above, the assignment by the FCC of certain frequencies for Mobile Satellite Services to certain organizations may preclude their use by organizations under the jurisdiction of other countries. Those services are planned to be performed on a worldwide basis, which definitely implies that those natural resources will not be available anymore. Is it in contravention with Article II of the Outer Space Treaty[165] (which prohibits national appropriation by claim of sovereignty, by means of use or occupation, or by any other means...) ?

Is this situation different from the current use of the space segment ?

Basically, we do not think so. When a satellite service is deployed in the GSO and the related frequencies assigned, this part of Outer Space is used but not owned and

[164] The FCC has claimed on behalf of the United States the entire unused portion of the Big LEO frequency band allocated to the Geostar radiodetermination satellite service (RDSS) and has divided it into four sub-segments, cf. Rothblatt, supra note 69, at 131-132.
[165] Outer Space Treaty, supra note 43.

nothing impedes the satellite owner to repeat this operation at other locations on GSO to reach a global coverage of the earth. It is not because the consequences of the implementation of those projects lead to worldwide system and that much orbital positions will be used, that we can conclude to a partial privatization of Outer Space.

Schulz asserts that " taken together, the Little Leo systems and their prospective launch vehicle suppliers represent the emergence of an industry that seeks the private acquisition and use of orbital resources ".[166] Of course, in comparison with the current use of orbital positions, basically by inter-governmental entities such as Intelsat, Inmarsat or Eutelsat, the big difference today is that those new systems are privately owned. But the use of the GSO by Astra has never led anyone to conclude that there was a privatization of certain orbital positions (thus the Outer Space) by them.

Rothblatt notes that: " Far from appropriating outer space, the FCC Little and Big LEO approvals did no more than provide the approved companies with a brief ten year licence, running from the date of initial operations ".[167]

[166] J. P. Schulz, supra note 70, at 195.
[167] M. Rothblatt, supra note 69, at 134.

d) Is the Lex Americana conform with the provisions of the ITU's constitution ?

Article 44 of the ITUs Constitution stipulates in its paragraph 2:

> In using frequency bands for 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 rationally, efficiently and economically in conformity with the provisions of 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.

This Article 44 encompasses similar principles as Resolution 70 (see above). Although, the text refers to geostationary orbits, it is worth for radio frequencies assignments. It is difficult to assess the efficient access (only one country is benefiting !) or the economical aspect (is keeping the benefits of auctions for itself economic ?). The only positive aspect is that it will help developing nations by providing advanced personal communications capabilities in every country in the world without requiring from such countries the enormous costs associated with telecommunications infrastructure.[168]

E. ITU's Role in the Standardization Process

" In information technology and telecommunications, standardization implies the compatibility of systems, which is vital to the promotion of interconnection and the interworking of an increasingly complex and varied system. What matters here is the combination of, on the one hand, deregulation (including the opening up of public procurement) and, on the other hand, the provision of common open

[168] Ibidem, at 132.

standards that should have the effects of reducing concentration and increasing competition. Common open standards means " manufacturer neutral" and not " de facto" international standards!". [169]

And what we need in worldwide standards, thus, ITU's coordination. " As to the worldwide standardization organizations, the ITU's Consultative Committee for International Telegraphy and Telephone (CCITT) drafts recommendations making communication between public telecommunications services possible... Until now, the typical times for ITU standardization have been two years for a standard following a wholly existing pattern, five years for a standard that was largely new, and ten years when the area was so new that a framework for the norms had to be established first. These periods will have to be compressed". [170]

As we may observe it, the role of ITU is not only limited to oversee the radio-frequencies management, it has also its word to say in the implementation of common standards in order to assure a proper development of the new devices.

F. Conclusion

This main goal of the ITU is the development of a structured telecommunication environment. The system established by the ITU is aimed to be politically neutral: it is supposed not to favour any nation, but with the combination of the application of the 'first come, first served principle' and the allocation of the radiofrequencies for

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[169] K. Grewlich, " Agenda for the 1990s", in M. Jassawalla, ed., *Global Telceommunications Policies: The Challenge of Change* (London: Greenwood Press, 1993) at 235.
[170] Ibidem, at 236.

S-PCS on a worldwide basis, it has allowed the United States to monopolize the radiofrequencies for its nationals.[171]

However, it has to be reminded that its role is limited to the licensing of the space segment. Although the United States have coordinated the access to space segment for their nationals, it does not imply the licensing of the gateway segment, to which we will now come.

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[171] We could question the fairness of such a system. Undoubtedly, it has led the richest nation to dominate the S-PCS environment. But, this leads to question the philosophy behind the 'first come, first served' principle, which would need a whole thesis of discussion in itself.

V. Effect on the existing mobile telecommunications networks in Europe and the United States

"International registration of even a global spectrum assignment does not, ipso facto, mean that an operator is free to provide service everywhere".[172] After assessing the telecommunications environment in the United States and Europe, we will try to analyze what are the problems facing the new comers to enter those markets (regulatory and licensing problems).

A. The Mobile Communications Environment in the United States

1. Introduction

Until the 1st January 1984, the telephone market was dominated by the Bell System (i.e. AT&T). The issue of the suit filed in 1974 by the U.S. Justice Department[173] led to the dismantling of the AT&T's telephone monopoly and gave birth to 7 new companies (Regional Bell Operating Companies): Bell South, Bell Atlantic, NYNEX, Pacific Telesis, US West, Southwestern Bell Corporation and Ameritech. Their general characteristic was that they are constraint to a certain area and are prohibited from offering long-distance services.

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[172] KPMG, at 203.
[173] M. Paetsch, supra note 56, at 122.

Till recently, the U.S. telecommunications industry was composed of three sectors, which were subject to varying regulatory control. While the telecommunications equipment market was fully deregulated and long-distance service offerings (despite being regulated) appeared to be competitive, local-exchange service, controlled by the Public Utilities Commissions, continued to be offered on a monopolistic basis. Since February 8, 1996, the adoption of the new Telecommunications Act of 1996 ends government rules that have maintained barriers between local and long-distance calling, cable TV, broadcasting, and wireless services.[174] Deregulation has been launched and the telecommunications market is open for all.[175]

> Phone companies, publishing companies, Hollywood studios, broadcasters, cable-TV operators, and information-technology outfits will go racing into each others' businesses. AT&T, for instance, has filed in all 50 states to offer local service.[176]

Besides, while Europe was building up its internal market, the United States endeavoured to reach a similar achievement, negotiating with both Canada and Mexico. This resulted in the North American Free Trade Agreement, creating the world's largest free-trade zone.

> With regard to telecommunications, it should be noted that the United States already treats Canada and Mexico as de facto "internal" markets. in particular, during the last WATTC in Melbourne [in 1988] the United States explicitly stated that it considers U.S.-Mexico and

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[174] C. Arnst and M. Mandel, "The Coming Telescramble: U.S. deregulation is launching a $1 trillion digital free-for-all" *Business Week* (8 April 1996) 38.

[175] For now, however, the Bells (local phone companies) are barred from entering new businesses within their own regions right away. They cannot for example own a cable-TV system in their home markets. But away from home they can do virtually anything they want, P. Elstrom, "Think Local - And Invade: Look who's ready to steal the Bell's Lunch" *Business Week* (8 April 1996) 43.

[176] C. Arnst and M. Mandel, supra note 174, at 38.

U.S.-Canada traffic as non international, and as such not subject to WATTC regulations.[177]

2. Mobile Systems in the United States

a) cellular mobile telephone systems

It is in 1983 that the first cellular-mobile system began its operations in Chicago. Although the cellular market was fragmented between many different providers, carriers of adjoining markets signed so-called roaming agreements, allowing their respective customers to use the infrastructure of the other system's operator while traveling within his cellular-geographic service area (CGSA).[178] Given the high number of roaming agreements, clearing houses were established to administer them.

After the establishment of the analog system (known as Advanced Mobile Phone System [AMPS]), its capacity problems arising in large cellular markets such as New York or Los Angeles made it clear that the current analog system would not be able to provide the capacity to accommodate the predicted subscriber growth.[179] The Cellular Telecommunications Industry Association (CTIA) decided to promote a second-generation cellular system based on the digital technology. The major feature of a digital cellular system is the completely digital connection between the

[177] Paetsch, supra note 56, at 117.
[178] Ibidem at 158. But the roaming customer has to pay the customary rate for air time plus a roaming surcharge and is billed by his "home market" carrier.
[179] Ibidem at 173-174.

subscriber and the network. The advantages of digital systems over analog ones being as follow:

- digital transmission makes more efficient use of the radio spectrum (up to five times in comparison with an analog system)

- lower power requirement and requirement of fewer chips provide steep cost reductions for terminals

- by digitizing the message, encryption can provide a high level of privacy

- digital systems allow a wider range of services and performances. [180]

But, on the contrast with Europe, where the digital system has been unified and favoured, problems arose in the selection of a digital technology standard: Extended-TDMA (E-TDMA), was proposed by Hughes Network System and IMM, CDMA by Qualcomm Inc. and N-AMPS by Motorola Inc.

In conclusion, no decision of implementing one system has been taken, the FCC contenting itself in encouraging multiple advanced-cellular systems. This has resulted in the development of a dual-mode cellular phone using the AMPS part for roaming among all cellular systems and incorporating any of the systems proposed as the second part.[181]

Presently, operators are using the CDMA system in addition to TDMA[182] but, with the possible implementation of IS95 CDMA by Ericsson, it seems that CDMA is

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[180] G. Amendola and A. Ferraiulo, "Regulating Mobile Communications" (1995) 19 Telecommunications Policy 29, at 30.

[181] Paetsch, supra note 56, at 178.

[182] J. F. Purchase, "The New Space Race: Satellite and Terrestrial Mobile Service Providers Battle for Market Share" *Via Satellite* (March 1995) 30, at 39.

going to be the dominant commercial standard in the second generation of mobile communications in the United States.[183] The selection will be decided exclusively by market forces.

b) private mobile radio

Essentially used for safety/special emergency purposes (medical services, rescue organizations, handicaped persons...), industrial, land transportation services (motor carrier, taxicab...) or specialized mobile carrier, they represent services devoted to limited categories of persons.

