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LEGAL CONSEQUENCES OF THE INCREASING RELIANCE OF SPACE NATIONS ON PRIVATE ENTERPRISES IN THE EXPLOITATION OF LEO RESOURCES

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Abstract

This paper analyses the legal consequences of the gradual appropriation of the utilization of LEO Outer Space resources by private enterprises. It first addresses the way in which these activities are affected by the consequences of deregulation and budget constraints. Public administrations rely now on private enterprises in order to ensure the continuity of public-funded programs that can no longer be publicly supported due to shrinking budgets. In the second part, this paper outlines several probable consequences of such a huge shift in terms of legal and political issues. With the opening of international commercial arenas to liberalized new trade practices, we see the gradual evolution of standard international law issues under the influence of some national laws and regulations. In the end, these trends may impact on the environmental and political equilibrium of nations on our planet.

Introduction

Outer Space ventures have largely if not completely become the realm of private enterprises operating under the control of public agencies or government bodies. This has been so since the beginning of the Outer Space adventure, but the arena has also largely been occupied up to now by national space agencies and by international public space organizations.

This era is over, with the exit of the international satellite organizations and with the permanent funding difficulties that public agencies like NASA and its foreign counterparts have been having at times of budget discussions for the last decade. The private sector is now very heavily engaged in every aspect of satellite operations and this is creating specific tensions throughout an international regulatory system that has not been devised to accommodate such massive private investment and does not seem to be able to cope with its consequences.[1] Let us also notice that, even though several domains of the most recently developed activities, especially on the low orbits of the Earth, have been instituted through publicly funded programs, several private entrepreneurs have inherited public programs with the aim of transforming them into viable commercial operations, in the US and in Europe.[2]

[1] ITU officials openly identify «... *a growing list of corporate applicants who abuse the ITU registration process to restrict market access or slow down the progress of their competitors ...* ». *ITU Streamlining Efforts Fall Short. Agency Backlog Continues to Grow*. Space News, 18 September 2000, p. 3, 34.

[2] Teledesic and several other US operators largely benefited from the Advanced Communications Technology Satellite (ACTS) program

In short, we are referring to the privatization of the Outer Space business, which we will address (I) in reference to LEO satellite communications, and (II) with some of their legal consequences.

I - The facts: the privatization of LEO activities

We will briefly sum up the privatization process of LEO activities in four steps: a recap of LEO satcom activities, a recall of the split between public and private responsibilities, an examination of the shift from public to private, and a mention of several other space activities that have followed exactly the same path.

A - Activities specific to the LEOs are numerous and bound to increase in the coming years.

The low Earth orbits (LEOs) may easily host close to 1000 civilian satellites within the next decade.[3] They will be dedicated to the following main activities:

- Broadband satellite communications: initially, they were thought to be used for massive data transfer purposes; but, by and large they are now used in connection with the Internet Protocol.

- Mobile satellite communications: in spite of the doomed Iridium experience, we all hope that Globalstar and its followers will succeed in implementing a successful mix of pure LEO mobile telephony with terrestrial connections via roaming agreements.

- Satellite navigation systems: initially elaborated as a defense system in the US. They are now becoming an inevitable instrument for a wealth of terrestrial applications. One wonders how it was possible to live before GPS was invented!

- Earth remote sensing for pacific purposes: in a similar fashion, remote sensing is being used for innumerable applications. Perceived as being a luxury gadget at first, it is now becoming a utility of life for urban planning, agricultural monitoring, weather watch, ice-cap measuring and ocean observation, etc.

- Space stations to be inhabited on a permanent basis: Mir and the ISS project are exciting ventures. We still have to see the implementation of a viable arrangement in this kind of enterprise, but negotiations towards a workable international *modus vivendi* for the ISS seem to be going reasonably well.

- Spy satellites for an increasing number of nations: this is top secret activity for reasons of national security, even though everybody knows that at least half a dozen nations have their own fleet of spy birds.

- Any other activity directed from the Earth or from LEOs and aimed at targets located on LEOs also belongs to this list. This list of LEO-based activities may not be exhaustive and we can envision new types of activities that may develop in the coming years, once other more common LEO activities have become familiar and generated follow-ons.

B - The traditional split of competence between public and private organizations

launched by NASA on 13 September 1993. Robustiano Fernandez, *NASA launches the opening ACTS for Ka-band.* Via Satellite, March 1997, p. 64. In Europe, Astrium and Alcatel Space benefited from CNES and ESA research programs as well. *Europe reduces Investment in Satellite Communications*, Space News, 18 September 2000, p. 18.

