Emmanuel Gouesse
Institute of Air and Space Law
McGill University, Montreal

August 2000

Responsibility in International Law for Commercial Space Activities

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfilment of the requirements of the degree of LL.M.

TABLE OF CONTENTS

Abstract

Space activities are increasingly undertaken by private companies. Space law, however, was mainly developed in the beginning of the space age, at a time where space activities were predominantly state activities. The rules that developed were thus focusing on the duties of states and concerned private entities only through the intermediary of states.

This thesis explores the applicable principles of space law and of the international law of responsibility. Taking into account the recent practice of private companies engaged in space business, the work also focuses both on its impact on the responsibility and liability regime as well as on the legal efficiency of the links between private entities and states.

In conclusion, the thesis makes several recommendations to improve the responsibility regime for space activities.

Résumé

Si la conquête de l'espace a été menée par les états, sa commercialisation est aujourd'hui entreprise par des intérêts privés. Le droit de l'espace, cependant, a été notablement développé à une époque où les États occupaient une place prépondérante. A cet égard, l'ensemble des règles du droit international spatial ne concerne manifestement que les états et ne vise les entreprises privées que par leur intermédiaire.

Après avoir déterminé les règles pertinentes du droit de l'espace et du droit international de la responsabilité, cette thèse vise, au vu des pratiques des compagnies privées impliquées dans les activités spatiales, à étudier la portée réelle du régime particulier de responsabilité pour les activités commercilaes, notamment privées, ainsi que l'efficacité juridique des liens entre les entreprises privées et les états. Enfin, face a la crainte de l'apparition de "paradis spatiaux" quelques propositions pour améliorer le régime de responsabilité sont avancées.

ACKNOWLEDGEMENTS

This thesis was written thanks to the support and wisdom of Professor Michael Milde, whose help aided me in completing it.

I also owe thanks to Professor Ivan Vlasic: his comments enhanced the basis on which was founded this work.

Many of the qualities of this thesis come from their advice.

I also have to thank the Paris Office of White & Case, whose scholarship (1997 "*Bourse d'études des juristes d'affaires*") gave me the chance to study at the Institute of Air and Space Law.

Last, but not least, among friends who supported me during the completion of the thesis, I am most grateful to John Harris and Ian Brown who kindly read the drafts of this thesis and counseled me on its writing.

"Man's venture into space should increase his sense of responsibility"[1]

Introduction

Space activities are nowadays subject both to commercialisation, *i.e.* the profit-making transfer of goods and services, and to privatisation, *i.e.*, transition of government's owned activities to purely private initiative.[2] Space law[3], however, was developed in a context where private undertakings in outer space were a rarity, compared to the massive involvement of states in this area. Hence, all the existing legal principles and rules, including the determination of responsibility, are directed at states and affect corporate entities only indirectly.

It is thus useful to explore the scope of the law of responsibility as it applies to commercial space activities, whether carried out by states, by international organisations or by private companies.

---

[1] M. Lachs, "The Treaty on Principles of the Law of Outer Space, 1961-1962" (1992/1993) 39 Netherlands International Law Review 301, quoted in J. M. Filho, "On Private, States and International Public Interests in Space Law" (1991) Proceedings of the 38th Colloquium on the Law of Outer Space 238.

[2] See K. Tatsuzawa, "The Regulation of Commercial Space Activities by the Non-Governmental Entities in Space Law" (1988) Proceedings of the 31st Colloquium on the Law of Outer Space 341.

[3] Space law is mainly constituted of five international treaties: the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other celestial Bodies*, 610 UNTS 205 (opened for signature at Moscow, London and Washington on January 27, 1967) [hereinafter the Outer Space Treaty]; the *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*, 672 UNTS 119, (opened for signature at Washington, London and Moscow on April 22, 1968) [hereinafter the Rescue Agreement]; the *Convention on the International Liability for damage Caused by Space Objects*, 961 UNTS 187 (opened for signature at London, Moscow and Washington on March 29, 1972) [hereinafter the Liability Convention]; the *Convention on Registration of Objects Launched into Outer Space*, 1023 UNTS 15, (adopted by the General Assembly of the United Nations, at New York, on 12 November 1974) [hereinafter the Registration Convention]; and the *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, UN DOC. A/RES/34/68 of December 5, 1979 [hereinafter the Moon Agreement].

This thesis will first focus on the evolution of space activities today with emphasis on the importance of commercialisation and privatisation (Chapter 1). Next it will identify the relevant principles of international law applicable to commercial space activities (Chapter 2), and it will examine the existing rules concerning the international law of responsibility, taking into account the specificity of commercial space activities by states and international organisations (Chapter 3). The following chapters deal with the situations where private space undertakings lead to international responsibility of a state for a damage done by a space object (Chapter 4) or by the space activity (Chapter 5). Last, the thesis will study the determination of the link between a private space company and a particular state (Chapter 6).

Chapter I: A Portrait of Outer Space Activities.

Since the launching of Sputnik, more than forty years ago, space activities have dramatically changed. Once the practical importance of outer space is explained, this chapter will identify the relevant current commercial space activities.

Section 1: The commercial conquest of outer space.

The commercial exploitation of outer space is the major result of its conquest.

§1: The Domain of Outer Space.

Space activities, as indicated by their name, occur in outer space. From an astrophysical standpoint, outer space could be described as an immense area surrounding the Earth, a large and cold "vacuum". However, to this day, there is no an authoritative legal definition of what outer space is and where it begins. The general view, nevertheless, is that outer space begins around 100-110 kilometers above sea level (the lowest possible perigee for an orbiting satellite). This proposal was made by the U.S.S.R.[4] in the United Nations Committee on the Peaceful Uses of Outer Space (C.O.P.U.O.S.) [5], and is also recommended by the International Law Association.[6] This question, however, is still considered as unsolved and very sensitive. [7]

---

[4] See for example United Nations General Assembly, *Report of the Legal Sub-Committee of the C.O.P.U.O.S. on its 26th Session* (UN Doc. A/AC.105/385, April 16, 1987) at 43.

[5] The C.O.P.U.O.S. is a subsidiary organ of the United Nations General Assembly. It is composed of two sub-committees, one technical and one legal. It is mainly through this body that the texts of space law are created. Today, 61 states are represented in C.O.P.U.O.S.

Satellites orbiting the Earth, are uniformly regarded as operating in outer space and above the sovereign territory of states. [8]

One can distinguish four general types of orbits. Currently, the most important is the Geostationary Orbit[9] (GSO) at approximately 35,700 kilometers above the Earth. A satellite in this orbit accomplishes a revolution at the same speed as the Earth, and thus does not move from a reference point situated on our planet. The advantage of these satellites is that only three of them are necessary to cover the entire globe. Used by telecommunications satellites since their advent, the orbit's usefulness is limited because it can accommodate only a limited number of satellites. Useless satellites and

---

[6] This view was expressed through a resolution adopted at its 58th Conference held in September 1978 (See International Law Association, *Report of the Fifty-Eight Conference Held at Manila*, (Cambrian News, 1980) at 2-3).

[7] The C.O.P.U.O.S. circulated a questionnaire on possible legal issues with regard to aerospace objects which indirectly raised again the issue of delimitation between airspace and outer space. In answer to it, the view was expressed by some delegations that this questionnaire could "revive the unproductive debate on the direct and topographical or indirect and functional approach to the definition and delimitation of outer space; and that such an examination of legal issues with regard to aerospace objects inevitably questioned the foundation of the law of outer space". Another view expressed that "there was no practical or legal need to pursue the debate on a delimitation of outer space and that the questionnaire was (...) unnecessary, premature and would raise further contentious issues and was unlikely to bring about any consensus results" (United Nations General Assembly, *Reports of the Legal Subcommittee of C.O.P.U.O.S. on its 35th session* (UN Doc. A/AC.105/639, April 11, 1996) at § 12 – 13.

On the (non) utility of such a precise definition, see L. Peyrefitte, *Droit de l'espace* (Dalloz, 1993) at 78-79. No problem due to this lack of definition between airspace and outer space has been raised yet: rockets are launched vertically and thus fly across the airspace of the state where the launching took place. As far as the American shuttle is concerned, it is also launched as a rocket, and for its landing over-flies the high seas and the United States. Problems might arise with spaceplane and the issue of innocent passage through the airspace of a neighboring state to reach outer space.

On this issue of a lack of definition, see also P.M. Martin, "Les définitions absentes du droit de l'espace" (1992) 182.2 RFDAS 111.

[8] According to Professor Gorove, "international customary law over the years appears to have firmly established the general accepted rule that earth orbiting satellites move in outer space and leaves no doubt that this area and the area beyond it is outer space" (S.Gorove, "Major Definitional Issues in the Space Agreements" (1992) Proceedings of the 35th Colloquium on The Law of Outer Space 76). See also in that sense, B. Cheng, " 'Space Objects', 'Astronauts' and related expressions" (1991) Proceedings of the 34th Colloquium on the Law of Outer Space 17, at 19-20.

[9] The exact name is the geostationary satellite orbit (I.T.U. Radio Regulations 1979 as amended in 1983 and 1985, article 8.14).

"The world market for commercial geostationary communications satellites between 1996 and 2006 is estimated at some 262 to 313 satellites, with a total value of between US$ 23.8 billion and US$ 28.7 billion" (Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space [hereinafter UNISPACE III], "Commercial Aspects of Space Exploration, including spin-off benefits", (UN Doc. A/CONF.184/BP/7, May 27, 1998) at 9).

man-made debris occupy an important part of this orbit, which renders increasingly difficult the access for new users. Problems of congestion are already known.[10]

The Low Earth Orbit (LEO) is one of the most interesting orbits for new communication satellite projects. Plans exist to place hundreds of satellites in this orbit. Its main advantage being that it decreases the time of access between a point on Earth and the satellite, compared to a geostationary satellite.[11]

The Middle Earth Orbit is a kind of compromise between the LEO and GSO, increasing the time of access to satellites and the number required to have a fair coverage of Earth.

Last, the Near-Earth Orbit is mainly used for remote sensing activities, including military reconnaissance. For these satellites uses the need for precision of the data is greater. Nowadays, it is technically feasible to have a satellite orbiting at 160 kilometers: with an aperture of the sensors of 3 meters, the underlying areas are observed as from a distance of 50 meters, with a resolution precise enough to study objects measuring 5 centimeters. [12]

Virtually all space activities heavily depend on the radio frequency spectrum. It is through that medium that communication to, from and through satellites is made possible. The radio spectrum, however, is a limited natural resource[13], due to the

---

[10] For example, over the Pacific Ocean (see M.W. Zacher, *Governing Global Networks* (Cambridge University Press, 1996) at 134).

[11] The delay necessary to get access to a satellite is of half a second for a geostationnary one, and only of 10 to 20 milliseconds for a LEO satellite, *i.e.* five times quicker (see " La guerre des réseaux de satellites a commencé", http://www.latribune.fr/archives/indexarc.html [hereinafter *La Tribune*] (25 November 1998).

[12] See A. Ducrocq, "La télédétection en ébullition", *Air et Cosmos* (March 28, 1997) 38. Commercial satellites do not have such a resolution yet. However, military satellites, like the American "Key Hole", for example, try to achieve this precision. It estimated that they have a resolution between 10 and 20 centimetres (see J-F. Augereau, "Spot Image s'associe à l'américain Orbimage pour la commercialisation de photos par satellite", *Le Monde*, (September 23, 1999) at 23).

[13] See article 33 of the I.T.U. Convention of Malaga (1973) and the United Nations General Assembly Resolution 38/80 of December 15, 1983 entitled: "International Co-operation in the Peaceful Uses of Outer Space".

physical characteristics of radio-waves. Moreover, only certain frequencies are appropriate for satellite communication. The most suitable band is now between 1 and 15 Ghz.[14] These characteristics of the radio spectrum (notably the fear of congestion and radio-interference) are the reason why the International Telecommunication Union (I.T.U.) has a particular role in arranging for the most effective share of that resource.

§2: Evolution of Space Activities.

Major commercialisation and privatisation of space activities may be considered as being relatively new phenomenon after forty years of space exploration and use, although this development had been expected since the very commencement of space ventures.[15]

The beginning of space use was primarily due to a desire of the first space powers (namely the U.S.S.R. and the U.S.A.) both to enhance their prestige, and more importantly, to achieve military supremacy.[16] As a matter of fact, the launch of Sputnik on October 4, 1957, during the International Geophysical Year, had a profound impact on the United States because it understood it as much more than merely a scientific exploit. It was the proof that the U.S.S.R. could produce long-range missiles, directly threatening American territory.[17] This dual aspect of outer space was responsible for the states to have the lion's share of space activities. It was only with

[14] See M.L. Smith, *International Regulation of Satellite Communication* (Nijhoff, 1990) at 6-7.
[15] See for example, M.S. McDougal, H.D. Laswell, and I.A. Vlasic, *Law and Public Order in Space* (Yale University Press, 1963) at 9.
[16] See J.M. Filho, *supra* note 1, at 242.
[17] *Ibid.*

the end of the Cold War and the subsequent decrease of military space budgets that the involvement of private actors on the space stage has become more obvious.

The space activities now involved not only national space agencies but also private domestic satellite ventures and even privately owned global systems. Some writers argue that the private model has better chance to succeed in space ventures, or at least with a better efficiency than public endeavor. "Innovation, cost-efficiency, more effective management and control, and clear-cut mission statements and goals" are quoted as reasons for the private sector to surpass the public sector,[18] because government systems are likely to be less efficient, requiring subsidies, suffering from corruption and patronage.[19]

However, the choice and the link between private and public interests is not that clear. Going from states' to private companies' involvement in space is the result of evolution. Of course, states programs, such as the International Space Station, and private undertakings, such as the mobile satellite constellations, coexist in outer space. But, most of the time, the evolution from state to private efforts was possible thanks to the involvement of governments. Even the critics of the management of public space systems consider that the public sector still has a role to play in the area of research and development.[20] The infusion of public funds in private space companies often permitted their development. Indeed, successful companies (such as Arianespace) are the result of governments programs.

Today, a growing number of commercial entities are involved in space activities. They act, or intend to act, in various fields, from the most orthodox to the less conventional ones. Next to the such private actors as the Arianespace, Martin Marietta and

---

[18] *Ibid.* at 244.

[19] See J.F. Galloway, "Privatizing An International Cooperative? The Case of INTELSAT" (1996) Proceedings of the 39th Colloquium on the Law of Outer Space 144, at 145.

Motorola companies, one can now find several newcomers, looking for very specific niches in the space market. For example, at least two American enterprises plan to engage in space tourism[21]; another one - more down to earth - pretends to give people on Earth the possibility to visit the Moon via a video transmitted by robots sent to this celestial body.[22] The exploration of space resources is also on the agenda: an American enterprise plans to launch an unmanned spacecraft to an asteroid residing between the Moon and Mars, with the intention of selling scientific data thus discovered.[23]

It should be emphasized that all but one of the international conventions on space activities were drafted and adopted during the first twenty years of space age, at a time where space activities were largely limited to states activities. As a consequence, the space law that emerged, including the one governing responsibility, was very much state-centered.[24]

---

[20] See for example J.N. Pelton "Organizing large space activities. Why the private sector model usually wins" (1992) 8.3 Space Policy 233, at 239.

[21] Spacevoyages, an American company, has scheduled its first space flight for six voyagers for Saturday, December 1, 2001. The price of the ticket is $98,000 per person. It's interesting to notice that the company defines space flight as being 100 km above sea level (see http://www.spacevoyages.com/brochures.html (date accessed: July 6, 1998)).

The other company, Space Aventures, from Fairfax (Virginia), claims it will provide sub-orbital travels as soon as the technology exist for a price which should be between $50,000 to 100,000 (see http://www.spaceaventures.com (date accessed: July 6, 1998)).

See also, V. Maurus, "Voyage en utopie. Le tour de la Terre en 80 minutes", *Le Monde Sélection hebdomadaire* (August 15, 1998) 6, and P.Loubière, "Tourisme spatial. Embarquement immédiat", *Sciences et Avenir* (April 1998) 78-81.

[22] See "Welcome to LunaCorp", http://www.lunacorp.com (date accessed: July 6, 1998).

[23] This company, SpaceDev, Inc., is situated in California (see "SpaceDev", http://www.spacedev.com (Date accessed: July 6, 1998)).

Another amazing use of space by a private actor has already started: an American entity sells space funerals. The price, to launch a portion of cremated, vary from US$ 5, 300 to US$ 12,500, depending whether the 'client' wants to be launched into Earth orbit or beyond the solar system. Already three flights were undertaken. (see "A Celestial Journey to Space for Departed Loved Ones...", http://www.celestis.com (date accessed: August 24, 2000)).

[24] See F. G. von der Dunk, "The Spider in the Web and the Rainproof Umbrella" (1991) 16 CIDA-E 27.

§3: Commercial Space Activities and International Cooperation.

Outer space is *par excellence* a field for international cooperation. Its profitable use requires a combination of high technologies and huge investments, providing a good incentive for several partners to work together for the accomplishments of desired results. The International Space Station can be considered as good illustration of this necessity, where the United States, Canada, Japan and several member states of the European Space Agency have joined forces in a common undertaking.

The same need for cooperation exists for commercial space activities. In particular, the need for global telecommunications has led to the establishment of several international organisations (*e.g.* INTELSAT[25], IMARSAT[26] and EUTELSAT [27]) to develop, operate and manage telecommunications space systems.

These organisations are managed on a commercial basis[28] and allow private companies of their member states to have direct access to the organisation. They all possess international legal personality.[29]

---

[25] INTELSAT was created in 1964, when the Agreement establishing the Interim Arrangement for a Global Commercial Satellite System and Special Agreement was opened for signature; its statute was reviewed in the Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT) and in an Operating Agreement Relating to the International Telecommunications Satellite Organization (opened for signature on August 20, 1971, which came into force on February 12, 1973). On the main characteristics of this organisation, see A.A. Cocca "The Legal Aspects Relating to the Civilian Applications of Space Technology", in N. Jasentuliyana, ed., *Perspectives on International Law* (Kluwer, 1995) at 415-418.

[26] In 1976 IMARSAT was created on the model of INTELSAT, through a convention and an operating instrument (the Convention on the International Maritime Satellite Organisation (INMARSAT) and the Operating Agreement on the International Maritime Satellite Organization), which entered into force on July 1, 1979. The name was changed in 1994 to "International Mobile Satellite Organization" (*Ibid.* at 418-422).

[27] EUTELSAT was created in 1977 but adopted its definitive form only in 1985 with the coming into force of the Convention Establishing the European Telecommunications Satellite Organization (EUTELSAT). Once again, the model adopted is designed on the INTELSAT model (*Ibid.* at 423-424).

[28] See Article III of the Agreement Relating to the International Telecommunication Satellite Organization "INTELSAT"; article 5 (3) of the Convention on the International Maritime Satellite Organization (INMARSAT); and article V (b) of the Convention Establishing the European Telecommunications Satellite Organization "EUTELSAT".

[29] See L. Peyrefitte, *supra* note 7, at 136.

The original aim of those organisations, however, was to obtain a monopoly over the telecommunications business, and thus reduce the possibility of private competition.[30] However, nowadays, they have to face the presence of private companies in their sector. State investment in international space organisations is also ruled by principles of privatisation of space activities. Hence, participating states demand that these organisations be ruled on commercial basis.[31] However, the issue of private competitors presents difficulties in the policy making of those organisations, for they have to fulfil a duty of public international service. Their main challenge now becomes to show some profit along while fulfilling their international obligations, an obligation that their private opponents do not have. Furthermore, private operators focus their services on the most profitable markets, thereby getting another competitive advantage over international organisations.[32] At the same time, international organisations, despite their international nature, also must respect national competition laws.[33]

The reaction of these international organisations to the emergence of private telecommunication companies follows was ingenuous. INMARSAT, for example, created a subsidy called ICO, a private company incorporated under the law of the

---

[30] See for example article XIV (d) of the INTELSAT Agreement. On this specific article, see H.L. van Traa-Engelman, "Commercial Utilization of Outer Space. Legal Aspects" (1989) Proceedings of the 32nd Colloquium on the Law of Outer Space 417, at 419-420.

[31] See also for example the principle of 'fair-return' of the European Space Agency. It aims at giving to the states and their national companies a percentage of the contracts issued for a specific space program as close as possible to their share of the investment. On this issue, see P.Usunier, "Les consortiums de satellites européens", in P.Vellas, ed., *La coopération entre industries aéronautiques et spatiales*, (Pédone, 1995) at 75-88, and K. Madders, *A New Force at a New Frontier* (Cambridge University Press, 1997) at 384-388.

[32] See M-C. Prémont, "L'entreprise privée sur la scène des télécommunications internationales par satellite" (1986) XI A.A.S.L. 259, at 274-275.

[33] See G. Venturini "Private Actors and Space Law: the Influence of Competition on Satellite Communications" in G. Lafferanderie and D. Crowther, eds, *Outlook on Space Law over the Next 30 Years*, (Kluwer, 1997), at 57.

United Kingdom. [34] This international organisation eventually gave up its international status to become a private company itself. [35] EUTELSAT may also be replaced by a private company. [36]

On the other hand, international organisations enjoy tax and jurisdictional immunities. Whereas their private competitors must pay taxes, may be sued before domestic courts and have to rely on their respective governments to represent their interests at the international level. The fact that an international organisation is willing to give up its advantageous status may seem surprising. It is, however, evidence of the importance attributed to private involvement and competition in space. Several reasons can be given to explain this seeming of contradiction. One of them is the pressure on those international organisations not to corrupt the competition in the telecommunications business.[37] Another one is that they need to finance their projects: their immunity of jurisdiction and execution, due to their international personality, renders bankers reluctant to lend them any money if they do not have the possibility to defend their interests in court.

---

[34] This creation was possible thanks to the doctrine of implied powers (*Ibid.* at 57)

[35] INMARSAT became a private entity on April 15, 1999. It is the first international governmental organisation to become a private company (see (April 15, 1999) http : www inmarsat org/pesroom/index html (Date accessed: August 25, 2000). It eventually changed its name to Inmarsat Venture Ltd. (see (July 17, 2000) http://www inmarsat org/pesroom/index html (Date accessed: August 25, 2000)).

[36] EUTELSAT should be formed of a private company (French *Société Anonyme*), in charge of all the assets of the international organisation, and of a smaller organisation in charge of the regulatory aspects, by mid-2001. (see "Les pays membres d'Eutelsat approuvent un plan de restructuration" *La Tribune* (May 19, 1998) and www eutelsat org/about/about_eutelsat/rub_part1 htm (Date accessed: August 25, 2000)).

[37] For example. EUTELSAT received some remarks from the European Union. EUTELSAT is considered by the European Commission as a telecommunications operator and thus is subject to any relevant rule of EC law (see G. Venturini, *supra* note 33, at 57).

Section 2: The Space Market: Evolution and Prospects.

The global space market, with a turn-over of 85 billions of dollars in 1997, employs 800 000 people.[38] The space uses that may be considered as being commercial are of three different types. They are telecommunications services, which had a tremendous growth in the 1970's, launching activities which mainly developed during the 1980's, and remote sensing which, with the emergence of several private companies, may be the major development of the 1990's.[39]

§1: Telecommunications.

The earliest market for space activities developed in the field of telecommunications. The first commercial satellite launched was for telecommunications and the first non-governmental companies were created for this purpose, too.[40]

To this day, telecommunications continue to be predominant among civilian space activities: Arianespace expects that 80 percent of satellites weighing more than one

---

[38] Including for terrestrial infrastructures. See "Une révolution pour les télécommunications" *La Tribune* (March 24, 1999) and "Un marché de 200 milliards de francs par an", *Historia* (May 2000) at 62.

[39] See P. Meredith, "Licensing of Private Space Activities in the United States" (1997) XXII-I AASL 413, at 414.
This thesis will restrain its study to the application of rules to those three specific areas. Other commercial activities are still too seldom or rather still too utopian to permit any relevant study. This is the case for manufacturing in space or space travel. Other activities directly linked to the conquest of outer space does not enter in the scope of this thesis either: *e.g.* for the manufacture of satellites, which are not properly speaking a space activity (so far, it happens only on Earth) and are governed by national laws and contractual relationships. This selection is also the one adopted by M. Couston (see M. Couston, *L'Europe puissance Spatiale* (Bruylant, 1991), at 34-38); she also includes the development of new materials (in micro-gravity for example) but recognizes that it is still an infant industry.

[40] Early Bird, the first commercial satellite was launched on April 6, 1965 for COMSAT, for telecommunication. The United States' government furnished the rocket: already, at that time, its policy was to encourage private participation (see I.H.Ph. Diederiks-Verschoor and W.P. Gormley, "The Future Legal Status Of NonGovernmental Entities In Outer Space: Private Individuals And Companies As Subjects And Beneficiaries Of International Space Law" (1977) 5.2 Journal of Space Law 125, at 133-134).

tone to be launched between 1997 and 2005 will be for telecommunications.[41] The LEO satellites to be launched (mainly for telecommunication purposes) will represent a market of ten billions dollars; telecommunication satellite revenues should rise to US$ 29 billion by the year 2000.[42]

The creation of COMSAT in the United States is a good illustration of the governmental approach to the commercialisation of space activities. Created under the Communications Satellite Act of August 31, 1962, COMSAT was an enterprise designed to provide domestic US communications by satellite and also at the same time to represent on the international level the American government in INTELSAT and INMARSAT. [43] It was thus intended to be a commercial venture but with some public purposes, such as the provision of services to developing countries, not justified from a purely market-oriented perspective. [44] By decision of the Government, the Congress and the Federal Communications Commission (F.C.C.), the two tier monopoly of COMSAT and INTELSAT was terminated in 1984, [45] international communications were opened to competitors distinct from INTELSAT. [46]

Today, thanks to the progress of miniaturisation, the future growth of space telecommunications will be largely based on the LEO satellites; it is estimated, for example, that the 66 satellites of the Iridium constellation have a computing capacity

---

[41] See C. Lardier, "210 à 250 satellites commerciaux à lancer" *Air et Cosmos* (February 14, 1997) 41.
[42] See S. Rouat, "Un charter pour les étoiles", *Sciences et Avenir* (April 1998) 82 and UNISPACE III, *supra* note 9, at 9.
[43] Comsat was also the manager of the INTELSAT's system.
[44] See J. F. Galloway, *supra* note 19, at 144.
[45] See R. Bender, *Launching and Operating Satellites. Legal Issues* (Nijhoff, 1998) at 122.
[46] See M.G. Bourély, "Quelques réflexions sur la commercialisation des activités spatiales" (1986) XI A.A.S.L. 171, at 179.

that exceeds that of all the geostationary satellites launched before.[47] Massive investments are being made to build satellites constellations able to bring mobile telecommunications all over the world.

The Iridium system was operational in 1998. [48] Thanks to its 66 satellites it was possible to communicate with a mobile phone with any location in the world. Competing projects were supposed to start soon. The most impressive is Teledesic. Its constellation is expected to consist of 288 satellites. Teledesic should be operational in 2004. [49]

The cost of those projects is very impressive. For example, Iridium is worth 7.5 billion of dollars[50], Teledesic is estimated at 9 billion[51], and Celestri (a system of 63 LEO satellites plus 6 in geostationary orbit, also designed for multimedia applications) is evaluated at 14 billion of dollars.[52]

Two problems threaten all these projects: the uncertain financing[53] and the still unsolved definition of their market.[54] Iridium, the first in this field, encountered difficulties in finding subscribers,[55] and eventually went bankrupt.[56]

---

[47] See M. Rothblatt, "Lex Americana: The New International Legal Regime for Low Earth Orbit Satellite Communication System" (1995) 23.2 Journal of Space Law 123, at 124.

[48] See "Satellite Service on Call", *The [Montreal] Gazette* (3 November 1998) D1.

[49] It was scheduled to be operational in 2003. See "Fast Facts" (September 22, 1998) http://www.teledesic.com/overview/fastfact.html (Date accessed: 3 November 1998) and http://www.telesedic.com/about/about.htm (Date accessed: August 25, 2000).

[50] See "Satellite Service on Call", *The [Montreal] Gazette* (3 November 1998) D1.

[51] See "Fast Facts" (September 22, 1998) http://www.teledesic.com/overview/fastfact.html (Date accessed: 3 November 1998).

[52] See C. Lardier, *supra* note 41.

[53] See W.B. Scott, "Multimedia Satcom Competition Intensifies", *Aviation Week and Space Technology* (April 6, 1998) 72.

[54] The companies justify their projects by the fact that telecommunication infrastructure cover only ten percent of Earth (but sixty percent of the global population). Hence, they estimate their market to be around 22 millions users in 2005. ICO, subsidiary of INMARSAT, estimated it could get 4.2 millions of subscribers in 2002. The price of communication should have been in average of 1.96 dollar per minute for an expected average use of 23 minutes per month per user (see T. Gadault, "Les communications par satellites prennent du retard", *La Tribune* (September 11, 1998)).

[55] After one month, Iridium had only 3 000 clients, whereas the company expected to get 100 000 subscribers, and required 500 000 clients to save its economical balance (see "Les difficultés d'Iridium causent le départ de son directeur général", *La Tribune* (April 26, 1999)).

As a consequence of those financing difficulties, the main projects could merge to survive.[57]

§2: Remote Sensing.