Although mobile-radio systems have always been confined to narrow geographic area, changes are occurring in the field since those systems are entitled to interconnect their operations at any location with the public-switched-network and start to provide quasi-nationwide two-way voice and data services. This will result in a significantly intensified competition with cellular operators.[184]

c) mobile radio data networks

Those networks are specifically designed to provide two-way data communications. Two systems have been developed:

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[183] P. Donegan, "CDMA: is it really new or is it just 'me too' ? " *Mobile Communications International* (July/August 1996) 39.

[184] Paetsch, supra note 56, at 193-194. The problem will be to lower the high costs of Special Mobile Radio equipment.

- ARDIS: joint venture between IBM and Motorola, capable of providing wide-area or quasi-nationwide two-way data services in more than 400 metropolitan area covering about 8,000 cities in 50 states.

- Mobitex System, operated by RAM Mobile Data Communication, installed in the top 50 U.S. metropolitan areas.[185]

d) paging systems

Those services are operated by private entities, RBOCs, and telephone companies. Although the market was, at its inception, divided between radio common-carriers (RCCs) and private paging operators (PPOs, confined to offer services for specialized facilities, such as hospitals, and not to private individuals), the difference between PCP and RCC has almost shifted away since the FCC allowed PCPs to render paging services to local governments and fire/police departments.[186] Paging services are cheap and the very high majority of customers (95.7 %) uses it on a local basis.[187] The future of paging systems will depend on two factors: the geographical expansion of paging networks and the development of a new generation of pagers which will allow users of PCS, laptops, and notebook computers to receive facsimiles and broadcast messages.[188]

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[185] Ibidem, at 195.
[186] Ibidem at 196.
[187] Ibidem, at 197.
[188] Ibidem, at 200.

3. The Third-Generation Mobile Communications Systems: Personal Communications Services in the United States

As we will see, the American approach to PCS differs significantly from the European with regard to the underlying regulatory process as well as the employed technological concept.

a) Introduction and Definition:

> In contrast to the mobile-communication-systems, PCS189 represent not a specific technology, but a concept. The vagueness and the complexity of the term PCS stems from the fact that it does not deal with a single well-defined system. Instead, PCS addresses the integration of various existing and new mobile-networks, in a way that allows a person to use a lightweight portable phone at home, in the office, and in an outdoor environment.190

In 1990, the FCC issued a Notice of Inquiry in which it defined the PCS as " encompassing a broad range of radio communications services that free individuals from the constraints of the wireline public switched-telephone network and enable them to communicate when they are away from their home or office telephone".[191] This new generation focuses on the relation 'person-to-person' instead of 'station-to-station', allowing the user to be reached under one number at any place and any time. The new LEOs generation are classified under the category of Satellite

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[189] We will use equally PCS (Personal Communications Systems) or PCN (Personal Communications Networks.

[190] Paetsch, supra note 56, at 232.

[191] FCC, Notice of Inquiry, Gen Docket 90-314, 5 FCC Rcd 3995 (1990) at 1.

Personal Communications Systems: The third generation mobile communications devices may as well be delivered by satellites[192]. It is the same basic concept but using a more developed technology allowing it to offer more services.

b) Economic and Technological Aspects

The new PCN systems focus on the provision of high quality two-way speech, data and supplementary communications services. Rates for mature systems may be as high as 155 Mbps. This rate is significantly higher than the AMPS system's 10 kbps and the 5 kbps for the big LEO and MEO systems.[193]

> PCN uses a much smaller cell than the conventional cellular systems: a 100-1,000 meter radius as opposed to a 2-30 kilometer radius. Given a fixed allocated bandwith for the service, the capacity of any cellular system is a direct function of the number of times the allocated frequency band can be partitioned and re-used. The size of the cell limits re-use of the partitioned frequency band: the smaller the cell, the more cells can be fit into an area[194]. Once the re-use pattern is laid out so that adjacent cells are not on the same partition frequency, the only way to increase the number of times the frequency band can be re-used is to decrease the size of the cells. This is the principle behind the PCN systems with their micro, pico and nanocell architecture.[195]

The PCS have encountered much problems in the United States for the allocation of spectrum to them. Of all the applicants, only Motorola has shown interest for both LEOs systems and PCN.[196]

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[192] N. Higham, "Mobile and personal communications: The European Commission's Green Paper" (1994) 18 Telecommunications Policy 705.
[193] J. F. Purchase, supra note, at 30.
[194] With more cell sites, frequencies can be reused more often, thus increasing system capacity.
[195] J. F. Purchase, supra note..., at 30.
[196] The operators being, among others, Millicom, Graphic Scanning, American Personal Communications, Matrix Personal Communications, LiTel, Bell South Enterprises, Locate,

Although the goal of PCS is to provide wireless communications, they will be heavily dependent on existing and newly-developed wired infrastructures for purposes such as tracking, routing, signaling as well as the transmission of information. Such traffic can be carried over leased telephone lines but this represents a significant percentage of the overall cost. Therefore, PCS operators are looking towards cable-TV networks and metropolitan area networks (MAN) as alternative network-delivery-facilities. Hence, various cable companies applied for experimental authorization to implement PCS networks, either on their own or in conjunction with entities more experienced in the provision of mobile-radio services.[197]

c) Conclusion

The implementation of PCS services is important because it could bring additional competition to the current domestic mobile radio services market. " Competition to existing cellular, paging and private radio services could result in lower consumer prices for those services, as well as an increase in the efficiency of those mobile service operators." [198] But this implementation will face major hurdles:

- there are numerous obstacles to deploy the microcell infrastructure, which requires many more towers (costing between $200,000 and $300,000) than cellular;

Advanced Cordless Technology, Cellular 21, Cellular General, Times, Advanced Mobile Communications and Unicell.

[197] Paetsch, supra note 56, at 231. Those companies include, inter alia, Time Warner Cable Group, Continental Cable Vision, Cablevision, Tele-Comunications Inc.

[198] A. C. Barrett and B. F. Marchant, " Emerging Technologies and Personal Communications Services: Regulatory Issues" 1 CommLaw Conspectus 8, at 8.

- snags in voluntary spectrum surrender by current license holders;

- marketing, particularly what factors will convince the public that PCS is better than cellular;

- economic viability, i.e., how PCS competes with cellular without getting into a price war.[199]

4. Regulatory Bodies

a) The Department of State

Being the body responsible for U.S. foreign relations, the DoS (aided by the FCC and NTIA) designates delegations that participate to ITU Conferences and other specialized conferences.[200] The lobbying power of these delegations is very strong; as we saw at WRC'95, they were able to have some radio frequencies allocated for items that were even not on the agenda of the conference.

b) The National Telecommunications and Information Administration

It oversees all federal government operations, including military operations. It coordinates closely its work with the FCC as numerous radiofrequency bands are shared between federal and nonfederal users. We will therefore pay less attention to it.

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[199] P. Flanagan, "Personal Communications Services: The Long Road Ahead" *Telecommunications, Americas adition* (February 1996) at 23.
[200] Ibidem at 128.

c) The Federal Communications Commission

The Federal Communications Commission (FCC) is an independent U.S. government organization, which was established by the Communications Act of 1934 in order to regulate interstate and foreign communications by wire, radio, television, satellite, and cable.[201]

It oversees the allocation and efficient management of spectrum for all nonfederal government operations (i.e. the private sector as well as state and local governments).[202]

The FCC's radio spectrum management is the result of the three-step process of allocation, allotment, and assignment of frequencies. The FCC only acts to assign frequencies within the appropriate spectrum bands. The licensing methods may be based on: comparative hearings, negotiated rulemaking, lotteries, pioneer's preference, and competitive bidding rules.[203]

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[201] Communications Act of 1934, P.L. 416, 73d Cog., c. 652, 48 Stat 1064, 47 USC §§ 151 through 609.

[202] P. Flanagan, supra note 199, at 130.

[203] *Comparative hearings*: The FCC can hold a hearing with all applicants for a licence if a substantial and material question of fact is presented or the Commission for any reason is unable to determine whether thepublic interest, convenience, and necessity will be served by the granting of the application.
Negotiated rulemaking: It is a process by which the FCC negotiates with all the applicants in order to award the licence.
Lotteries: It is a game of chance. Applicants must file on a specific day, and the application must typically include explicit engineering information and a guarantee that the Commission's financial requirements can be met and the a winner is drawn.
Pioneer's Preference: It is preferential treatment in the licensing process for parties requesting spectrum allocation associated with the development of new communications services.
Competitive biddings: It is a synonym for auctioning the licence. The licence goes to the applicant who is willing to pay the more.

When licensing a satellite communications system, the FCC issues two kinds of licences: first, for the radio frequency spectrum, than for the operation of the satellite system.

> The FCC's rulemaking procedure for assigning frequencies consists of several 'notice-and-comment' periods. First, private companies may petition the FCC for an 'issuance, amendment or repeal of a rule or regulation'. Once a petition is filed, the FCC will release a 'Public Notice' to inform interested parties of the petition. Comments in support of or in opposition to the petition may be filed up to thirty days after the Public Notice has been issued. Replies may be filed up to 15 days after the comments have been filed. If the [FCC] determines that the petition discloses sufficient reasons in support of the action requested, a 'Notice of Proposed Rulemaking' will be issued in the Federal Register to notify potentially interested parties of the rulemaking and set time limits for comments and reply comments to be submitted in opposition or support of the proposed rulemaking. After consideration of the comments and replies, the FCC will issue a final decision in the form of a 'Report and Order'.[204]

Once the frequency allocation and assignment have been decided, each LEO satellite system must comply with FCC licensing requirements and obtain permission from the FCC to construct, launch and operate a satellite. To obtain this operating license, an applicant must submit information concerning the character and citizenship of the applicant, the financial ability of the applicant to construct, launch and operate the proposed satellite system. The applicant must also demonstrate the technical feasibility of the proposed system.[205]

To date, only the U.S. Federal Communications Commission has issued licenses for the construction, testing and U.S. operations of MSS-based systems under the

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[204] T. Stevens, supra note 9, at 407.
[205] Ibidem, at 408.

negotiated rulemaking process (licenses granted in January 1995 to Globalstar, Iridium and Odyssey). As we will see below, the licensing system is much simpler in the United States than in Europe because of the fact that the United States are only one state, on which the FCC has the full power to rule the telecommunications business.