[3] *US FAA scales back its non-GSO launch forecast for next 11 years.* Space News, 12 June 2000, p. 8. This article envisions 600 to 700 payloads to be launched, in addition to the existing ones (Iridium, Globalstar, ICO, Orbcomm, etc.) and the military low orbit satellites.

1. Public concern and interest in space systems

It is expressed by government agencies, such as NASA, ESA, NASDA, CNES, CSA, etc., by public international or regional organizations, such as: UN-COPUOS, ITU, WTO, EU bodies and by the remaining public cores of the former ISOs.

2. Private interest in space systems

It is expressed by manufacturers, operators and service providers. At first, there were essentially manufacturers, then private operators and service providers appeared, as a consequence of the development of the separate systems provisions of the Intelsat Agreement. PanAmSat was among the first to claim its capacity to operate a fleet of satellites, which initiated the beginnings of private satellite operators.

3. Mixed organizations include:

We identify this ''new'' category with the disappearance of the former international satellite organizations. Actually this category comprises all types of private space enterprises and it has been augmented of large defense and space conglomerates that are now gathering all sorts of satellite-related activities: manufacturing, operating, service providing and even the media.

C - The shift from public to private operational responsibilities.

1. The easing of tensions between the two Cold War superpowers had consequences:

- the halting of the production of mass-destruction weapons, on Earth and through space;
- the conversion of some of them into civilian equipment, like the SSBMs into launchers,
- the evolution of certain aspects of defense, which include purely civilian activities as illustrated by the move towards more sophisticated instruments: the debate on the use of nuclear energy in Outer Space and the evolution of Earth monitoring technology into an all encompassing type of activity (when is a ''civilian'' high resolution remote sensing satellite spying and when is it not?).

2. The necessary re-orientation of a huge military industrial capacity is accompanied by:

- the economic reality of the workers that are employed in the factories of these industries,

- the ''civilianization'' of a soon-to-be-idle industrial capacity,

- the development of the concept of ''global'' defense, in tune with the ''globalization'' of the economy.

3. Since the Cold War, new tensions are at play.

Rogues states are now free from being monitored by the two superpowers. These tensions do not ease the need for conflict monitoring and deterrence strategy. But this is another topic, beyond the scope of our present paper.[4]

4. Other space activities directly related to LEO satellite communications, follow exactly the same trend:

[4] The accelerated privatization of the space sector directly leads to the militarization and the weaponization of Outer Space. Please see our other paper: IAA-00-IAA.3.1.06, in the current 51th Congress.

- the launching business,
- weather monitoring activities,
- archive management,
- spin-off activities, etc.

In other words and whatever method is used to achieve the transfer from public to private, the appropriate way to describe this phenomenon in business management terms is to refer to the outsourcing of the management of administrative resources to private interests.[5]

II - Some of the legal consequences of the privatization of LEO communications

A - The submersion of the standard ''international'' approach by a new ''global'' approach.

This evolution (1) is important for nation states, (2) is materialized with the recourse to more flexible international legal instruments, and (3) is strengthened by the apparent inconsistency of certain public policies.

1. Nations tend to disappear.

National distinctions upon which one state used to base discriminations that in the past seemed proper to conduct a ''national'' policy are no longer acceptable. They may no longer consider their own ''national'' interest as a priority in detriment to the interest of the rest of the world (ROW), as it is illustrated with the EU building process. This entails several consequences:

- New global organizations mold international trade: the WTO is the best example, dragging the whole telephony business in the wake of the Basic Agreement on Telecommunications. Logically, this could include LEO mobile communications as soon as they are connected to basic telecommunications. Would this not be a clear case of abuse of power, should an organization such as the WTO end up regulating Outer Space communications as some voices already tend to claim?[6]

- Signatories of ''global'' legal instruments tend to be both, public and private bodies. We still have government delegations authenticating the adoption of new regulations that will be implemented *erga omnes*, like during WRC-2000, but these regulations are the result of a subtle mix of influences emanating from various private interests and bear an impact on all telecom operators.