Remote sensing is the observation of Earth from a distance. It can be done both from aircraft and satellite. The former requires the authorisation of the subjacent state[58], the latter operates from space, thus avoiding the issue of the territorial sovereignty. [59]

The process of remote sensing may be divided into two different phases: the first one is the sensing itself of the territory. It happens in outer space thanks to a satellite. The second phase occurs on Earth; it consists in the storage, treatment and analysing of the information, once the data collected has been transmitted to a ground station.

The possible uses of remote sensing are various. It can be used for geological purposes, in order to study large areas of territory otherwise difficult to access by traditional means. It can also be used for discovery of valuable resources of a country, or for agricultural surveys.[60] Remote sensing from space is particularly useful in

---

[56] See "Faillite définitive pour le téléphone satellitaire Iridium" *Le Monde* (March 19-20, 2000) at 30.

[57] See Th.G. "Craig McCaw pourrait fusionner les constellations ICO et Teledesic", *La Tribune* (March 18, 2000).

[58] This is a direct consequence of article 1 of the 1944 Chicago Convention on International Civil Aviation (ICAO Doc. 7300/6 (1980)).

[59] As this thesis deals with commercial space activities, remote sensing designates in this work only remote sensing from outer space.

[60] For example, a farmer in Oregon (United States), uses an image per week to follow the evolution of his harvest and the ones of his neighbors, in order to be able to control irrigation, prevent any disease but also to speculate (see P.Clergeot and M.Pousse, "Les images satellites, pour le meilleur et pour le pire", in E.Morlin, ed, *Penser la Terre. Stratèges et citoyens: le réveil des géographes*" (Autrement - série Mutations, n° 152, January 1995) at 149).

cartography. [61] It can be used for civilian purposes, but is also a very efficient tool of the military. [62]

The resolution (the size of the smallest object that can be detected on the data) of civil systems can vary for example from 30 meters, for the American Landsat satellites, to 10 meters, for the French Spot satellites, to less than one-meter resolution offered by some Russian and American companies.

Remote sensing systems revenues should exceed one billion dollars by the year 2000. It is estimated that its market should grow by a factor of three to five, within the next few years, depending on the development of new market segments.[63]

One relatively new company, Space Imaging, intends to launch a satellite with a ground resolution of two meters.[64] At this time, it already markets the data of the Indian satellites "IRS" that have a five meters resolution.

Another company, Earthwatch, launched in December 1997 a satellite EarlyBird 1, expected to provide a resolution of three meters. However, the satellite was lost. The launch of another satellite, Quickbird equipped with sensors giving a sub-meter resolution, was planned for 1999 and re-scheduled for the third quarter of 2000.[65]

---

[61] The McDonalds Company is said to use such maps in North America to find out the best locations for its new restaurants: free spots and main roads are easily identified (*Ibid.* at 157).

[62] For example, the European Union regularly buys some remote sensing data to try to locate any agricultural plot used in a way contrary to the common agricultural policy (*Ibid.* at 155). In the mean time, Remote sensing data can be used to program the targets of missiles, or to avoid attack by surprise from a foe. For a list of possible military uses of remote sensing, see http://www.orbimage.com/apps/national/national.html (Date accessed: August 9, 1998).

[63] See UNISPACE III, *supra* note 9, at 11-12.

[64] See "The New Era in the Information Age Begins. Space Imaging Corporate Profile" (February 1997) http://www.spaceimaging.com/home/overview/profile/si_profile.html?Next_Gen (Date accessed: 7 November 1998).

[65] See "EarthWatch Forges Ahead Without EarlyBird 1 Satellite" (April 7, 1998) http://www.digitalglobe.com/news/pr98/pr_ebloss.html (Date accessed: 7 November 1998) and http://www.digitalglobe.com/corporate/FAQ.html (Date of access: August 25, 2000).

Still another company, Orbimage, planned to launch in 1999 and 2000 two satellites with one meter resolution. It eventually re-scheduled the launches for the second and third quarter of 2001. It operates already two other remote sensing satellites. [66]

§3: Launching.

It is estimated that eight countries have now the technical capacity to engage in the space launching business. Currently, the market is dominated by the European and the American enterprises.

The French Arianespace (operator of the Ariane IV and now Ariane V rockets), with more than 180 satellites put into orbit, fulfils over fifty percent of the global demand for the launching of telecommunication satellites.[67] Originally developed by the European Space Agency, Arianespace is today a company incorporated under the French law.[68] The American companies launched 58 satellites by the Delta and Atlas rockets. [69] Other major participants in this activity are the Chinese and the Russian.[70]

---

[66] See "Orbimages. Company Overview", http://www.orbimage.com/corp/organization/organization.html (Date accessed: 7 November 1998) and http://www.orbimage.com/news/launch.html (Date accessed: August 25, 2000)).

[67] For example, in 1998, Arianespace got 13 of the 21 contracts for the launching of geostationnary satellites (See "Arianespace met sa réorganisation à l'ordre du jour", *La Tribune* (January 7, 1999) From 1992 to 1997, Arianespace had 48.5 % of the market share of commercial satellites launching, leaving to the U.S.A. only 33% (See UNISPACE III, *supra* note 9, at 7).

[68] Arianespace is a very good example of privatisation of a space activity; it was developed by international cooperation thanks to the European Space Agency and then given to a private status (See M.Couston, *Droit spatial économique- Régimes applicables a l'exploitation de l'espace* (Sides, 1994), at 89-99). Arianespace is currently a *Société Anonyme* incorporated under French Law but with a governmental body, the French space agency (*Centre National d'Études Spatiales*), as main shareholder. Following the trend in Europe of privatisation and mergers in the aerospace industry, the French government should nevertheless restrict its participation and leaves the majority of the stocks to private entities (See P. Marx, "Arianespace attend son transfert au privé", *La Tribune*, (21 Octobre 1998)).

[69] Delta is funded by Boeing, Atlas by Lockheed Martin. The Americans companies are handicapped to access to the launch pads: the US Air Force uses the site of Cap Canaveral with a priority over the civil operations (see P. Marx, "Les concurrents se bousculent sur le pas de tir", *La Tribune* (October 21, 1998).

[70] *Ibid.*

To those countries must be added Japan, Israel, Ukraine and India.[71]

Explosions of Delta[72] and Zenith[73] rockets in 1998 demonstrate that this activity is still ultra-hazardous in its nature, and that the financial consequences of each operation can be extremely costly. The insurance market is still very sensitive to any loss: the failed launch of the new Delta 3 rocket and the on-orbit failure of two Hughes satellites caused the insurance brokers to face approximately 700 million dollars in claims in 1998.[74]

With 1,697 satellites to be launched during the period 1998-2007, the total market value for launching services over the decade 1997-2006 is estimated at US$ 33.4 billion. The commercial launching industry is expected to expand at more than 10 per cent annually.[75] To be able to develop, the launch providers are now facing a fierce competition to attract the transport of LEO satellites: this new market will grow in the

---

[71] See "L'Inde rejoint le club des grandes puissances spatiales", *La Tribune* (May 27, 1999). Brazil also intends to have its own launcher (See C. Lardier, "Echec du lanceur brésilien VLS-1", *Air et Cosmos* (7 November 1997) 59).

[72] See C. Covault, "Boeing Delta 3 Explodes; Commercial Debut Ruined", *Aviation Week & Space Technology* (August 31, 1998) 22.

[73] On September 10, 1998, a Russian Zenith 2 rocket exploded with 12 satellites for the Globalstar constellation on board. The share of the Globalstar Company immediately lost half of its value (see T. Gadault, "Les communications mobiles par satellites prennent du retard", *La Tribune*, (September 11, 1998)).
From the beginning of 1998 to may 1999, 10 % of the launches done by American companies failed, a rate which is the double of the last six years, and leads to a loss of more than 3.5 billions of dollars (See "Série noire pour les lanceurs US dans un marché où la concurrence s'exacerbe" (May 20, 1999) http://www.yahoo.fr/actualite/19990520/international/927204300-yaho103.html (Date accessed: May 27, 1999)).

[74] See J.C. Anselmo, "In Orbit", *Aviation Week & Space Technology* (September 7, 1998) 51.
In 1996, space insurance had a gross profit of US$ 288 million. Insurance rates for space launches ranged from 15 to 18 per cent of the insured value (see UNISPACE III, *supra* note 9, at 14).

[75] See UNISPACE III, *supra* note 9, at 6. See also T.Gadault, "La fusée Ariane 5 relance l'Europe dans la course à l'espace" *La Tribune* (October 22, 1998): according to this article, the classical market of geostationary satellites remains stable with a turnover around 2.5 billion of dollars for twenty to thirty launches per year. He also cites the figure of 14 billions French francs for this specific market.

near future with the development of mobile constellations, which also means hundreds of satellites launches. More than thirty companies are competing for this business.[76]

[76] Figure given by General H.M. Estes, commander in chief of the U.S. Space Command, quoted in W.B. Scott, "Cincspace Wants Attack Detectors on Satellites" *Aviation Week & Space Technology* (August 10, 1998) 22.

Chapter II: The Legal Principles Applicable to Commercial Space Activities.

Commercial space activities are governed by the general principles applicable to any space activity, but also by specific provisions concerning the specificity of each of those commercial space activities.

Section 1: General Principles.

The use of outer space by non-state actors was not obvious at the outset of the space age. Outer space was in the beginning a place of confrontation between the two space powers and the evolution of space law could not avoid the influence of the contradictory doctrinal ideas of the U.S.A. and U.S.S.R.. The possible involvement of private enterprises in outer space was one of the controversial ideological issues. Therefore, it is interesting to study how and under what conditions the use of outer space by private companies for commercial purpose was accepted.

§1: The Legality of Private and Commercial Space Activities.

The acceptance of private actors on the space stage results from a compromise between the U.S.S.R. and the U.S.A. The Soviet view was that the principle of free use and access to outer space should be applicable to states only, to avoid any possible

disorder or confusion arising from private participation.[77] On the other hand, the U.S.A. argued that outer space should be used as freely as the high seas, thus providing equal opportunity to their private enterprises to use outer space.[78]

The compromise between those two different views was to allow private activities in outer space, but under the control of states. It was set forth in Principle 5 of the United Nations General Assembly Resolution 1962(XVIII), and later was incorporated in the 1967 Outer Space Treaty. The relevant provision appears in article VI of this treaty, which reads:

> "States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the moon and other celestial bodies, whether such activities are carried on by governmental agencies *or by non-governmental entities*, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the moon and other celestial bodies, shall require authorisation and continuing supervision by the appropriate State Party to the Treaty...".[79]

Consequently, subject to governmental supervision, any entity - whatever is its legal nature - is allowed to use outer space as freely as any state.[80] Articles VII and IX of the Outer Space Treaty also confirm this view.[81] However, a clear prerequisite for private space activities remains in the duty to obtain the authorisation of a state; otherwise, no private activity may be legally undertaken in outer space.

---

[77] See A.S. Piradov, *International Space Law* (Progress, 1976) at 97.

[78] On the Soviet and American views, see K. Tatsuzawa, *supra* note 2, at 342.

[79] Emphasis added.

[80] See M.G. Bourély, *supra* note 46, at 176. According to him, the only criterion to be allowed to use outer space is to be considered as an entity, therefore preventing individuals to act on their own, except if they act through a company (companies, unlike private people, are "entities").

[81] Article VII makes reference to a State party's "natural or juridical persons" as possible victims for damage occurring on the Earth, in air space *or in outer space*. Article IX deals with a duty to undertake consultations "if a State Party to the Treaty has reason to believe that an activity or experiment by it or *its nationals* in outer space (...) would cause potentially harmful interference with activities of other States Parties" (emphasis added).

On the other hand, one can notice that whereas private enterprises are expressly allowed to make use of outer space, there is no explicit reference in the Treaty to commercial space activities.[82]

The permissibility of commercial space activities could be based on the well-known and controversial judgement of the Permanent Court of International Justice, according to which any activity not expressly forbidden is considered lawful and therefore allowed in international law.[83] Moreover, the principle of freedom of use of outer space, as set forth in article I of the Outer Space Treaty, does not exclude commercial operations.[84] However, the use of outer space for profits might be in conflict with the "common interests principle" of article I, which states:

> "The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."

The question arises then of determining what are the legal implications of this provision. It is usually considered that it should not be interpreted literally, *i.e.* creating the obligation to share benefits, but as a general goal, as the expression of the hope that the activities will be beneficial in a general sense.[85] For example, commercial activities may be considered in accord with this principle as long as they

---

[82] See P.D. Nesgos, "International and Domestic Law Applicable to Commercial Launch Vehicle Transportation" (1984) Proceedings of the 27th Colloquium on the Law of Outer Space 98.
[83] See the Lotus Case (France v. Turkey), [1927] P.C.I.J. Reports, Series A, N.9, at 18.
[84] Outer Space Treaty's article I deals with "exploration and use of outer space". "Exploration" seems to designate scientific research, whereas "use" seems to designate all the other space activities. Commercial space activities are thus mere "use" of outer space, and are ruled by the general regime of the Treaty (see M.G. Bourély, *supra* note 46, at 173-174).
[85] See S.Gorove, "Implications of International Space Law for Private Enterprise" (1982) 7 A.A.S.L. 319, at 320-322.

contribute to raising the standard of living for people or to enhance national economies.[86]

The practice of space powers in offering their space capabilities on a commercial basis, and of other countries to accepting them[87], as well as national space laws[88], confirm the legality of commercial space undertakings. The doctrine also supports this view.[89]

§2 : The Necessary Link Between Private Companies and States.

States bear international responsibility for operations by private entities in outer space (article VI); any damage caused by a space object they launch, even if it is operated by a non-state agency, can engage their liability (article VII); and they have the duty to avoid any harmful interference that space activities of their nationals could cause to other states (article IX).

The involvement of states in private space activities is not limited to issues of responsibility. As a writer pointed out in regard to American corporations:

> "If the financing hurdles can be cleared, there are several regulatory hurdles for U.S. organisations: construction permits to build spacecraft that will include any radio operation (just about every conceivable useful spacecraft); a radio license for

[86] See H. Qizhi, "Legal Aspects of Commercialization of Space Activities" (1990) Proceedings of the 33rd Colloquium on the Law of Outer Space 58, at 58-59. See also K. Tatsuzawa, *supra* note 2 at 343.
[87] See J. Rzymanek, "Some Legal Aspects of Commercialisation of Outer Space" (1987) Proceedings of the 30th Colloquium on the Law of Outer Space 246, at 247.
[88] Few countries have domestic legislation aimed directly towards space activities. The main developed municipal legal body is in the United States, with for the example the Commercial Launch Service Act of 1984 (amended in 1988), the Land Remote Sensing Commercialization Act of 1984 and the Land Remote Sensing Policy Act of 1992. Only four other countries enacted municipal laws: the United Kingdom (Outer Space Act 1986 (1986 Chapter 38)); Sweden (Act on Space Activities (1992:963)); South Africa (Space Affairs Act N.84 of 1993) and the Russian Federation (Law on Space Activities, signed into law August 20, 1993).

spacecraft transmissions; radio licenses for any ground facilities transmitting to a spacecraft; and a launching license from the Department of Transportation." [90]

The responsibility of states for private activities is not the only practical reason why companies need to overcome numerous administrative clearances. Outer space is a field of international cooperation[91], and states being *par excellence* actors on the global stage, [92] it is up to them to fulfil the role of cooperation. As earlier pointed out [93], the area of outer space usable for commercial satellites is relatively limited, and so is the radio spectrum. To avoid space objects using the same spot (thus creating physical interference), to avoid satellites using close radio frequencies in the same area (thus creating frequency interference), states must coordinate their activities: otherwise outer space would become, instead of a valuable resource, a chaotic wasteland.

The role of coordinator in the sharing and distribution of radio frequencies belongs to the International Telecommunication Union (I.T.U.), the oldest specialised organisations within the United Nations framework.[94]

As explained by Professor Peyrefitte, the radio spectrum, as well as outer space, may not be subject to a claim of national appropriation. Hence, the user of a frequency band has no property right over it: if an allocated frequency is not used anymore, it is

---

[89] See P.D. Nesgos, *supra* note 82, at 99.

[90] S.Doyle, "Legal Aspects of Space Commercialization" in N. Jasentuliyana, ed., *Space Law. Development and Scope*, (Praeger, 1992) at 130-131. And this writers concludes: "Such an undertaking is not for the weak or faint-hearted." (*Ibid.* at 131).

[91] See chapter 1, section 1, paragraph 3, above.

[92] They enjoy international legal personality. See N.Q. Dinh, P.Daillier, A.Pellet, *Droit international public*, (Librairie Générale de Droit et de Jurisprudence, 1994) at 394-395.

[93] See chapter 1, section 1, paragraph 1, above.

[94] See "I.T.U. History", http://www.itu.ch/aboutitu/history/history.html (date accessed: August 16, 1998).

then considered as being free and can be allocated to a new user. This shows that the radio spectrum is a natural resource that can be easily wasted.[95]

Hence, it is within the I.T.U.'s framework that states must apply to obtain the frequencies that their national companies need. Private enterprises have no direct access to this procedure.[96] They have to rely on their government to represent their interests.[97]

Another involvement of the state in regards to private space projects is through the duty to register any object launched into outer space. This registration has to be done both at the national and at the international level.[98] This requirement of the Registration Convention exists primarily to make identification of satellites easier, in order to enhance the provisions of the 1972 Liability Convention.[99]

In short, the regime for private space activities can be summed up as giving freedom to the enterprises, and international responsibility to the states.[100] Hence, the necessity of keeping a close link between an enterprise and its state of nationality (or registry)[101] is obvious. This argument is also enhanced by the fact that space activities are global

---

[95] See L. Peyrefitte, *supra* note 7, at 262.

[96] Only governmental agencies can deal with the I.T.U.; see P.L. Meredith and G.S. Robinson, *Space Law: A Case Study for the Practitioner* (Nijhoff, 1992) at 190-191.

[97] This procedure is time consuming. Indeed, notification has to be done sometimes up to nine years before the satellite system starts to be operated (on this issue and on the way to have notification linked to real and well-founded projects, in order to avoid the so-called "paper-satellites", see F. Lyall, "Paralysis by Phantom: Problems of the I.T.U. Filing procedures" (1996) Proceedings of the 39th Colloquium on the Law of Outer Space 187; on the American procedure to ensure of the financial possibility of intended systems, see P. Meredith, *supra* note 39, at 415-416). It took for example five years to Motorola to get a license for the Iridium system.

[98] See Outer Space Treaty, article VIII and 1975 Registration Convention, article 2 and 3.

[99] See S. Courteix, *Le droit de l'espace*. (La Documentation Française, documents d'études N. 3.04, 1990) at 16.

[100] See M.G. Bourély, "La commercialisation des activités spatiales: aspects juridiques", (1989) XXXVII, Annales de l'Université des sciences sociales de Toulouse 43, at 56.

[101] See Chapter VI, section 1, paragraph 2, below, on the role of the State of registry. This states is the one that must keep jurisdiction and control over the space object (Outer Space Treaty, article VIII).

activities, which can cause global problems, which can be solved at intergovernmental level only. [102]

§3: The Limits of the Freedom of Use of Outer Space.

The freedom to use outer space is not absolute. According to article VI of the Outer Space Treaty, states shall ensure that "national activities are carried out in conformity with the provisions set forth in the present Treaty". In other words, the same limits shall apply to private and states activities. In short, those restrictions are the ones set forth in the Outer Space Treaty. They include: prohibition of national appropriation (article II), respect for international law (article III), use of outer space for peaceful purposes (article IV and Treaty's preamble), duty to avoid harmful contamination, adverse changes in the Earth environment and harmful interference (article IX).

To recall those constraints is not rhetorical. One of the main characteristics of space activities is that it is possible to use them for civil and military purposes. This dual use of space technology becomes obvious with launching activities: rockets launching TV satellites and military missiles are close technologies.[103] Furthermore, several companies in the remote sensing market are selling their products to the military.[104] On the other hand, some military technologies can be used for civilian purposes.[105]

---

[102] See Y.M. Kolossov, "On The Problem of Private Commercial Activities In Outer Space" (1984) Proceedings of the 27th Colloquium on the Law of Outer Space 66, at 68.

[103] For example, the Missile Technology Control Regime [hereinafter MTCR] encompasses in its scope of applications complete rocket systems, including ballistic missiles systems as well as space launch vehicles, if they are "capable of delivering at least a 500 kg payload to a range of at least 300 km". See *Agreement on Guidelines for the Transfer of Equipment and Technology Related to Missiles*, (1987) 26 I.L.M. 601.

[104] For example, the company Eyeglass expects to have 25 % of its turnover coming from government contracts, such as the monitoring of borders. See *Space News* (31 October - 6 November 1994) 1, 21.

[105] The anti satellite weapon "Miracle", the most powerful laser in the world, developed by the US army might be used to launch small satellites (see S. Raphael, "La toupie de l'espace", *Sciences et Avenir* (July 1998) 85).

Unfortunately, the meaning of the "peaceful use" remains unclear [106], apart from the obvious (mass destruction weapons are prohibited in orbit around the Earth, as expressly stated by article IV of the Outer Space Treaty).

The question of harmful interference, especially as far as frequencies are concerned, is not an abstract issue either. The threat to radio astronomy, posed by the huge LEO satellite constellations, is a good illustration.[107]

Even the prohibition of appropriation needs to be emphasised. Not so much because of the location of satellites in outer space[108], but mainly with respect to celestial bodies. For example, an American company, SpaceDev, Inc., has the project to send a spacecraft to a near earth asteroid, situated between the Moon and Mars, and to land some scientific instruments on this celestial body, in order to be able to sell the scientific data obtained. This company, according to its own presentation, also "intends to claim ownership of the asteroid in order to benefit its shareholder and humanity by setting a precedent for private property rights in space, which may help accelerate the opening of space to all".[109] The legality of such a claim, in the light of article II of the Outer Space Treaty, is disputable.

---

[106] See I.A. Vlasic, "Space Law and the Military Applications of Space Technology", in N. Jasentuliyana, *supra* note 25, at 392.

[107] See chapter 5, section 2, paragraph 3, below.

[108] The argument was made that satellites, at least in the geostationary orbit, occupy always the same place, years after years, preventing other satellites to use those slots, and thus could be considered as a *de facto* appropriation. This statement was done within the framework of the Bogota Declaration of 1976. On those arguments and counter-arguments, see J. Marchan, *Derecho Internacional del Espacio. Teoria y Politica*, (Banco Central Del Ecuador, Quito, 1987) at 845-850 and S. Courteix, "Questions d'actualités en matière de droit de l'espace" (1978) A.F.D.I. at 892-893.

[109] "SpaceDev, Inc. Executive Summary", http://www.spacedev.com/SpaceDev/About_SpaceDev.html (Date accessed: July 6, 1998). If such a claim will help to open space to all should be discussed. As observed by M. Lachs, "frequently the practices of dividing and disposing of lands and whole continents led to conflict and strife. The lesson should have been learnt" (M. Lachs, *The Law Of Outer Space* (Sijthoff, 1972) at 19-20, quoted in I.H.Ph. Diederiks-Verschoor and W.P. Gormley, *supra* note 40, at 125).

Section 2: Specific regimes.

The above mentioned general rules are augmented by specific provisions for the different uses of outer space. Among them are several principles concerning telecommunications and especially the use of satellites for Direct Broadcasting Services; a resolution by the United Nations General Assembly regulating remote sensing, as well as the United Nations General Assembly resolution governing the use of nuclear power sources in outer space.

§1: Telecommunications.

Telecommunication, as defined in the I.T.U. Convention, is "any transmission, emission or reception of signs, writing, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems".[110]

The principal legal obligation that the operation of communications satellites must respect, seems to be of purely technical nature: namely to allow the best and most efficient use of the radio spectrum. This means that each new or intended system has to coordinate with the existing ones. This duty is mainly done through the International Telecommunication Union. This international organisation is in charge of allocating the radio spectrum to the different users and of the Geostationary Orbit slots allocation. Each position and frequency registered through the International

---

An asteroid could generate more than 20 000 billions of dollars of turn-over (see S.Raphaël, "Astéroïdes, le nouvel eldorado", *Sciences et Avenir* (April 1998) at 84-85).

[110] Annex 2 to the International Telecommunication Convention (Nairobi, 1982).

Telecommunication Union is internationally protected. This implies that new comers must avoid any physical and frequency interference with the registered systems.[111] However, this international protection is legally weak; there is no binding mechanism to enforce the decisions of the I.T.U., nor any mandatory dispute settlement system. All the users rely on the good faith of other users, and on their common interest in having the most efficient use of radio-frequencies. Still, the present arrangement may cause trouble as the number of communication satellites grows. The prospect of hundreds of mobile communications satellites to be launched in the Low Earth Orbit threatens some existing users of the radio spectrum[112], whereas in some industrialised countries the number of possible orbital slots leads to domestic competition between private companies.[113] Because the current legal system is based mainly on the common sense of the users, and in the absence of any binding decision-making body, some countries request more slot allocations in the geostationary orbit than they need in order to lease them for profit, thus abusing the system.[114]

Private entities wishing to operate a communication satellite must also coordinate their system with the operating international telecommunications organisations of which their state of nationality is a member. This is the case with INTELSAT, INMARSAT and EUTELSAT. According to the charters of those organisations, this duty to coordinate new systems has two implications.

---

[111] For a more comprehensive view of the registration system, see: P.L. Meredith and G.S. Robinson, *supra* note 96, at 157-209. It is interesting to notice the existence of *a priori* planing for the geostationary orbit, in order to keep some future opportunities for space powers to-be to use this limited natural resource. The allocation used to be done only on a "first come, first served" basis.

[112] This is especially true for radio astronomy. On this issue, see chapter 5, section 2, paragraph 3, below.

[113] There is only one spot available for Japan for communications services in 2000. It was booked a few years ago with I.T.U., but today two companies filed an application to their Government to get it (see P. Kallender, "Firms Fight over Orbital Slot", *Space News* (November 3-9 1997) 4).

[114] This is the famous case of the Kingdom of Tonga, which claimed sixteen geostationary orbital slots, and eventually gained six of them. See J.I. Ezor, "Costs Overhead: Tonga's Claiming of Sixteen

One is technical, to avoid interference with the satellites used by those organisations. This obligation is of the same kind as the one required by the I.T.U.- but does not replace it. The proposed system has to be technically compatible with INTELSAT (or INMARSAT, or EUTELSAT) and I.T.U. specifications.

The second implication is economic. New systems should not result in any economic harm for the mentioned international organisations. This implies that those organisations must be aware of every new project of their member states because, by introducing competition with their systems, this could lead to adverse financial consequence for the affected organisation.[115] For example, a European company incorporated in Luxembourg, *Société Européenne des Satellites* (S.E.S.) operator of the Astra satellites, as opposed to the EUTELSAT organisation, is a good example of a private competing system.[116] EUTELSAT is itself an authorised exception to the INTELSAT organisation.[117]

The most problematic legal issue concerning the use of communication satellites is linked to the question of sovereignty. Because they can transmit any data, any information, to any country they fly over, satellites (being in outer space, an area outside any sovereign jurisdiction) may be considered as having direct consequences on states sovereignty. This problem is especially accurate with Direct Broadcasting Systems (D.B.S.), also called Direct To Home.

Geostationary Orbital Sites and the Implications for the US Space Policy" (1993) 24 Law and Policy in International Business 915, and P.L. Meredith and G.S. Robinson, *supra* note 96, at 167-169.

[115] See Article XIV (d) of the Agreement Relating to the International Telecommunications Satellite Organization, Washington August 20, 1971 (for a comment of this article, see M-C Prémont, *supra* note 32, at 266-282). The equivalent exists for EUTELSAT (article XVI of the Convention Establishing the European Telecommunications Satellite Organization).

The competition between EUTELSAT and the S.E.S. means also competition to use the same slots; The position situated between 28° and 29° East is disputed (see T. Pirard, "Des interferences entre EUTELSAT et Astra", *Air et Cosmos* (March 14, 1997) 40).

[116] See L. Peyrefitte, *supra* note 7, at 254.

D.B.S. are satellites systems transmitting radio or television programs directly from the satellite to individual receivers.[118] This means that to receive information transmitted from space, any person only needs to have an antenna. The contents that are transmitted are hard to control by the receiving states. This is the reason why the argument of state sovereignty was raised to limit non-authorised D.B.S.

Two international texts were adopted on that subject, in order to solve the conflict between state sovereignty[119] and the principle of free flow of information.[120]

The first text was adopted by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) in 1972. This "Declaration of Guiding Principles on the Use of Satellite Broadcasting for the Free Flow of Information, the Spread of Education and Greater Cultural Exchange"[121] calls on states to reach prior agreements before broadcasting programs to a foreign territory.[122] However, this text does not give any reason why state sovereignty should prevail over freedom of information.

The United Nations General Assembly, in its resolution 37/92 of December 10, 1982, expressed the same view as the UNESCO, through a two-tier mechanism. This text

---

[117] See S. Courteix, "EUTELSAT: Europe' Satellite Telecommunications" (1984) Michigan Yearbook of International Legal Studies 85, at 98-100.

[118] According to the I.T.U. Regulations, Section 3.18 a broadcasting satellite means a "radiocommunication service in which signals transmitted or retransmitted by space stations are intended for direct reception by the general public" (quoted in A.A. Cocca, *supra* note 25, at 425).