To summarize, the licensing process for Big LEOs has been the following: The FCC adopted a "Report and Order" in "Docket CC 92-166" establishing rules and policies.[206]

a) financial qualifications: To be licensed, applicants must have current assets on their balance sheet or have committed outside sufficient to construct the entire system and operate it for one year.

b) technical qualifications: The applicants have to provide "global coverage" (i.e. between 70° North Latitude and 55° South Latitude for at least 75% of every day) and continuous coverage is required for the entire United States.

c) regulatory classifications of operators: Licensees need not operate as common carriers[207]. There is no restriction against foreign ownership of the space segment, however there are restrictions in service provision (this could affect the

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[206] Final Report of the ERO, supra note 141, at 84.

[207] In the United States, the FCC uses two primary regulatory classifications in telecommunications: Common Carrier - service providers obliged to serve anyone requesting service on non-discriminatory terms and conditions or Private Carrier -service providers offering optional services on a contractual basis, R. Frieden, "Legal and Regulatory Challenges to Universal Personal Communication Services Provided by Low Earth Orbiting Satellites", Proceedings of the Thirty-Sixth Colloquium on the Law of Outer Space, International Institute of Space Law of the International Astronautical Federation, October 16-22, 1993, at 452.

implementation of ICO)[208]. But this is now subject to international negotiations under the WTO (see below).

d) construction milestones: The Order generally requires each licensee to begin construction of its satellites within a certain period.

In conclusion , the FCC has decided to license the complete systems including the space segment: the FCC grants authority to the companies to build, launch, and operate spacecraft; gateway stations; mobile terminals and to use frequencies assigned to them. The advantage is that it allows a best control of all the potential entrants and an efficient use of the spectrum. However, it can lead to incompatibility in the amount and location of radio spectrum which other administrations have allocated for such services.[209]

B. The Mobile Communications Environment in Europe

1. Introduction

In the past, the telecommunications equipment markets of the EU member countries were characterized by insufficient scale and specialization economies, protective procurement policy of national PTTs, insufficient standardization, and excessive certification requirements for customer premise equipment, resulting in a high cost of Non-Europe.[210]

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[208] Final Report of the ERO, supra note 141, at 79-80.
[209] Ibidem.
[210] M. Paetsch, supra note 56, at 257.

Member States have always granted licences in relation to a certain technology (radio paging or cellular telephony for instance), which has resulted in an incompatibilty of networks or terminal equipment.[211]

Licensing procedures vary enormously and the criteria for the award of licences are unclear in some countries.

2. Mobile Services Offered in Europe

Different mobile services have been developed in Europe, each with a different success:

- **First Generation**: Analogue Cellular Telephony, provided by the monopoly PTT's who were automatically licensed under their monopoly powers, except in France, the United Kingdom where private operators have been licensed.

  The development of different cellular standards have precluded the possibility of Pan-European roaming.[212] Only a few countries have a compatible system (e.g. the four Scandinavian Countries or the Benelux).

- Radio Paging, also provided by the monopoly PTT's. Only six countries have licensed private operators: France, the United Kingdom, Sweden, Portugal, Spain and The Netherlands. Besides, a project, called ERMES (European radio message system) is currently being developed and supported by the European Union to provide paging service throughout Europe.[213]

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[211] E. Paul, "Regulatory Liberalization of Mobile Communications in the European Union" (1995) 2 Telecommunications and Space J., 351, at 352.
[212] Paetsch, supra note 56, at 277.
[213] Ibidem, at 304.

- Mobile Data (or Mobile Radio Data Networks [RDNs]), offered in certain European countries, are used to provide data, rather than voice, communications to field service organizations and are intended to be operated as public networks providing quasi-nationwide coverage. Private operators have been licensed in the United Kingdom, The Netherlands and France.
- Private Mobile Radio, of limited area coverage, are essentially used by taxi companies and the vast majority of if is not connected to the public switched network.[214] It is of no relevancy for our work.
- Digital Cellular Telephony:
  - Telepoint: a system by which calls can be made from within about 20 meters of a base station usually located in a public place. It did not have the success expected.
  - **Second Generation**: GSM or Groupe Spécial Mobile: GSM licenses are not technology specific, which means that an operator can provide cellular telephony, radio paging, mobile data and other services without the need for separate licences.[215] Besides, a Council Directive[216] required Member States to reserve GSM frequencies (the 890- 915 MHz and 935-960 Mhz spectrum) and set out the basis for a common digital specification to allow users to "roam", that is, use the equipment in different Member States. [217]

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[214] Paetsch, supra note 56, at 28.
[215] Paul, supra note 211, at 354.
[216] 87/372/EEC OJ L196/85 17.07.1987.
[217] GSM is now used in more than 100 countries with 10 million users. The list of countries includes now the US, with a PCS 1900 network operating commercially in Washington DC. P.

Because of its technologic characteristics and the political support[218], GSM system is dominating the European mobile market.[219]

> The Pan-European GSM network and the presently operating analog systems are completely independent, and also use different frequency bands. Hence, GSM terminals are only capable of accessing the digital network, and there will be no dual-mode phones. Significant economies of scale are realizable since equipment adhering to one standard is marketable in 17 European countries, all of which signed the GSM Memorandum of Understanding[220]. Aside from these advantages, the GSM network is assumed to be spectrally up to ten times more efficient than analog systems, thus offering an equally larger network capacity (...) In summary, it can be said that GSM represents at the present time the most spectrum-efficient, homogeneous, and fraudproof cellular system in the world.[221]

- **Third Generation**: UMTS (Universal Mobile Telecommunications System) which encompasses the PCN: Personal Communications Networks (or PCS, Personal Communications Services) are micro cellular networks[222] operating to the GSM standard (known as DCS 1800) but at a much higher frequency,[223] and thus offering

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Jackson, "USA: Into the Wider World-Wireless Symposium and Exhibition" *Electronic Times* (29 February 1996) 20.

[218] Council Recommendation of June 25, 1987 on the coordinated introduction of public Pan-European cellular digital land-based mobile communications in the Community (87/371/EEC).

[219] Although that GSM has its problems, particularly relatively poor speech quality and network capacity limits. Both of these aspects are now being addressed by manufacturers like Nokia, Motorola, Ericsson and Siemens which are working on improved versions of the systems digital speech encoder. R. Wilson, supra note 4, 26.

[220] In September 1987, the MoU (Memorandum of Understanding) was signed by 15 European countries having accepted GSM as their digital standard. As of January 1996, the GSM MoU Group had 168 members in 92 countries, the majority of which are not European and more than twelve and a half million mobile subscribers world-wide are using GSM. P. Azoulay, "The GSM Standard: An Impetus for the Globalization of Mobile Communications ?" (1st Quarter 1996) 21 Communications & Strategies, 95 at 101.

[221] Paetsch, supra note 56, at 293-295.

[222] On the contrast with the United States, where no choice has been made between Cordless-Based PCS and Cellular-Based PCS , the quasi abandonment of the telepoint system (based on a cordless technology) in Europe has led to the adoption of the cellular technology for the PCS.

[223] Besides, the cell size will be smaller than with GSM networks (between 400 m and 8 km, and thus will imply a higher infrastructure investment, whereas GSM cell size are between 1 and 30km) and PCN will only support national roaming.

a higher capacity of traffic volume. The idea of the PCN concept is that each subscriber is assigned one personal number, under which he or she can receive or initiate phone calls, regardless of his or her respective location.[224] The regulatory framework for PCN is still developing in Europe. The UMTS platform will derive mostly from GSM digital cellular and incorporate other standards, including DECT (office-oriented cordless telephony), TETRA (trunked private mobile radio) and ERMES (pan-European paging system).[225] The European Commission's attempt to steer UMTS is criticized by some actors who think that the market should be the only rule.[226] Licenses have been issued only in the United Kingdom,[227] Germany[228] and France to the private sector. No PTTs offer the service, possibly due to the high cost of establishing networks which would, in any case, offer competitive services to the PTTs' GSM services.[229]

From the comparison of the situations in the United States and in Europe, it appears that the U.S. have further liberalized the telecommunications than the European Union. "Whereas U.S. operators of the third-generation and/or advanced mobile

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[224] Paetsch, supra note 56, at 328.
[225] K. Hart, "EC throws weight behind mobile spec" *CommunicationsWeek International* (4 March 1996) 1.
[226] Ibidem, 1.
[227] Three consortia have been licensed: The Mercury PCN consortium, composed of: Mercury (60%), Motorola (20%), and 20% unallocated; The Unitel consortium, includes STC (which is in fact controlled by Northern Telecom, for 30%), US West (30%), Thorn (25%), DBP (15%); The British Aerospace consortium-MicroTel-, comprises, Bae (35%), Pacific Telesis (20%), Millicom (14%), Matra (10%), Sony (4%) and 17% unallocated.
[228] The licence was issued to a consortium made of Thyssen, Preussen Elektra, Vodaphone and Bell South.
[229] Paul, supra note 59, at 356.

communications (UMTS/FLMPTS) have the opportunity to carry traffic through strong, independent network carriers such as CATV (Cable TV) or MAN (Metropolitan Area Networks) companies, European operators, in toto, are almost entirely dependent on fixed network services provided by the national PTT".[230] Therefore, they have to rely on the newly established regulatory bodies (Ministries of Telecommunications) to determine and enforce cost-based network pricing. However, with the deregulation of the telecommunication sector scheduled for the 1 January 1998, Europe should rapidly reach the same situation.

3. The Regulatory Bodies

As we have pointed out with United States where the licensing is complete, in Europe, administrations distinguish the space segment (for which the ITU procedures suffice) and the service provision, and thus focus on the licensing of service providers and their gateway earth stations[231]. Once a satellite system has been coordinated, the system has a certain coverage area. "In order for this coverage area to be turned into a service area, a license [sic] for a certain Earth segment has to be obtained. In Europe service providers have to apply for this licence in each of the European countries in order to be able to provide a service for that country".[232] We will therefore focus our attention on two countries to analyze the actual process of establishing a telecommunications network in those countries and then try to analyze the global European situation.