- New private NGOs are showing up with a *de facto* regulating power.[7] A prime example in this domain is the burgeoning of the Internet experience, whereby huge chunks of public activities are monitored by non-publicly elected or appointed bodies.[8] As soon as we have the ''Internet in the sky'', all these Internet regulating bodies will be

[5] *US Legislation Would Impose Restrictions on NASA. Bill Directs Agency to Outsource Station Research, Commercialization.* Space News, 18 September 2000, p. 4.

[6] *Satellite Operators Face Barriers in Global Market. Many Nations Ignore International Free-Trade Treaties.* Space News, 18 September 2000, p. 1, 34.

[7] The Internet Engineering Task Force (IETF), the Internet Assigned Numbers Authority (IANA), the Internet Corporation Assigned Names and Numbers (ICANN) and Portable Network Graphics (PNG). ICANN assumes responsibility for (i) IP address space allocation, (ii) protocol parameter assignment, (iii) Internet's domain name system management, and (iv) root server system management.

[8] Only to name a few: the *Global Internet Project (GIP)* is an international group of senior executives from 12 of the largest corporations from the telecommunication services and equipment manufacturing sector that are committed to fostering the continued growth of the Internet. We also have the *Internet Law & Policy Forum*, or the *Internet Policy Institute*, or the *Electronic Frontier Foundation*, etc. A list of several of these NGOs may be found on the GIP web site at http://gip.org. Among the most dynamic of the regional chapters, we may cite EuroISPA that covers 10 European countries and the Internet Industry Association (IIA) which were recently reported to negotiate a MoU across the Internet that will provide *« for the sharing of information, participating in joint initiatives, and developing internationally consistent policies on self regulation and Internet governance »*. Communications Week International, 20 March 2000.

participating to the utilization of Outer Space and its regulation.[9]

2. Flexible legal instruments tend to develop.

We are seeing a proliferation of Memoranda of Understanding (MoUs), Memoranda of Agreement (MoAs), and other types of international *ad-hoc* agreements that do not have the same legal value than standard treaties and conventions but they still bind the parties who have signed them.[10] Always open to amendments, MoUs and MoAs can only be contested in front of agreed upon courts, which means they have a restricted acceptance.

But we also tend to see the development of regulatory practices that may some day prove to be in contradiction with international law, like the auctioning of radio frequencies. Nobody will dispute the fact that LEO communications belong to Outer Space activities but they are, for their biggest part, not ruled by internationally binding documents. They are only broadly covered by the standard space treaties of the early space age and by *ad hoc* recent regulations, hastily elaborated under ITU auspices since WARC-92. For the last three to five years we have seen the practice of auctions being developed for terrestrial mobiles because they are supposed to be the best way to allocate the use of radio frequencies. From a purely economic vantage point, that argument may be a good one, though we personally disagree with it.[11] In a short-term perspective, auctions could be the best way to replenish a Treasury's coffers.[12] If we agree to consider that an auction is a sale, then auctions can not be conceived in the situation of orbital slots, because they contradict space treaties that forbid Outer Space appropriation.[13]

3. The "global" enforcement of territorially restricted "national" legal and regulatory processes.

We are now referring to standards, patents and imposed technology limits that all foster the interest of those who want to gain from monopoly situations, which they want to protect from others.

Conflicts of standards are nowadays best illustrated with the 1st, 2nd and 3rd generations of mobile telephony, whereby and alternatively North America (AMPS or 1G),

[9] Larry Martinez, *Space Telecommunications and the Internet: Implications for the Outer Space Treaty*. Proceedings of the 40th IISL Colloquium, October 6-10, 1997, pp. 393-401.

[10] For example, the GSM MoU was signed on 7 September 1987 by network operators that committed to the GSM standard and unique frequency by 1 January 1991. It is the founding charter of the GSM Association created in 1992 with members that are signatories of this MoU. This Association is oriented towards servicing the mobile communications community that provides and uses GSM equipment worldwide (2nd generation mobile phones). It tallies over 300 operators in 146 countries of the world. http://gsmworld.com.

[11] Right now, the EC authorities are examining complaints lodged by several European mobile operators regarding the legality of the auctioning process used by a few EU governments for the allocation of 3G mobile licenses. For an in-depth analysis (and rebuttal) of FCC procedures from an economic and legal point of view, please read Lawrence J. Spiwak, *From International Competitive Carrier to the WTO: A Survey of the FCC's International Telecommunications Policy Initiatives 1985-1998*. Federal Communications Journal, December 1998, p. 111 and March 1999, p. 519.