[119] See for example article 2§7 of the United Nations Charter.

[120] This principle is set forth in the United Nations Universal Declaration on Human Rights of 1948 (General Assembly Resolution 217 A (III)), article 19, which provides the right "to seek, receive and impart information and ideas through any media and regardless of frontiers". This provision is repeated in the *International Covenant on Civil and Political Rights*, 19 December 1966, (1967) 61 AJIL 870, article 19 (2).

[121] UN Doc. A/AC.105/PV.117 (1972).

[122] Article IX §1 states: "(...) it is necessary that States, taking into account the principle of freedom of information, reach or promote prior agreements concerning direct satellite broadcasting to the population of countries other than the country of origin of the transmission."

requires notification and consultation, but the consultation itself leads to a process of prior consent.[123]

This prior consent principle, repeated in those two international texts, has not become a rule of international law.[124] Indeed, those documents in their entirety have no legally binding effect.[125] It is important to recall that none of the industrialised countries (*i.e.* those having the technical and financial possibilities to apply these principles) voted for the 1982 resolution. An *opinio juris* does not exist. Moreover, the practice of states is not uniform. For example, while Saudi Arabia, Iran, Egypt, Syria or Qatar prohibit in their national laws the use of parabolic antenna, other countries tolerate those devices (*e.g.* Algeria, Morocco, Tunisia) and some states do not object to TV broadcasts by foreign private companies directed towards their territory.[126]

Does this imply that an absolute freedom of broadcasting by satellites exists, related to the freedom of information? To make such a claim would not be justified.

First, there are some undisputed principles applicable to Direct to Home Television: respect for international law, equal rights of states to conduct activities in this field, international cooperation, the requirement for peaceful settlement of international

---

[123] See Paragraph 13 and 14 of the resolution. See P. Achilleas, *La television par satellite. Aspects juridiques*, (Montchrestien, 1995) at 97-98.

[124] On this issue, see especially D. Fisher, *Prior Consent To International Direct Satellites Broadcasting* (Nijhoff, 1990) at 197.

[125] As noted by the International Court of Justice: "General Assembly resolutions, even if they are not binding, may sometimes have normative value. They can, in certain circumstances, provide evidence important for establishing the existence of a rule or the emergence of an opinio juris. To establish whether this is true of a given General Assembly resolution, it is necessary to look at its content and the conditions of its adoption; it is also necessary to see whether an opinio juris exists as to its normative character. Or a series of resolutions may show the gradual evolution of the opinio juris required for the establishment of a new rule" (*Case concerning the legality of the threat or use of nuclear weapons*, advisory opinion of July 8, 1996, *I.C.J. Reports 1996*, paragraph 70).

[126] See J.H. Castro Villalobos, " The DBS Declaration of 1982: The TV Marti Case" (1994) Proceedings of the 38th Colloquium on the Law of Outer Space 6, at 11-12. Moreover, another issue is the enforcement of those national prohibitions against antenna: totalitarian regimes are indeed the only ones that can afford to try to implement it. Even regimes usually considered as being severe are not very efficient: few years ago, the Iranian government enacted a law prohibiting the use of parabolic antenna, but its enforcement is still not very adequate (see R. de la Baume and J.J. Bertolus, *Les nouveaux maitres du monde*, (Belfond, 1995) at 143.)

disputes, states and international organisations' responsibility for activities undertaken by them or under their jurisdiction.[127]

There are also some technical obligations required by the International Telecommunication Union, in order to avoid any spill-over as far as practicable.[128] Lastly, states keep their sovereign rights over their territory and may, thus, restrain their nationals' access to DBS, through jamming, for example.[129]

In other words a right of DBS broadcasting exists, but the receiving state has the right to protest against and to prevent it.

The practical consequence for the commercial broadcaster is a possibility to use foreign territories to get access to markets otherwise not accessible, or not under the same conditions. Among others, American channels broadcasting in Europe understood this possibility. For example, 'Cartoon Channel' and 'TNT' are two programs that were transmitted from the territory of the United Kingdom, bypassing requirements imposed on operators in other national markets (especially in France as they did not respect quotas of programs produced in the European Union).[130]

§2: Remote Sensing.

Remote sensing activities have been for a long time exclusively state activities. Even the first private companies involved in this business (*i.e.* Eosat in 1984 in the United

---

[127] See P. Achilleas, *supra* note 123, at 97 and at 124-134.

[128] DBS Satellite must be designed in a way to cover only States accepting it. However, unavoidable spillover is acceptable. See I.T.U. WARC 1971, Radio Regulation 428A and 2674§1.

[129] The legality of jamming under international law is still discussible (See R.Bender, *supra* note 45, at 164).

[130] See R.de La Baume and J.J.Bertolus, *supra* note 126, at 150-152.

States, SpotImage in France since 1986) relied on remote sensing satellites launched and operated by states. They still rely heavily on their governments for variety of purposes.[131]

Privatisation in Russia and growing commercialisation of space activities in the U.S.A. has led to the growth of private remote sensing industry. Thus in the U.S.A. several companies - SpaceImaging, EarthWatch, or Orbital Sciences- have recently emerged and still others may follow.

At the international level, the only semi-authoritative principles governing remote sensing activities were incorporated in the General Assembly Resolution 41/65 adopted by consensus on December 3, 1986.[132] This text gives a broad definition of remote sensing activities, encompassing both the space segment of this activity (the sensing of the Earth itself), and its Earth segment (process of analysis and dissemination of the data).[133] However, the scope of application of the resolution is

---

[131] *Inter alia* for the continuation of the programs. The privatization of the American system Landsat was a failure. The launch of the satellite Landsat VI did not succeed, and the company EOSAT -created to commercialize the U.S. Government's Landsat program - was acquired by the new company SpaceImaging (see "The New Era in the Information Age Begins. Space Imaging Corporate Profile" (February 1997), http://www.spaceimage.com/home/overview/profile/si_profile.html#Company (Date accessed: August 17, 1998). The continuation of the Landsat serial with the launching of Landsat VII relies again on governmental agencies, especially the National Oceanic and Atmospheric Administration (N.O.O.A.) (See "LANDSAT-7 LAUNCH DELAYED", NASA Press Release: 98-41, http://www.nnic.noaa.gov/SOCC/L7PR-1.htm (Date accessed: August 17, 1998)).
The French Company, SpotImage, even if it leads the world market for remote sensing, relies on the French governmental space agency for its initial financing; it is not anticipated that SpotImage will cover the entire development cost of new systems until the Spot 5 satellite is launched. The Canadian Company Radarsat relies also on its government for its financial abilities (See P. Clerc, "Comparative Analysis of RADARSAT and SPOT Policies", quoted in R. Jakhu, *Space Law: Applications. Course Materials*, (McGill University, 1997-1998) at 293-314).

[132] It is worth while noticing that the only legally binding international set of rules that came in existence for remote sensing activities is the *Convention on the Transfer and Use of Data of the Remote Sensing of the Earth from Outer Space* (signed in Moscow on May 19, 1978), UN Doc. A/33/162 June 29, 1978. Ten countries, including the U.S.S.R., were parties to it. However, the successor states do not apply this treaty anymore (See G. Zhukov, "Une expérience historique: la convention de Moscou de 1978 sur le transfert de l'utilisation des données de téléobservation de la Terre à partir de l'espace" in S. Courteix, ed., *Droit, télédétection et environnement* (SIDES, 1994) at 189-194).

[133] According to principle 1.e of this resolution: "The term 'remote sensing activities' means the operation of remote sensing space systems, primary data collection and storage stations, and activities in processing, interpreting and disseminating the processed data".

still further reduced as it only concerns remote sensing done with a civilian purpose, excluding its application to any military data gathering. [134]

The utilisation of remote-sensing satellite does not require the authorisation of the underlying state: principle IV of the 1986 resolution implicitly denies a right of prior consent.[135] A counterpart for sensed countries is, nevertheless, planned: a right to access to the data gathered is embodied in principle XII, which states:

> "As soon as the primary and the processed data concerning the territory under its jurisdiction are produced, the sensed State shall have access to them on a non-discriminatory basis and on reasonable cost terms. The sensed State shall also have access to the available analysed information concerning the territory under its jurisdiction in the possession of any State participating in remote sensing activities on the same basis and terms, taking particularly into account the needs and interests of the developing countries".

This principle means that a sensed state should have access to the primary and processed data gathered about its territory, under at least the same conditions - especially for price and delay - as every other state. Taking into account the importance of the data gathered through remote sensing, this is not only a means to protect the economic interests of sensed states, but also their security (by revealing, for example, aggressive preparations on the part of their neighbors).

---

[134] Principle 1 (a) of the resolution limits the scope of application of the resolution to remote sensing done only "for the purpose of improving natural resources management, land use and the protection of the environment".

[135] Developing countries claimed a right of prior consent to any sensing of territories under their jurisdiction, as was also claimed for D.B.S.

However, as far as analysed information[136] is concerned, this provision only concerns a right of access for information in possession of a state, not in the hands of a private company. This could mean that the sensed states cannot claim access to any information possessed by a private firm.

Nevertheless, a customary rule might be evolving through the national policies respecting data dissemination. Thus, the United States with the Land Remote Sensing Commercialization Act of 1984 and the Land Remote Sensing Policy Act of 1992 provided for a broad access to primary data by sensed states, in accordance with the 1986 Resolution.[137] The Canadian company, Radarsat International Inc., acts in accordance with certain guiding principles elaborated by the Canadian Space Agency reflecting the UN resolution. [138] The French enterprise SpotImage, though it does not have any official policy on access to data, also respects in practice the principles adopted in 1986 by the United Nations General Assembly.[139]

§3: Launching Activities.

As far as launching activities are concerned, their international legal framework may be considered to be based mainly on article VII of the Outer Space Treaty and the 1972 Liability Convention. As indicated in its title, the Convention provides a set of

---

[136] "Primary data", "processed data" and "analysed information" are the different evolution of the treatment of the remote sensing data to interpret them. See Principle 1 (b), (c) and (d) for their exact definitions.

[137] See W. von Kries, "The UN Remote Sensing Principles of 1986 in the Light of Subsequent Developments", (1996) 45.2 ZLW 166, at 173.

[138] *Ibid.*

[139] See L. Dufresne, "Le système de distribution des données et produits Spot" in S. Courteix, *supra* note 132, at 149.

rules to protect the victims of any space related accident through an original regime of liability. [140]

Another relevant treaty - the Agreement on Guidelines for the Transfer of Equipment and Technology Related to Missiles- aims to limit the export of missiles. However, its broad definitions make it also applicable to rockets.[141] As a consequence, it limits the possibility of newcomers in the space launch industry.

The United States of America, with Ukraine, Russia and the People Republic of China also entered into other various bilateral treaties.[142] Those agreements cover, *inter alia*, the number of launches those countries can make and the pricing of each launch.

To recapitulate, the two main conclusions relating to the legal regime applicable to private space activities are that the rules are directed towards states, and that most of the principles aimed at specific space uses lack binding force.

---

[140] See Chapter IV, below.

[141] See *supra* note 103.

[142] The U.S. and China signed a Memorandum of Agreement Regarding International Trade in Commercial Launch Services for a period starting January 1, 1995 till December 31, 2001. It replaces an agreement signed in January 1989. On February 21, 1996, the U.S. and Ukraine signed an Agreement Regarding International Trade in Commercial Space Launch Services, that should expire end of 2001. It provides for example that Ukraine is permitted to launch only 5 satellites to the Geostationary Orbit, plus another 11 launches though a U.S. led joint venture. Lastly, an Agreement Between the Government of the United States of America and the Government of the Russian Federation to Amend the 'Agreement Between the Government of the United States of America and the Government of the Russian Federation Regarding International Trade in Commercial Space Launch Services" was signed on January 30, 1996 to increase the authorised number of launches which Russia could provide under a previous agreement signed in 1993. See D.J. Burnett and D. Lihani, "U.S. National Space Policy and Bilateral Launch Service Agreements" (1996) Proceedings of the 39th Colloquium on the Law of Outer Space 263, at 265-270.
Those agreements are heavily discussed within the United States. If they grant a time-limited protection against new competitors to the launching companies, they prevent the clients of the launching industry from enjoying the main advantage of competition: cheaper launches (*Ibid.* at 265). They should expire in 2001; the United States should not renew them (see H. Wassenbergh, "International Space Law: A Turn of the Tide", (1997) XXII-6 *Air and Space Law* 334, at 340).

Indeed, the Outer Space Treaty in its very title specifies that it is concerned with the "principles governing *the activities of States* in the exploration and use of outer space, including the moon and the celestial bodies".[143] Hence, private space activities are concerned only indirectly by those rules, through the obligations of their respective states. This is the reason why the responsibility of states for non-governmental entities is so important: the only obligations that private firms have to respect are those incorporated in domestic legislation.[144] If the states bore no international responsibility for them, private entities could operate without any legal restraint. Because states are held responsible for their private entities, they provide a guaranty to other states against any abuse of space or damage arising from those operations.

It should be emphasised that the principles relating to the main space activities (telecommunication and remote sensing) are uncertain in their legal effect. The best that can be said for those principles is that they are soft law. [145]

---

[143] Emphasis added. See also Outer Space Treaty article XIII: "The provisions of this Treaty shall apply to the activities of *States* Parties to the Treaty in the exploration and use of outer space (...)" (Emphasis added).

[144] This could raise a problem, as only five states (the United States of America, Sweden, the United Kingdom, Russia and South Africa) have some specific acts on space activities. On the obligation for States to enact specific laws regarding space activities under article VI of the Outer Space Treaty, see M.G. Bourély, "Quelques réflexions au sujet des législations spatiales nationales" (1991) XVI A.A.S.L. 245.

[145] They cannot be considered as customary law if the incumbent space powers disagree, even if all the other states would consider them as binding. This is the consequence of the relevance of the implication of "States whose interests were specifically affected" for the definition of international custom, as defined by the International Court of Justice in the North Continental Shelf Case (*North Sea Continental Shelf Case*, (Federal Republic of Germany v. Denmark and The Netherlands), ICJ Reports 1969, 3, at paragraph 73). This is the reason why the United Nations General Assembly Resolution 37/92 concerning DBS, even though adopted by 108 votes against 13 has no binding implication: industrialised countries (and thus space powers) voted against or abstained. The same argument is acceptable for resolution 41/65 on remote sensing, adopted by consensus, due to the interpretation of some provisions given by representatives of industrialised countries (See *infra* note 324-325 and accompanying text).

Chapter III: The International Law of Responsibility.

We shall explore the basic principles of state responsibility and their efficiency for private interests in space (section 1), and study how state responsibility of states and international organisations can be engaged and enforced for their own space activities (section 2).

Section 1: Definition of State Responsibility.

The international law of state responsibility regarding commercial activities raises two main issues. Once defined the basic principles and concepts involved, we shall study the question of state responsibility for the acts of one of its national, and explore how private interests are then safeguarded.

§1: From Responsibility to Liability.

"*Ubi Societas, Ibi Jus*". Where there is a society, there is law. And where there is law, there is responsibility. Any legal system must ensure through principles of liability the respect of its rules. This is also correct with the international community and international law. States, subjects of international law, can be held liable for not complying with their legal obligations (*e.g.* failure to respect a treaty, violation of a state's sovereignty, injuries to foreign diplomatic representatives, etc...).[146] States'

[146] See D.J. Harris, *Cases and Materials on International Law* (Sweet & Maxwell, 1991), at 460.

liability for infringement of their international obligations is usually called responsibility.[147]

However, one can draw a distinction between state responsibility and state liability at the international level.[148] Responsibility is linked with moral obligations of states, with their duty to respect international law, to avoid internationally wrongful acts.[149] Liability, on the other hand, is linked with practical consequences of responsibility: obligation to pay compensation when a damage has occurred, for example. Hence, liability is the practical consequence of responsibility. This distinction between responsibility and liability is not reflected in the French or Spanish languages.[150]

Liability is a logical consequence of responsibility. Responsibility, nevertheless, may also arise from liability: for example if a state does not fulfil its obligation to pay compensation (liability) its international responsibility can be recognised, as the non-respect of this obligation is an internationally wrongful act.

The distinction between the combination of concept {responsibility/moral obligations} on one hand and {liability/practical consequences} on the other hand is of great interest for space law. Article VI of the 1967 Outer Space Treaty provides that states bear international responsibility for their activities in outer space, whereas article VII states the principles of a liability regime for damage due to the space object.

---

[147] *Idem*.

[148] See especially, F.G. von der Dunk, "Liability Versus Responsibility in Space Law: Misconception or Misconstruction?" (1991) Proceedings of the 34th Colloquium On The Law of Outer Space 363. This author criticises the "artificial" borderline between responsibility and liability drawn by the International Law Commission in the two parts of its Draft Articles on State Responsibility (1980) II Y.B.I.L.C. 30 and (1986) II. Y.B.I.L.C. 38..

[149] According to the International Law Commission Draft Articles on State Responsibility, article 1: "every internationally wrongful act of a State entails the international responsibility of that State".

In other words, any damage produced by a space object does not need to be the consequence of an internationally wrongful act to entail a right to reparation. The mere existence of a damage leads to the liability of the launching state(s), hence to a right to be compensated without the requirements linked to international responsibility. On the other hand, any damage occurring from the space activity itself requires the fulfillment of those prerequisites to lead to compensation: *inter alia* the evidence of an internationally wrongful act and proof that it is imputable to a state.

Responsibility arises if there is a breach of an international obligation attributable to a state. There is no criterion of fault, nor of damage.[151] The consequence is that the state must repair (principle of *resitutio in integrum*, as expressed in the Chorzow Factory Case)[152] in order to restore the situation that would have existed if the wrongful act had not occurred.[153] If reparation is impossible, the state must compensate (in monetary form most of the time)[154] or give satisfaction, through official apologies for example.[155]

There is also a possibility for a state to be held internationally responsible, even if no gross violation of international law is attributable to it. This is the so-called "due diligence" principle: it means that states must respect certain minimum standards of

---

[150] In those languages there is only one word to translate those two complementary notions (*responsabilité* and *responsabilidad*).
[151] See F.G. von der Dunk, *supra* note 148, at 363-364.
[152] See *Chorzow Factory Case* (Indemnity)(Merits) (Germany v. Poland), P.C.I.J. Reports, Series A, N. 17.
[153] See N.Q. Dinh, P.Daillier, A.Pellet, *supra* note 92, at 768.
[154] *Ibid.* at 768-769.
[155] Especially if no damage occurred (*Ibid.* at 769-770).

behavior [156] (such as the treatment of aliens on their territory). If such standards are not respected by a given state, it will be held responsible as if it committed an internationally wrongful act.

For example, the assault of an embassy by private persons is not an act committed by a state or its organs. Hence, the state did not commit an internationally wrongful act and cannot be responsible for it. However, the state may have failed to take all necessary measures to protect the embassy. In other words, it did not respect the international standards expected for the protection of diplomatic relations: its negligence (and not the acts of the group) is a fault and the source of its international responsibility. As a corollary, this principle also means that it will not be held responsible for the assault if it did not have any possible control over the group (this may happen with large rebellions).

Due diligence is, in fact, only an apparent exception to the prerequisite of having international wrongful acts committed by - and attributable to - a state to make it responsible.[157] Indeed, responsibility is engaged on the ground of a lack of due diligence because the state's organs were negligent, especially regarding obligations to stop or to repair any detrimental act.[158]

---

[156] As recognised by Max Huber in the Island of Palmas Case: the sovereignty of a state "has as corollary a duty: the obligation to protect within the territory the rights of other states, in particular their right to integrity and inviolability" (*Island of Palmas Case* (Netherlands v. U.S.A.), [1928], Permanent Court of Arbitration, 2 R.I.A.A. 829).

[157] See N.Q. Dinh, P.Daillier, A.Pellet, *supra* note 92, at 742.

[158] The most well known example of due diligence is expressed in the judgement of the Corfu Channel Case. The International Court of Justice spoke about "every State's obligation not to allow knowingly its territory to be used for acts contrary to the rights of other States", which is clearly an obligation of due diligence. The obligation of the Albanian authorities to notify the existence of a minefield in their territorial water was more generally based, nevertheless, on "certain general and well-recognised principles, namely: elementary consideration of humanity, even more existing in time of peace than in war; the principle of freedom of maritime communication; and every State's obligation not to allow knowingly its territory to be used for acts contrary to the rights of other States." (*Corfu Channel Case (Merits)* (UK v. Albania), I.C.J. Reports 1949 at 22)

Hence, this notion is subjective and depends heavily on circumstances (especially on the possibility for the concerned state to have knowledge and proper means to intervene to stop a situation contrary to the interests of another state).[159]

Concerning space activities, this due diligence principle is enacted through article VI *in fine* of the Outer Space Treaty, which provides that the "appropriate state" shall exercise "continuing supervision" over the space activities of non-governmental entities. How this control is exercised depends on the will of states: there is no obligation to enact a text of domestic space law. France, for example, does not have any law directly relating to space activities by private entities. "Continuing supervision" can be understood, nevertheless, as imposing on states a minimum standard of control over private corporations. Hence, the mere fact that an act contrary to the principles of the Outer Space Treaty is perpetrated by a private person, and not by a state organ is thus not a relevant argument to set aside state responsibility. States must control. [160]

Regarding liability (as opposed to the notion of responsibility), a specific regime has been developing in international law. It concerns the so-called "ultra-hazardous activities". When such an activity is concerned, the mere existence of a damage gives a right for a victim state to be compensated. Liability does not depend on a degree of blameworthiness but merely of the existence of a risk. This situation relies on an issue of equity: the state whose activity generated the prejudice did not commit any

[159] See N.Q. Dinh, P.Daillier, A.Pellet, *supra* note 92, at 736.
[160] As pointed out, there is no duty for states to have national legislation regulating private space activities. However, the existence of a well-developed system of licensing, as it is the case in the U.S.,

wrongful act, thus it cannot be held internationally responsible. The state that suffers the damage, nevertheless, may suffer great losses for an activity to which it was completely innocent. Under the general theory of responsibility, it would not have a right of compensation.

This strict-liability principle is a logical development of the jurisprudence of the Trail Smelter Case and of principle 21 of the Stockholm Declaration[161]. It was mainly developed in environmental law, for oil pollution or nuclear activities.[162] Space law, in this respect, was one of the very first domains, with the Liability Convention, to enact at the international level a regime of strict liability.[163]

Ultra-hazardous liability is necessary to space law: the risks of space activities are encountered by all the countries of the world. As a writer explained on the issue of Nuclear Power Sources (NPS):

> "A satellite which orbits the Earth completes one full orbit circa every 90 minutes and overflies thereby all States in one or two days depending on its trajectory. For this reason as the 'neighbour' of a launching state of an NPS Satellite the entire world has to be seen and not only the surrounding countries".[164]

---

seems to be the most efficient way for a state to be aware of the undertakings of its national companies and thus to fulfil its duty of continuing supervision over the activities of non-governmental entities.

[161] According to this principle, "States have, in accordance with the Charter of the United nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, *and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.*" (emphasis added).

[162] *E.g.* several conventions provide automatic liability of the exploiting party of a nuclear facility, up to a certain limit after which the state becomes liable.

[163] On this issue, see J. Barboza, "International Liability for the Injurious Consequences of Acts Not Prohibited by International Law and Protection of the Environment" (1994) III.247 RCADI 291; C.G. Caubet, "Le droit international en quête d'une responsabilité pour les dommages résultant d'activités qu'il n'interdit pas" (1983) AFDI 99; and P.M. Dupuy *La responsabilte des Etats pour les dommages d'origine technologique et industrielle*, (Pédone, 1976).

[164] M. Benko and K-U Schrogl, *International Space Law in the Making*, (Frontières, 1993) at 46.

In short, the issue of responsibility for space activities is based on three different and complementary notions. A principle of general responsibility for activities in outer space, with all the classical requirements of international law (internationally wrongful act imputable to a state or its organs), is enacted in article VI of the Outer Space Treaty. The imputability, however, is enlarged, compared with classical international law, as it is expressly provided that states are also responsible for non-governmental entities (hence, not only for their organs). *In fine*, this article reinforces this principle of responsibility with the complementary concept of due diligence, to impose a clear duty on states to control the acts of their private national entities. At last, to protect innocent victims on the surface of Earth, a regime of liability (without the prerequisite of a fault) is set forth in article VII of the Outer Space Treaty and in the Liability Convention.

§2:The Responsibility of States for Their Nationals: An Innovation?

States are responsible for internationally wrongful acts attributable to them. It means that they are not responsible for acts done by their nationals. In this respect, article VI of the Outer Space Treaty seems to innovate, as it provides state responsibility for private activities. This new regime, however, has some precedents: two such possibilities already existed under general international law.

The first possibility is when the acts of a national are attributable to the state because the private entity acted on behalf of this state, as its agent.[165] The criterion used to

[165] See ILC Draft Articles on State Responsibility, *supra* note 148, article 8.

define an agent is based on state involvement. The critical point is to know whether the state had "effective control" or not over the entity.[166]

As far as private space activities are concerned, the involvement of states is obvious. The recourse to state aids (beyond research and development) is a part of this business. For example, only American companies can be chosen by NASA for their launching activities: it is impossible for foreigners to apply for a US governmental market, despite the political anger of Europeans.[167] Possibilities to grant direct support may even be contemplated by governments.[168]

The space market relies heavily on states. Development of private space companies depends on governmental policies.[169] Private activities require numerous state authorisations, hence (even if they are not state agent *stricto sensu*) states behaviour may be considered as an "approval given" to these activities and a "decision to perpetuate them".[170]

The authorisation obligation provided in article VI of the Outer Space Treaty thus only renders official the link and cross interests between states and private

---

[166] See *Nicaragua Case*, I.C.J. Rec. 1986 at 64-65, and *Hostages in Teheran Case*, I.C.J. Rec. 1980 at 37.

[167] According to a statement done in 1990 by some representatives of the European Space Agency, this policy bars 80 % of the American satellite market to European launchers; in Europe, no equivalent restriction exists (see H.P. van Fenema, "Cooperation and Competition in Space Transportation" in C.J. Cheng and P. Mendes de Leon, eds, *The Highways of Air and Outer Space over Asia*, (Nijhoff, 1992) at 291-292). This situation led to a real dispute between American and European for the launching activities (See the TCI Case in M. Couston, *supra* note 68, at 183).

[168] The duty to use US governmental funds for international aids to help private remote sensing companies to develop their market with developing countries was embodied in the Commercial Space Bill of 1997. This state aid would have been indirect. The Commercial Space Bill of 1997 provided that the government should not compete with the private sector (section 206§d); NASA was encouraged - under certain conditions - to purchase data to commercial providers (section 202); and governmental agencies were invited to give some aids to developing countries in order for them to buy data to private enterprises (section 206). This last provision would have helped the private sector to create and develop its market thanks to some public funds. See http://thomas.loc.gov/cgi-bin/query/C?c105:./temp/~c1057G2Fck (Date accessed: June 1997).

[169] Privatisation of the US remote-sensing system was done under the principle that "the national interest of the United States lies in maintaining international leadership in civil remote sensing" (Land Remote-Sensing Commercialization Act of 1984, sec 101 (3)).

companies.[171] As a matter of fact, states have under article VI a duty to supervise private space activities. In other words, state responsibility for private space activities is a development of the "state agent" notion, which exists in the classical scheme of the international law of responsibility.

The second possibility of state responsibility for an act committed by a natural person is when the action of this individual is allowed by a negligence of the state, especially in its duty of due diligence. Several precedents exist concerning the failure to protect aliens[172], or the use of a territory in a way contrary to the interest of other states.[173] The duty of the "appropriate state" under article VI of the Outer Space Treaty is a duty of due diligence: it has the obligation of continuing supervision over non-governmental entities. In this respect if a state is unable to supervise an activity that it has authorised, it is in breach of its duty of due diligence, hence responsible for the damages committed in the scope of this activity.[174]

---

[170] Two elements to held a state internationally responsible for the acts of a private person (See *United States Diplomatic and Consular Staff in Tehran*, Judgment, I.C.J. Reports 1980, at 37).

[171] It should be stressed that the licensing process at the national level expressly gives to states a control over private entities, in order to avoid any danger for its national security, its international obligations or even its foreign policy. This process can have some extra-territorial effect and relies on a deterrent function: the possibility to impose high fines. The best example is the United States law for remote sensing (see S. Parisien, "La commercialisation des activités de télédétection spatiale aux États-Unis: considérations nationales et internationales" (1995) XX-II AASL 241, at 255-256).

[172] See article 8 of the ILC Draft Articles on State Responsibility, *supra* note 148. Several examples can be found in the awards of the Iran-US Claim Tribunal; see for example *Yeager v. Iran*, 17 Iran-U.S.C.T.R. 92.

[173] See the *Trail Smelter Case* (U.S. v. Canada), [1938 and 1941], 3 R.I.A.A. 1905).

[174] Regarding the large number of satellites to be launched for the LEO constellations, the question arises whether states will be able to have any effective control over the utilisation of hundreds of satellites and, following article VIII of the Outer Space Treaty, to retain "jurisdiction and control", over them (see G.Venturini, *supra* note 33, at 60).

§3: The Protection of Private Interests.

A private company, victim of an international wrongful act in the course of its use of outer space, does not have any direct possibility to present a claim against a state under international law. It may rely on domestic courts to get compensation, but will face tremendous issues of private international law (*e.g.* determination of the competent forum) and state immunities. It may also rely on its state of nationality, through the process of diplomatic protection.