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[230] Paetsch, supra note 56, at 344.
[231] Final Report of the ERO, supra note 141, at 79-81.
[232] Ibidem, at 99-100.

a) at the national level

According to Anthony Navarra, Globalstar executive vice-president for business development, " The single largest hurdle we face is to obtain licenses to operate Globalstar in all the regions of the world." Aided by their strategic partners around the world, they are currently working on obtaining licensing in some 50 countries.[233]

We will take the case of France to assess the different barriers that each player will face. In France, since the entry into force of the Green Paper on Satellite Communications[234], mobile satellite networks open to the public are licensed as radioelectric networks under Articles L.33-1 and L.34-3 of the Posts and Telecommunications Code (P&T Code)[235] and are connected to the public (which will be the case for the LEOs systems via their possibility to switch to the local mobile network or to reach a correspondent on the fixed network).

i) Licensing

Mobile telecommunications services have to be licensed by the Minister of Posts and Telecommunications (MPT). Candidates are selected by way of a public call for tender (appel à candidatures). The two currently existing mobile telephone

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[233] R. Shaw, supra note 20, at 10.

[234] Towards Europe-wide systems and services-Green Paper on a common approach in the field of satellite communications in the E.C.; Communication from the Commission; COM (90) 490 final, November 20, 1990.

[235] Law n°90-117 of December 1990 Defining the New Regulatory Framework of the French Telceommunications Industry, constituing the Chapter I of Part I of Book II of the first volume of the Post and Telecommunications Code.

networks are those of France Telecom (*Itineris*) and the SFR (Société Française du Radiotéléphone, a privately owned company). A third license has been attributed to Bouygues Telecom, a consortium headed by Bouygues (construction, civil engineering, television) which counts among its partners Mercury and the U.S. RBOC Southwestern Bell. This system uses the DCS 1800 standard.[236] The licence holders are obliged to provide a minimum coverage and services, with penalties if these obligations are not respected. The licence holders have full freedom over pricing and sales and wide discretion as to the usefulness of using service providers.[237]

ii) PTT Interconnect Agreements

Public Network, according to Code Article L.32-14°, means all of the telecommunications networks established or operated by the public operator (France Telecom) to serve the needs of the public in general. As an exception to France Telecom's statutory monopoly on networks open to the public under Code Article L.33-1, the MPT may license other operators to establish radioelectric networks open to the public. Such radioelectric may be terrestrial or satellite based.[238]

Networks open to the public are to be connected to the public network. Thus, the MPT, by licensing an operator to establish such a network, do not formally

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[236] Ph. Shin, "France" in Telecommunications Law and Practice by Colin D. Long (London, Sweet & Maxwell, 1995) 401, at 410.
[237] G. Amendola and A. Ferraiulo, supra note 180, at 35.
[238] Ph. Shin, supra note 236, at 420.

authorise to interconnect but go straight to the terms and conditions to be included in the interconnection contract. It is the MPT who lays down the basic conditions for such interconnection in the licence authorizing the service.[239] Mobile operators are obliged to use lines leased from France Telecom (even France Telecom's separate GSM management) and to pay for their use at the standard tariff.[240]

iii) Scope of Foreign Participation Permitted

Article L.33-1.II of the P&T Code provides that no license may be granted for the establishment and operation of a radioelectric network for the purpose of providing a telecommunication service to the public, to any company in which more than 20 per cent of the capital or voting rights are held directly or indirectly by a person or persons of foreign nationality.

A person of " foreign nationality" is defined by this Article as a foreign individual or a company the majority of whose capital is *not* held directly or indirectly by an individual or legal entity of French nationality. However, the limitation does not apply to nationals (individuals or legal entities) of a Member State of the European Union.[241]

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[239] Ibidem, at 420-421.
[240] G. Amendola and A. Ferraiulo, supra note..., at 35.
[241] Art. L. 33-1, II, PTT Code.

iv) Terminal Equipment Certification

Article L.34-9 specifies that any terminal equipment designed for connection to a public network, as well as any radioelectric terminal equipment regardless whether it is to be connected to a public network, is subject to the prior approval of the MPT.

In accordance with the Mutual Recognition Directive, Articles R.20-17 to 20-21 provide for recognition, without any formalities required, of the certification delivered by an institution officially authorized to deliver such certification. In addition, the results of tests carried out by laboratories officially designated by other Member States can be validly used in order to obtain a certification in France.[242]

v) Conclusion

The biggest obstacle for new comers will definitely be the foreign ownership condition. Unless, they find French partners that are willing to create a subsidiary and to operate the system, they might have a hard time with the licensing.

Another solution could come from the European Union which could obtain powers to licence the new comers on a global European basis (see below).

Under the auspices of the European Union, negotiations could be led between the United States and the European Union for the opening the European market at the reciprocal condition that the United States telecommunications market be open to European competitors. This would follow the Commission's proposal on

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[242] Ph. Shin, supra note 236, at 429.

telecommunications licensing made in late 1995, which gives the Commission authority to implement a foreign ownership limit against a particular country only if the Council approves special measures.[243] In the United States, according to the new Telecommunications Act 1996, the FCC may not grant a radio licence to a foreign government or representative thereof, or to a corporation that is directly or indirectly controlled by another corporation having more than a twenty-five percent foreign ownership.[244]

b) At the European level

1) EC Green Paper on Telecommunications Services[245]

A new policy was initiated with the Green Paper.[246] The objective pursued by it was the creation of a telecommunications environment that would provide European

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[243] G. E. Oberst, "The European Union's New Licensing Approach" *Via Satellite* (March 1996) 12.
[244] Communications Act of 1934, P.L. 416, 73d Cog., c. 652, 48 Stat 1064, 47 USC §§ 151 through 609, As Amended (1996), *Pike & Fischer, Inc.* 1996.
[245] Commission of the European Communities, "Towards a Dynamic European economy: Green Paper on the Development of the Common Market for Telecommunications services and equipment", COM(87) 290 final, June 30, 1987.
[246] S. D. Lando, "The European Community's Road to Telecommunications Deregulation" (1994) 62 Fordham L. Rev., at 2159. It started with the Green Paper and continued through subsequent directives: Commission Directive 88/301 on Competition on the Markets in Telecommunications Terminal Equipment, 1988 O.J. (L 131) 73; Commission Directive 90/388 of June 1990 on Competition in the Markets for Telecommunications Services, 1990 O.J. (L 192) 10, amended by the Commission Directive 96/19/EC of 13 March 1996, 1996 O.J. (L 74) 13; Council Directive 90/387 on the Establishment of the Internal Market for telecommunications Services through the Implementation of Open Network Provision, 1990 O.J. (L 192) 1; the Satellite Communications Directive 94/46, 1994 O.J. (L 268) 15, which extends the operation of the Services and Terminal Equipment Directives to satellites; Commission Directive 95/51/EC of 18 October 1995 amending Directive 90/388/EC with regard to the abolition of the restrictions on the use of cable television networks for the provision of already liberalized telecommunications services, 1995 O.J. (L 256) 49; Commission Directive 96/2/EC of 16 January 1996 amending Directive 90/388/EEC with regard to mobile and personal communications, 1996 O.J. (L 20) 59. The Commission also released the Guidelines on the Application of Competition Rules to explain what type of inter-company agreements violate competition laws: Commission Guidelines on the Application of EEC Competition Rules in the Telecommunications Sector, 1991 O.J. (C 233) 2.

consumers with a wide array of communications services, facilitate the rapid diffusion of new technologies, and establish and maintain coherent development between the EC Member Countries. To bring this about, the Green Paper proposed the opening up for all telecommunications services (such as the terminal equipment market), except the provision and/or operation of the network infrastructure and a limited number of "basic services," both of which will remain in the domain of the PTTs in "order to safeguard public service goals".[247] This led to the creation of the European Telecommunications Standard Institute (ETSI).

Besides, the Green Paper did not cover the area of satellite and mobile communications.

In other words, the Commission's attention has been directed at creating the minimum equal conditions of competition in the absence of which new market entrants would be placed at a competitive disadvantage, by first seeking to dismantle the national monopolies of telecommunications operators (Tos) and trying to create a favourable environment for telecommunications (with, for instance, the implementation of the principle of mutual recognition of licences[248]). Therefore, the Commission has in all of its policies accorded its priority to the separation of the regulatory and operational activities of national TOs.[249]

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[247] M. Paetsch, supra note 56, at 258.

[248] A directive on mutual recognition of licences has been proposed. "Under that proposal an operator obtaining a licence for the provision of satellite services from one Member State in accordance with agreed harmonized conditions would be allowed to provide the service in all Member States. That proposal has now been abandoned. It was defeated by protectionist barriers erected by many operaters and administartions, mainly those in the southern European countries." S. Sharrock, "Longing for a license" *Satellite Communications* (July 1996) 34, at 35.

[249] P. Alexiadis, "European Union Telecommunications Policy", in Colin D. Long, *Telecommunications Law and Practice* (London: Sweet & Maxwell, 1995), 1-709, at 224.

2) The Green Paper on Mobile Communications[250]

In this new document, the Commission recognized the importance and the growth of mobile communications and concluded that there were significant regulatory barriers to entry to the mobile market and licensing restrictions which still limit competition, restrict the ability to "roam", and prevent mass price reduction. The Commission recognized the following barriers: The maintenance of exclusive or special rights in the sector, the continuing tendency to license, not by function, but by technology, which can lead to market fragmentation; national orientation of licensing activities, which results in the need for a service provider to make applications in all or many member states before being able to offer pan-European service or even pan-European roaming; inconsistent approaches between member states with regard to service provision; continuing delays in the allocation of certain key radio frequencies; the lack of a Union response to US-dominated initiative in satellite-based communications; restrictions on mobile operators providing their own fixed infrastructure and/or sharing infrastructure with others; lack of access by Europeans to third-party markets.[251]

The Commission came with a certain number of propositions which form the core of the Green Paper[252]:

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[250] Towards the Personal Communications Environment: Green Paper on a Common Approach in the Field of Mobile and Personal Communications in the European Union, (27 April 1994) COM (94) 145 final [*Hereinafter quoted as* Towards Personal Communications].
[251] N. Higham, "Mobile and Personal Communications: The European Commission's Green Paper" (1994) 18 Telecommunications Policy 705, at 708-709.
[252] Ibidem, at 709 and fol.