[12] According to Mr. Reed Hundt, Chairman of the US FCC during an address to the Institute of International Economics, in Washington: "*We are wealth creators. Indeed, we even make money for the US Government. Our auctions of airwaves have raised $25 billion, which actually, literally puts us in the Guiness Book of World Records and makes me the most profit-generating government official since, I think, Gengis Khan...*". Space News, November 4-10, 1996, p.14.

[13] Yet, auctions of orbital slots are proposed by the current Chief of the FCC Satellite and Radiocommunication Division. *ITU streamlining Efforts Fall Short. Agency Backlog Continues to Grow*. Space News, 18 September 2000, p. 3, 34. These remarks provide evidence that auctions, whether at national or international level, may be (1) illegal in terms of international treaties (appropriation of a public good), (2) uneconomical in terms of profitability (by raising the level of return) and, (3) anti-competitive (by excluding competition with an exclusivity arrangement). Also: Ian Coe, *Legal issues surrounding spectrum auctions*, Proceedings of the Forty-first Colloquium on the Law of Outer Space. IISL 1998, pp. 194-204.

then Europe (GSM or 2G) set the tone.[14] Eventually, a compromise may be found or some other player may impose its own UMTS or 3G standard. Mass production of the equipment will produce windfall that will be commensurate with the size of (several) continents.

Differently, patents aim at forbidding market access. Some patent procedures look quite ludicrous.[15] Others are much more subtle and may, via their side effects, contribute to pushing companies into bankruptcy, as in the case of ICO Global and the TRW patent litigation that was settled out of court at a heavy price. Non-US satellite operators have learnt the lesson and now flatly reject what looks like futile procedural actions that only aim at blocking legitimate competition.[16] In other cases, as Professor Christol says, *''persistence pays off''*.[17]

Imposed technology limits are best illustrated by the 1996 US GPS policy that was reinforced by Congress in 1998.[18] The GPS standard was hoped to be adopted by the ROW, even though its signal was degraded by a magnitude of 1 to 100. Facing the logical lack of enthusiasm expressed by the ROW, especially the Galileo supporters, President Clinton decided to authorize an (almost) full fledge US GPS standard on 1 May 2000. Yet, the GPS is still loaded with its original flaws, mainly that it is under USAF control and that it is void of any liability to be endorsed by US authorities, should an aircraft incident happen because of a system malfunction anywhere in the world. This last event may not be a fiction, because the GPS system is not immune from periodic technical malfunctions.[19] This is why the so-called ''free'' of charge access to the GPS could eventually prove to be very costly to its non-US users.

4. The inconsistency of certain public bodies in their handling of public interest matters impacts on their authority (and will) with regards to LEO activities.

The remote sensing debate that has been going on in the US since the disappearance of Landsat 6 in 1993 illustrates the ups and downs of the discussion.[20] However, there is

[14] Peter Grindley, David J. Salant, Leonard Waverman, *Standard wars: The Use of Standards as a Means of Facilitating Cartels*, IJCLP, Issue 3 (Summer 1999), No 2. pp. 1-49.

[15] It has been reported some time ago that an Internet service provider intended to patent the ''double click'' of the mouse because it claimed having been the first to use this technical device to have access to the features of a web page. More recently and in a similar fashion, it was reported that British Telecommunications PLC intended to raise payments from ISPs in the US on the basis of a patent (No 4 873 662, issued in the US in 1989 and expiring in 2006) that BT took out on hyperlink technology. *BT Says Patent Gives It Right To Hyperlink Payments*, Financial Post (Toronto), June 6, 2000.

[16] *India Rejects Leo One Bid To Patent Orbital Scheme*, Space News, July 17, 2000, p. 2. In that case, Leo One pretended to patent a communications constellation scheme using satellites in equatorial and polar orbit.

[17] *Hughes eyes windfall from decades-old patent lawsuit*, Via Satellite, May 1999, p. 10. Carl Q. Christol, *Persistence Pays Off: The Case Of Hughes Aircraft Company vs. USA, 1976-1999*. 50th IAC Congress, Amsterdam, October 4-Oct. 8, 1999, IISL IAF-99-IISL.3.10. A deeper study on patents in space law (including the ICO Global-TRW litigation) may be found in: Bradford Lee Smith, *Recent Developments In Patents For Outer Space*, 50th IAC, October 4-8, 1999, IISL-99-IISL.3.09. Not so dramatic, patent litigation may lead to business arrangements, as in the case of CD Radio against XM Satellite Radio. Both companies will jointly finance the development of dual-mode radios based on shared intellectual property, expected to be available by 2004, while current patent infringement litigation should be interrupted. *Satellite Radio Frontier*, Frontier Status, 29 February 2000. On the original patent litigation: *CD Radio files patent lawsuit against XM Satellite Radio*, Via Satellite, April 1999, p. 10.