The Liability Convention creates a new claim mechanism for damage caused by a space object. In particular, it avoids some requirements of diplomatic protection such as the exhaustion of local remedies.[175] The claim, however, still depends on states. It cannot be brought directly by a private company against a state or another private company.[176] It should be emphasized that this mechanism is only applicable for damage caused by the space object, and in no case due to the activity itself.[177] In other words, a private entity victim of a state space activity (for example on an issue of appropriation of outer space) cannot rely on the mechanism of the Liability Convention to be indemnified. Its sole international recourse will be the diplomatic protection of its state of nationality, on the basis of article VI of the outer space treaty.

Recourse to diplomatic protection is an uncertain remedy for private entities. States have no duty to make a claim and, if they get compensation, the harmed entity has no right on the money granted. States do not have any obligation to their nationals: in the

[175] See Liability Convention, article XI§1.
[176] See Chapter 4, section 2, paragraph 2, below.
[177] See *infra* note 266 and accompanying text.

diplomatic protection mechanism, the claim does not belong to the harmed party but rather to the state.[178]

This mandatory recourse to states to claim compensation seems to be a disadvantage for private entities. Any damage will involve a difficult legal process to be compensated, and its issue is uncertain. This mechanism, nevertheless, is also in the very interest of private space companies – and of their potential victims. Private entities cannot directly claim compensation but, on the other hand, they are not internationally responsible: a state will be held responsible for their action.

Financial investment in satellite construction and launching, as well as possible damage caused on the surface of the Earth, could involve the loss of tremendous amounts of money. If a private company were declared responsible for such a damage, the risk it would take in space activities would merely be to go bankrupt and to lose all its assets. It would be deterrent for private involvement in space.[179] It would also be dangerous for the victims, if the author of the damage goes bankrupt and becomes unable to pay all the compensation due.

---

[178] See B. Bollecker- Stern, "Le préjudice dans la théorie de la responsabilité internationale" (Pédone, 1973) at 106-109.

[179] See B.A. Hurwitz, "Liability for Private Commercial Activities in Outer Space" (1990) Proceedings of the 33rd Colloquium on the Law of Outer Space 37.

Section 2: Extent of the Responsibility.

§1: Commercial Space Activities by States.

The direct consequence of article I of the International Law Commission Draft Articles on State Responsibility[180] is that responsibility for commercial space activities operated by states (through governmental entities or private companies on behalf of the state) is born by the state itself. Any infringement of the principles of the Outer Space Treaty is a breach of international law, hence an internationally wrongful act.[181] General international law applies, with the possibility for states to claim compensation against each other through diplomatic channels and to have recourse to counter-measures (in the respect of international law, and *inter alia* of the UN Charter that prohibits the use of force).[182]

This responsibility of the state becomes a strict liability if a space object that a state launched for a commercial activity produces a damage. The 1972 Liability Convention applies to any space object, whether its purpose is commercial or not.

§2: Commercial Space Activities by International Organisations.

International organisations also have commercial space activities. They were created to maximize international cooperation, which was rendered necessary by the large

[180] Quoted *supra* note 149.
[181] Provided that the state is party to the treaty. Otherwise, it should also be proven that the principle infringed has become a rule of customary international law. As all major space powers are party to the 1967 Treaty, this evidence may be easy to make.
[182] See United Nations Charter, article 2 (4).

amount of financial and technical means associate with space projects. The best example is still INTELSAT.

Under the classical law of international responsibility, international organisations, as opposed to their member states, are responsible for their own actions.[183] However, space law has developed a specific regime for international intergovernmental organisations. Article VI *in fine* of the Outer Space Treaty states that responsibility for space activities of international organisation is born by the organisation and its member states. Once again a principle of vicarious responsibility of a state is provided.

Regarding the space object launched by or for an international organisation, article VII of the Outer Space Treaty does not refer to international organisations. Article XXII of the Liability Convention, nevertheless, reiterates the principle of state vicarious liability and develops it. According to this article:

> "1. In this Convention, with the exception of Article XXIV to XXVII[184], references to States shall be deemed to apply to any international intergovernmental organisation which conducts space activities if the organisation declares its acceptance of the rights and obligations provided for in this Convention and if a majority of the States members of the organisation are States Parties to this Convention and to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.[185]

---

[183] See L.Peyrefitte, *supra* note 7, at 295.

[184] Those articles concern the signature, denunciation, and entry into force of the Convention.

[185] For example, the European Space Agency made such a declaration (Assembly resolution 2777 (XXVI), annex, of 29 November 1971). See United Nations General Assembly, *Report of the Legal Subcommittee of the C.U.O.P.U.O.S. on the work of its 37th session* (UN Doc. A/AC.105/698, April 6, 1998) at 18.

2. States members of any such organisation which are States Parties to this Convention shall take all appropriate steps to ensure that the organisation makes a declaration in accordance with the preceding paragraph.

3. If an international intergovernmental organisation is liable for damage by virtue of the provisions of this Convention, that organisation and those of its members which are States Parties to this Convention shall be jointly and severally liable; provided, however, that:

a. any claim for compensation in respect of such damage shall be first presented to the organisation;

b. only where the organisation has not paid, within a period of six months, any sum agreed or determined to be due as compensation for such damage, may the claimant State invoke the liability of the members which are States Parties to this Convention for the payment of that sum.

4. Any claim, pursuant to the provisions of this Convention, for compensation in respect of damage caused to an organisation which has made a declaration in accordance with paragraph 1 of this Article shall be presented by a State member of the organisation which is a State Party to this Convention."

In other words, claims shall be directed first towards the organisation and, if it does not pay, to a member state of that organisation. When an international organisation does not make a declaration of acceptance, the state representing the victim has no obligation to present its claim to the international organisation: it can address it directly to a member state. Member states have, nevertheless, a possibility to claim to all the other member states of the organisation for any reimbursement.

This situation is logical, as international organisations do not exist on their own, but thanks to their member states.[186] Moreover, those member states are the ones who get profits of the international organisations action.

Whether their space policy is done on their own, through international organisations or relying on private initiative, states are at the center of responsibility. This principle is understood by the international community to such an extent that, sometimes, when a principle of responsibility is reiterated in international texts, the role of international organisations is avoided to focus only on states.[187]

§3: Enforcement of International Responsibility and Dispute Settlement.

Enforcement of international law is a classical question. The lack of mandatory dispute settlement procedures and the non-existence of any global enforcement mechanism are well-known arguments. Does that mean that international law is weak and useless? Yet, as noticed by a judge of the International Court of Justice, there is no state, nowadays, that pretends that it does not care of international law.[188]

---

[186] See the *Reparation for Injuries Suffered in the Service of the United Nations Case*, Advisory Opinion, I.C.J. Reports 1949 at 174, in which the International Court of Justice insists on the will of Member States to recognise that the United Nations is an international person, and what its capacity is.

[187] See principle XIV of the United General Assembly Resolution on Remote Sensing 41/65 of December 3, 1986. This principle avoids the issue of direct responsibility for international organisations for remote sensing activities. According to it, states are responsible for remote sensing activities undertaken by international organizations. Not a word concerns primary responsibility of those organisations, despite the fact that some of them, such as the European Space Agency, have recourse to remote sensing. See L.Peyrefitte, *supra* note 7, at 295-296.

[188] "Aucun État ne prétend plus, à l'époque contemporaine, se moquer du droit et tous déclarent le respecter, voir le servir" G. Guillaume, *Les grandes crises internationales et le droit* (Seuil, 1994) at 8.

A single state, through counter measures, can ensure the respect of international law.[189] Several states may also join to make international law respected; this is especially linked to the notion of collective self-defense.[190] Risk of ostracism for a state that does not respect the international order: it can be banned from the international community.

This traditional view, however, encompasses only relations between states, which can have recourse to all the possible means of international law to try to settle their disputes: mediation, conciliation, good-offices, arbitration or juridical settlement through the International Court of Justice.[191] As a last recourse, they can rely on putting pressure on the other party, within the limits permitted under international law (such as prohibition of the use of force).[192] For example, the U.S.A. re-established some customs duties on several agricultural products exported from Honduras, in order to force the Honduras' Government to act against two television channels broadcasting American programs in infringement of copyrights law.[193]

Development of private satellite operators (especially with hundreds of satellites to be launched in low-earth orbit) and importance of state activities in outer space may lead to dispute between non-governmental entities and states. Private companies, like

---

On this issue, see especially L. Henkin, *How Nations Behave. Law and Foreign Policy* (Columbia University Press, 1979).

[189] See for example the *Air Service Agreement Case* (France v. United States), [1978] Arbitral Tribunal, quoted in D.J. Harris, *supra* note 146, at 11-15.

In a broader way, A. d'Amato uses the term "reciprocal-entitlement violation" (A.d'Amato, "Is International Law Really 'Law'?" in M. Koskiennemi, ed., *International Law* (Darthmouth, 1992) at 25-46).

[190] See article 51 of the United Nations Charter.

[191] On this issue, see J.G. Merrils, *International Dispute Settlement*, (Grotius, 1991).

[192] See United Nations Charter, article 2 (4).

[193] See "Des Américains menacés au Honduras après l'exécution d'un Hondurien en Arizona" (April 25, 1998) http://www.yahoo.fr/actualite/980425/international/893530560-yaho893530599095.html (Date accessed: April 25, 1998). This a usual way of proceeding against piracy for the United States (See T. Kosuge, "Legal Problems of Direct Broadcasting by Satellite - programme, advertising and copyright issues" in C-J Cheng and P. Mendes de Leon, eds, *supra* note 167, at 96).

individuals, are not considered as enjoying an international personality,[194] and thus lack capacity to intervene on the international stage to protect their rights.

In international law, legal dispute settlement mechanisms allowing natural or juridical persons to sue a state are rare. They are in very specific fields, mainly for the protection of human rights[195] (but also exist in other domain as the law of the sea).[196] Some possibilities, however, exist to have economic dispute between states and private companies settled by arbitration, through the International Convention for the Settlement of Investment Dispute (I.C.S.I.D.) [197] process or the arbitration tribunal of the International Chamber of Commerce for example.

However no similar mechanism for space disputes had been provided. The development of binding procedures for commercial activities (whether private, done by state or by international organisations) would be a method to secure the tremendous investments involved in satellites operation. There is room to hope for a new development in this field, with the creation of an arbitration tribunal in Paris [198] and the work of the International Law Association to produce a draft convention to constitute an international tribunal for Space Law.[199]

---

[194] See N.Q. Dinh, P.Daillier, A.Pellet, *supra* note 92, at 618.

[195] For example within the framework of the European Convention on Human Rights (signed in Rome, 4 November 1950) quoted in M. Delmas-Marty C. Lucas de Leyssac, Eds, *Libertés et droits fondamentaux*, (Seuil, 1996), 69.

[196] The United Nations Convention on the Law of the Sea created a Tribunal for the Law of the Sea. Private companies may seize the tribunal. However, the defending state may ask to the state that sponsors the company to take its place in the procedure (Article 190. 2).

[197] See the *Convention on the Settlement of Investment Disputes between States and Nationals of Other States* (Washington, 1965), (1965) 4 ILM 532.

[198] The International Space and Aviation Arbitration Court (See M.G. Bourély, "Creating An International Space and Aviation Arbitration Court" (1993) Proceedings of the 36th Colloquium on the Law of Outer Space 144).

[199] The Final Draft of the Revised Convention on the Settlement of Disputes Related to Space Activities (as amended at the 68th ILA Conference) is quoted in K-H. Bockstiegel, "Neue weltraumrechtliche Arbeiten der International Law Association (ILA)", (1998) 47.3 ZLW 337.

Another issue remains, namely disputes between purely private entities. In such a case, international law and the international organisation are not directly concerned. It is a matter for the application of national laws. The main question is the determination of the competent forum and law.[200] This is an argument to develop a treaty of private international law in order to enhance the unification of domestic regulations applicable in this area.

Another problem should also be emphasised, as far as international organisations are concerned, is that they have a direct advantage from their international personality, namely immunity of jurisdiction and execution. Moreover, a private entity facing a dispute with an international organisation is also confronting indirectly the interests of the all the member states of this organisation: any compromise might be difficult to make. This gives to international organisations an unacceptable advantage over private entities.[201] The existence of an international dispute settlement system to which international organisations could participate would be a step in the right direction.[202] The trend of privatisation of international organisations, nevertheless, has the advantage to bring the actors of space activities on an equal footing for the issue of responsibility.

See also K-H Bockstiegel and W. Stoffel, "Private Outer Space Activities and Dispute Settlement" (1994) 1 Telecommunications and Space Journal 327, at 334.

[200] On this issue, see L.J. Eisenstein, "Choice of Law Regarding Private Activities in Outer Space: A Suggested Approach" (1986) 16 Calif. W. Int'l Jrnl 282. See also, focusing on the applicable law in the United States, L.G. Dribin, "What Space Law Will Govern Accidents and Breaches of Contract in Outer Space" (1988) Proceedings of the 31st Colloquium on the Law of Outer Space 165.

[201] See K-H Bockstiegel and W. Stoffel, *supra* note 199, at 333-334.

[202] The Final draft of the Revised Convention on the Settlement of Disputes Related to Space Activities (as amended at the 68th ILA Conference), in its articles 1 and 69 provides the possibility for international intergovernmental organisations to become party to it.

Chapter IV: Liability of States for the Space Objects.

Satellites, component parts of rockets, debris of previous launchings or of satellites, all those items can fall to the Earth, or collide with other objects in outer space. The risk for third parties, on the surface of the Earth, is not negligible. Several cases of debris re-entry into the Earth atmosphere, with eventual impact on the ground, are known.

For example, in November 1960, reportedly some debris of an American satellite fell on a farm in Cuba; several people were injured and a cow was killed.[203] In June 1969, five seamen on a Japanese ship were injured, struck by a satellite segment.[204] Other more dramatic cases have occurred, involving nuclear danger. The famous Apollo 13 mission returned to Earth with a nuclear generator intended for the moon, and finally lost it: the nuclear generator has never been found; NASA hopes it lies deep in the Pacific Ocean. [205]

In 1978, a satellite launched by the U.S.S.R., "Cosmos 954", crashed in a remote part of the North-West Territories of Canada, with a nuclear generator on board. This accident is the only international dispute which has arisen from a damage caused by a space object. Radioactive pieces of various sizes were found in Canada's North-West Territories, and the soil of the area had to be cleaned. Canada presented to the Soviet Union a claim for more than six millions of dollars. The case was eventually settled by an informal agreement, not within the framework of the 1972 Liability Convention. By it was agreed that the U.S.S.R. should pay to Canada the sum of $3 million.[206]

---

[203] See M.N. Taishoff, *State Responsibility and the Direct Broadcast Satellite* (Frances Pinter, 1987) at 107.
[204] *Idem.*
[205] See B. Cheng, "International Liability for Damage Caused by Space Objects", in N. Jasentuliyana and R-S.K. Lee, eds., *Manual on Space Law*, vol.1, (Sitjhoff, 1979) at 83-84.
[206] See *Cosmos 954 Incident, U.S.S.R. Note*, (1979) 18 I.L.M. 899, and *Re: Cosmos Satelitte 954, Statement of Claim by Canada*, (1981) 20 I.L.M. 689.

The risk of return to Earth of space objects exists also with the new satellite constellations; due to the large number of satellites planned to be launched the situation may become alarming. For example, the Teledesic project was first expected to consist of a constellation comprising 840 satellites, 10% of which per year might fall on Earth. This meant 84 satellites a year, or more than 3 satellites every 2 weeks. Despite the delay in the operation of mobile satellites constellation, statistics seem alarming: it is estimated that, nowadays, an average of one object falls on Earth every day. [207] It would be unrealistic to expect all of them to disintegrate completely upon their re-entry in the atmosphere, or to fall on the high seas or on an uninhabited area.

The drafters of the Outer Space Treaty were aware that, because space activities are ultra-hazardous by nature, there is a need to protect potential victims from these activities. They were more concerned with the risks posed by space activities on Earth than the ones existing in outer space.[208] It is true that risk for satellites in outer space are not very important, at least according to statistics. The number of collisions in outer space seems to be still pretty low: some experts estimate that the risk of accidents in outer space is of one every 42 years.[209] As a matter of fact, the only recorded accident concerns the French satellite "Clementine" which collided with a former part of an Ariane IV rocket in July 1996.[210]

---

[207] See R. de La Baume and J.-J. Bertolus, *supra* note 126, at 166 and B. Cot, "Dangers volants identifiés", *L'Express* (July 22, 1999) at 24-25.
[208] See D. Maniatis, "The Law Governing Liability for Damage Caused by Space Objects: from State Responsibility to Private Liability" (1997) XXII-I A.A.S.L. 369, at 378-379.
[209] See N. Johnson, NASA Program Director, quoted in B. Cot, "Dangers volants identifiés", *L'Express* (July 22, 1999) at 24-25. Nevertheless, according to some writers several accidents would have already occurred: see M. Bourély, "Quelques particularités du régime de la responsabilité du fait des activités spatiales" (1990) XV A.A.S.L. 251, at 252.
[210] See "L'encombrement de l'espace devient crucial," *Air et Cosmos* (March 21, 1997) at 40.

The probabilities for collision is still relatively low but it increases dramatically with the development of space activities: in 1980 the time necessary to have a collision between two active satellites was estimated at 90 million years. In 1984 it became 27000 years, and it was expected to become only one year by the year 1990.[211] This tremendous evolution does not take into account the existence of space debris, whose development is also frightful. It is estimated that only six percent of the most important objects orbiting around Earth are useful.[212] The North America Aerospace Defense Command of the US Air Force is tracking every day the trajectory of not less than 9,500 space debris of more than ten centimeters, but the NASA estimates the total number of such debris to 2.17 million.[213] It is also estimated that there are around 3.5 million of debris of less than 10 centimeters.[214] The financial consequence of a collision in outer space can be enormous: it is easily estimated that a commercial satellite can have a value of at least 500 million dollars.[215]

The solution of the drafters of the Outer Space Treaty was to provide a regime of liability that relies on the mere existence of damage. This principle was set forth in article VII:

> "Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such

---

[211] See B.A Hurwitz., *State Liability for Outer Space Activities in Accordance with the 1972 Convention on International Liability for Damage caused by Space Objects*, (Nijhoff, 1992), at 33.
[212] See "L'encombrement de l'espace devient crucial", *Air et Cosmos* (March 21, 1997) at 40.
[213] See R. Fekete, O. Cousi, "Qui est responsable des débris spatiaux ?", *Les Échos* (December 5-6, 1997) at 57.
[214] See "Les débris de l'espace", *Sciences et Avenir* (September 1999) at 13.
[215] See C.W. Kunstadter, "The Economics of Space Operations: Insurance Aspects" in J.A. Simpson, *Preservation of Near earth Space for Future Generations* (Cambridge University Press, 1994), at 160.

object or its component parts on the Earth, in air space or in outer space, including the moon and other celestial bodies".

This principle was confirmed and developed through the 1972 Liability Convention. This agreement created a regime of absolute liability for damage to third parties on the surface (or aircraft in the air) and a regime of fault liability for damage occurring in outer space. We shall study the scope of application of this Convention and the original regime it provides.

Section 1: The Liability of Launching States.

The main idea of the 1967 Outer Space Treaty, in its article VII, and of the 1972 Liability Convention can be summed up in few words: liability for damage caused by a space object is born by the launching state(s). However, this poses several questions as space law lacks definition in this respect.

We shall try to determine what the responsible states are, referred to as "launching state(s)" in the Liability Convention, what "launching" and "space object" mean, keeping in mind the challenges to those tentative definitions done by the practice of private companies.

§1: What is a Launching State?

The 1972 Liability Convention, like the rest of space law, is state centered. This means that the entire liability regime set forth by this agreement is directed towards states. The responsible entity for a space object is its "launching state".

According to article 1 (c) of the Liability Convention:

> " The term 'launching state' means:
>
> (i) a state which launches or procures the launching of a space object;
>
> (ii) a state from whose territory or facility a space object is launched;"

This definition seems to be quite broad, relying on an objective link between the launching activity and the definition of a responsible state. Indeed, in accordance with article VII of the 1967 Outer Space Treaty, there are four possible definitions of a launching state: The one that launches, the one that procures the launching, the one from whose territory the launching is done, and the one from whose facility the activity takes place. Of course, there can be more than four launching states, with a joint launching of satellites for two different countries, for example. Therefore, the system seems well constructed, especially with the criterion of the territory to link a space object to a responsible state. This reminds us of the famous Roman law principle: "*mater certa, pater incertus*". Thanks to the missiles detection system that exist, any launching cannot be hidden to the international community. [216] Any space object should be, then, easily linked to a state.

[216] See B.Cheng, "Space Objects and their various connecting factors", in G. Lafferanderie and D. Crowther, *supra* note 33, at 205.

The potential efficiency of this regime, however, is threatened by private activities. The Liability Convention only deals with launching states, not with non-governmental entities. It voluntarily avoids any reference to private launchings.[217] A sensitive question arises: if a launch is done by a private company, is it encompassed by the Convention? Launching states are defined by their actions: "a state which *launches* or *procures* the launching", or by objective link to the activity (territory/facility). If the action is done by a non-governmental entity, there is no state to launch in the textual meaning of this sentence. We have, then, to rely on the objective criteria: territory and facilities of a state. However, private launches can also avoid those two factors (*e.g.* with launching from an area outside any sovereign jurisdiction: from a platform in the high sea or from an aircraft[218]). In such a case, there might be no launching state; article VII of the Outer Space Treaty and the Liability Convention would become useless.

The dramatic example of the Sea-Launch project is a good illustration of a limit to the "launching state" definition. It intends to do some launching by a private company (not by a state), from the high-seas (outside any sovereign territory), from a platform owned by the company (not a state facility), and among its first customers are some private companies (no state procures the launching). Moreover, the company is incorporated in the Cayman Island (for tax purposes). The launching itself will be done under the supervision of the American company Boeing (40% interest in the Sea Launch company). The platform was built by Kvaerner, a Norwegian enterprise (20% of the share). The Ukrainian NPO Youjnoye and the factory Youjmach furnish the Zenith rocket (they have 15% of the company), and the company RSC Energya,

[217] See I.H. Ph. Diedericks-Verschoor and W.P. Gormley, *supra* note 40, at 147.

[218] If the Sea-Launch already operates from the high-sea, so far no commercial launcher uses aircraft. This should, nevertheless, happen by 2003. Some Russian and Ukrainian companies have joined in a

responsible of the technical assistance, is Russian (25 % participation in the project). The first launch was scheduled for the end of October 1998.[219] 18 launches were planned in 1998.[220] Will there be any launching state, liable for the space objects?

The doctrine on this issue is split into two parts. On one hand, the Liability Convention does not refer to activities of natural or juridical persons of a state, but it would appear logical to read it in conjunction with the Outer Space Treaty, through its article VI, which provides responsibility of states for their nationals.[221] Indeed some writers think there are several launching states even when the activity is operated by and for private entities. Their view is that a state is a launching state as soon as an entity which has its nationality participate in the launching.[222]

On the other hand, some writers consider that the Liability Convention is inapplicable to such a case. There is no direct intervention of states in the launching process, and article 1 of the Convention only refers to states: the link of nationality is not a

---

consortium called "Air Launch" (see "Des satellites lancés par avion", *Le Figaro* (April 27, 2000) at 16).

[219] The first launch had been rescheduled for March 1999, due to a survey by the American administration of a possible illegal transfer of technology to Russia and Ukraine ("Le premier essai de Sea Launch reporté" *La Tribune* (October 29, 1998).
On March 28, 1999, Sea-Launch successfully launched a Zenith rocket, and is now fully operational (see "Sea Launch réussit son premier lancement de fusée sur plate forme") *La Tribune* (March 29, 1999).

[220] For all those details, see C. Sotty, "Le Sea Launch en voie d'achèvement en Russie" *Air et Cosmos* (June 5, 1998) at 54-56.
A launch for the ICO company failed in the beginning of 2000 (see "Past Launches", http://www.sea-launch.com/special/sea-launch/past-launches.html (Date accessed: August 26, 2000). Lately, a launch for Panamsat was successful (See "Current Launch", http://www.sea-launch.com/special/sea-launch/current-launches.html (Date accessed: August 26, 2000)).

[221] See S. Gorove, *Developments in Space Law: Issues and Policies* (Nijhoff, 1991), at 189. However, this writer is of the opinion that such an interpretation would run contrary to the strict interpretation of the language used in the Liability Convention.

[222] See for example, P.D. Nesgos, *National Law and Commercial Activities in Outer Space*, D.C.L. Thesis, Mc Gill University, 1983 at 281, according to whom "a private individual providing a payload for launch could be found to have procured the launch, and thus, constitutes his country a launching state".

sufficient criterion to make a state a launching state.[223] This is a textual interpretation of the treaty, in accordance with article 31 of the 1969 Vienna Convention on the Law of Treaties.[224]

An intermediate view can be found when one considers that launching states are also defined by the use of their territory or their facility and understands this as a direct reference to their territorial or quasi-territorial jurisdiction.[225] This means, in the case of a launch from an area outside sovereign jurisdiction by non-governmental entities, that the state that has quasi-territorial jurisdiction on the launching, through the use of facilities registered in this state, is the only launching state.[226] This approach has the advantage of defining a liable state under the Liability Convention while avoiding at the same time the peculiar issue of the nationality link between private entities and responsible states. However to consider as "launching state" the state that has jurisdiction over the facility (*i.e.* for a launching from the high-sea over the ships and platform) brings the famous flags of convenience in space law. This result can be counter-productive, going against the intentions of the drafters of the Convention.[227]

Hence, the need for a clarification of what the "launching state" is, was pointed out by the legal subcommittee of the C.O.P.U.O.S..[228]

---

[223] See P-M. Martin, "Quel Avenir Pour Les Articles VI Et VII du Traité sur L'Espace" (1997) 46.2 ZLW 222, at 224-225; and K-H Bockstiegel, "The Term 'Launching State' In International Space Law" (1994) Proceedings of the 37th Colloquium on the Law of Outer Space 80, at 81-82.

[224] See the *Convention on the Law of Treaties* (signed in Vienna on May 23, 1969), (1969) 8 I.L.M. 679.

[225] See B. Cheng, *supra* note 205, at 103 and 120-121.

[226] See K-H. Bockstiegel, *supra* note 223, at 82.

[227] See P.M. Martin, *supra* note 223, at 225: in such a case, according to him, article VII of the Outer Space Treaty loses all its signification for the questions of liability.

[228] "New developments in the field of launching technology and the privatization of this sector could lead to the conclusion that this definition is not sufficient. Therefore, on the basis of a technical review in the Scientific and Technical Subcommittee (...) it should be investigated whether the definition of the term "launching State" still adequately covers all launching activities" (United Nations General Assembly, *Report of the Legal Subcommittee of the C.U.O.P.U.O.S. on the work of its 37th session* (UN

§2: What Do "Launching" and "Procures a Launching" Mean?

The only definition of "launching" given by the space treaties is partial. Only article I (b) of the 1972 Liability Convention gives a definition, which is: "The term 'launching' includes attempted launching". There is no, however, any practical legal issues linked to the lack of definition of launching.

From a practical viewpoint it could be correct to define launching as "placing or attempting to place a vehicle constructed for the purpose of operating in, or placing a payload in a suborbital trajectory or in outer space".[229] Regarding unsuccessful launchings, in accordance with article 1(b) of the Liability Convention, any aborted launching is considered as a launching. Professor Gorove expressed an interesting analogy with criminal law for this purpose. He suggested several guidelines to consider whether a tentative launching is encompassed by the Liability Convention:

> "(a) attempted acts must be intended; (b) they cannot be absolutely impossible of commission; (c) they must involve 'perpetration' or 'execution,' rather then mere 'preparation;' (d) they have to come close to success; and (e) the means used must be adequate."[230]

The main question linked to launching for commercial satellite lays with the exact definition of a procurement of a launching. A launching state is not only the state that

---

Doc. A/AC.105/698, April 6, 1998) at 20). A Working Group received the task to work on the deifinition of 'launching state', and might issue a draft definition (See United Nations General Assembly, *Report of the Legal Subcommittee of the C.U.O.P.U.O.S. on the work of its 39th session* (UN Doc. A/AC.105/738, April 20, 2000), Annex II).

[229] S. Gorove, *supra* note 8, at 77.

[230] S.Gorove, *supra* note 221, at 186.

launches but also the one that "procures a launching".[231] The question arises to know what this idea of procurement exactly means. To draw again an analogy with criminal law, one could say it must be considered as meaning help and assistance, *i.e.* bringing complicity to the state that launches. The most obvious case of a launching procurement is when state A's satellite is launched by state B. State A definitely "procures a launching";[232] he is in a way the 'intellectual perpetrator' (*auteur intellectuel* in French criminal law) of the launch.

However, the distinction between a mere involvement (such as the supplying of a minor component) and a real procurement is hard to draw for other instances.[233] For example, most of the financing of satellites and launches are done through some consortiums or pool of banks. Does it mean that to help someone to finance a satellite and its launch is procuring a launching? Some writers expressed this view.[234] However, the participation of financing, even if necessary to have the economical capability to operate and launch satellites, seems to be too remote from the technical operations involved in the launch itself. The purpose of the Liability Convention is to protect third parties against ultra-hazardous activities. Financing, as such, does not seem to be ultra-hazardous: to include the entities responsible of the financing appears to go beyond the intent of the drafters of the Convention.