1) *Licensing conditions for mobile network operators*

The regulation should be minimal: licensing should be based on objective grounds, transparent, non-discriminatory, proportional and limited to the essential requirements (as defined in the Services Directive, the ONP Framework Directive and the Terminal Equipment Directive). There should be no restrictions on foreign ownership by other Union and EEA nationals, but reciprocal access has to be obtained from other non-European countries. Mutual recognition has to be implemented.

2) *Licensing conditions for service providers*

The Commission recommends[253] that service provision should not be subject to licensing, although member states may continue to require a declaration of activities to their national regulatory authority (NRA) and impose a certain Code of Practice.

3) *Interconnect rules*

The Commission recognizes that, because payments for delivery of calls over the local network and payments for leased lines and intelligent network functions may together account for 30-50% of the revenue of a mobile network operator, fair terms of interconnections with the fixed network are crucial but the basic framework exists already with the ONP Framework , the ONP Voice Telephony and ONP Leased Line Directives.

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[253] Towards Personal Communications, supra note 250, at 9.

4) *Infrastructure*

Mobile network operators should be able to install and use, or to share, their own transmission and also the fixed links between base stations and the point of interconnection with the fixed network.

5) *Radio frequency allocations*

Coordination on allocation of spectrum in Europe is to continue to be carried out by the ERC and the ERO, but these bodies are urged to consult widely.

6) *Numbering*

The Commission recognizes that fair access to, and allocation of, numbering is also fundamental to the successful evolution of mobile communications towards PCS.

In addition, the Commission published in 1994 a Communication on the consultation process on the Green Paper, where it was stipulated as a priority area of action that, " while licensing of mobile operators will continue to be at a nation level, satellite based services should be licensed at a European level".[254] The licensing process should have been established by 1 January 1996.[255]

> The case for issuing licences on a continent-wide basis rather than a country-by-country basis surfaced half way through the licensing of second generation GSM services. But throughout the pre-and-post Maastricht era, the European Commission has been unable to muster enough support to move forward onto this oh-so-sensitive domain... at

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[254] Communication to the European Parliament and the Council on the Consultation on the Green Paper on Mobile and Personal Communications in the European Union (COM (94) 492 final, 23.11.1994).

[255] Paul, supra note 59, at 360.

> the March 1st [1996] workshop, Task Force members[256] were extremely careful to state that they believe pan-European licensing for UMTS should only be considered as an option at this stage.[257]

4. Europe and Satellite Personal Communications Systems

a) Introduction

For the European Commission, those new systems are viewed as a complement to terrestrially-based mobile or fixed systems. " The greatest use of satellite PCS is believed to be as a complement to worldwide mobile terrestrial cellular networks, in particular GSM." [258] The market for the satellite services in Europe is viewed as rather small -except in eastern Europe and some Mediterranean countries- because of plans to develop an extensive terrestrial digital cellular phone network.[259]

On other aspects, the EU sees a great opportunity for European industries to participate in these programs (actual European industry contracts are valued at about 500 million ECU, while potential further contracts are estimated to reach tens of billions of ECU, especially in handsets)[260] but is concerned by the fact that the U.S early licensing could foreclose opportunities for EU industry to participate in

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[256] A UMTS Task Force has been set up by the European Union to reshape Europe's policy making machinery.

[257] P. Donegan, " Europe's new policy maker" *Mobile Communications International* (April 1996) 37-38.

[258] Proposal for a European Parliament and Council Decision on an Action at a Union Level in the Field of Satellite Personal Communications Services in the European Union (COM (95) 529 final, 08.11.1995), at 3 and 5.

[259] S. Perry, "EU Urged to Set Up Single Satellite Licensing System", *The Reuter European Community Report* (8 November 1995) BC cycle.

[260] Proposal for a European Action, supra note 258, at 5.

the benefits of this new opportunity. Hence, it wishes that no undue obstacles (such as regulatory barriers) be put against those systems.

As of today, most aspects of S-PCS provision have, in principle, already been liberalized throughout the EU, including the establishment of S-PCS gateways, provision of S-PCS services and the provision and utilization of S-PCS handsets (subject to the standard European type approval regime). On October 13, 1994, following the trend set out in the Green Paper on a common approach in the field of satellite communications, the Commission adopted Directive 94/46 on satellite communications.[261] This directive liberalizes all satellite services with the exception of those that are specifically escluded, such as voice telephony. However, the voice telephony definition does not encompass S-PCS, which are therefore liberalized. Satellite services are liberalized, but it does not imply that the telecommuncation service itself will be automatically licensed.

b) The Commission's position

The Commission has focused its attention on Satellite Personal Communications Services in a document called: "Proposal for a European Parliament and Council Decision on an Action at a Union Level in the Field of Satellite Personal Communications Services in the European Union".[262]

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[261] Commission Directive 94/46/EC of 13 October 1994 amending Directive 88/301/EEC and Directive 90/388/EEC in particular with regard to satellite communications, 1994 O.J. (L 268) 15.
[262] Proposal for a European Action, supra note 258.

In this document, the Commission has expressed its will to reach an agreement to a common approach to selection and authorization of satellite PCS in the Union, allowing the Member States to issue relevant authorizations for the provision of satellite personal communications services on the basis of coordinated national regulatory conditions and criteria.[263]

According to the Commission, there needs to be compatibility between any European spectrum usage and usage in other regions of the world. "The spectrum is to some extend controlled by those who first claim on the spectrum in the context of the ITU procedures and there is a danger that, unless precautions are taken, systems capable of providing service in Europe may be selected by a process outside European jurisdiction. Therefore a European approach for licensing is urgently needed in order to use limited frequency resource most efficiently and to strengthen the combined European position on this matter".[264] The objectives of action shall be to ensure, within a period of three years:

- selection of satellite PCS space segment operators;
- adoption of common conditions to be attached to authorizations for satellite PCS space segment operators;
- harmonization of conditions for the authorization of providers of satellite personal communications services, gateway operators, and, if required, for the circulation and use of equipment;

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[263] Ibidem, at 6-7.
[264] Commission of the European Communities, Press Release, *Rapid*, IP: 95-1202.

- the establishment of a dialogue and, where appropriate, negotiations between the European Union and third countries with the aim of establishing international cooperation in order to promote development of satellite personal communications services and remove the obstacles to their development (the principle of Community action will be aimed at ensuring effective and comparable access for Community organizations in all markets).

However, it appears that the Telecommunications Council of September 27, 1996[265] decided to adopt a compromise on the regulation of n the process of S-PCS operators[266]. Harmonization and coordination have to be favoured (the Commission has mandated the CEPT[267] to come with a project of harmonization of frequency usage and of the conditions[268] to be attached to general authorizations) but licensing of satellite operators and authorization[269] of providers of satellite services remain in

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[265] Council of the European Union, General Secretariat, Press Release 10259/96 (Presse 247-G).

[266] Member States are to ensure that telecommunication services and/or networks can be provided either without authorization or on the basis of a general authorization , to be supplemented where necessary by rights and oblogations requiring individual licences. The latter may be granted only if the beneficiary secures access to radio-frequencies or a numbers... Members States may limit the number of individual licences for a category of telecommunications services and for the establishment and/or operation of telecommunications infrastructure only to the extent required to ensure the efficieny use of radio frequency or for the time necessary for the entry into service of a sufficient quantity of numbers.

[267] The Conference of European Postal and Telecommunication Administrations.

[268] Any conditions attached to authorizations should be objectively justified in relation to the service concerned and should be non-discriminatory, proportionate and transparent. The purpose of the above conditions is to ensure compliance with the relevant essential requirements (e.g. the security of network operations, data protection, protection of the environment, subscriber's protection...)

[269] If, in the context of the cooperation with the CEPT, the number of authorizations to provide an S-PCS were to be restricted owing to the scarcity of frequencies available, Member States would be obliged to coordinate their authorization procedures in order to select systems which can operate in the Community (i.e. to ensure that the same space segment operators and S-PCS service providers are licensed in all Member States).

the hand of each Member States, according the principle of subsidiarity. This follows the trend defended by the ITU in the Report on GMPCS presented by D. Lieve to the World Telecommunication Advisory Council for which, "national sovereignty remains the basis of international relations in the world of telecommunications policy and of national decision-making about advanced international telecommunication systems... This will, and should, continue to be the case in the future."[270] Besides, to facilitate the provision of those new services, a "one-stop-shopping" procedure shall be implemented as well as a "Licensing Committee".

c) E.U. Competition rules: Article 85 and 86[271]

[270] D. Lieve, "Report of the World Telecommunication Advisory Council", 18 January 1998, available on Internet, www. itu.ch/pforum/symp-repe.html, at 2.

[271] Article 85: 1. The following shall be prohibited as incompatible with the common market: all agreements between undertakings, decisions by associations of undertakings and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition within the common market, and in particular those which:
(a) directly or indirectly fix purchase or selling prices or any other trading conditions;
(b) limit or control production, markets, technical development, or investment;
(c) share markets or sources of supply
(d) apply dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;
(e) make the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts.
2. Any agreements or decisions prohibited pursuant to this Article shall be automatically void.
3. The provisions of paragraph 1 may, however, be declared inapplicable in the case of:
- any agreement or category of agreements between undertakings;
- any decision or category of decisions by associations of undertakings;
- any concerted practice or category of concerted practices;
which contributes to improving the production or distribution of goods or to promoting technical or economic progress, while allowing consumers a fair share of the resulting benefit, and which does not:
(a) impose on the undertakings concerned restrictions which are not indispensable to the attainment of these objectives;

The Commission announced in June 1995 that it was investigating Globalstar and Iridium to see if they complied with EU competition rules.[272] The Commission is concerned that these few operators do not acquire a monopoly position in a lucrative expanding market, but that they work in a climate of fair competition. It is primarily worried however about possible distortions of EU competition rules, in particular the nature, terms and conditions of the distribution policies chosen by the consortia, the nature of links with cellular land-based networks and the access by competing mobile satellite systems to infrastructure owned by partners in one of them.