[18] *Commercial Space Act of 1998*. 105th Congress, (HR 1702, S. 1473), Public Law No: 105-303. October 28, 1998. As per Section 104 (a) of this Act: « *Congress finds that the GPS ... has become ... essential ... because of the emergence of a US commercial industry which provides GPS equipment and related services* ». Sec. 104 (b) « *... Congress encourages the President to ... (2) (A) establish the GPS and its augmentations as an acceptable international standard, (B) eliminate any foreign barriers to applications of the GPS world-wide ...* ».

[19] *Satellite Watch: One Up, Two Down*, GPS World, September 2000, p. 18.

[20] *Landsat 7 maintains quality*, Space News, 7 August 2000, p. 34. *Landsat 7: last of its kind?* Space News, 12 April 1999, p. 2. Edwin Scheffner, *Landsat's persistent uncertainties*, Space News, 24 November 1997, p. 15. Joanne Irene Gabrinowicz, *Remote sensing perspectives*, Space News, 21 July 1997, p. 15. *A $ 50 M hot*

not much at stake here from a legal point of view, since any nation and/or enterprise is free to build its own earth watch system as soon as it controls the necessary technology. By having a confused remote sensing policy in the late 1990s, the US lost control of the remote sensing technology.[21]

The on-going debate on the high resolution issue is an off-spring of the previous one, whether it is a threat to national security or not, including the spreading of high resolution technology to other states around the world with obvious security motivation. We certainly agree with the comment made by one distinguished speaker at a recent Carnegie Conference, « *the genie is out of our bottle* », though we may dispute the real meaning and intention of the speaker in his use of the pronoun "our".[22]

A similar phenomenon, but much wider in scope, is at play with US export control measures. The US Government is now squeezed between the necessity to control the export of sensitive US-made satellite equipment, for legitimate national security reasons, while in the same time it is lobbyied by US manufacturers to relax these same control measures for the sake of (i) expanding or (ii) maintaining their commercial positions. In other words, what is legal in the US in terms of satellite exports is determined by non commercial considerations in a context of (political) globalization. Needless to say that such confusion is transmitted to the Allies of the US, the manufacturers of which do not like to be told by US officials that what they are doing is illegal in terms of US laws and regulations, which, really, is the least of their concern, unless US laws are acknowledged for their extra-territorial impact.[23]

B - A new way to handle activities that are global in nature: governance by NGOs and by international institutions

The trend towards sector governance or global governance is illustrated by (1) the growing number of bodies that *de facto* govern new activities escaping standard public controls, (2) the lack of consciousness about the global dimension of Outer Space activities, and at the same time (3) the uniqueness of Outer Space, which should be taken into account more often.

1. "Governance" by NGOs vs "regulation" by political states and institutions

The one example to invoke here is the phenomenal development of the Internet, a once-publicly regulated utility, which has been transferred to the private domain and now tends to escape any public regulation. This sector is developing its own self-regulating bodies.[24] Once Internet is channeled through satellites, then a new type of media will almost totally stand outside governmental jurisdiction.

2. The slow awakening of consciousness about the global dimension of LEOs and other Outer Space activities

potato, the US Government should drop Landsat 7, Space News 26 June 1995, p. 18.

[21] Editor commentary, *Losing control*, Space News, 20 march 2000, p. 18.

[22] *Transparency and Civil Society*, Carnegie Endowment for International Peace, 26 May 1999.

[23] *US universities seek space export guidelines. Confusion mounts over what falls under ITAR.* Space News, 28 August 2000, p. 34.