---

[231] See 1972 Liability Convention, article 1 (c)(i). In French is used the expression: "*faire procéder*".
[232] See K-H Bockstiegel, *supra* note 223, at 81.
[233] *Ibid.*
[234] See R. Martin, "Legal Ramifications of the Uncontrolled return of Space Objects to Earth" (1980) 45 J. Air L. & Com. at 471, quoted in D. Maniatis, *supra* note 208, at 383.
According to M.N. Taishoff, *supra* note 203, at 112, "If we assume the 'simplest' case of damage –in the sense of proof- that of actual, physical damage caused by a satellite falling out of orbit and back on earth, would all the states (provided they signed and ratified the Conventions) whose nationals financially participated in the launching be considered liable for damage suffered? The answer indeed appears to be yes, since states are responsible for all national activities in space, be they governmental or non governmental." This approach reads article VII of the Outer Space Treaty and the Liability Convention through the state responsibility principle of article VI of the Outer Space Treaty. Some writers would disagree (see S. Gorove, *supra* note 221).

The issue of technical involvement is also questionable. If a state produces a small component used for a launch, does it mean it procures the launching? Its capacity to control the operation is non-existent. It should not be considered, in equity, as responsible for the launching.

The idea expressed in those two examples is that whereas satellite financing and components are necessary for a launch to take place, they are remote from any damage that a launching may cause. It is doubtful that they could be considered as a *proxima causans* of a damage, *i.e.* as a direct cause. In international law, the view is to take into account only direct consequences of anyone's act.[235]

Still, other involvement in the launching process raise also the question whether they should be considered as procuring a launch. This is the case for a satellite's export license. A country that allows one of its companies to export a satellite to be launched could be considered as procuring a launching. The exportation is the first and unavoidable step to bring the satellite on the launch pad: the exporting state has the possibility to prevent a launch that could be considered as dangerous or contrary to international law. This is even more exact for states authorising and licensing the launching activity itself. [236]

For commercial satellites, the question also exists with issues of 'in orbit deliveries' or 'satellite leasing'. If a state A launches a satellite which is latter used by a company of

---

[235] "En principe, la solution est simple et ferme. Selon une pratique et une jurisprudence internationales constantes, seul le préjudice direct est succeptible d'engager la responsabilité internationale." (N.Q. Dinh, P.Daillier, A.Pellet, *supra* note 92, at 755). See also B. Bolecker-Stern, *supra* note 178, at 221.

[236] See H.A. Wassenbergh, "Public Law Aspects of Private Space Activities and Space Transportation in the Future" (1995) Proceedings of the 38th Colloquium on the Law of Outer Space 246, at 247. However, the view wether authorization is synonimous or not to procurement of a launching is disputed. See United Nations General Assembly, *Report of the Legal Subcommittee of the C.U.O.P.U.O.S. on the work of its 39th session* (UN Doc. A/AC.105/738, April 20, 2000) at 11).

state B, can it be considered that state B procured the launching? Or, especially if the satellite was not originally intended to be used or bought by B's company, should the definition of launching be extended in order to have state B considered as a launching state? This would mean that a new launch takes place when B bought the satellite from A. Such a case would imply that launching is not only the placing or attempted placing of a satellite in orbit, but any operation leading to a change in the operator or in the user of the object.

There is no generally accepted answer, nor a binding definition of what is a launching. Hence, to encompass, through an extended interpretation, transactions occurring once the satellite is launched would have the advantage of bringing responsibility closer to the operators. The need for a better definition of what state is responsible and for what is also in the interest of the development of commercial and private space activities.[237]

§3: What is a "Space Object"?

"Object launched into outer space" [238], "launching of an object into outer space"[239], "space object"[240] or even "space objects launched into earth orbit and beyond"[241], all

[237] According to P. Nesgos: "Clarification of which participants and their launching states would be internationally liable for damage arising from space activities at launch and during the conduct of space activities would be welcome by the commercial space industry" (P.D. Nesgos, "Commercial Space Law: Practical Examples Relating to Contracts, Insurance and Finance" (1994) Proceedings of the 37th Colloquium on the Law of Outer Space 305, at 311).

[238] 1967 Outer Space Treaty, article VIII, 1968 Rescue Agreement and 1974 Registration Convention in their very title.

[239] 1967 Outer Space Treaty, article VII.

[240] 1972 Liability Convention, in its title and in article I, II, III, IV, V, VII; 1968 Rescue Agreement, article 5, 1974 Registration Convention, articles I, II, IV, V and VI

[241] Article II of the 1974 Registration Convention

the space treaties use the term "space object" but sometimes with those slight differences.[242] However, there is no comprehensive definition in any of the space treaties of what a "space object" is. Only a partial definition can be found in the 1972 Liability Convention, article I (d), and in the 1974 Registration Convention, article I (b). Those articles refer back to the notion of space object: "The term 'space object' includes component parts of a space object as well as its launch vehicles and parts thereof".[243]

One of the main question for liability, especially as far as the 1972 Liability Convention is concerned, is to know what can be understood by "space object" and what is a damage caused *by* a space object.

It is doubtless that satellites in outer space are meant to be space objects.[244] Nevertheless, this answer needs to be more comprehensive: when does an object start and stop being a space object?

Let us first study the case of satellites on their way to outer space or whose launch failed. The 1972 Convention includes in its scope of application any "attempted launching".[245] Hence, any satellite intended to reach outer space should be considered as a space object in the scope of this Treaty[246]: to exclude objects during the launching

---

[242] On the question of whether all those concepts have the same meaning, see B. Cheng, *supra* note 8, at 17. As the Liability Convention deals only with the term "space object", we shall restrain our short survey of this issue to it.

[243] This definition is applicable to the other space treaties. The Outer Space Treaty, the 1968 Rescue Agreement and the 1979 Moon Agreement in their preparatory works did not regard components parts of a space object as non space objects (See S. Gorove, "Issues Pertaining To The Legal Definition 'Space Object'" (1995) 2 Telecommunications and Space Law Journal 135, at 137).

[244] See S. Gorove, «Towards A Clarification of The Term 'Space Object'- An International Legal And Policy imperative?» (1993) 21.1 Journal of Space Law 11, at 21.

[245] 1972 Liability Convention, article I(b).

[246] In 1964, Australia and Canada proposed to define space object as "an object or any of its components parts which a launching State has launched or *attempted to* launch into outer space" (UN Doc. A/AC.105/C.2/SR.106, p.67, emphasis added; Quoted in B. Cheng, *supra* note 8, at 26-27). The idea that space object should encompass objects involved in attempted launching, and thus to rely on

phase would be against the intent of the drafters of the Liability Convention and of article VII of the Outer Space Treaty.[247] The practice seems to conform with this view.[248]

The same argument can be stated when a satellite comes back to Earth[249]: on its way back and when it comes into contact with the ground, it is a space object. However, once it is safely recovered and is not used any more as a space object, it ceases *ipso facto* to be ruled by the Liability Convention. [250]

In short, a space object is an object which is on its way to or from outer space, or which is orbiting.[251]

This implies that any commercial satellite, once its launching has started, is ruled by the 1972 Liability Convention and article VII of the 1967 Outer Space Treaty. Its launching state(s) will be considered liable for any damage caused by it.

---

the intention of its makers, is a leitmotiv in the doctrine. See, for example, B.Cheng, "Spacecraft, Satellites and Space Objects" in R. Bernhardt (Ed.) *Encyclopedia of Public International Law*, vol.11, 1989, at 310, quoted *infra* note 248; G. Gál "Space Objects-'While in Outer Space'" (1994) Proceedings of the 34th Colloquium on the Law of Outer Space 84, at 85; H. Wassenbergh, "An International Legal Framework for Private Space Activities", (1997) XXII-I A.A.S.L. 529, at 532, and M. Lachs, *supra* note 109, at 69, quoted in H. Wassenbergh, "A Launch and a Space Transportation Law, separate from Outer Space Law" (1996) XXI-I *Air and Space Law* 28, at 29.

For an opposite view, see H. Wassenbergh, *Idem*; According to him, the definition of 'space object' should exclude attempted launchings when it does not reach outer space, unless the parties to the Liability Convention so agreed.

[247] See B. Cheng, *supra* note 8, at 20.

[248] According to B. Cheng, "From the legal standpoint, 'space object' is, in current practice, the generic term used to cover spacecraft, satellites and, in fact, anything that human beings launch or attempt to launch into space, including their component and launch vehicles, as well as part thereof". (B. Cheng, *supra* note 246, at 310).

[249] A voluntary case of this possibility occurred. The space shuttle was used to bring back to Earth some satellites whose launch failed and reached useless orbits. Once repaired, those satellites were sold and launched again (See I.I. Kuskuvelis, "The space risk and commercial space insurance" (1993) 9.2 *Space Policy* 109, at 118).

[250] According to Professor B. Cheng, "(...) a space object does not cease to be a space object (...) merely by the fact that [it has] returned to earth. One can probably say that they do not cease to be such until perhaps [it has] been dismantled or otherwise disposed of." (B. Cheng, *supra* note 8, at 24 and 26).

[251] See S. Gorove, *supra* note 244, at 21.

Nevertheless, the question is more difficult for any fallen parts from a satellite, for satellites broken in several pieces or even useless satellites, in other words, once a satellite has degenerated or has become "space debris".

This kind of debris can exist from the very beginning of a space activity with, for example, some wires used for a launching, travelling their own way in space. The question of space debris is difficult, mainly regarding the qualification of space objects and the applicability of the Liability Convention. A short survey of this issue seems to lead to a positive answer: the Liability Convention is applicable to space debris.[252] Indeed, to hold a different view would go against the intention of the drafters of the Liability Convention.[253]

The definition given by the doctrine of the notion of space objects leads us to consider that the scope of application of the Liability Convention is broad. However, a strict limit exists as this treaty encompasses only damage caused by a space object.[254]

Is the mere use of a satellite that causes damage concerned by this convention? This seems to be too far-fetched a solution. The use of a satellite means that we move to the question of the activity, for which a regime of responsibility exists in article VI of the 1967 Outer Space Treaty. To consider space activities as ruled by two regimes at the same time seems to lead to an ambiguous solution, with a responsibility regime and a liability regime existing for the very same case, *i.e.* with a regime requiring an internationally wrongful act and another one providing absolute liability. This would be non-sense. Moreover, the idea of damage, as defined in article 1(a) of the Liability

[252] See S. Gorove, *supra* note 243, at 140.
[253] *Ibid.* at 139.

Convention and in article VII of the Outer Space Treaty,[255] focuses on harm produced by physical forces as the initial causal factor.[256] The Liability Convention, nevertheless, goes beyond a mere requirement of physical contact: the view that a collision but also the use of laser beams[257] or killer satellites are considered as being in the scope of the Convention was expressed.[258] This is in conformity with the rationale of the Convention, as laser beams definitely have a physical (and deliberate) impact on their target.

The question of frequency interference, on the other hand, could be discussed. Is it a damage caused by a space object? We can wonder if it really causes damage in the meaning of the Liability Convention. Within the definition of this international agreement, the most probable damage caused by frequency interference would certainly be "damage to property". But such damage is not irrevocable, it does not really have any physical consequence; most probably it will have only some economical outcomes, and thus falls outside the applicability of the Convention.[259] This view was already expressed for article VII of the Outer Space Treaty which, according to the U.S. Senate Committee on Foreign Relations, "pertains only to physical, non-electronic damage that space activities may cause to the citizens or property of a signatory State".[260]

---

[254] See 1972 Liability Convention, article II and III.
[255] « The term "damage" means loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organisations » (Liability Convention, article 1a).
[256] See C.Q. Christol, *The Modern International Law of Outer Space* (Pergamon Press, 1982) at 90. See also S. Mosteshar, "Responsibility for Pure Economic Loss Arising from Space Activity" (1991) Proceedings of the 31st Colloquium on the Law of Outer Space 274.
[257] See B. Cheng, *supra* note 205, at 122.
[258] See M.D. Forkosk, *Outer Space and Legal Liability* (Nijhoff, 1982), at 83.
[259] See Chapter IV, section 2, paragraph 2, below.
[260] Quoted in C.Q. Christol, *supra* note 256, at 91.

Furthermore, the argument that the Liability Convention is not applicable to damage due to the activity is usually expressed by the doctrine: it is clear, for example, that the 1972 Convention is not applicable to telecommunications and remote sensing, main uses of outer space.[261] Evidence of this argument can be found in the resolution of the United Nations General Assembly 41/65 of 1986, entitled "principles on remote sensing". Principle XIV of this text deals with responsibility. It recalls article VI of the Outer Space Treaty and the general principles of international law, but does not express that article VII of the Outer Space Treaty or the Liability Convention are applicable to remote sensing activities.

Section 2: The International Liability Regime.

The liability regime of the 1972 Convention is based on fault only for damage done in outer space: on Earth one applies a strict liability regime. We shall study what kind of damage is recoverable and what specific procedure was set forth through this Convention. Despite the fact that this international treaty was an improvement of international law to protect individuals of ultra-hazardous activities, we shall examine what the loopholes of this regime are.

[261] A good reason for that is also because they cannot produce any damage recoverable under the Convention (see Chapter IV, section 2, paragraph 2, below, and P. Achilleas, *supra* 123, at 135; according to him the Liability Convention is applicable only to the conception and functioning of the space systems, not to the programs they carry).

§1: The Absolute or Fault Liability Regime.

The 1972 Liability Convention creates two distinct regimes of liability for damage caused by a space object. The best mechanism developed by the Convention protects innocent third parties: it relies on a regime of absolute liability, whereas for damage occurring between two space activities, the procedure is based on fault.

Any damage due to a space object on the surface of the Earth or on an aircraft in flight is ruled by a regime of absolute liability.[262] This means that the state claiming compensation for a victim does not have to prove any fault. It is the most efficient regime to protect any harmed party. Such a view has already been set forth for other activities, such as aviation[263], but the particularity of the Liability Convention is that this treaty does not provide any limit to the amount of reparation. This means that the full amount of damage should be compensated.

The reason why this approach was taken can be explained by a desire to afford an efficient protection to victims. Space activities are very technical activities. To have to prove a fault or an internationally wrongful act on the part of the operator of the satellite would be difficult.[264]

For any damage caused elsewhere than on the surface of the Earth to space object (or to persons or property on board) by another space object, the launching state of the

---

[262] See Liability Convention, article II.

[263] See the *Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface*, signed at Rome, on October 7, 1952 [hereinafter Rome Convention]. Its article 11 provided a limited amount of reparation.

[264] However, in the case of the Cosmos 954 accident, the Canadian claim argued that the mere fact that a satellite entered into the airspace of a state was a violation of its sovereignty and, as such, entitled the state to get compensation. See (1979) 18 I.L.M. 907.

latter is liable for its fault, or for a fault of a person for whom this state is responsible.[265]

The typical case encompassed here is the collision between two space objects. This would happen between two highly technological activities, with the same level of financial and technical involvement. The requirement of a fault is the most logical approach; as stated by Manfred Lachs:

> "The underlying premise of this solution is obviously that once space objects (including any that may suffer damage) have left the ground all launching states may be presumed to have taken similar risks. Thus none is favoured by the law. This appears well founded." [266]

However, this raises the question whether it can be efficient in practice. There is no definition in any of the space treaties of what is fault. In case of a collision between two satellites out of control, the determination of a fault may result in endless discussions.[267] Moreover, this notion is not very helpful in case of small debris: how would it be possible to determine the state responsible for the generation of the debris, and *a fortiori* to impute the fault to a state?[268]

§2: Procedure and Recoverable Damage.

Reparable damage under the Liability Convention encompasses "loss of life, personal injury or other impairment of health, or loss of or damage to property of states or of

---

[265] See Article III Liability Convention
[266] M. Lachs, *supra* note 109, at 126.
[267] See M. Benko and K-U Schrogl, *supra* note 164, at 259.
[268] *Ibid.*. Nevertheless, it should be stressed that fault is the general term used to hold someone's liability; it can evolve easily -through new interpretations- to follow technical improvements. For example, the French Civil Code relies on the notion of fault (see article 1382 of the French Civil Code).

persons, natural or juridical, or property of international intergovernmental organisations."[269]

This definition is certainly one of the broader existing in international law.[270] The Convention does not provide any limit to the compensation and also clearly specifies the principle of *restitutio in integrum* in its article XII. Nevertheless, some limits exist. For example one can wonder to what extent economic losses are taken into account, especially when they are purely indirect. If a satellite is damaged and becomes unusable, should the state responsible for the damage compensate only the loss of property (*i.e.* the value of the satellite) or also the loss generated by the fact that the satellite could not be used anymore? Given the specificity of commercial space activities, this question is particularly relevant: most of financing of space activity is done before the launch, and profits gained by the activity can start only when the satellite is operated in outer space. The liability regime is applicable only to direct and material damage, not to moral damages and does not encompass damage caused to victims other than persons or goods.[271] It appears that pure economic losses are not recoverable under the Liability Convention, even if principles of justice and equity call for such a reparation; this is an argument in favor of a new drafting of the Liability Convention.[272]

The procedure to get compensation under the Liability Convention relies on states. However, to provide the most efficient method to indemnify natural or juridical

---

[269] Liability Convention, article I (a).
[270] See A.A. Cocca, "The Principle of 'Full Compensation' in the Convention on Liability for Damage Caused by Objects Launched into Outer Space" (1972) Proceedings of the 12th Colloquium on the Law of Outer Space 92, at 93.
[271] See M. Bourély, *supra* note 209, at 255.
[272] See S. Mosteshar, *supra* note 256, at 274-275.

persons, several states can present a claim against a launching state. This protection goes beyond the classical approach of diplomatic protection.[273] The state of nationality may introduce a claim but, if it fails to do so, the state where the damage was sustained has also the right to present a claim. If none of those states act, the state of permanent residence of the victim can claim against a launching state.[274] This is a real progress in the protection of the victims at the international level. However, the defense of their interest still relies on state with all the possible limits existing under the practice of diplomatic protection: no obligation to get full compensation of the damage suffered, nor any duty for the state to redistribute the compensation it obtained.[275]

Moreover, the claim goes through a mechanism that relies on diplomatic channels[276] or, if the claim is not settled within one year, through a "Claim Commission"[277] in charge of deciding the merits of the case and the compensation to be paid.[278] This Commission, due to its composition[279] and to its goal, resembles an arbitration tribunal. However, this is the weakest point of the liability regime of this Convention: the decision of the Commission is final and binding only if the parties have agreed, otherwise it "shall render a final and recommendatory award".[280] Even if the term of "award" is usually used in the context of arbitration, this means that, without the consent of the parties, the Commission is a mere mandatory conciliation commission, or a non-binding arbitration court. It is a mixture between the usual pattern of

---

[273] Under the diplomatic protection rules, only the state of nationality can present a claim (See N.Q. Dinh, P.Daillier, A.Pellet, *supra* note 92, at 760). This is a real limit for harmed enterprises, as it was in the case of the Barcelona Traction. The state of nationality of the company (Canada) did not claim against Spain, preventing the Belgian shareholders of the company to get any compensation from the Spanish government: the claim by Belgium was denied by the International Court of Justice (see *Barcelona Traction, Light and Power CO. Case*, (Belgium v. Spain) I.C.J. Reports 1970).

[274] See Liability Convention, article VIII.

[275] See *supra* note 178 and accompanying text.

[276] See Liability Convention, article IX.

[277] See Liability Convention, article XIV.

[278] See Liability Convention, article XVIII.

conciliation (non-mandatory commission and non-binding decision that may be challenged through new negotiations or through another mechanism of dispute settlement such as arbitration) and of arbitration (final and binding awards).[281]

This hybrid regime can only undermine the principle of absolute liability, as a launching state can refuse to make the "awards" of the Commission binding, posing the dispute in the area of general international law where no central and mandatory mechanism of dispute settlement exists.[282]

§3: Limits of the Regime.

The 1972 Liability Convention has thus several weak points. The first one is its lack of definitions. What constitutes a space object, what is a launching, and especially what is a procurement of a launching? These need to be defined as well as the applicability to private launchings of the Convention. The very consequence is that for a precise launching, states cannot be certain whether they bear any vicarious liability.[283] However, this lack of definition is not an unsurpassable obstacle. Further definitions could be expressed in subsequent space treaties or United Nations General Assembly's resolutions to give guidelines on the applicability of this Convention to commercial space activities. The weakest point, nevertheless, of this liability regime is the non-existence of a dispute settlement system, and the lack of practical notions for

---

[279] See Liability Convention, articles XV, XVI and XVII.
[280] See Liability Convention, article XIX.
[281] The Organisation for Security and Cooperation in Europe has adopted a similar pattern for disputes resolutions: a conciliation commission can be constituted at the request of only one state (See C. Bertrand, "La nature juridique de l'Organisation pour la Sécurité et la Coopération en Europe" (1998) 102.2 RGDIP 365, at 383-384).
[282] See Chapter III, section 2, paragraph 3, above.
[283] See D. Maniatis, *supra* note 208, at 384.

damage occurring in outer space. The definition of what constitutes a fault in the operation of a satellite is unknown: this later point, however, could be and should be defined on a case by case basis. Still, this lack of precise regime is not an incentive for the commitment of private interests in space activities. To enhance them, the creation of an instrument of international dispute settlement for space activities applicable both to states and private enterprises would be a step in the right direction.

Furthermore, the question also arises whether the Liability Convention applies in the case of a collision between two space objects, which have a common launching state. Article III of the Convention restricts its application for accidents occurring in outer space to the case of damage to a space object of one launching state caused "by a space object of another launching state". What is to be understood by "another launching state" needs to be clarified. This could mean that as soon as the two space objects have a common launching state, the Convention is not applicable.[284] This interpretation would imply, for example, that all the satellites launched by Arianespace (around 50 % of the commercial satellites launched nowadays)[285] would not be concerned by the Liability Convention for damage occurring between them. In other words: the fewer states are involved in a launching, the more the Liability Convention could be applied to it. This would narrow down further the scope of application of the Convention. Nevertheless, one wonders if article III does not only express the obvious: that the liability Convention is applicable only if both satellites have at least one different launching state. Indeed, article III can be understood as not requiring the involved space objects to have all their launching states being different, but only one of them. Obviously the Convention may be applicable only between two different states: this interpretation conforms more with the intention of its drafters.

---

[284] See D. Maniatis, *supra* note 208, at 380-381 and B. Hurwitz, *supra* note 211, at 33.

What would be the point, otherwise, to prevent state A to settle its dispute with state B through the Liability Convention on the only ground that their satellites have both state C as a launching state?

So far, this lack of comprehensive regime, this lack of binding mechanism, this ambiguity of definitions has not had any obvious consequence in the practice of space activities. Indeed, the Liability Convention has never been applied, and the only occasion where it could have been enforced (*i.e.* in the Cosmos 954 accident), it was used as a mere reference, a mere argument on the part of Canada to obtain compensation. However, the tremendous development of private space activities and the problematic question of space debris could lead to a development of damage in outer space. The protection of the important interests involved in space activities as well as the protection of innocent third parties should be done through the most efficient framework possible. The lack of precision of the definitions involved in the Liability Convention, especially for launching states, could make states more hesitant to approve the involvement of their nationals in space activities.[286]

The end of the cold war (and with it the end of the systematic denial by the U.S.S.R. of any binding dispute settlement system) and the challenging of the existing legal solutions by private entities, such as the Sea Launch project, are good incentives to find a more comprehensive framework for damage caused by space objects. It would be better to improve the framework before the number of space accidents starts to

---

[285] From 1992 to 1997, Arianespace had 48.5 % of the market share of commercial satellites launching, leaving to the U.S.A. only 33% (see UNISPACE III, *supra* note 9, at 7).

[286] See W.B. Wirin, "Practical Implications of Launching State- Appropriate State Definitions" (1994) Proceedings of the 37th Colloquium on the Law of Outer Space 109, at 112.

increase. The number of uncertainties may contribute to develop the number of disputes, which would in turn harm the commercialisation of space activities.[287]

One solution might be through the creation of an international fund.[288] Another solution might be to give up the liability for the space object centred towards the launching states, once the transportation has been completed.[289] Indeed, the number of states having the technical means to perform a launching on their own is small. Once the launching is completed, it would appear logical to have the liability relying on the state having jurisdiction over the operator of the satellite, not the state that produced the launching: the possibility of in-orbit delivery, leasing, and other transfer of property rights of a satellite cuts the links between the launching state and the effective control over the satellite.[290]

---

[287] See S. Gorove, *supra* note 8, at 76.

[288] See M. Benko and K-U. Schrogl, *supra* note 164, at 262-264.
J.F. McMahon, in 1962, proposed that if a state was held absolutely liable for a commercial activity that benefits a large number of states, it should be compensated by an international fund (See J.F. McMahon, "Legal Aspects of Outer Space" (1962) 27 BYIL 339, at 387). The main advantage of such a fund is that in case of damage on a massive scale, it is an utopia to think that a state will be able to pay several billion of dollars to compensate. It could be created through an amendment to the Liability Convention (See B. Hurwitz, "An International Compensation Fund for Damages Caused by Space Objects" (1991) Proceedings of the 34th Colloquium on the Law of Outer Space 201, at 202; see also G.C.M. Reijnen, *Utilization of Outer Space and International Law* (Elsevier, 1981) at 115). The division of the participation by states in this fund may be problematic.

[289] See H. Wassenbergh, "A Launch and a Space Transportation Law, separate from Outer Space Law?" (1996) XXI-1 Air and Space Law 28. The liability for the space object could then rely on the state of registry (see H.A. Wassenbergh, *Principles of Outer Space Law in Hindsight*, (Nijhoff, 1991) at 30).

[290] This is an argument to cut the liability regime from the launching state, once the satellite is operational in orbit. On this issue, see F.G. von der Dunk, "The Illogical Link: Launching, Liability and Leasing" (1993) Proceedings of the 36th Colloquium on the Law of Outer Space 349, at 354-356.

Chapter V: Responsibility for Activities in Outer Space.

Article VI of the Outer Space Treaty provides that "States Parties to the Treaty shall bear international responsibility for national activities in outer space". We shall explore what is the exact extent of state responsibility under this provision and how it has developed for each kind of space activities.

Section 1: Extent of the Responsibility.

The responsibility of state under article VI of the outer space treaty is, thus far, focused towards "activities in outer space". We shall examine what is considered as an activity in outer space, with a special interest for the Earth segment of space activities, and what kind of acts can lead to the responsibility of states and what is the reparable damage.

§1: Activities in Outer Space.

According to article VI of the Outer Space Treaty, the general principle of state responsibility encompasses "activities in outer space". Hence, arises the question of its meaning. Two approaches can be argued, a narrow one and a broad one.

The narrow approach considers this provision literally: the activities concerned are the ones taking place in what is considered as outer space. In other word, this 'spatial (or topographical) approach' regards any action occurring beyond the lowest frontier of

outer space as subject to the responsibility of states.[291] *A contrario*, any activity that occurs beneath this limit is not a space activity: it does not occur *in* outer space. The problem of this argument is that there is neither general definition nor delimitation of outer space. The view was expressed by the Soviet Union that the lowest limit of outer space was around 100-110 kilometers, which corresponds to the lowest possible satellite orbit. Such a statement was also made by the International Law Association. However, there is not yet any general *opinio juris* on this question, and the issue both of defining a limit to outer space and of knowing if there is a need to define such a limit is unsolved.[292]

The broader approach, on the other hand, relies on the intention of the action, more than on its location. For example, in this view, the future space plane that will travel through outer space would be a space object (even while in airspace) and subject to the 1972 Liability Convention, not to the 1952 Rome Convention. This view is based on the function performed; hence its name of 'functional approach'. The decisive element becomes not the place where the object is, but the activity performed (*i.e.* if it is orbiting[293]) or intended to be performed. [294]

There may be, nevertheless, a compromise between those two views. On one hand, the general opinion of the doctrine is that every satellite orbiting is in outer space:[295] hence, any satellite operation in orbit happens in outer space and is obviously a space

---

[291] See G. Gal, *supra* note 246, at 84.
[292] See *supra* note 4, 6 and 7 and accompanying texts.
[293] See G. Gal, *supra* note 246, at 85.
[294] See L.Peyrefitte, *supra* note 7, at 86-89, and on the issue of attempted launching for space objects, see Chapter IV, Section 1, paragraph 2, above.
[295] See *supra* note 8 and accompanying text.

activity.[296] On the other hand, the underlying intention of any space related operation cannot be merely set aside. Launches - even attempted launch - are encompassed by the space treaties: from the very beginning of their operation - and not only when the rocket reaches a certain altitude - they are space activities.[297] The definition of 'space object' reinforces this approach.

This interpretation is in accordance with the scope of application of the British and Swedish domestic space law, which apply respectively to the launching, procurement of a launch of a space object and any activity in outer space,[298] and to activities carried entirely in outer space, launching and maneuvering.[299]

In other words, space activities are a mixture of activities beyond airspace and intended to interact with such activities.

Outer space, nevertheless, is used by commercial activities as an area offering, thanks to its specificity, a unique means to interact with terrestrial activities. Telecommunications allow people on Earth to exchange information. Remote sensing increases the knowledge on our planet. Commercial space activities are Earth-oriented. Hence, the direct issue is to define where state responsibility for "activities in outer space" stops, *i.e* to define to what extent states bear responsibility for the Earth segment of space activities.