Do satellite consortia present a dominant position and abuse of it ? It will inevitably be true, because of limited spectrum, that there will only be a few companies providing satelllite facilities.[273] If we consider that they only offer a mobile service, we could argue that companies providing satellite based PCN services are not dominant when they operate in a country where are alternative mobile services

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(b) afford such undertakings the possibility of eliminating competition in respect of a substantial part of the products in question.

Article 86:

Any abuse by one or more undertakings of a dominant position within the common market or in a substantial part of it shall be prohibited as incompatible with the common market in so far as it may affect trade between Member States. Such abuse may, in particular, consist in:

(a) directly or indirectly imposing unfair purchase or selling prices or other unfair trading conditions;

(b) limiting production, markets or technical development to the prejudice of consumers;

(c) applying dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;

(d) making the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts.

[272] S. Perry, supra note 259, BC.

[273] KPMG, at 166.

(such as GSM). But if we accept that the ability to roam internationally is sufficient to make a satellite PCN service unique, than satellite networks operators may well have a dominant position.[274] Another question would be to assess if the operator abuse of its position. It would be the case if a satellite service operator also runs a terrestrial service and uses the satellite service to gain market advantage in the cellular service without offering similar terms to other organizations.[275]

In the forecast plans of satellite consortia, they will work with local gateway operators, but it seems that they will not work with more than one local operator in each country and preferably with established cellular operators. " As control of both sides of the interface [in the service plane] rest with one organization, many issues are resolved, although abuse of a dominant position is more likely to occur." [276]

In November 1995, the Commission issued an Article 19(3) Notice[277] concerning Inmarsat-P indicating that it intended to take a favorable position on the notified agreements[278]. Subsequently, it took also a favourable view towards the Iridium and Globalstar systems in September 1996[279]. T We can stress the merit of the

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[274] Ibidem.
[275] Ibidem.
[276] Ibidem, at 162.
[277] Notice Pursuant to Article 19 (3) of Council Regulation 17 concerning for a negative clearance or an exemption pursuant to Article 85 (3) of the EC Treaty, Case IV/35.296-Inmarsat-P, 95/C 304/06.
[278] System and partnership agreements.
[279] Notice Pursuant to Article 19 (3) of Council Regulation 17 concerning for a negative clearance or an exemption pursuant to Article 85 (3) of the EC Treaty, Case IV/35.518-Iridium, 96/C 255/02.

Commission's inquiry but we can also question the necessity of investigating so early systems which are still in an embryonic state.

In addition, the World Telecommunication Advisory Council assessed in early 1996 that among the objectives to follow were to facilitate implementation of these new systems and also to promote competition in the provision of these services.[280] "Competition between GMPCS service providers should be encouraged. No operator capable of providing GMPCS service should be excluded from the market unless there are compelling public policy reasons, such as instances in which the spectrum available in a case is not sufficient for all systems to operate, should such situations arise."[281]

C. Does competition exist between traditional cellular and Big LEO systems ?

In a conclusion of our survey of the American and European environment, we have to assess a last question: are those S-PCS systems a threat for existing mobile communications ? According to a general trend, they have to be viewed as a complement to existing cellular and proposed PCS services. Despite the incredible proliferation in cellular and PCS systems around the world, there will still be vast geographic areas not covered by any wireless communications. "Some projections

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[280] D. Lieve, supra note 270, at 2.
[281] Ibidem, at 4.

indicate that by the year 2000, less than 25 percent of the earth's land surface will have cellular or PCS coverage. The area that is not covered will be one of the target markets for big LEOs."[282] The satellite-based system operators have realized that they cannot compete directly with terrestrial wired systems on price, one of the most market sensitive element. Therefore, they have decided to integrate their systems with cellular coverage, offering a handset phone with dual mode capability[283] (see above).

We can make a table to sum-up the differences between mobile (digital cellular) and LEO systems. They can be characterized under six dimensions:

1) **information content**: voice, data, location, message

2) **mode**: one-way, two-way

3) **coverage area**[284]: indoor, local, wide-area, quasi-nationwide

4) **mobility**[285]: low, medium, high

5) **service charges**: low, medium, high

6) **cost of the terminal**: low, medium, high

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[282] K. P. Corbley, supra note 90, at 78.

[283] See A. Guntsch and al., "Integrating GSM with new satellite systems" *Mobile Communications International* (May 1996) 62.

[284] The coverage can be divided in local, which encompasses a metropolitan area, wide-area comprises one or more metropolitan areas and nationwide designates the population of the whole country.

[285] Mobility comprises factors such as size and weight of the terminal used.

	Digital Cellular	S-PCS
information content		
• voice	X	X
• data	X	X
• location	X	X
• message	X	X
mode		
• one-way	X	X
• two-way	X	X
coverage area	wide-area	worldwide
mobility	medium	high
service charges	medium	high
cost of the terminal	low	high

From this chart, we can conclude that new S-PCS will not be able to compete with cellular systems in the European Union and in the United States (except perhaps for very remote places): They present to much similarity on the technical point of view to justify the high cost of the S-PCS service.

VI. S-PCS and Sovereignty

A. Introduction

All those LEOs systems share in common the feature of worldwide satellite frequency utilization via constellations of regulatory replaced satellites,[286] but to operate within a country, a telecommunication system must be licensed and authorized within that country, unless there would result an infringement of the state's sovereignty. We have already analyzed the licensing process in the United States and Europe above, but we still have to focus on sovereignty problems arising with the implementation of those systems.

Countries are concerned that they could have no control over those systems which could infringe their sovereignty and even bypass national carriers. Besides, we will see in what way the GATS may facilitate the deployment of those systems.

B. Sovereignty's Concerns

As the WTAC Symposium recognized it recently, the sovereign right of national decision-making applies to the regulation of GMPCS, as to other telecommunication systems and services. "In exercising that right, national policy makers and regulators should take into account the technical requirements and constraints facing GMPCS operators, and develop their regulatory policies so as to

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[286] Rothblatt, supra note 69, at 125.

foster international compatibility with respect to those policies and thus facilitate timely deployment of GMPCS and full realization of the economic benefit." [287]

To assess the potentiality of by-passing national networks, we have to make the following distinctions between the new comers:

Globalstar, as well as Odyssey and ICO will use the same architecture of networks, which will facilitate the licensing of those services: in the three projects, the idea is to sell the 'product' (the airtime) to national or regional service providers, who will responsible of the commercialization[288] of the product within their geographical area[289].

Hence, the fact that Globalstar does not use satellite cross-links and depends upon interconnect with terrestrial networks has been successfully leveraged to alleviate the concerns of governments with PTT monopoly environments who feel that Iridium could become a bypass carrier. Reuters News Agency in Beijing, China noted that a senior official at the Telecommunications Ministry said he thought that Globalstar could accommodate China's commercial interests as well as concerns over sovereignty. The advantage is that it relies mainly on terrestrial networks.[290]

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[287] D. Lieve, supra note 270, at 4.

[288] Service Providers will be responsible for marketing and retail sale of the services and terminals and will have primary contact with end users. They will also be responsible for all aspects of account management and customer care including customer credit, billing, accounting and customer credit risk.

[289] Globalstar will work with Service Providers, Odyssey with National Service Operators and ICO with National Service Wholesalers and National Service Retailers. The name might be different but the function is the same.

[290] R. Shaw, supra note 20, at 6.

However, Iridium system has created concerns in certain countries. The network architecture uses service providers, which will be able to operate in more than one country[291] and Iridium's cross-satellite link capabilities has brought out fears that they could become bypass carriers, which is somewhat worrying countries that still have government controlled carriers. For this reason, Iridium is seeking agreements with local service providers (carriers or PTOs) who will be responsible for conforming with national regulations.

For example, Iridium is facing problems with Vietnam. " According to Iridium representatives, Vietnam need only to agree to allow the system to be used in country. A service fee will be routed to Vietnam for all calls made from Vietnam on the Iridium network. Vice President Mark Gercenstein said: " We only need Vietnam to be a service provider, allowing sales and repair services to subscribers based here" . If Vietnam agrees, it will be offered the right to deal with customers in its territory, collect bills and do other services. " We will still have the system any way if Vietnam does not approve, but we will respect the national sovereignty and will not allow customers to use Iridium handsets in Vietnam," Gercenstein said." [292]

To overcome this problem, Iridium has made an interesting move to obtain more easily the licences it needs, by creating an Iridium Gobal Ownership Programme under which governments will be able to invest up to $275,000 for a small stake in the enterprise.

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[291] As a consequence, they will not necessary have the nationality of the country to operate within that country.

[292] Quoc Vinh, " Telecom leader to Join Vietnam Global satellite network" *Vietnam Investment review* (26 December 1994) 6.

According to Iridium, the intention is not principally to raise additional capital, but rather to provide an "unprecedented opportunity for each developing country to have an equity stake in a... telecommunications infrastructure that will serve its citizens nationwide even in the most areas, and also as they travel anywhere in the world." Philantropic intentions notwithstanding, some industry cynics say that the move is intended to deflect criticism from developing countries -directed at all the proposed global telecommunications systems- that they are missing out on the telecommunications revolution occurring in the First World.[293]

C. Global Telecommunications Network under the scrutiny of the WTO

With the inclusion of telecommunications in the GATS, it has opened the door to liberalization and modified drastically the national vision of the telecommunications business. "Although the above table represents only a preliminary proposal, it underscores the potentially tremendous impact of such a GATS Telecom Annex on

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[293] "Iridium Investment Initiative to Bring in Smaller Countries" *Computergram* (29 November 1995) 5.

the domestic regulatory policy of a GATT-ratifying country. It significantly diminishes the authority of the domestic regulatory agency, since it requires it to conform with the GATS Telecom Annex".[294]

The deadline of April 30, 1996 saw the breakdown of recent World Trade Organization talks on basic telecommunications services which had been focusing on the opening of telecom markets to competition and the allowance of increased foreign investment.[295] The deadline for the conclusion of an agreement is now February 15, 1997.