[24] Raymund Werle, Volker Leib, *The Internet Society and its Struggle for Recognition and Influence*, Max-Planck-Institut Working Paper 99/12, November 1999. Available on the site of the Max-Planck Institute at http://www.mpi-fr-koeln.mpg.de/

With the turn of the millennium it is reassuring - and worrying at the same time - to see the UN taking the lead with regards to the global governance concept. It would be hard not to see the global impact of our way of living on our immediate environment and attempt at finding remedies for the very serious unbalances that already affect our Earth's global commons. But what about the Outer Space global commons ? By reading all the literature devoted to space, it seems that ''commercialization'' is the only benchmark by which space projects must now be evaluated. Before long, hundreds of communication satellites will be flying over our heads, but it seems that the only problem left to be solved is that of the radio frequencies and the possibility of their interference with other LEO or non-LEO systems, or between LEO systems and Earth radio services. From time to time, one may hear a distant - almost faint - voice recalling the issue of the space debris, while few people simply refer to other issues like LEO traffic congestion and the increasing potential for satellite collisions, or the issue of the fair return and sharing of economic benefits from Outer Space activities, or the issue of the adequacy between space venture investments and economic development on Earth, or the connection between Earth's global governance and Outer Space governance.

3. The current commercialization trend may not take sufficiently into account the uniqueness of LEO activities

Actually, the type of law that is applied to Outer Space activities is not ''space law'' as some of us know it, but an extension of the law of contracts as it is known and practiced on Earth within territorial state limits. This standard law of contracts is merely extended to Outer Space activities.[25] Is there a (legal) difference between selling pork bellies, soja beans or Persian Gulf brent and a LEO satellite? Some object that ''space law'' is not designed to further Outer Space business,[26] as we often hear it with the development of LEO communications. Unfortunately, the experience that has been accumulated so far in terms of environmental protection (on Earth) does not advocate in favor of optimism with regards to auto-regulating mechanisms in Outer Space.[27]

In many projects, the uniqueness of Outer Space and of LEO activities would need to be strengthened. Otherwise, a question comes to mind here whether Outer Space is a mere extension of the Earth, and whether LEO activities are only a trivial addition to those of the nearby Earth's atmosphere. To take as an example with intellectual property rights (IPRs), earlier this year the International Chamber of Commerce (ICC) published a document on emerging IP issues.[28] Browsing through the whole document, we might expect see several references to Outer Space and the need to devise an appropriate regimen for IPRs in Outer Space. Space activities appear in Part II of the document, having being regrouped with other current and emerging IP issues. They are appropriately introduced as one of the new forms of intellectual property and technologies involving the *''potential application of national legislation in Outer*

[25] As a matter of test, it is instructive to discuss about space law issues with a space industry practicing lawyer to measure the important inroads made by the business approach into non-business issues related to the Outer Space.

[26] Richard Berkley, *Space Law Versus Space Utilization: The Inhibition of Private Industry in Outer Space*, Wisconsin International Law Journal, Vol.15, No 2, Spring 1997, p. 421.

[27] Erin A. Clancy, *The tragedy of the Global Commons*, Indiana University School of Law, Vol 5, No 2., Spring 1998. p. 601.

[28] *Current and emerging intellectual property issues for business.* ICC Commission on Intellectual and Industrial Property. January 2000.

Space and the ownership and use of IPRs in Outer Space''. It recalls that a Unispace III workshop recommended to study the feasibility of harmonizing international IP standards in Outer Space.

Frankly, the words of the Unispace III workshop sound much better than the ICC's reference to the ''application of national legislation'' in Outer Space. However, with time elapsing in order to elaborate this harmonization, actual ICC recommendations may come *after* the LEO activities have been developed, thus creating a *fait accompli.*

Conclusion

This presentation has not extinguished the question on the legal consequences of the increasing privatization of Outer Space activities, particularly on the LEOs. It has only attempted to illustrate the accelerating privatization trend while, at the same time, it underlined a certain deficit in the slow (if any) taking into consideration of the specificity of Outer Space. Should this gap between the business beat and the rule of law process not be reduced, the future may confirm to us that Outer Space is going to be another wild *Eldorado*, possibly restricted to a minority of actors. In all logic, the basic Outer Space treaties should then be amended in order to take into account this evolution of our times and clarify the rules of the game, because we do not think that those that we have now constitute an appropriate and straightforward legal framework to allow for a private entrepreneurial approach of Outer Space.[29]

[29] F. Von der Dunk. *Public Space Law and Private Enterprise*. Unispace III, July 1999. The author makes a very interesting and thorough analysis of the compatibility of the OST and of the Liability Convention with the development of Outer Space private business enterprises. The demonstration is not an easy one because of the ambiguity of most of the wording of the space treaties.