---

[296] For example, H. Wassenbergh defines space activities as "activities in outer space or undertaken in connection with the operation of civil space objects" (See H. Wassenbergh, "An International Legal Framework for Private Space Activities", *supra* note 246, at 533).
[297] See M. Bourély, *supra* note 144, at 251.
[298] See article 1 of the UK Outer Space Act 1986 (1986 Chapter 38).
[299] See section 1 of the Swedish Act on Space Activities (1992:963).

§2: Consequences of Space Activities on Earth.

With a strict "spatial approach", no consequence on Earth is taken into account to determine the applicability of article VI of the Outer Space Treaty. "Activities in outer space" are limited to what happens 'over-there'. Does not the Outer Space Treaty expressly concern "exploration and use of outer space"?[300]

With a strict "functional approach", acts on Earth pertaining to space activities should be taken into account. This raises again some specific questions linked to activities: for example, should the mere fact of filling of fuel for a rocket be considered as a space activity? A positive answer to this question may be given. However, this seems to be a too far-fetched solution. One can consider that the issue of space activity in the context of responsibility has to be examined with the issue of damage and proximate causes: if a space activity causes a damage, the filling of the rocket that permitted the activity to take place is a cause too remote to entail any international responsibility.

A broad view was adopted by some writers, especially when a clear separation between space and earth segments exists. For example, remote sensing process involves two distinct steps. The first one is the sensing of the state, by a satellite. It is an activity in outer space. The programming from Earth of the sensors, the designation of the areas to be observed have only one consequence: the sensing that takes place in outer space. The observation is definitely in the scope of article VI of the Outer Space Treaty. The second step, however, happens entirely on Earth: it is the phase of treatment and interpretation of the data collected. Damage due to remote sensing is

[300] Article XIII of the Outer Space Treaty. See C.Q. Christol, *supra* note 256, at 89.

more likely to happen with this terrestrial segment, *i.e.* with the analysis of the information and its dissemination (or retention).

Is the distribution of sensed information an "activity in outer space"? The answer is negative: all the operations after the sensing, all the damaging possibilities (for example wrong analysis and retaining of information on environmental catastrophe) would happen only on earth. A restrictive and spatial approach of this issue leads to disregard article VI as a possible ground for state responsibility for remote sensing activities.

This can be considered as a real danger. Other writers have expressed the view that such an analysis of responsibility for earth segments of space activities should be avoided.[301] Hence, it was argued that space activities should encompass the ground segment, as it is a corollary to any space activity.[302]

However, this approach, even founded on reasonable grounds, is hardly acceptable. A literal interpretation of "in outer space" seems to be the most appropriate with the wording used by the drafters of the Outer Space Treaty.[303]

Under general international law, activities that cause damage must have a proximate cause to hold responsibility. Remote damage should not be compensated. This means that damage caused by an operation of the earth segment of a space activity is too remote from the space activity to be encompassed by article VI of the Outer Space Treaty. Moreover, even if the earth segment exists only thanks to the activity in outer space, it does not involve the same issues that have led to a specific regime of liability

[301] See V.S. Vereschetin and V.M. Postyshev, "Responsibility of States for Remote Sensing Activities", (1985) Proceedings of the 28th Colloquium on the Law of Outer Space 247, at 248.
[302] See Y.M. Kolossov, *supra* note 102, at 68.
[303] See M. Bourély, *supra* note 144, at 252.

for space objects. There is no more an ultra-hazardous activity once the applications are undertaken on Earth. This does not imply that the earth segment escapes any possible rule of responsibility: any wrongful act attributable to a state will lead to its international responsibility, but with the usual requirements of international law. The only practical difference is that most of the principles embodied in the Outer Space Treaty are not directly applicable to the earth segment. However, most of those principles are useful only for activities happening strictly in outer space (*e.g.* non-appropriation, prohibition of weapons of mass destruction in orbit around the Earth) or have an equivalent under general international law (protection of environment). This does not prevent the outer space treaty from expressing some specific provisions for the earth consequences of space activities (on the return of space objects, for example).

Hence, the earth segment of space activities is ruled by general international law and not directly by the Outer Space Treaty.

§3: Wrongful Acts and Reparable Damages.

States bear international responsibility for activities of their nationals in outer space. According to the International Law Commission, responsibility requires an internationally wrongful act to be held. In the context of commercial space activities such acts are the ones contrary to the principles of the 1967 Outer Space Treaty: those activities are subject to the general regime of this convention.[304] This is a direct

[304] See Chapter 1, above.

incentive for states to control activities of their nationals in outer space, especially through national laws.

Internationally wrongful acts for commercial space activities, however, are not limited to the infringement of the basic space law principles. Space activities also have the duty to respect international law.[305] In the mean time, internationally wrongful acts occasioned directly by a private person can engage state responsibility: they become attributable to a state on the basis of article VI of the Outer Space Treaty.

There is no specific way to compensate a damage due to activities occurring in outer space: damage due to a space activity is compensated as any other violation of international law. Hence, the classical way of approaching international disputes is applicable to space disputes: recourse to diplomatic protection (if necessary), to mediation, to conciliation, or to arbitration, and application of the principle of *restitutio in integrum*.[306] Furthermore, remote damage, including economic prejudice, should not be compensated as it is the case under general international law.[307]

We shall study, nevertheless, how this view is effective for the specific regimes of telecommunication and remote sensing and the sensitive issue of satellite interference (which is a mixture between earth and space activities).

---

[305] See 1967 Outer Space Treaty, article III.

[306] See *supra* note 178 and accompanying text.

[307] As noted by Sir E. Thornton in an arbitration case: "the Umpire has always been opposed to consequential damage and think they ought never to be taken into consideration" (Moore International Arb., quoted in B. Bolecker-Stern, *supra* note 178, at 221).

Section 2: Specific Regimes of Responsibility.

§1: Telecommunications

One of the main issues for telecommunications, and especially D.B.S., is the applicability of the Liability Convention. The general view of the doctrine is that this convention, because it requires physical impact and because of its definition of damage, is not applicable to programs carried by DBS.[308] Indeed, according to Professor N.M. Matte:

> "pecuniary loss due to transmission failure or incorrect, unclear, retarded or otherwise faulty transmissions which may arise from telecommunications activities is ... not covered [by the definition of damages in article 1(a) of the Liability Convention]"[309].

Hence, the main question arises to determine to what extent states are exactly responsible for telecommunications by their nationals in the framework of article VI of the Outer Space Treaty.

In 1972, the U.S.S.R. introduced a proposal to the C.O.P.U.O.S. for a Convention on Principles Governing the Use by States of Artificial Earth Satellites for Direct

---

[308] According to B.A. Hurwitz, broadcasts by satellites may cause financial damage to persons directly affected by them, such as copyright owners, or local manufacturers or store owners whose clientele is induced by commercial advertisements, not allowed in the receiving state, to buy the products in a neighbouring state, however "in this case, there is no difference of opinion among publicists. These type of damages are not covered by the Convention" (B.A. Hurwitz, *supra* note 211, at 18). See also N.M. Matte, *Aerospace Law: Telecommunications Satellites* (Butterworths, 1982) at 73, and P.Achilleas, *supra* note 123, at 135.

Broadcasting Television and reiterated several times its proposal for state's responsibility during the discussions of the legal sub-committee on D.B.S. According to the article VII of one of these drafts:

> "States shall bear international responsibility for all national activities connected with the use of artificial earth satellites for the purpose of direct television broadcasting, irrespective of whether such broadcasting is carried out by Governmental agencies or by non-Governmental organizations and juridical persons and of whether it is carried out by states independently or through international organizations. Television broadcasting with artificial earth satellites to foreign states may be carried out only by organizations which are under the control of the Governments of the states concerned".[310]

This proposal is close to the wording of article VI of the Outer Space Treaty. However, a closer look shows that it goes far beyond that. The duty of authorisation and continuing supervision by states is changed to a requirement that the activity shall be done by an entity under state control. The principle of state responsibility is not limited to space activity but is extended to any activity "connected with the use of artificial earth satellite". Such a prolongation of the duties of states was unacceptable for western countries, such as the United States. According to them, such a provision could lead the states to be responsible for the contents of the broadcasts, a situation they found inadmissible when broadcasting entities are not subject to state control.[311]

On the other hand, N.M. Taishoff considers that the Liability Convention may be applicable to seditious or subliminal transmissions, although the question of assessing damages and amount of compensation is unsolved (See N.M. Taishoff, *supra* note 203, at 116).

[309] N.M. Matte, *supra* note 308, at 82-83.

[310] UN. Doc A/AC.105/WG.3(V)/CRP.1, quoted in M. Lesueur-Stewart, *To See the World. The Global Dimension in International Direct Television Broadcasting by Satellite*, (Nijhoff, 1991) at 451.

[311] *Ibid.*, at 450.

Thus, it was hard to reach a compromise between the tenant of the free flow of information and the tenant of an efficient protection of the receiving states.

The result was that no agreement could be found within the C.O.P.U.O.S., and that no international treaty was reached. A mere resolution of the General Assembly set forth several principles on DBS. However, this text was not adopted by consensus, as it is usually the case for the work done by the C.O.P.U.O.S.: Resolution 37/92, entitled "Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting", did not get the approval of western countries.[312]

Principle 6 of this resolution expressed the principle of state responsibility for D.B.S.:

> "States should bear international responsibility for activities in the field of international direct television broadcasting by satellite carried out by them or under their jurisdiction and for the conformity of any such activities with the principles set forth in this document"

Compared with the first Soviet proposals, the principle expressed in this text was far from putting pressure on the state. Indeed, the responsibility is expressed more as a wish than an obligation ("states *should* bear international responsibility"[313] and not "shall"). The issue of nationality to determine the responsible state is avoided. It is difficult to rely on the concept of nationality for D.B.S.: major multinational groups involved in those activities, due to their transnational character, lead to practical difficulties in defining the responsible state. It is interesting to note that principle 6 has recourse to the notion of "jurisdiction" for private broadcasting. A notion that some

[312] See C.Q. Christol, *Space Law. Past, Present and Future* (Kluwer, 1991), at 114-130.
[313] Emphasis added.

writers find implied in article VI of the Outer Space Treaty.[314] This solution was retained for the European Convention on Transfrontier Television.[315]

According to the wording of principle 6 of this resolution, the international responsibility of states should be engaged for any action contrary to the principles embodied in this document. However, the legal value of this resolution is weak. It is not an international treaty, and it cannot really be considered as a crystallization of an *opinio juris*: too many 'interested states' did not vote for it. Nevertheless, one can consider that state responsibility pertains to those principles that are considered as generally accepted. Hence, this resolution offers, through principle 6 and its reference to state jurisdiction, an interesting guideline for the interpretation of article VI of the Outer Space Treaty in the context of D.B.S., especially for the determination of what "appropriate state" means. As far as the other provisions are concerned, it remains that what is considered as an international wrongful act for DBS may cause endless discussions (*e.g.* with the issue of prior consent).

§2: Remote Sensing.

Like telecommunications, remote-sensing activities do not seem to be in the scope of application of the Liability Convention and of article VII of the Outer Space Treaty.[316] It appears that there should not be any special problems arising from the mere gathering of data from space.[317] It is very doubtful whether those provisions would be

---

[314] See Chapter VI, section 1, paragraph 3, below, on the concept of the appropriate state..
[315] See Council of Europe's *European Convention on Transfrontier Television*, signed in Strasbourg, May 5, 1989, (1989) 28 I.L.M. 857, article 3 and 5.
[316] See B.A. Hurwitz, *supra* note 211, at 19.
[317] See V.S. Vereschetin and V.M. Postyshev, *supra* note 301.

applicable to the earth segment of remote sensing, *i.e.* to the dissemination of data. Once again, reparable damage under the Liability Convention "seems to imply direct damage caused by the space object and not damage which resulted from the intentional or negligent act of a party involving the use or dissemination of data".[318] In the specific case of remote sensing, this result is disputable due to the impression that it leads to the separation of the action (gathering of data) from its result (dissemination of data).[319] Still, the damage would be produced by the activity following the survey by the satellite and not by the space object itself.[320]

Regarding responsibility for the activity (article VI of the Outer Space Treaty) some writers conclude from the regime of remote sensing as defined by the General Assembly in its 1986 resolution 41/65 that all the process of remote sensing (hence, the earth segment too) belongs to "activities in outer space". According to these writers, this is obvious from the definition given of remote sensing activities, encompassing the two segments.[321] Principle XIV, nevertheless, draws a distinction between two regimes of responsibility applicable to the earth and to the space segments. Indeed, if it recalls, with some minor changes, on one hand article VI of the Outer Space Treaty[322], it refers on the other hand to the general law of responsibility.[323]

---

[318] See S. Gorove, "Some Thoughts on Liability for the Use of Data Acquired by Earth Resource Satellites" (1972) Proceedings of the 10th Colloquium on the Law of Outer Space 109.

[319] See V.S. Vereschetin and V.M. Postyshev, *supra* note 301, at 248.

[320] See S. Gorove, *supra* note 318, at 109.

[321] See L.Peyrefitte, *supra* note 7, at 88 on resolution 41/65, principles on remote sensing, article 1 e.

[322] Principle XIV express the view that states "bear international responsibility for *their* national activities in outer space" (emphasis added), whereas article VI of the Outer Space Treaty provided that states "bear international responsibility for national activities in outer space".

[323] Principle XIV states : « In compliance with article VI of the Treaty on Principles Governing the activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, States operating remote sensing satellites shall bear international responsibility for their activities and assure that such activities are conducted in accordance with the provisions of the Treaty and the norms of international law, irrespective of whether such activities are carried out by governmental or non-governmental entities or through international organizations to which such States are parties. This principle is without prejudice to the applicability of the norms of international law on State responsibility for remote sensing activities. »

Furthermore, this separation is also clear in the interpretation given by the representatives of industrialised countries in respect of principle XIV of the 1986 Resolution.[324] The representatives of the United States, Sweden and the Netherlands considered that principle XIV did not provide a new ground for international responsibility than the one existing already in article 6 of the 1967 Outer Space Treaty and in general international law. The French representative more clearly stated that principle XIV relying on article VI of the Outer Space Treaty, implied state responsibility only for activities carried out in outer space.[325]

Remote Sensing activities are then only ruled for responsibility by article VI of the Outer Space Treaty and the guideline of the United Nations General Assembly Resolution 41/65, "Principles on Remote Sensing". The main issue with remote sensing is to know if states are responsible, according to those two provisions, for the dissemination of data by private entities, *i.e.* for the earth part of this activity done by a company.

As we saw previously, the answer seems to be positive for some writers, or at least they are in favor of a regime where the response would be positive in order to have the most efficient protection of the interests of the sensed states.[326] To avoid such a possibility of responsibility for states means that, due to the fact that the space segment of the activity is very likely to engage any responsibility, private remote sensing is not *de facto* in the scope of state responsibility.

---

[324] The position that the terrestrial implications should not be covered by the principle of responsibility existing for space activities has already been expressed in 1983 by the US representative to C.O.P.U.O.S. (See V.S. Vereschetin and V.M. Postyshev, *supra* note 301, at 247).

[325] See O. de Saint-Lager, "Aspects juridiques de la télédétection spatiale- Annexe II: Déclarations interprétatives", in J. Dutheil de la Rochère, ed., *Droit de l'espace, aspects récents* (Pédone, 1988), at 245-249.

[326] See V.S. Vereschetin and V.M. Postyshev, *supra* note 301.

The reactions of the industrialised states to principle XIV confirmed this view. Hence, there might never be a case where state responsibility could be engaged for remote sensing activity undertaken by a private entity.

However, it remains that principle XIV restated the applicability of international law and the general principles of state responsibility. This implies that a state may become responsible for its nationals, if they acted on its behalf or if it pertains to its duty of due diligence to prevent any action (or omission) contrary to the interest of another state. Principle XIV also provides for the responsibility of states for "their activities" whereas article VI of the Outer Space Treaty expresses that the responsibility is born "for national activities in outer space". In other words, principle XIV added the determiner 'their', which implies that the activities belonging to the state (*i.e.* when it is the operator of the satellites) are only concerned. This seems to narrow down the scope of application of principle XIV compared to article VI of the Outer Space Treaty.

Nevertheless, remote sensing activities even done by private companies still rely heavily on governments. SpotImage, Radarsat, are private companies, but their systems belong to their respective national space agency. Their governments have an effective control of their operations[327] (for example, the *Centre National d'Études Spatiales*, the French space agency, is the main shareholder of SpotImage and operates its satellites). Those entities, even if they were created under private law, are indeed agents of their states. Hence, those states, through their companies, could be held

[327] This criterion of effective control is a requirement to determine if a state is responsible for some private actions. See the *Nicaragua Case*, June 27, 1989, I.C.J. Rec. at 64-65.

responsible for not respecting international law, including the principles embodied in the 1986 resolution that have crystallised as rule of international customary law.

The same argument is also relevant to the United States. As far as the Landsat system is concerned, it was created and operated by governmental agencies: the involvement of the American state is obvious. This is also true for the newest remote sensing companies. Indeed, the licensing system created by the Land Remote Sensing Policy Act of 1992[328] provides some restrictions. No remote sensing system in the U.S. may be operated without a license from the Secretary of Commerce, which must be aware of all its characteristics. In consultation with the Secretary of State and the Secretary of Defense, it may limit the distribution and even the collection of data. It is expressly provided that those operations shall not interfere with the national security of the United States, its international obligations and even its foreign policy. Any illegal operation may lead to fines of up to ten thousand dollars per day. The government must also have access to the data gathered.[329] The involvement of the American government goes beyond the requirement to supervise private companies. Indeed, commercialisation of data by private companies is done with the official goal of achieving the leadership of the U.S. in the remote sensing market.[330]

---

[328] On the Land Remote Sensing Policy Act of 1992, see S. Parisien, *supra* note 171.
[329] *Ibid.* at 255-256.
[330] See Land Remote Sensing Policy Act of 1992, section 5601§ 7.

§3: Interference.[331]

Private companies involved in the telecommunication business have a regrettable trend of keeping as much as they can of the radio spectrum for their own use. This practice has existed since the very beginning of radio.[332] The development of LEO constellations was in part also undertaken on the same resort, with a strategy of pre-emption.[333] As a matter of fact, it can be said that the first country to notify the I.T.U. of its intention to launch a LEO system, and who also implements it, has an exclusive right on the frequency it uses.[334] In a way, private companies apprehended space resources in the same manner as the first super powers invested in outer space, relying on the principle of the "first come, first served". The advantage is to the 'first mover'.

The use of the radio spectrum is definitely an activity occurring in outer space. It is vital to the tracking of satellites, the relays and transmission of information to, from and through satellites. Space objects would be useless without the use of the radio

---

[331] Interference may be defined as "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". And harmful interference means "interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with the Radio Regulations". (I.T.U. Radio Regulations, quoted in S.D. White, "International Regulation of the Radio Frequency Spectrum and Orbital Positions" (1995) 2 Telecommunications and Space Journal 329, at 333).

[332] The Marconi Company for example prohibited under its license agreements any ship carrying its equipment to enter in communications with a radio station having an apparatus of another brand; "Those who monopolized the technology monopolized the radio spectrum and thus restricted its use by others" (R.Jakhu, "The Evolution of the I.T.U.'s Regulatory Regime Governing Space Radiocommunication Services and the Geostationary Satellite Orbit" (1983) VIII A.A.S.L. 381, at 382).

[333] See L.Benzoni, "Club, monopole, marché: enjeux de l'organisation économique de l'espace" in P.Kahn, ed., *L'exploitation commerciale de l'espace. Droit positif, droit prospectif*, (Litec, 1992) at 28-29.

[334] See M. Rothblatt, *supra* note 47, at 128-129.

spectrum and, due to its importance for them, it is a space activity subject to the responsibility principle of article VI of the Outer Space Treaty.

Nevertheless, the development of private constellations is a threat to other activities using the radio spectrum. The best example is the issue of radio astronomy.[335]

Radio astronomy uses the fact that atoms and molecules radiate at different frequencies, for example hydrogen (H) corresponds to a frequency of 1.42 GHz, hydroxyl (OH) to 1.6 GHz.[336] It is a passive radio-communication service: it receives only information, it does not send, broadcast or transmit anything. Its signals are around nine times weaker than those of active services.[337] The use of satellites on frequencies corresponding to the radiation of a particular atom hides its source and thus prevent radio-astronomers to study it from Earth.[338] Radio astronomy is possible only in "radio-quiet" bands.[339]

Interference caused by the use of satellites is a damage produced by an "activity in outer space", as satellites are in outer space. State responsibility relying on article VI of the Outer Space treaty could be enforced. Moreover, the state that authorised the use of a frequency that produces interference, especially when the license was given against the I.T.U. rules, is also responsible.[340] It acted as the 'appropriate state' and, as such, failed in its duty of supervision. It is also responsible under the rules of general

---

[335] For a presentation of the different satellites systems and their possible influence on radio astronomy, see "Committee on Radio Astronomy Frequencies. Challenging Space Systems" (May 20, 1998) http://www.ntra.nl/craf/satellit.htm (Date accessed: June 2, 1998).

[336] See S. van den Bergh, "The effects of Space Debris and Satellite Interference on Astronomy", in K.H. Bockstiegel, ed., *Environmental Aspects of Activities in Outer Space* (Heymanns, 1990), at 72.

[337] See T.A. Th. Spoelstra, "Radio Astronomy in Telecommunication Land: The I.T.U. and Radio astronomy" (1997) XXII.6 Air and Space Law 326.

[338] For example, the Iridium system emits on a frequency of 1621Mhz, indeed very close to the one of the hydroxyl (See "Le téléphone portable contre la radioastronomie" *Sciences et Avenir* (May 1998) 24.)

[339] See R.J. Cohen, "The threat to radio astronomy from radio pollution" (1989) 5.2 Space Policy 91.

[340] See N.M. Matte, *supra* note 308, at 71.

international law for the conduct of its governmental agency that issued the authorisation which generated a damage.

In this case, however, the principle of *restitutio in integrum* is easily enforceable. It is enough for passive use of the radio spectrum that the interference stops, in order to renew the *statu quo ante*. Unfortunately, the high pressure of private interests and the lack of interest of the appropriate countries (including the United States) are incentives for private companies not to spend any money and to avoid this issue.

The issue so far has not lead[341] to any litigation between radio astronomers and telecommunication companies, even if the issue of the legal value of an I.T.U. footnote was very much discussed.[342] The trend is to get agreements between the two adverse interests. The telescope of Arecibo (Porto-Rico) thus obtained from Motorola to have a limitation of interference each night during eight hours.[343] This means that radio-astronomers are going to miss any important event happening at day. After six months of negotiations, Motorola also concluded an agreement with the European Science Foundation. Until March 1999, the company could not generate a level of interference incompatible with radio-astronomy observation. At that time an

---

[341] To the best knowledge of this writer.

[342] The foot note in question is the I.T.U.-R Radio Regulations footnote S5.372, which prohibits harmful interference to radio astronomy in the 1610.6-1613.8 MHz band. A discussion began on the interpretation of this provision between Motorola (in charge of the Iridium satellites) and the Committee on Radio Astronomy Frequencies (CRAF). See "Craf Newsletter 1998/1" http://www.nfra.nl/craf/nws19801.htm#mot (January 1998. Date accessed: June 2, 1998).
The I.T.U. is competent to deal with frequency interference (article 45 of the I.T.U.'s Constitution); it is clear however that it lacks –and especially its Radio regulations Board- of any enforcement power to impose any sanction (On this issue see S.D. White, *supra* note 331, at 346-348).

[343] See "Le téléphone portable contre la radioastronomie" *Sciences et Avenir* (May 1998) 24.
The bankruptcy of the Iridium system does not solve the issue of interference of its satellites. There is still a possibility that another American company buys the constellation and uses it (see www.nfra.nl/craf/iridium.html (Date accessed: August 26, 2000).

agreement on the determination of a second level not to be exceeded were to be made, all interference were supposed to stop by 2006.[344]

Beside article VI, the main provision that can engage state responsibility for interference is article IX of the Outer Space Treaty. This article provides a duty to enter into consultation if the activities of a national in outer space could cause some harmful interference to another activity. Thus, it is a duty of co-operation that is stated. In other words, it relies on the good faith of the different parties involved. The non-respect by a state to enter in good faith in discussions concerning interference is an international wrongful act and leads to holding it responsible.[345]

It is worth noting that it is precisely through consultation that the issue of interference for the Iridium satellites - before the bankruptcy of the system - was settled, directly between users and not between their states of nationality.

[344] See "Un Yalta des fréquences radio", *Sciences et Avenir* (October 1998) 8.

[345] Good faith is a very important principle in international law. For a striking example, see the *Nuclear Test Cases*, (Australia v. France; New Zealand v. France) I.C.J. Reports 1974.

Chapter VI: How to Define the Relevant Link between Enterprises and States.

Liability for Space objects relies on objective criteria (states from whose territory or from whose facilities a launch is made) and subjective criteria (states that launch or procure a launch). The usefulness of those two criteria demonstrates its limit with the case of private launchings, when only the objective criteria can be used, *in extremis* in the case of the Sea-Launch project. In the broader issue of responsibility for space activities, links are even more subjective. We shall explore what the possible loopholes are in the determination of a link between a private space activity and a state, and taking also into account the specific regime of liability for damage done by a space object, what are the risks that the development of private commercial space activities can create for the balance of space law.

Section 1: Definitions and their interaction.

The Outer Space Treaty refers mainly to the state of nationality, to the state of registry, and to a so-called "appropriate state" whose definition could vary with the activity.

§1: State of Nationality.

The clearest designation of a responsible state for space activity is the one concerning the "national activities in Outer Space", in article VI of the Outer Space Treaty. It expressly provides state responsibility for activities of their nationals, even for non-

governmental entities. There is no doubt as to the interpretation of this point: the text is clear, and its genesis is also unambiguous.[346]

Nevertheless, two questions can be raised.

The first one is the extent of the responsibility of the state for the activities of its nationals. Indeed, one can understand "states ... shall bear international responsibility for national activities in Outer Space, ... whether such activities are carried on by governmental agencies or by non-governmental entities" as limiting its scope to the activities involving the state [347], in other words to the classical case in the international law of state responsibility where a private person acts on behalf of a state.[348] In this case, the provision about non-governmental entities in article VI is set forth to avoid any legal fiction where a state would charge one of its juridical persons to operate a space activity in lieu of the state itself. This argument is reinforced by principle XIV of the resolution 41/65 "Principles on Remote Sensing" which provides states responsibility for "*their* national activities".[349] What other reason for the use of the word "their" if not to indicate that the activity belongs to the state?

However, the genesis of article VI of the Outer Space Treaty, as a compromise between the Soviet and American approaches, the development of the existing domestic law and practice are strong counter arguments and evidence of the principle of the vicarious responsibility of states for all space activities of their nationals.

---

[346] See chapter 2, section 1, paragraph 1, above.

[347] See H.A. Wassenbergh, "Responsibility and Liability for Non-Governmental Activities in Outer Space", quoted in *E.C.S.L. Space Law and Policy Summer Course* (Nijhoff, 1994) at 198-210.

[348] According to Professor Wassenbergh, "the term 'national activities' normally refers to activities of the state concerned, *i.e.* to government activities" (H. Wassenbergh, *supra* note 289, at 23)

[349] Emphasis added.

The second question is directly linked to the concept of nationality. Indeed, when a transnational company is involved in a space activity, what state can be considered as its state of nationality? Acting through subsidiaries situated in different countries, or using the possibility of incorporation in tax havens, such a company may not have the nationality of the country where its decisions and its economic power really are. As the International Court of Justice recognized on the issue of determination of nationality for an enterprise in the specific field of diplomatic protection, the main evidence is usually to refer to the laws of the state under which the corporate entity is incorporated and has its registered office. However, some states refer only to the headquarters of the enterprise (*siège social*), to its place of management or center of control, or to a criterion of substantive ownership. And the Court concludes, "no absolute test of the 'genuine connection' has found general acceptance. Such tests as have been applied are of a relative nature, and sometimes links with one state have had to be weighed against those with another".[350]

It can be expected that the difficulty to define the nationality of an enterprise in the scope of diplomatic protection will also exist concerning the definition of the responsibility of a state for its activities. A direct consequence might be to have a state considered as responsible for an activity over which it has no jurisdiction nor control.[351]

This issue of the determination of nationality of transnational corporations is not specific to space activities. However, its usual consequence on the international stage concerns investments or diplomatic protection. In other words, it only concerns the

---

[350] *Barcelona Traction, Light and Power CO. Case*, (Belgium v. Spain) I.C.J. Reports 1970, at paragraph 70. This difference between the real national interests of a company and its nationality at the international level is a difficult issue. On it, see B. Stern, "La protection diplomatique des investissements internationaux. De Barcelona Traction à Electronica Sicula, ou les glissements progressifs de l'analyse." (1990) 4 J.D.I. 897-945.

[351] See B. Cheng, *supra* note 205, at 87.

life and interests of the company and its shareholders. When it comes to space activities, the issue concerns third parties, foreigners to the determination and legal construction of nationality. It concerns their protection and the possibility to be compensated for any damage due to space activities.