"The issues raised by satellite PCS will also be of importance in the context of the negotiations on the World Trade Organization (WTO) with a view to ensuring the application of the principle of effective and comparable access in all markets."[296]

The U.S. issued a proposal on 9 May which would open its satellite communications market to foreign companies under an order from the Federal Communications Commission known as DISCO II (for Domestic International Satellite Consolidation Order)[297]. If the rule is approved, foreign companies operating satellites with unexploited ground coverage touching the U.S. may be allowed to sell services, but several conditions will apply: fees for access to spectrum and mandatory reciprocity for U.S. companies to sell in the home country could be imposed. This may be problematic for operators such as ICO Global

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[294] M. Paetsch, supra note 56, at 106.
[295] "Japan, Canada, EU Blamed for WTO Shortcomings" *Telecommunications Reports* (20 May 1996) 6.
[296] Proposal for a European Action, supra note 258, at 3.
[297] Th. Foley, "U.S. regulators face global scrutiny" *CommunicationsWeek International* (20 May 1996) 1.

Communications, which is London-based but owned by dozens of countries. What is his " home" country ? Besides, of the four current operators, ICO is the only one which has not been licensed in the United States. ICO officials believe it would be unfair if it or its service providers are forced to pay for access to the U.S. market[298] (whereas its competitors are using another portion of the bandwith which was allocated free).

Presently, U.S. may agree to open their market if its WTO partners are willing to open their markets.[299] " The United States said it will waive foreign ownership limits, retained in the new Communications Act, for U.S. subsidiaries of foreign companies." [300]

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[298] Th. Foley, supra note 297, at 34.
[299] Ibidem.
[300] J. L. Schenker, "Deal flurry to close WTO talks" *CommunicationsWeek International* (22 April 1996) 34.

VII. Consequences of those global systems on other satellites organizations

There are three global satellite organizations which aim at offering global systems. They differ from the new systems as these international satellite systems are publically owned.

A. Intelsat

The International Telecommunications Satellite Organization (Intelsat) was established on 20 August 1964 when the representatives of 11 countries signed an 'Agreement Establishing Interim Arrangements for a Global Commercial Communications Satellite System'. Definitive arrangements were signed in August 1971 and entered into force in February 1973, one of the objective being:

> Desiring to continue the development of this telecommunications satellite system with the aim of achieving a single global commercial telecommunications satellite system as part of an improved global telecommunications network[301] which will provide expanded telecommunications services to all areas of the world and which will contribute to world peace and understanding.[302]

Are the new projects a threat to Intelsat objectives ?

The increasing competition INTELSAT faces primarily comes from fiber-optic cables and other satellite systems,[303] most prominently through cellular.[304]

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[301] Emphasis by the author.

[302] *Agreements Relating to the International Telecommunications Satellite Organization "Intelsat"*(1971) 10 International Legal Material 909; 23 UST 3813; TIAS 7532.

[303] Goldstein, supra note 1, at 244. He notes below: " Global fiber-optic capacity has doubled each year for the past five years. Over the next five years, it is expected to double again from its current level... Global fiber growth is concentrated in major point-to-point transoceanic routes and regional loops in Europe, Africa, and the Asia-Pacific region. Fiber is perceived by customers to provide lower prices and higher quality than satellites for major routes. INTELSAT believes,

1. Introduction

International telephony was the first service provided by Intelsat through its 'Early Bird' satellite and is still the main service (69,000 voice channels in full time used, or 72% of the total traffic; 1984).[305]

> Since the first telecommunications satellite was put in orbit, the market for international satellite telecommunications has grown at a healthy rate. In part because of this growth, several companies applied to the FCC for licenses to operate international telecommunications satellites. The FCC ultimately rejected INTELSAT's position and decided to grant licenses for separate systems, subject to notable restrictions[306].[307]

Besides, many other services were then provided, such as international television, telegraph, facsimile, digital video and data. Intelsat developed this two last decades other services which will have to face new competition:

- *Intelsat Business Service*: IBS is an integrated digital service designed to carry the full range of telecommunications services, including voice, facsimile, data applications and video teleconferencing. It permits small and medium sized antennas

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however, that the differences in cost and quality are not as great as customers perceive". And on page 245: "Despite the growth in fiber-optic capacity, however, INTELSAT still holds a large market share of telephony service because there are a number of areas in which cable is not practical. There are many routes for which cables cannot be provided economically and where they are significantly less cost-effective than satellites... Accordingly, INTELSAT believes that satellite and fiber-optic cables can play complementary roles in providing telecommunications services and will share in future market growth".

[304] Alexandra M. Field, "INTELSAT at a Crossroads" (1994) 25 Law & Policy in International Business, 1335-1366, at 1350.

[305] J. N. Pelton and J. Howkins, *Satellites International* (New York: Stockton Press, 1988) at 123.

[306] The separate systems were limited to provision of services through the sale or long-term lease of transponders and could not connect with the public switched network.

[307] C. Rourk, supra note 7, at 332-333.

to be located near end-user premises and in major cities, providing direct access and minimizing dependence on terrestrial switched networks.[308]

- *Intelnet*: The Intelnet service, started in 1984, is used for data transmission to very small earth stations or 'microterminals'. Intelnet can be used, for example, to broadcast financial news to a great number of receive-only stations.[309] It address the needs of government and private agencies to gather and distribute information to remote locations practically and inexpensively. INTELNET terminals are easely transportable and can be as small as 65 cm in diameter by using spread-spectrum digital modulation techniques.[310]

- *Vista (and Super Vista)*: It provides telecommunications services such as voice and low speed data to rural and remote communities. The service can provide both domestic and international links. The new Vista and Intelnet services can have widespread application in the developing world. The key to theses services is the introduction of small low cost earth terminals that can support thin routes requirements.[311] As of December 1994, Intelsat comprises as of December 1994, twenty-two geostationary satellites which provide international, regional, and domestic telecommunications services ranging from public switched telephony to broadcasting to dedicated business services.[312]

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[308] Ibidem.
[309] Ibidem.
[310] M. S. Snow, *The International Telecommunications Satellite Organization (INTELSAT): Economic and Institutional Challenges Facing an International Organization* (Baden-Baden: Nomos Verl.-Ges., 1987) at 126.
[311] Pelton and Howkins, supra note 305, at 123.
[312] Goldstein, supra note 1,at 246.

2. Regulatory aspects

While Article XIV only prescribes a technical coordination for the establishment of separate domestic and specialized systems, the mechanism differs for separate international systems.[313]

Article XIV (d) of the INTELSAT intergovernmental agreement states:

> To the extent that any Party or Signatory or person within the jurisdiction[314] of a Party intends individually or jointly to establish, acquire or utilize space segment facilities separate from the INTELSAT space segment facilities to meet its international public telecommunications services requirements, such Party or Signatory, prior to the establishment, acquisition or utilization of such facilities, shall furnish all relevant information to and shall consult with the Assembly of Parties, through the Board of Governors, to ensure technical compatibility of such a facilities and their operation with the use of the radio frequency spectrum and orbital space by the existing or planned INTELSAT space segment and to avoid significant economic harm to the global system of INTELSAT.[315]

Two reasons may plead in favor of an authorization by Intelsat:

- the new services are mobile telecommunications, a service which is not offered by Intelsat.

- in the past, separate systems, such as ISI, Cygnus, PanAmSat, RCA, FINANSAT, Columbia and McCaw have filled an application and have been authorized. Although INTELSAT's reaction to the applications went far beyond the filing of comments with the FCC (articles authored by attorneys affiliated with or retained by INTELSAT appeared in law journals, and Director General Santiago Astrain of

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[313] Snow, supra note 310, at 84.

[314] Emphasis by the author.

[315] *Agreements Relating to the International Telecommunications Satellite Organization "Intelsat"*(1971) 10 International Legal Material 909; 23 UST 3813; TIAS 7532.

INTELSAT testified before Congress. INTELSAT argued that the negotiators of the INTELSAT agreements never contemplated the entrance of separate systems, that such systems would cause significant economic harm to INTELSAT, and that INTELSAT should be the sole arbiter of whether the separate systems should be allowed, the FCC ultimately rejected INTELSAT's position and decided to grant licenses for separate systems, subject to notable restrictions (the separate systems were limited to provision of services through the sale or long-term lease of transponders and could not connect with the public switched network).[316]

Snow was already writing in 1987: " Despite its earlier monolithic opposition[317] to separate systems, INTELSAT now seems inclined to yield to the inevitable".[318] More and more, it seems that this procedure will disappear. " For instance, although competing international satellite systems authorized by the United States are currently restricted in the amount and type of international public switched services that may be provided over their networks, this policy has minimal practical effect. In fact, this policy is scheduled for elimination by January 1997, allowing open competition for all services" [319]. However, it is interesting to note that in the licences[320] granted by the FCC to Big LEO operators, the FCC especially ordered

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[316] C. Rourk, supra note 7, at 331.
[317] Snow notes that much of INTELSAT's monolithic opposition to separate systems may derive from the fact that the majority of its signatories are telecommunications administrations with various organizational and psychological motives for opposing change, supra note 310, at 94.
[318] Snow, supra note 310, at 91.
[319] Goldstein, supra note 1, at 245.
[320] In re Application of TRW Inc. for Authority to Construct, Launch, and Operate a Low earth Orbit Satellite System in the 1610-1626.5 MHz/2483.5-2500 MHz Band, 31 January 1995, FCC Docket 95-130; In re Application of Loral/Qualcomm, L.P. for Authority to Construct, Launch,

that consultations under Article XIV of the INTELSAT Agreement and Article 8 of the INMARSAT Convention be completed.[321]

From the wording of the FCC (consultation and not coordination) and the actual rumors surrounding the future repeal of Article XIV, we may conclude that no coordination is necessary.

3. Economic environment

To understand the possible threat of these new comers on Intelsat, we have to understand how the Intelsat systems work:

> When a customer places a phone call requiring the services of INTELSAT, the customer must deal with the organization that owns INTELSAT for the customer's country. This company is typically a PTT. The country receiving the call has a similar arrangement for routing the call from the downlink (the earth station receiving the call) to the party receiving the call. Under this system, at least three companies are involved in the completion of international call. The charge for the call is split between the two terrestrial companies, who must later pay for INTELSAT's services. The charge for the space segment of the call can be nearly 10 percent of the cost of the call between two countries with well-developed terrestrial networks. INTELSAT's services are an indirect cost to the user and a relatively fixed cost to the service provider.[322]

It is Intelsat's position as a service provider which might well be hindered. But, as was remarking it J. B. Gantt, "LEOs will not supplant the services of existing geostationary satellite communications systems, such as INTELSAT, INMARSAT,

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and Operate a low earth Orbit Satellite System in the 1610-1616 Mhz/2483-2500 Mhz Band, 31 January 1995, FCC Docket 95-128; In re Application of Motorola Satellite Communications, Inc. for Authority to Construct, Launch, and Operate a Low Earth Orbit Satellite System in the 1616-1626.5 Mhz Band, 31 January 1995, FCC Docket 95-131.

[321] Ibidem, at point 28.

[322] C. Rourk, supra note 7, at 344.

and EUTELSAT, as well as various domestic satellite systems. Instead, they will supplement the existing systems in the case of those users whose needs demand them, and who are willing to pay for the more flexible service capabilities that LEOs intend to furnish." [323]

4. Conclusion

The international telecommunications market might be to a certain extent threatened by new comers (especially special services such as IBS, Intelnet and Vista). But on a global appreciation, because of the cost of those systems, Intelsat is not threatened. But the actors in the general market of international telecommunications (i.e. national carriers) might be opposed to those new competitors.

Caplan already pointed out in 1986 that:

> The power brokers in European satellite communications know full well that [separate satellite systems will not destroy INTELSAT]. However, they also know that separate systems will, as part of their service, transmit to small earth stations owned by and located at the end user's place of business. This service will result in the bypassing of the terrestrial network which, in the past, has been used to carry signals from the large INTELSAT earth station to the end user. And thus, the PTTs who own and operate the terrestrial networks will lose on intracorporate communications. Until now, the PTTs have had little to say about this possibility, preferring to hide behind the shield of INTELSAT.[324]

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[323] J. B. Gantt, "Legal Issues Concerning Low Earth Orbit Communicating Satellites: Opening Remarks of the Panel Moderator" Proceedings of the Thirty-Sixth Colloquium on the Law of Outer Space, October 16-22, 1993, International Institute of Space Law of the International Astronautical Federation, 445.

[324] L. A. Caplan, "The Case for and Against Private International Communications Satellite Systems" (1986) 26 (2) *Jurimetrics J.*, at 197.

Snow concluded by saying that the advent of separate systems has been rendered inevitable because of the restructuring of economic incentives and signals that the new technology has entailed.[325]

In conclusion, we can predict that INTELSAT will not be a factor of opposition. Even if it takes a position against those new systems (as it did in the early 1980s), the outcome will be the same[326]. Indeed, Vice President Gore launched in December 1993 the National Information Infrastructure. This program is defending as much as deregulation as possible (while still maintaining the safeguards necessary to avoid monopolistic takeovers and to support an expanded view of universal service) and is based on five policies, including: encouragement of private investment, promotion and protection of competition and universal service[327]. In this context, we would not see how INTELSAT could defend a position against the entry of those new comers. Besides, member country governments have agreed to phase out consultations completely in 1996 or 1998.[328]

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[325] Snow, supra note 310, at 102.

[326] The United States released in 1985 the White Paper in which they pleaded that separate satellite systems were in the public interest, thus pressuring INTELSAT to authorize the competitors (see Field, supra note...., at 1350).

[327] Vice President Albert Gore, Remarks at the National Press Club, (Dec. 21, 1993), transcript available on the Internet at Gopher.tamu.edu.

[328] Field, supra note 304, at 1361.

B. Intersputnik

Intersuptnik is the international satellite communications system set up by the socialist and communist countries which did not want to join Intelsat initially because the influence of the United States would be too strong.

The system operates a full range of communications services: voice, vision, data, etc and uses satellites located in the geostationary orbit.[329]

Since the end of the communist era, the power of the Organization has been undermined and will not be able to compete with the new systems.

C. Inmarsat

It was funded by its member countries to provide satellite communications facilities for the world's shipping and offshore industries and came into existence in 1982. Inmarsat, like Intelsat, is commercially-oriented, earning revenues from the sale of its services.

On the regulatory aspects, we have to mention that Article 8 of Inmarsat Convention organizes, as Intelsat Convention, a coordination procedure for separate satellite systems. The remarks we have made for Intelsat are therefore worth applying to Inmarsat coordination procedure.

To face the growing competition in the communication sector, it has decided to extend its services into the field of mobile satellite telecommunications, in particular

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[329] J. N. Pelton and J. Howkins, supra note 305, at 128.

aeronautical mobile satellite services.[330] Inmarsat is currently leading the market, but its lead is threatened by new entrants and the potential LEO systems.[331]

Inmarsat, which charges almost $ 8 a minute for its global " phone in a suitcase" service that is operational now, had to react if it did not want to be left out of the game. Hence, it preferred to attack its potential competitors on their field by creating ICO (see above).

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[330] Ibidem, 130.
[331] Field, supra note 304, at 1350

VIII. Conclusion

At the end of this survey on the licensing aspects of S-PCS, we realize that global telecommunications, although technically possible, will not be achieved as long as each country in the world refuses to participate in it. Each national administration will maintain the right to determine whether, and in what form, S-PCS will be provided in its territory. The biggest trouble for those systems will be to obtain the licenses. The use of National Service Provider, although responsible for obtaining the national licenses, will not totally solve the problem. Only the prospect of economic benefits for the licensing countries might positively influence reluctant countries; actually, countries could take advantage of these new systems by different means: licence fees, fees charged by Accounting Authorities or billing organizations, revenues from traffic originating from that country to a S-PCS terminal (fixed-to-mobile direction).

In conclusion, although licensing will be sometimes troublesome, it as a challenge that those new operators should be able to overcome.

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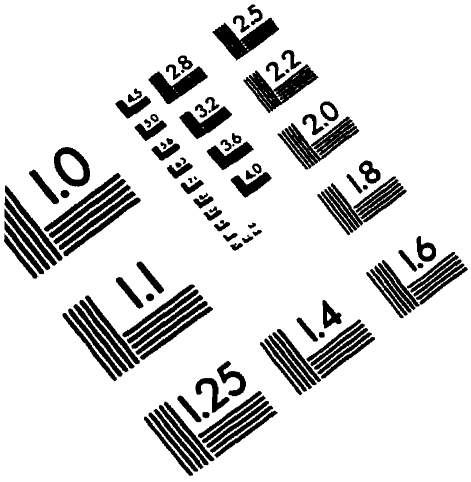
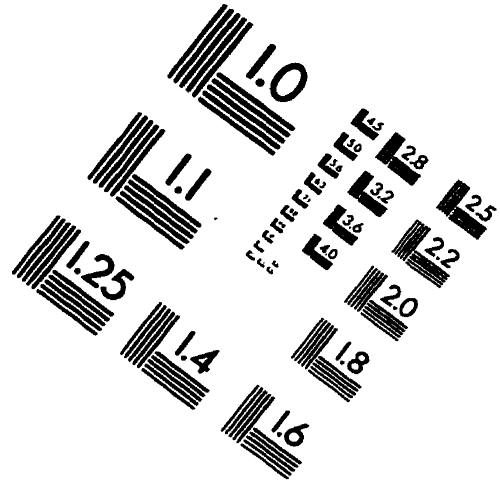
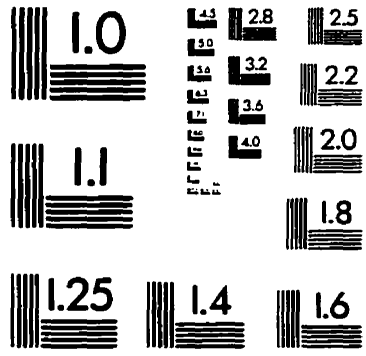
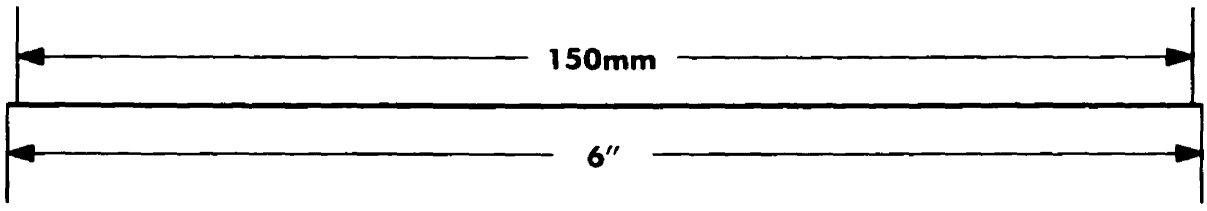
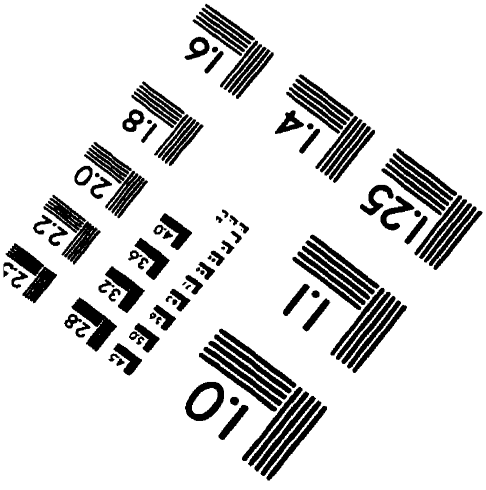
IMAGE EVALUATION
TEST TARGET (QA-3)

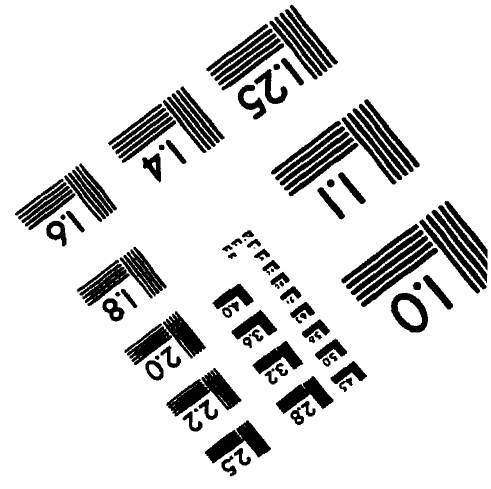












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