The Sea-Launch project can be regarded as a paradigm of the difficulties to define the relevant link with a state for the purpose of international responsibility. This company is registered in the Caymans Islands, but its place of control (with the prominent role of Boeing) is located in the United States. Moreover, this venture is licensed under American law. The United States, nevertheless, considers this project in a way as Ukrainian: the launchings done from the Sea-Launch are included in the total amount of launching to be done by this country under the U.S.A.-Ukraine agreement on launch providers.[352]

§2: State of Registry.

The state of registry is defined in article I (c) of the Registration Convention, as "a launching state on whose registry a space object is carried". Its role in the context of responsibility is explained by article VIII of the Outer Space Treaty: it is the state that keeps jurisdiction and control over the space object. It is a necessity to have such a state, as outer space is a place outside sovereign jurisdictions. The determination of the state of registry gives the possibility to have a national system applicable to the space object. This can concern problems such as the transfer of ownership of a satellite, or the law applicable to astronauts inside the said space object. Because it has

[352] See *supra* note 153, *infra* note 390 and accompanying texts.

jurisdiction over the space object, the state of registry is responsible to ensure that it is not used in a way contrary to the principles of the space treaties.[353] This duty comes from the general one of due diligence.[354]

The state of registry, however, may be only one of the launching states, according to article 1(c) of the Registration Convention. In a case of in-orbit delivery, leasing or any transfer of property after the launching, the same problem is faced as with liability for space objects. Once the launching operation is achieved and successful, the launching state, and hence the state of registry, may not have sufficient links with the operator of the satellite to have the legal means to control the activity and use of the satellite.

Moreover, there might be no state of registry at all. If a launching, as contemplated by a project like the Sea- Launch, prevents any state to qualify as a launching state, *a fortiori* there can be no state of registry.[355]

There is no obligation under the Outer Space Treaty for all the space objects to be registered; this obligation (more or less immediate concerning the domestic registry but not for the international one held by the United Nations) was provided only in 1975 through the Registration Convention.[356] In other words, all the states that are party to the Outer Space Treaty and not to the Registry Convention do not have any duty to register space objects.

---

[353] See A. Dragiev, "Legal regulation of State Responsibility in Law of Outer Space", (1989) Proceedings of the 32nd Colloquium on the Law of Outer Space 313, at 316.

[354] See chapter 3, section 1, paragraph 1, above.

[355] See G.C.M. Reijnen, *supra* note 288, at 116 and 120-121. Except, once again, if the nationality of the private entity that launches is considered, in relation with article VI of the Outer Space Treaty, as a sufficient link to make its state of nationality a launching state (See B. Cheng, *Studies in International Space Law* (Clarendon, 1997) at 627).

[356] See B. Cheng, *supra* note 355, at 625. For a study of the application of the Registration Convention, see L. Perek, "The 1976 Registration Convention" (1998) 47.3 ZLW 351.

It should be added that in case of plurality of launching states, they have the possibility, but solely among themselves, to determine which of them is or shall be the state of registry.[357] This could lead to agreements creating the equivalent of 'flags of convenience' for space law.[358]

Furthermore, as the state of registry is the one which is supposed to exercise jurisdiction and control over the space object, situations where a state will be held internationally responsible for a space object or for an activity over which it has no jurisdiction in fact are possible. Several reasons could be invoked. The state could qualify as a launching state whereas it did not actively participated in the launch, for example, or it could be considered that one of its national undertakes an activity in outer space while its national law will not allow the state to exercise such jurisdiction.[359]

§3: Appropriate State.

Article VI of the Outer Space Treaty, as well as article 14 of the Moon Agreement, rely on what is called "the appropriate state" to authorise and supervise space activities of non-governmental entities. This appropriate state is the main link with private companies to ensure the respect of space law. However, once again, a question of definition arises. Indeed, what is an "appropriate state"?

---

[357] See Article II (2) of the Registry Convention.

[358] See B.Cheng, *surpa* note 355, at 628-629. According to him, the wording of article II (2) allowing those agreements, including future ones, can also permit to separate the registration from the jurisdiction over the object : "Article VIII of the Space Treaty now serves at best as a presumption".

The term "appropriate" does not have any specific legal meaning, and no definition exists or can be found in the space treaties or their preparatory works. The 1963 resolution on basic principles governing space activities[360], referred to the "concerned state". This evolution of term (even if "appropriate" seems more legal than "concerned") does not however bring any explanation to the determination of the state.

The doctrine relies on several views to try to define what the appropriate state is.

One of them is that the appropriate state is the state of nationality of the enterprise. Article IX of the Outer Space Treaty provides a duty for the states to avoid any harmful interference by their nationals, a duty that seems to pertain to the more general obligation of exercising the "continuing supervision" of article VI. It seems then logical that the state of nationality, having a duty pertaining to the appropriate state, is this appropriate state.

Further, article VI deals both with the state of nationality and the appropriate state. It considers that "states shall bear international responsibility for nationals activities in Outer Space", and deals also with the duties of the appropriate state. Hence, it may be considered that the appropriate state is the state of nationality of the entity.[361] However, if it was the intent of the drafters of the Outer Space Treaty to be the same and unique state, why did they use two different terms?

---

[359] See H. Bittlinger, "Private Space Activities: Questions of International Responsibility" (1987) Proceedings of the 30th Colloquium on the Law of Outer Space 191, at 194.

[360] See United Nations General Assembly resolution 1962(XVIII), "Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space", December 13, 1963.

[361] See for example, B.C.M. Reijnen, *The United Nations Space Treaties Analysed* (Frontières, 1992), at 114, and G. Silvestrov "On the Notion of 'Appropriate' State in Article VI of the Outer Space Treaty", (1991) Proceedings of the 34th Colloquium on the Law of Outer Space 326, at 327.

A second view of the doctrine is to consider that the appropriate state is a launching state. The appropriate state has to give its authorisation in order for the private company to use outer space. The launching of a company's space object by a state or with the permission of a state (through the use of its territories or facilities) gives to the operator of the launched space object the possibility to have a space activity. Without the support of the launching state, this private entity would not enjoy such an opportunity. In other words, the launching state gives a *de facto* authorisation to the private enterprise to exercise a space activity. A role that belongs to the appropriate state.

Another view could be to define the appropriate state in a more subjective way, rather than trying to rely on other definitions. It is clear that the appropriate state is the one that has to authorise and supervise the space activities of private entities. Hence, it could be argued that in the case of a private company using outer space, the appropriate state is the one that has given the authorisation and that exercises supervision over the company. In short, the appropriate state is the licensing state.

One can wonder how a compromise may be found between those three different views. Indeed, the term "appropriate" suggests a practical approach with the space activity concerned. According to an English dictionary, appropriate designates what is "correct, suitable, or acceptable".[362] In the context of responsibility, it is certainly the notion of "suitable" that the drafters of the space treaty had in mind. This means that the appropriate state is the state whose link to the non-governmental entity or its activity is the most relevant; the one that will have the best legal leverage over them.

[362] J.Sinclair (Ed.), *Collins Cobuild English Language Dictionary* (HarperCollins, 1987), at 61.

In other words, the appropriate state could be the launching state as far as the launching activity is concerned, or the state having jurisdiction over the operator of the activity. It is the one that has the best link with the activity or the best possibility to control the use of the satellite.

This idea of efficiency of the legal system relies on the issue of state jurisdiction. In this respect, Professor Bin Cheng designates the appropriate state has the one having '*jurisaction*' over the entity.[363] Two elements of positive law confirm his interpretation. The role of appropriate state for D.B.S. is given to the state having jurisdiction over the transmission of the program under the European Convention on Transfrontier Television.[364] Moreover, article 14 of the Moon Agreement also links the issue of continuing supervision to the state having jurisdiction over the non-governmental entity.[365]

The state that has jurisdiction over the operator, and thus over the activity itself, is the one that has the most effective legal control. This is the reason why it should be privileged. In this respect, the draft Unidroit Convention on International Interests in Mobile Equipment introduces the notion of jurisdiction of the state from whose territory the satellite is "physically controlled".[366]

This consideration of the jurisdiction to determinate the appropriate state is well founded in international law. As was stated in the Trail Smelter Arbitration: "a state owes at all times a duty to protect other states against injurious acts by individuals

---

[363] See B. Cheng, "The Extra-Terrestrial Application of International Law" (1965) 18 Current Legal Problems 132 and B. Cheng, *supra* note 355, at 622-623 and at 637.

[364] See *European Convention on Transfrontier Television*, signed in Strasbourg, May 5, 1989, (1989) 28 I.L.M. 857, articles 3 and 5.

[365] Article 14 (1) of the Moon Agreement states *in fine* that "State Parties shall ensure that non-governmental entities under their jurisdiction shall engage in activities on the moon only under the authority and continuing supervision of the appropriate state party". This might imply a separation between the state having jurisdiction over the company and the appropriate state. However, it also leaves the possibility that this appropriate state is the one who has the action under its jurisdiction.

[366] See article 42 of the *Preliminary Draft Unidroit Covention on International Interests in Mobile Equipment*, UNIDROIT 1998. Study LXXII-Doc.42.

from within its jurisdiction".[367] This protection is possible if the state exercises supervision over the activity. Hence, should not the state of jurisdiction be the appropriate state?

Furthermore, the supervision is possible only if the state may exercise any kind of jurisdiction (or '*jurisaction*') over the activity. Otherwise, the specification of its obligation would be useless. In practice, the role of authorisation and supervision can be understood as an explanation of the duty of due diligence that states have to exercise.[368] It is also possible to understand it as designating the state of registry as it is the one that is supposed to have jurisdiction and control over the space object.[369] This raises the question of the links between the state of registry and the state having jurisdiction over the operator: the two states may be different, as the state of registry is a launching state. Those two jurisdictions, however, can be exercised in parallel.[370]

An effective definition of the appropriate state leads to consider as such the state whose nationality the private entity has, but also in the same time, the state from where the activity is carried out.[371]

Thus, the definition of what the appropriate state is depends on the circumstances of each case, and is more factual[372] than legal.

---

[367] *Trail Smelter Case* (U.S.A. v. Canada), [1938 and 1941], 3 R.I.A.A. 1905, at 1963.
[368] See A.Dragiev, *supra* note 353, at 314, and the Trail Smelter Case, quoted *supra* note 367.
[369] See K. Tatsuzawa, *supra* note 2, at 344.
[370] *Ibid.*
[371] See M. Howald, "Private Space Activities and National Legislation" (1989) Proceedings of the 32nd Colloquium on the Law of Outer Space 344, at 345.
[372] See J. Rzymanek, *supra* note 87, at 248.

Section 2: Cross-Borders Operations: Challenging the System.

Transnational companies use the different legal systems to have recourse to the one which best fits their needs. This can be achieved in several ways. It can be called "forum shopping" when a company chooses to have its activities located in a special place to have its law applicable to the business.[373] It can also be the classical example of looking for tax advantages in the so-called "tax havens".[374] It can also be the search for a specific regime less demanding than the one of its country of origin: in the case of maritime business, it is the case with the "shipping centers", which give the famous "flags of convenience".

We shall see how this practice of tax haven can influence the law of responsibility for commercial space activities, if the emergence of space haven is a possibility in the existing space law, and what are the possible solutions to avoid this issues.

§1: From Tax Havens...

Commercial space activities are not exceptions to the trend in business activities to get the most beneficial legal systems for financial transactions. The Sea-Launch project, for example, is incorporated in the Cayman Island only for this purpose. Another company, West Indian Space Limited (a new comer in the space market that wants to operate a little constellations of remote sensing satellites), is also incorporated in this

---

[373] See N.Q. Dinh, P.Daillier, A.Pellet, *supra* note 92, at 676. In a narrower sense forum shopping is the choice of a foreign court able to grant damages or advantages that the plaintiff would not have had with the naturally competent court (See T.R. Brymer, "Le 'Forum Shopping' ou la course à la compétence: la réponse des tribunaux anglais" (1992) 181.1 RFDAS 9).

[374] See L. Leservoisier, *Les paradis fiscaux* (Presses Universitaires de France, Collection Que sais-je? N.2500, 1990), at 12.

tax haven.[375] This legal construction for tax benefits purposes is common and is usual in business practice, for example with aircraft financing. However, as far as space activities are concerned, one can wonder if this possibility is not dangerous in the context of responsibility.

Indeed, article VI of the Outer Space Treaty provides responsibility of the state for national activities in outer space. If the criterion of the place of incorporation were applied to the Sea-Launch, it would be under the responsibility of the Cayman Island (or most probably of the United Kingdom)[376] for which the launchings are done.

Thus, there are two dangers. The first one would be to have responsible states without any possibility of supervising or controlling the space activities of their pseudo-nationals. This means that the principle of due diligence is not as efficient against them as it is for space powers. The due diligence principle relies mainly on the capcity of states to avoid the activity that generated a damage. If the state does not have the necessary technology to this end, it cannot be held responsible on that ground. The counter-argument, however, is that a country that cannot, due to its lack of technical and financial means or knowledge, supervise a space activity is in breach *ipso facto* of its duty of due diligence, since it should not have authorised it. Nevertheless, tax haven are often countries whose main source of income relies on those financial transactions through their jurisdiction, and are often countries with poor financial possibilities. In other words, they probably could not compensate any damage due to a space object.

---

[375] This company is a joint venture between Core Software Technology, an American enterprise, and Israel Aircraft Industries, and Israeli firm (see *Space News* (17-23 February 1997) 7).
[376] The United Kingdom represents the Cayman Island internationally (See A. Kerrest, "The Launch of Spacecraft from the Sea", in G. Lafferranderie and D. Crowther, eds., *supra* note 33, at 231).

The question can be raised whether this nationality link of tax havens would be accepted under international law. In the case of the Sea-Launch, the company is incorporated in the Cayman Island. But the main operation is done by Boeing, American company, with a license of the United States. In other words, the place of incorporation appears to be only a legal fiction and does not correspond to the facts. Indeed, the United Kingdom does not regard it as one of its national as it did not apply the 1986 Outer Space Act, despite its international responsibility for the Cayman Island. Moreover, this company is an American company in the meaning of the 1984 Commercial Space Launch Act of the United States as amended in 1988.[377]

It should also be stressed that, for example, the famous Notteböhm case of the International Court of Justice states that a genuine link must exist between a private person and a state to consider the nationality on which is based the exercise of diplomatic protection.[378] Hence, as far as responsibility is concerned, the danger of incorporation in tax havens seems to be avoidable for an efficient involvement of the state of nationality.

However, risks exist for private companies. Indeed, if it is considered that the place of incorporation leads to the determination of nationality, then any exercise of diplomatic protection, any recourse to the Liability Convention, might be done only by this state of nationality, which may not have any interest to exercise its protection. The

---

[377] Under section 2603 (11) (c) of this act, is considered as American citizen and hence subject to a licence any entity whose controlling interest is held by an individual citizen of the United States, or by an entity organized or existing under the laws of the United States. However, despite the disapproval of Boeing, this venture is considered by US trade officials as encompassed by the US-Ukrainian bilateral treaty that limits the number of launch to be done by an Ukrainian rocket until 2001 (See P.B. de Selding, "European Protest Suggested" *Space News* (July 14-20, 1997) 15; see also D.J. Burnett and D.Lihani, *supra* note 142, at 267: the sea-launch was expressly encompassed by the US-Ukraine agreement in a protocol attached to it).

[378] See *Notteböhm Case* (Liechtenstein / Guatemala), April 6, 1955, I.C.J. *Rec.* 1955 at 4.

Barcelona Traction Case is a very good illustration of the limits existing when the state of incorporation does not want to be involved in any process. Indeed, the state of the shareholders could not claim any compensation.[379]

On the other hand, it is true that article VIII of the Liability Convention provides that the state where the damage was sustained, or of the place of permanence residence of the victim, may also introduce a claim. These criteria, nevertheless, might not be applicable for a company acting in outer space. The state in which territory the damage was sustained might not exist in the case of a collision between two space objects. And, as far as the state of permanence residence is concerned, its existence for a juridical entity is doubtful, or refers back to the notion of incorporation (hence of nationality).

This situation implies that space companies incorporated in tax havens can rely only on domestic recourses when they suffer a damage due to a space object. The issues of the determination of the competent tribunal and the applicable law, as well as of the relevant standards of behavior (fault, negligence, or strict liability regime), may also lead to endless discussions and make their compensation risky.

§2: ...To Space Haven?

The fear of having space havens existed since the beginning of space law[380], due to the famous example of "flags of convenience" in maritime law. This reappears nowadays with the development of private space activities.[381]

---

[379] This issue, nevertheless, is disputed between the solution of the Barcelona Traction Case and the one of Electonica Siccula. See B. Stern, *supra* note 350.

[380] See C.W. Jenks, *Space Law* (Stevens, 1965), at 212.

The general trend among the doctrine considers that, so far, no space haven exists. The practice, however, seems to go toward this direction. When a country claims several slots on the geostationary orbit to lease them to foreign companies, is not it acting as a space haven? Interested companies will find with it some possibilities that their countries cannot afford due to the shortage of slots. Moreover, when a television is located in a country to broadcast its programs to neighboring states in order to avoid their regulations, is not this country acting as space haven? And when a company gets a concession from a foreign state to use its territory (with some immunities of jurisdiction and execution) as a launching area, is not it a space haven?

Those examples are not fiction; they are real. This is the case of Tonga[382], of the United Kingdom[383], and of Zaire in 1978.[384]

Indeed, when a state grants a territory to a company to do some launchings, this seems to be the more far-fetched case of space haven, with all the legal fears linked to it: no control over the activity, no financial resources to compensate potential victims. This situation is avoidable, due to the technical character of space activities. Space technology is sensitive. It is subject to export control and restrictions. The launching technology is tied to the MTCR Treaty. This could be used as an argument to prevent a new comer in the launching market to have access to the relevant technology. Satellites to be launched also carry technologies with dual possibilities and are usually

---

[381] See A.Kerrest, "Le rattachement aux Etats des activités privées dans l'espace. Réflexions à la lumière du droit de la mer." (1997) XXII-II AASL 113, at 137.

[382] Tonga, small island in the pacific obtained six orbital slots by the I.T.U. Some of those slots are rented to an American company for 2 million of dollars a year each (See I.H.Ph. Diedericks-Verschoor, "Legal Aspects Affecting Telecommunications Activities in Space" (1994) 1 Telecommunications and Space Journal at 88, and *supra* note 119 and accompanying text). For a proposal to avoid this abuse of the system and the so-called "paper-satellites", see F.Lyall, *supra* note 97.

[383] See R. de la Baume and J-J. Bertolus, *supra* note 126, at 151.

[384] See G. Fahl, "Note sur le contrat du 20 octobre 1978 entre la république du Zaire et l'OTRAG", (1978) AFDI 920-926.

subject to strict control.[385] In other words, a company can not build facilities and proceed to launchings without the consent of an incumbent space power. The development of the Sea-Launch project is an illustration of this: the American Government suspended this project to start a survey on a possibility of an illegal transfer of technologies to Ukraine and Russia.[386] States can also prohibit companies within their jurisdiction from using satellites launched or operated from other countries.[387] This regulatory tool could be used as an incentive to diminish the potential market of satellites linked to space havens. The development of world trade, however, may in the future prevent a state from restricting access of its nationals to foreign markets and launchers.

Hence, a state that would allow one of its national to use and abuse of foreign possibilities would be in breach of its duty of due diligence, and could be regarded as responsible as the "appropriate state", in the meaning of article VI of the Outer Space Treaty.

Nevertheless, there is one interesting precedent. In 1978, Zaire granted a German Company, called OTRAG, a huge territory (two times larger than Switzerland) with immunities for its staff, to make some launchings at low price. The project did not succeed: the Zairian government cancelled the agreement within a year. This experiment also happened in Libya but failed. This was done against the will of the state of nationality, Germany. One can wonder in such a case what could have been

---

[385] For example the United States even think about requiring their prior consent to any launching of an American satellite by a non-American company in the name of the non proliferation of ballistic missiles (See J. Isnard, "Contre la prolifération, les Etats-Unis veulent contrôler les transferts de technologies", *Le Monde* (March 3, 1999) 5.

[386] See "Le projet original de Sea Launch", (August 21, 1998) http://www.latribune.fr/tribjour/journal/2108-031.HTM (Date accessed: August 21, 1998).

[387] Canada for example obliges companies involved in Direct to Home Television to use domestic satellites (See O.L. Robert, "Canada Makes DTH Exception" *Space News* (10-16 February 1997) 17;

the responsible states. Zaire, as a launching state, obviously. But could have Germany be held responsible, on the basis of its personal jurisdiction over the company, considering OTRAG as undertaking "national activities in Outer Space"? The answer may be positive.[388]

Another example might happen soon, but this time with the consent of the state of nationality. Beal Aerospace intends, thanks to financial aid from the US government, to launch satellites from a foreign territory. It plans to rent the Sombrero Island in the Caribbean for 98 years.[389] In such a case, if a launching is done for a private company, the launching state according to the Liability Convention will be only the state renting the island. If it does not have the financial funds necessary to compensate victims in case of a major failure of the company, the 1972 Liability Convention would be useless. The only international recourse would be against the United States on the basis of article VI of the Outer Space Treaty (on the grounds that is the state of nationality, and the appropriate state, especially if it licenses the activity). It seems, however, that the United Kingdom is the state representing internationally the Sombrero Island. Whether the British domestic law, the Outer Space Act of 1986, will be applicable is thus an interesting question.[390]

---

however, due to a shortage of capacity, temporary agreements with US satellites operators were possible).

[388] According to C.W. Jenks (*supra* note 380, at 212), "the State from which the financial resources were furnished could not divest itself of its responsibility by contending that activities financed (and probably organised and controlled) by its nationals cease to be 'national activities' when chartered by another State".

[389] See E.H. Phillips, "Beal Aerospace Developing New Launch Vehicle", *Aviation Week and Space Technology* (April 6, 1998) at 74-75. So far only an option to lease was signed, with the Antiguan government in December 1997 (See "Facilities" http://www.bealaerospace.com/facilities.html (Date accessed: 8 November 1998)).

[390] See "Facilities" http://www.bealaerospace.com/facilities.html (Date accessed: 8 November 1998). The Outer Space Act is applicable to dependent territories (article 2.3 of the 1986 Outer Space Act, *i.e.* "a) a colony, or b) a country outside Her Majesty's dominions in which Her Majesty has jurisdiction in

Lately, the American company reserved its decision to rent the Sombrero Island due to a delay caused by an environmental survey undertaken by the British Government. On the other hand, it concluded an agreement with the Cooperative Republic of Guyana, in order to build the first private spaceport. This agreement does not provide any specific immunities or extra-territoriality for its employees. The application of the Liability Convention to this private spaceport could be interesting: sovereignty over the area where it will be located is disputed.[391]

§3: Need for a New Approach?

It cannot be denied that, thus far, no problem of responsibility nor of liability involving a private company for space activity has arisen.[392] The existence of space heaven is still more a fear than a reality. However, the development of satellites constellations, the accumulation of space debris, the multiplication of new comers in the space markets and the privatisation of space actors are relevant factors that demonstrate that states are getting less and less involved in the decision process and the control of what happens in outer space.

The regime of responsibility to protect third parties on Earth, but also for activities undertaken in outer space, relies on a system of definitions whose loopholes may become dangerous. The two main consequences are that potential victims of a space object or of an activity in outer space may have some troubles to obtain the compensation that the Outer Space Treaty aimed to provide and that a state may be

---

right of Her Government in the United Kingdom" (article 13 of the Act)). On this issue, see F. Lyall, "UK Space Law" (1992) Proceedings of the 39th Colloquium on the Law of Outer Space 385.

[391] See http://www.bealaerospace.com/privatespaceport.htm, and especially for the details of the agreement: http://www.bealaerospace.com/questions.htm (Date accessed: August 25, 2000).

held responsible for an activity over which it did not have jurisdiction, thus no possibility of control.

The need for a clarification of the responsibilities and the necessity to bring them closer to the tort-feasors (or at least of the state having jurisdiction over them) is obvious.

State responsibility for private activities is still a necessity, in order to have the warranty that major damages can be compensated. It is true that some private companies have some financial means far beyond the possibilities of some sovereign states.[393] Nevertheless, beyond the fact that the recourse to state responsibility is a supplementary protection for victims, space activities are still essentially undertaken by companies from the major industrialised countries. The limited number of launch providers reinforces the prominent role of those happy, but few, states who are more likely to have financial means to compensate potential victims.

It appears logical, nevertheless, that the responsibility of the activity should be expressly vested on the state that has jurisdiction over the place from where the space object is physically controlled. This means that the Liability Convention should be amended to enlarge expressly the definition of launching states to the launching and procurement of launching done by their nationals or under their jurisdiction. In the mean time the responsibility of the launching states should ceased once the space object is operational in orbit and comes under the control of another operator (thus,

---

[392] To the best knowledge of the writer; precedents concern only contract liability linked to failed launchings (see, for example, Martin Marietta Corp. v. INTELSAT (763 F Supp. 1327, D. Md. 1991)).

[393] For example, the total turn over of the telecommunication companies Matushita, Sony, Motorola, Philips, AT&T and NT&T exceeds the gross national product of all South America (See R. de la Baume and J-J. Bertolus, *supra* note 126, at 194).

the operator coming under the jurisdiction of another state, this state, in turn, would become liable).[394]

There is no emergency yet to develop a new regime of responsibility and liability. States have the possibility through their national legislation, as they are clearly invited to do so under article VI of the Outer Space Treaty, to force private companies, even outside their territorial jurisdiction, to get necessary insurance and to respect some fundamental principles through a system of supervision and licensing. For example, the United States obliges its national companies to get insurance, or prove financial responsibility, for 500 million dollars for third-party claims. The government is hence liable for third-party claims in excess of this amount.[395]

The United Kingdom also provided the possibility for a protection of its budget: according to article 5.2 of the Outer Space Act of 1986, the Secretary of State may require the licensee to insure himself. The Swedish government is also protected as the 1992 Act on Space Activity expressed that any licensee has a duty to reimburse the state. As far as France is concerned, Arianespace is also responsible to get an insurance of 400 million French francs.[396]

Domestic space laws, through those various examples, show that they have the advantage of protecting state finances from the expense they could encounter, due to a damage done by a private company for which they are responsible under a relevant provision of international space law. As there is a lack of precise definition in order to point out what state is exactly responsible for what, domestic space law is for the state

[394] On the need to change the extent of liability for launching states, see H.A. Wassenbergh, "The Law Governing Private Commercial Activities of Space Transportation" (1993) 21.2 Journal of Space Law 97, at 109.

[395] The Commercial Space Launch Act, as amended in 1988, provides that the United States will, nevertheless, indemnify the excess only up to 1.5 billion dollars (See K. Yelton, "Evolution, Organization and Implementation of the Commercial Space Launch Act and Amendments of 1988" (1989) 4 The Journal of Law and Technology 117, at 134-135).

a possibility to get a legal insurance. This does not imply that there has to be a mutation from state responsibility to private liability: even if this gets the liability closer to the perpetrator, the legal provision chosen in the law can offer a partial protection for the companies (as it is the case under American law with a two tiers liability), thus giving them an incentive to invest in space activities.

Furthermore, domestic space law - through the issuance of license - also permits states to exercise a better supervision over their national companies (or companies they consider as being under their jurisdiction). It also helps states to have a better leverage for ensuring the respect of space law and control the strategic dimension linked to any space activity.[397] Hence, it is surprising that states do not protect themselves against financial hurdles that national space activities of their non-governmental entities can create. One can especially think of France, major space power, who does not have any specific act ruling private space activities.[398]

The most necessary evolution of space law, taking into account the privatisation of space activities and the loopholes in the responsibility regime as well as its state-centred procedures, relies certainly in the development of an international instrument for dispute settlement. The draft convention of the International Law Association (if it leads to the adoption of an agreement among the major space powers) would be a step in the right direction. Even if this dispute settlement system would be more useful for

---

[396] See L. Peyrefitte, *supra* note 7.

[397] For example, the US Land Remote Sensing Policy Act of 1992 provides that the American government can have access to the data gathered by private companies (see S. Parisien, *supra* note 171).

[398] France, however, applies in a remote manner the duty of authorization of article VI of the Outer Space Treaty. All the main French space companies (Spot Image, Arianespace, for example) have the French space agency (CNES) as shareholder. Nevertheless, in a context of privatization of its space activities and mergers of the aerospace companies in Europe, a law directly aimed towards private space activity may be not superfluous.
On the French approach, see F. G. von der Dunk, *supra* note 24, and on the role of the CNES, see P. Clerc in S. Courteix, ed., *Le cadre institutionnel des activités spatiales des états* (Pédone, 1997) 63.

pure space disputes (*i.e.* not involving innocent third parties on the ground) it would be a more effective protection of private interests and thus an incentive for the development of space activities. Moreover, decisions and awards given through this convention would help to better define and determine the scheme of responsibility, and thus to develop the law applicable to outer space activities. [399]

[399] According to article 38 (1) of the Statute of the International Court of Justice, judicial decisions (and the teachings of the most highly qualified publicists) are a subsidiary mean for the determination of rules of law.
Amendments to the Liability Convention for a clarification of definitions, such as "launching state" for example, is a possibility. However, even if the C.O.P.U.O.S. is aware that it could improve space law in this way, the road to change the space treaties is long. See United Nations General Assembly, *Report of the Legal Subcommittee of the C.U.P.U.O.S. on the work of its 38th session*, (UN Doc. A/AC.105/721, March 30, 1999) at 8 and 14.

Conclusion

Space activities become more and more commercial. The trend towards privatisation and mergers in Europe is a paradigm of this evolution. In the mean time, the framework of responsibility has not changed since the 1970's and still reflects a period where space activities were state activities. Hence, space law provides a regime of responsibility which is state-centered, whether for activities in outer space (article VI of the Outer Space Treaty) or for damage du to the space object (article VII of the Outer Space Treaty, and 1972 Liability Convention). This regime seems well constructed through the statement of complementary principles of responsibility, liability and due diligence.

However, the division between the responsibility regime for the activity and the liability regime for the space object illustrates its limits when it comes to private space activities. Definitions which draw a link between a company and a possible responsible state are numerous and vague. The state of nationality of the activity, the so-called appropriate state, as well as the launching state and the state of registry do not have a precise definition.

The practice of private entities for space activities is original as compared to state practice. Private entities have developed original procedures to launch space objects (for example from the high-seas or from an island rented to a foreign state). They have also developed specific financial methods (incorporation in tax havens, leasing of satellites in orbit). Hence, this leads to the fear of not having for a given case a responsible state (hence no reparation for the victims in case of damage) or a state which would be held responsible for an activity it could not control.

There is obviously a need to redefine the international responsibilities for space activities, in order to keep them in harmony with private developments and closer to the operator of the concerned satellite.

Furthermore, the development of a mandatory dispute settlement system is also a necessity in order to enhance the protection of possible victims.

As far as states are concerned, the development of domestic law, specifically aimed towards space activities, must be emphasized. It would be helpful to enforce the duties pertaining to the appropriate state under article VI of the Outer Space Treaty, and it would also allow for the possibility to have a certain financial recourse and protection against any vicarious liability due to an entity that the states cannot control.

Bibliography

Primary Sources

INTERNATIONAL CONVENTIONS

- Charter of the United Nations (San Francisco, 1945), quoted in D.J. Harris, *Cases and Materials on International Law* (Sweet & Maxwell, 1991), at 970.
- Convention on International Civil Aviation (Chicago, 1944), ICAO Doc. 7300/6 (1980).
- European Convention on Human Rights (Rome, 1950), quoted in M. Delmas-Marty C. Lucas de Leyssac, Eds, *Libertés et droits fondamentaux*, (Seuil, 1996), 69.
- Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface, (Rome, 1952), ICAO Doc. 7364.
- Convention on the Settlement of Investment Disputes between States and Nationals of Other States (Washington, 1965), (1965) 4 ILM 532.
- Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, (Moscow, London and Washington, 1967), 610 UNTS 205.
- Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Washington, London and Moscow, 1968), 672 UNTS 119.
- International Covenant on Civil and Political Rights, (1967) 61 AJIL 870.
- Convention on the Law of Treaties (Vienna, 1969), (1969) 8 I.L.M. 679.
- Agreement establishing the Interim Arrangement for a Global Commercial Satellite System and Special Agreement; Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT) and Operating Agreement Relating to the International Telecommunications Satellite Organization (20 August 1971).
- Convention on the International Liability for Damage Caused by Space Objects (London, Moscow and Washington 1972), 961 UNTS 187.
- Convention on Registration of Objects Launched into Outer Space, (New York, 1974), 1023 UNTS 15.
- Convention on the Transfer and Use of Data of the Remote Sensing of the Earth from Outer Space (Moscow, 19 May 1978), UN Doc. A/33/162, 29 June 1978.
- Convention on the International Maritime Satellite Organisation (INMARSAT) and Operating Agreement on the International Maritime Satellite Organization (entered into force on 1st July 1979).
- Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, UN DOC. A/RES/34/68, 5 December 1979.
- Cosmos 954 Incident, U.S.S.R. Note, (1979) 18 I.L.M. 899.
- Re: Cosmos Satelitte 954, Statement of Claim by Canada, (1981) 20 I.L.M. 689.
- Convention of the International Telecommunication Union (Geneva, 1992), as amended (Kyoto, 1994).
- United Nations Convention on the Law of the Sea (Montego Bay, 1982), (1982) 21 ILM 1261.
- Convention Establishing the European Telecommunications Satellite Organization (EUTELSAT).
- Agreement on Guidelines for the Transfer of Equipment and Technology Related to Missiles, (1987) 26 I.L.M. 601
- European Convention on Transfrontier Television, (Council of Europe, Strasbourg, 1989), (1989) 28 I.L.M. 857

- U.S. - China Memorandum of Agreement Regarding International Trade in Commercial Launch Services.
- Agreement Between the Government of the United States of America and the Government of the Russian Federation to Amend the 'Agreement Between the Government of the United States of America and the Government of the Russian Federation Regarding International Trade in Commercial Space Launch Services' (30 January 1996).
- U.S. - Ukraine Agreement Regarding International Trade in Commercial Space Launch Services (21 February 1996).

UNITED NATIONS GENERAL ASSEMBLY RESOLUTION

- Resolution 217 A (III), Universal Declaration on Human Rights, 10 December 1948.
- Resolution 1962(XVIII), Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, 13 December 1963.
- Resolution 37/92, Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting, 10 December 1982.
- Resolution 38/80, International Co-operation in the Peaceful Uses of Outer Space, 15 December 1983.
- Resolution 41/65, Principles on Remote Sensing, 3 December 1986.
- Resolution 47/68, Principles Relevant to the Use of Nuclear Power Sources in Outer Space, 14 December 1992.

UNESCO RESOLUTION

- Declaration of Guiding Principles on the Use of Satellite Broadcasting for the Free Flow of Information, the Spread of Education and Greater Cultural Exchange (UNESCO General Assembly, 1972).

DRAFT CONVENTIONS

- International Law Commission' Draft Articles on State Responsibility (1980) II Y.B.I.L.C. 30 and (1986) II. Y.B.I.L.C. 38.
- Final Draft of the Revised Convention on the Settlement of Disputes Related to Space Activities (as amended at the 68th ILA Conference), (1998) 47.3 ZLW 337-350.
- Preliminary Draft Unidroit Covention on International Interests in Mobile Equipment (UNIDROIT 1998. Study LXXII-Doc.42).

REPORTS OF THE C.O.P.U.O.S.

- *Report of the Legal Sub-Committee of the C.O.P.U.O.S. on its 26th Session* (UN Doc. A/AC.105/385, 16 April 1987).
- *Reports of the Legal Subcommittee of C.O.P.U.O.S. on its 35th session* (UN Doc. A/AC.105/639, 11 April 1996).
- *Report of the Legal Subcomittee of the C.O.P.U.O.S. on the work of its 37th session* (UN Doc. A/AC.105/698, 6 April 1998).

- *Report of the Legal Subcomittee of the C.O.P.U.O.S. on the work of its 38th session* (UN Doc. A/AC.105/721, 30 March 1999).
- *Report of the Legal Subcomittee of the C.O.P.U.O.S. on the work of its 39th session* (UN Doc. A/AC.105/738, 20 April 2000).

UNISPACE III

- Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, "Commercial Aspects of Space Exploration, including spin-off benefits" (UN Doc. A/CONF.184/BP/7, May 27, 1998).

CASES

- Lotus Case, (France v. Turkey) [1927] P.C.I.J. Reports, Series A, N.9, 18.
- Island of Palmas Case, (Netherlands v. U.S.A.) [1928], Permanent Court of Arbitration, 2 R.I.A.A. 829.
- Trail Smelter Case, (U.S. v. Canada) [1938 and 1941], 3 R.I.A.A. 1905.
- Reparation for Injuries Suffered in the Service of the United Nations Case, Advisory Opinion, [1949] I.C.J. Reports, 174.
- Corfu Channel Case (Merits), (UK v. Albania) [1949] I.C.J. Reports, 4.
- Notteböhm Case, (Liechtenstein v. Guatemala) [1955] I.C.J. Reports, 4.
- North Sea Continental Shelf Case, (Federal Republic of Germany v. Denmark and The Netherlands) [1969] ICJ Reports, 3.
- Barcelona Traction, Light and Power CO. Case, (Belgium v. Spain) [1970] I.C.J. Reports, 3.
- Nuclear Test cases, (Australia v. France; New Zealand v. France) [1974] I.C.J. Reports, 253.
- Air Service Agreement Case, (France v. United States) [1978] 18 RIAA 416.
- United States Diplomatic and Consular Staff in Tehran, [1980] I.CJ. Reports, 3.
- Case Concerning the Legality of the Threat or Use of Nuclear Weapons, advisory opinion of 8 July 1996, [1996] 35 ILM 809.
- Yeager v. Iran, (U.S. v Iran) [1987] 17 Iran-U.S.C.T.R. 92.

NATIONAL LAWS

- Russia: - Law on Space Activities (20 August 1993)
- Sweden: - Act on Space Activities (1992:963)
- South Africa: - Space Affairs Act N°.84 of 1993
- United Kingdom: - Outer Space Act 1986 (1986 Chapter 38)
- United-States: - Land Remote-Sensing Commercialization Act of 1984
  - Commercial Launch Service Act of 1984 (amended in 1988)
  - Land Remote Sensing Policy Act of 1992

Secondary Sources

BOOKS

- Achilleas P., *La television par satellite. Aspects juridiques* (Montchrestien, 1995), 199p.
- Bender R., *Launching and Operating Satellites. Legal Issues* (Nijhoff, 1998) 343p.
- Benko M. and Schrogl K-U, *International Space Law in the Making*, (Frontières, 1993), 275p.
- Bernhardt R. (Ed.) *Encyclopedia of Public International Law*, vol.11, 1989, 353p.
- Böckstiegel K-H., *Environmental Aspects of Activities in Outer Space*, (Heymanns, 1990), 318p.
- Bollecker- Stern B., *Le préjudice dans la théorie de la responsabilité internationale*, (Pédone, 1973), 382p.
- Cheng B., *Studies in International Space Law*, (Clarendon, 1997), 798p.
- Cheng C.-J. and P. Mende de Leon (Ed.), *The Highways of Air and Outer Space over Asia*, (Nijhoff, 1992), 364p.
- Christol C.Q., *Space Law: Past, Present and Future*, (Kluwer, 1991), 516p.
- Christol C.Q., *The Modern International Law Of Outer Space*, (Pergamon Press, 1982), 932p.
- Courteix S. (Ed.) *Droit, télédétection et environnement*, (SIDES, 1994), 292p.
- Courteix S. (Ed.) *Le cadre institutionnel des activités spatiales des états. Étude comparative*, (Pédone, 1997), 380p.
- Courteix S., *Le droit de l'espace*. (La Documentation Française, documents d'études N. 3.04, 1990), 47p.
- Couston M. and Pillardon L., *L'Europe, puissance spatiale*. (Brylant, 1991), 322p.
- Couston M., *Droit spatial économique. Régimes applicables à l'exploitation économique de l'espace*, (Sides, 1994), 282p.
- de La Baume R. and Bertolus J.-J., *Les Nouveaux maitres du monde*, (Belfond, 1995), 237p.
- Dinh N.Q., Daillier P., Pellet A., *Droit international public*, (Librairie Générale de Droit et de Jurisprudence, 1994), 1317p.
- Dupuy P.M., *La responsabilité des Etats pour les dommages d'origine technologique et industrielle*, (Pédone, 1976), 309 p.
- Dutheil de la Rochère J., ed., *Droit de l'espace, aspects récents* (Pédone, 1988), 188p.
- Fisher D., *Prior Consent To International Direct Satellites Broadcasting*, (Nijhoff, 1990), 236p.
- Forkosk M.D., *Outer Space and Legal Liability*, (Nijhoff, 1982), 290p.
- Gorove S., Developments in Space Law. Issues and Policies, (Nijhoff, 1991), 416p.
- Guillaume G., *Les grandes crises internationales et le droit*, (Seuil, 1994), 319p.
- Harris D.J., *Cases and Materials on International Law*, (Sweet & Maxwell, 1991), 1040p.
- Henkin L., *How Nations Behave. Law and Foreign Policy*, (Columbia University Press, 1979), 400p.
- Hurwitz B.A., *State Liability for Outer Space Activities in Accordance with the 1972 Convention on International Liability for Damage caused by Space Objects*, (Nijhoff, 1992), 245p.
- Jakhu R., *Space Law: Applications. Course Materials*, (McGill University, 1998), 459p.
- Jasentuliyana N. (Ed.), *Perspectives on International Law*, (Kluwer, 1995), 556p.
- Jasentuliyana N. and R-S.K. Lee (Eds), *Manual on Space Law*, vol.1, (Sitjhoff, 1979), 479p.
- Jasentuliyana N., *Space Law. Development and Scope*, (Praeger, 1992), 281p.
- Jenks C.W., *Space Law*, (Stevens, 1965), 476p.
- Kahn P. (Ed.), *L'exploitation commerciale de l'espace. Droit positif, droit prospectif*, (Litec, 1992), 500p.
- Koskiennemi M. (Ed.), *International Law*, (Darthmouth, 1992), 516p.

- Lachs M., *The Law of Outer Space*, (Sijthoff, 1972), 196p.
- Lafferranderie G. and Crowther D., eds., *Outlook on Space Law over the Next 30 Years*, (Kluwer, 1997), 473p.
- Leservoisier L., *Les paradis fiscaux*, (Presses Universitaires de France, Collection Que sais-je? n° 2500, 1990), 128p.
- Lesueur-Stewart M., *To See the World. The Global Dimension in International Direct Television Broadcasting by Satellite*, (Nijhoff, 1991), 630p.
- Madders K., *A New Force at a New Frontier. Europe's development in the space field in the light of its main actors, policies, law and activities from its beginning up to the present*, (Cambridge University Press, 1997), 604p.
- Marchan J., *Derecho Internacional del Espacio. Teoria y Politica*, (Banco Central Del Ecuador, Quito, 1987), 1001p.
- Matte N.M., *Aerospace Law: Telecommunications Satellites*, (Butterworths, 1982), 354p.
- McDougal M.S., Laswell H.D., and Vlasic I.A., *Law and Public Order in Space*, (Yale University press, 1963), 1147p.
- Meredith P.L. and Robinson G.S., *Space Law: A Case Study for the Practitioner*, (Nijhoff, 1992), 384p.
- Merrils J.G., *International Dispute Settlement*, (Grotius, 1991), 288p.
- Morlin E. (Ed), *Penser la Terre. Stratèges et citoyens: le réveil des géographes*, (Autrement, série Mutations, n°152, 1995), 187p.
- Nesgos P.D., *National Law and Commercial Activities in Outer Space*, (D.C.L. Thesis, McGill University 1983), 392p.
- Peyrefitte L., *Droit de l'espace*, (Dalloz, 1993), 352p.
- Piradov A.S., *International Space Law*, (Progress , Moscow, 1976), 271p.
- Reijnen B.C.M., *The United Nations Space Treaties Analysed*, (Frontières, 1992), 330p.
- Reijnen G.C.M., *Utilization of Outer Space and International Law*, (Elsevier, 1981), 179p.
- Simpson J.A., *Preservation of Near Earth Space for Future Generations*, (Cambridge University Press, 1994), 247p.
- Smith M.L., *International Regulation of Satellite Communication*, (Nijhoff, 1990), 245p.
- Taishoff M.N., *State Responsibility and the Direct Broadcast Satellite*, (Frances Pinter, 1987), 203p
- Vellas P., *La coopération internationale entre industries aéronautiques et spatiales*, (Pédone, 1995), 331p.
- Wassenbergh H.A., *Principles of Outer Space Law in Hindsight*, (Nijhoff, 1991), 173p.
- Zacher M.W., *Governing Global Networks. International Regimes for Transportation and Communications.*, (Cambridge University Press, 1996), 299p.
- Zhukov G. and Kolossov Y., *International Space Law*, (Praeger, 1984), 224p.

ARTICLES

- Barboza J., "International Liability for the Injurious Consequences of Acts Not Prohibited by International Law and Protection of the Environment" (1994) III.247 RCADI 291.
- Bertrand C. , "La nature juridique de l'Organisation pour la Sécurité et la Coopération en Europe" (1998) 102.2 RGDIP 365.
- Bittlinger H., «Private Space Activities: Questions of International Responsibility» in International Institute of Space Law (1987) Proceedings of the 30th Colloquium on the Law of Outer Space 191-196.
- Böckstiegel K-H, «Neue weltraumrechtliche Arbeiten der International Law Association (ILA)», (1998) 47.3 ZLW 331-350.
- Böckstiegel K-H, «The Term 'Appropriate State' in International Law» (1994) Proceedings of the 37th Colloquium on the Law of Outer Space 77-79.
- Böckstiegel K-H. and Stoffel W., «Private Outer Space Activities and Dispute Settlement», (1994) 1 Telecommunications and Space Journal 327-337.

- Böckstiegel K-H., «The Term 'Launching State' In International Space Law» (1994) Proceedings of the 37th Colloquium on the Law of Outer Space 80-83.
- Böckstiegel K-H., «The Terms 'appropriate State' and 'Launching State' in the Space Treaties- Indicators of State Responsibility and Liability for State and Private Space Activities» (1991) Proceedings of the 34th Colloquium on the Law of Outer Space 13-16.
- Bourély M., «Quelques particularités du régime de la responsabilité du fait des activités spatiales» (1990) XV A.A.S.L. 251-272.
- Bourély M.G., "Creating An International Space and Aviation Arbitration Court" (1993) Proceedings of the 36th Colloquium on the Law of Outer Space 144-149.
- Bourély M.G., «La commercialisation des activités spatiales: aspects juridiques», (1989) XXXVII Annales de l'Université des sciences sociales de Toulouse 43-71.
- Bourély M.G., «Quelques réflexions au sujet des législations spatiales nationales» (1991) XVI A.A.S.L. 245-265.
- Bourély M.G., «Quelques réflexions sur la commercialisation des activités spatiales» (1986) XI A.A.S.L. 171-185.
- Brymer T.R., "Le 'Forum Shopping' ou la course à la compétence: la réponse des tribunaux anglais" (1992) 181.1 RFDAS 9.
- Burnett D.J. and Lihani D., «U.S. National Space Policy and Bilateral Launch Service Agreements» (1996) Proceedings of the 39th Colloquium on the Law of Outer Space 263-270.
- Castro Villalobos J.H., « The DBS Declaration of 1982: The TV Marti Case» (1994) Proceedings of the 38th Colloquium on the Law of Outer Space 6-14.
- Caubet C.G., "Le droit international en quête d'une responsabilité pour les dommages résultant d'activités qu'il n'interdit pas" (1983) AFDI 99.
- Cheng B., « 'Space Objects', 'Astronauts' and Related Expressions» (1991) Proceedings of the 34th Colloquium on The Law of Outer Space 17-27.
- Cheng B., «The Extra-Terrestrial Application of International Law», (1965) 18 Current Legal Problems 132-152.
- Cocca A.A., «The Principle of 'Full Compensation' in the Convention on Liability for Damage Caused by Objects Launched into Outer Space» (1972) Proceedings of the 12th Colloquium on the Law of outer Space 92-95.
- Cohen R.J., «The threat to radio astronomy from radio pollution» (1989) 5.2 Space Policy 91-93.
- Courteix S., "Questions d'actualité en matière de droit de l'espace", (1978) A.F.D.I. 892.
- Courteix S., «EUTELSAT: Europe' Satellite Telecommunications» (1984) Michigan Yearbook of International Legal Studies 85-101
- Diedericks-Verschoor I.H.Ph., «Legal Aspects Affecting Telecommunications Activities in Space» (1994) 1 Telecommunications and Space Journal 81-91.
- Diederiks-Verschoor I.H.Ph., and W.P. Gormley, «The Future Legal Status Of NonGovernmental Entities In Outer Space: Private Individuals And Companies As Subjects And Beneficiaries Of International Space Law», (1977) 5.2 Journal of Space Law 125-155.
- Dragiev A., «Legal regulation of State Responsibility in Law of Outer Space» (1989) Proceedings of the 32nd Colloquium on the Law of Outer Space 313-316.
- Dribin L.G., «What Space Law Will Govern Accidents and Breaches of Contract in Outer Space» (1988) Proceedings of the 31st Colloquium on the Law of Outer Space 165-171.
- Eisenstein L.J., «Choice of Law Regarding Private Activities in Outer Space: A Suggested Approach», (1986) 16 Calif. W. Int'l Jrnl 282-311.
- Ezor J.I., «Costs Overhead: Tonga's Claiming of Sixteen Geostationary Orbital Sites and the Implications for US Space Policy» (1993) 24 Law and Policy in International Business 915-941.
- F.Lyall, "UK Space Law", (1992) Proceedings of the 39th Colloquium on the Law of Outer Space 385.
- Fahl G., «Note sur le contrat du 20 octobre 1978 entre la république du Zaire et l'OTRAG» (1978) AFDI 920-926.

- Filho J.M., «On Private, States and International public Interests in Space Law» (1995) Proceedings of the 38th Colloquium on the Law of Outer Space, 238-245.
- Gál G. «Space Objects-'While in Outer Space'» (1994) Proceedings of the 34th Colloquium on the Law of outer Space 84-86.
- Galloway J.F., «Privatizing An International Cooperative? The Case of INTELSAT» (1996) Proceedings of the 39th Colloquium on the Law of Outer Space 144-150.
- Gorove S. «The Growth of Domestic Space Law: A U.S. Example» (1990) 18.2 J. of Space Law 99-111.
- Gorove S., «Implications of International Space Law for Private Enterprise» (1982) 7 A.A.S.L. 319-331.
- Gorove S., «Issues Pertaining To The Legal Definition 'Space Object'», (1995) 2 Telecommunications and Space Law Journal 135-151.
- Gorove S., «Some Thoughts on Liability for the Use of Data Acquired by Earth Resource Satellites» (1972) Proceedings of the 10th Colloquium on the Law of Outer Space 109-110.
- Gorove S., «Towards A Clarification Of The Term 'Space Object'- An International Legal And Policy imperative?» (1993) 21.1 Journal of Space Law 11-26.
- Gorove, «Major Definitional Issues In The Space Agreements» (1992) Proceedings of the 35th Colloquium on the Law of Outer Space 76-79.
- Howald M., «Private Space Activities and National Legislation» (1989) Proceedings of the 32nd Colloquium on the Law of Outer Space 344-347.
- Hurwitz B.A., «An International Compensation Fund for Damages Caused by Space Objects», (1991) Proceedings of the 34th Colloquium on the Law of outer Space 201-203.
- Hurwitz B.A., «Liability for Private Commercial Activities in Outer Space» (1990) Proceedings of the 33rd Colloquium on the Law of Outer Space 37-41.
- Jakhu R., «The Evolution of the I.T.U.'s Regulatory Regime Governing Space Radiocommunication Services and the Geostationary Satellite Orbit» (1983) VIII A.A.S.L. 381-406.
- Kennedys K.C., «The ABM Treaty and Star War Testing» (1986) 80 American Journal of International Law 854-877.
- Kerrest A., "Le rattachement aux Etats des activités privées dans l'espace. Réflexions à la lumière du droit de la mer." (1997) XXII-II AASL 113.
- Kolossov Y.M., «On The Problem of Private Commercial Activities In Outer Space» (1984) Proceedings of the 27th Colloquium on the Law of Outer Space 66-70.
- Kuskuvelis I.I., «The space risk and commercial space insurance» (1993) 9.2 *Space Policy* 109-120.
- Lessard S., «International Trade in Telecommunications Services. Towards Open markets», (1997) XXII-I AASL 403-412.
- Lyall F., «Paralysis by Phantom: Problems of the I.T.U. Filing Procedures» (1996) Proceedings of the 39th Colloquium on the Law of Outer Space 187-193.
- Maniatis D., «The Law Governing Liability for Damage Caused by Space Objects: from State Responsibility to Private Liability», (1997) XXII-I A.A.S.L. 369-401.
- Martin P.M., «Les définitions absentes du droit de l'espace», (1992)182.2 RFDAS 111-114.
- Martin P-M., «Quel Avenir Pour Les Articles VI Et VII du Traité sur L'Espace» (1997) 46.2 ZLW 222-227.
- McMahon J.F., «Legal Aspects of Outer Space» (1962) XXVII BYIL 339-399.
- Meredith P., «Licensing of Private Space Activities in the United States» (1997) XXII-I AASL 413 –416.
- Mosteshar S., «Responsibility for Pure Economic Loss Arising from Space Activity» (1991) Proceedings of the 31st Colloquium on the Law of Outer Space 274-275.
- Nesgos P.D., «Commercial Space Law: Practical Examples Relating to Contracts, Insurance and Finance» (1994) Proceedings of the 37th Colloquium on the Law of Outer Space 305-314.

- Nesgos P.D., «International and domestic Law Applicable to Commercial Launch Vehicle Transportation» (1984) Proceedings of the 27th Colloquium on the Law of Outer Space 98-111.
- Parisien S., «La commercialisation des activités de télédétection spatiale aux États-Unis: Considérations nationales et internationales», (1995) XX-II AASL 241-289.
- Pelton J.N. «Organizing large space activities. Why the private sector model usually wins», (1992) 8.3 Space Policy 233-244.
- Perek L., «The 1976 Registration Convention», (1998) 47.3 ZLW 351-360.
- Prémont M-C., «L'entreprise privée sur la scéne des télécommunications internationales par satellite» (1986) XI, A.A.S.L. 259-285.
- Qizhi H., «Legal Aspects of Commercialization of Space Activities» (1990) Proceedings of the 33rd Colloquium on the Law of Outer Space 58-61.
- Rothblatt M., «Lex Americana: The New International Legal Regime for Low Earth Orbit satellite Communication System», (1995) 23.2 Journal of Space Law 123-140.
- Rzymanek J., «Some Legal Aspects of Commercialization of Outer Space» (1987) Proceedings of the 30th Colloquium on the Law of Outer Space 246-250.
- Silvestrov G., «On the Notion of 'Appropriate' State in Article VI of the Outer Space Treaty», (1991) Proceedings of the 34th Colloquium on the Law of Outer Space 326-330.
- Spoelstra T.A.Th., «Radio Astronomy in Telecommunication Land: The I.T.U. and Radio Astronomy», (1997) XXII.6 Air and Space Law 326-333.
- Stern B., "La protection diplomatique des investissements internationaux. De Barcelona Traction à Electronica Sicula, ou les glissements progressifs de l'analyse." (1990) 4 J.D.I. 897-945.
- Tatsuzawa K., «The Regulation of Commercial Space Activities by the Non-Governmental Entities in Space Law» (1988) Proceedings of the 31st Colloquium on the Law of Outer Space 341-348.
- Tavernier P., «L'Année des Nations-Unies. 19 décembre 1985 - 19 décembre 1986. Questions juridiques.» (1986) AFDI 495-527.
- van Fenema H.P., «Cooperation and Competition in Space Transportation» (1994) XIX.2 Air & Space Law 81-88.
- van Traa-Engelman H.L., «Commercial Utilization of Outer Space. Legal Aspects» (1989) Proceedings of 32nd the Colloquium on the Law of Outer Space 417-423.
- Vereschetin V.S. and Postyshev V.M., «Responsibility of States for Remote Sensing Activities» (1985) Proceedings of the 28th Colloquium on the Law of Outer Space 247-250.
- von der Dunk F. G., «Liability versus Responsibility in Space Law: Misconception or Misconstruction?», (1991) Proceedings of the 34th Colloquium On The Law of Outer Space 363-364.
- von der Dunk F. G., «The Spider in the Web and the Rainproof Umbrella», (1991) 16 Revista del Centro de Investigacion y Difusion Aeraunotico Espacial 27-43.
- von der Dunk F.G., «The Illogical Link: Launching, Liability and Leasing» (1993) Proceedings of the 36th Colloquium on the Law of outer Space 349-359.
- Von der Dunk F.G., "Loopholes in Liability? Aspects of liability for damage sustained in the course of satellite telecommunications activities" (1995) 2 Telecommunications and Space Journal 153-174.
- von Kries W., «The UN Remote Sensing Principles of 1986 in the Light of Subsequent Developments», (1996) 45.2 ZLW 166-179.
- Wassenbergh H., «A Launch and a Space Transportation Law, separate from Outer Space Law?» (1996) XXI-1 Air and Space Law 28-32.
- Wassenbergh H., «An International Legal Framework for Private Space Activities», (1997) XXII-I A.A.S.L. 529-535.
- Wassenbergh H., «International Space Law: A Turn of the Tide», (1997) XXII-6 *Air and Space Law* 334-341.

- Wassenbergh H., «Public Law Aspects of Private Space Activities and Space Transportation in the Future» (1995) Proceedings of the 38th Colloquium on the Law of Outer Space 246-249.
- Wassenbergh H.A., "The Law Governing Private Commercial Activities of Space Transportation" (1993) 21.2 Journal of Space Law 97.
- White S.D., «International Regulation of the Radio Frequency Spectrum and Orbital Positions» (1995) 2 Telecommunications and Space Journal 329-350.
- Wirin W.B., «Practical Implications of Launching State- Appropriate State Definitions» (1994) Proceedings of the 37th Colloquium on the Law of Outer Space 109-117.
- Yelton K., "Evolution, Organization and Implementation of the Commercial Space Launch Act and Amendments of 1988" (1989) 4 The Journal of Law and Technology 117.