

## FLY ME TO THE MOON: LEGAL AND POLITICAL CONSIDERATIONS OF SPACE EXPLORATION INITIATIVES \*

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### Abstract

The recent announcements by the United States, the European Space Agency, the People's Republic of China and others of their respective space exploration programmes indicate a resurgent interest in large-scale space exploration on the part of a growing number of nations, organizations and commercial enterprises. The authors of this paper examine elements of the legal and political backgrounds of the announced exploration initiatives. After a short introduction, the authors sketch the current status of international law applicable to these initiatives, including issues of non-appropriation, planetary protection, the use of nuclear power sources, and international cooperation. This account of the status quo of international law is followed by an analysis of the political impulses driving space exploration initiatives. Based on these findings the authors develop prospects for the further development of international law.

### I. Introduction

For the purposes of this paper, we define "space exploration initiatives" as high-risk, complex techno-scientific programmes undertaken by national and international entities to extend human infrastructure into the solar system and beyond. A wide range

of other space-based activities are primarily earth-focused, including communication, navigation, environmental, or military reconnaissance missions, and are therefore not "explorations" outward from the more immediate earth-space environment. Space exploration is about leaving the earth.

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While the initial stages of such efforts are generally robotic information-gathering projects, the longer-term goals include transporting human beings to explore and exploit celestial bodies.<sup>2</sup>

Since the turn of the millennium, a significant mutation has altered the seemingly inexorable evolutionary trend toward a commercialized civilian international space sector.<sup>3</sup> While the commercial-civilian sector continues to diversify both in terms of space systems (navigation, Internet, reconnaissance), system operators (hybrid international consortia of commercial launch and network providers), and user communities (military, civilian and commercial, including tourism), they are not alone on the launch pad. Governments have re-discovered the solar system and are implementing massive strategies to move human infrastructure to the moon and Mars by the mid-21<sup>st</sup> Century.

For not only are the long-standing space powers (United States, European Space Agency), but also the governments of China, Japan, India, and others, implementing a growing number of space exploration initiatives. This paper asks 'why?' and examines the implications of this resurgence in governmental space exploration initiatives for the evolution and structure of the international space legal regime, which up to now has been adapting successfully to a diminishing role of governmental entities amid a plethora of hybrid commercial-civilian space systems.

The last time a human walked on the moon was in December 1972, since then, no space explorers have ventured more than 1000 km from the earth's surface. Money has also been locked into earth orbit, particularly in the International Space Station (ISS), "the world's largest public works project." In fact, one could argue that more money has been spent showing the exploration of outer space from 1972 to 2006, than was spent on actual space exploration probes, whether manned or robotic.<sup>4</sup> To successfully get human beings to Mars and back will cost trillions of dollars. Consequently, the resurgence of governmental space exploration initiatives represent not only a massive increase in space sector funding, but also a re-emergence of governments as major players in the commercial-civilian space sector.

Who are the major players going to be?

*United States:* On January 14, 2004, three months following the first successful Chinese orbital mission, U.S. President George W. Bush announced a major U.S. space exploration initiative, which includes milestone dates for returning humans to the moon and eventual missions to Mars.<sup>5</sup> Calling for "human and robotic missions to the moon, Mars and beyond," the presidential announcement set in motion a presidential commission to outline the vision's goals and implementation, and a major space

<sup>2</sup> See, Frank Moring, Jr., "Configuration Concepts: Early lunar habitat work focuses on dust, storage, and crew privacy," *Aviation Week and Space Technology*, July 24, 2006, pp. 56-8. For details of the different initiatives see Objectif Mars - La Conquête Spatiale depuis ses origines, *Air & Cosmos Hors-Série*, June 2006.

<sup>3</sup> Although the governmental military space platforms constitute the largest near-earth space presence, they are major users of commercial space services.

<sup>4</sup> According to conservative estimations, the six *Star Wars* movies alone have earned more than \$3.4 billion in worldwide revenues, <http://www.supershadow.com/starwars/boxoffice.html>, which is more than the most expensive space exploration project to date: the joint US-ESA Cassini-Huygens mission currently orbiting Saturn after landing the ESA Huygens probe on Titan in January 2005 will end up costing \$3.26 billion, <http://saturn.jpl.nasa.gov/faq/mission.cfm>.

<sup>5</sup> The text can be found at: [http://www.whitehouse.gov/space/renewed\\_spirit.html](http://www.whitehouse.gov/space/renewed_spirit.html).

architecture study describing the plan's operational strategy.<sup>6</sup>

European Space Agency: The European Space Agency (ESA) in 2001 announced its Aurora Programme, designed "to create, and then implement, a European long-term plan for the robotic and human exploration of the solar system, with Mars, the Moon and the asteroids, [and] to search for life beyond the Earth."<sup>7</sup>

China: On October 15, 2003, China succeeded its first manned orbital mission<sup>8</sup> In February 2004, China announced its program to explore the moon and to land human beings there sometime after 2017, with *taikonauts* walking on Mars in the 2040-2060 timeframe.<sup>9</sup>

Japan: In 2005, the Japanese Aerospace Exploration Agency (JAXA) released its long-term vision plan, which articulated plans for manned spaceflight and lunar landings in the 2025 timeframe.<sup>10</sup> Japan reaffirmed its ambitions as major space exploring nation in November 2005 as its Hayabusa spacecraft made a soft landing on the asteroid Itokawa.<sup>11</sup>

India: The Indian Space Research Organization (ISRO) announced in 2004 its Chandrayaan I lunar

reconnaissance and surface impactor mission, due to be launched in 2007-2008 timeframe.<sup>12</sup>

Other Space-faring Nations: Following time-tested footsteps of the space-faring pioneers, countries with significant ballistic missile capabilities find that they also can launch scientific satellites into earth orbit or beyond. Both Israel and Brazil have satellite and/or launcher capabilities.<sup>13</sup>

### - The Politics of Space Law

There are several explanations for the rather sudden resurgence in governments' interest in mounting massive space exploration initiatives. Conventional political analysis would point to the traditional nation-state motives of military prowess and national prestige.<sup>14</sup> Both factors are certainly operating here, but are deficient in their explanatory power. While military motives were central to early space exploration programs using dual-use launching and orbital payload technologies, military space programs are now well established with their own R&D establishments and operating networks.<sup>15</sup> If a military lunar presence had been perceived as advantageous to the U.S. or Soviet military services, there would have been a much more assertive lunar program by either during the 1970s while both countries were pursuing moon programs.

The prestige factor appears to have more explanatory power. The ubiquitous World

<sup>6</sup> See, *Report of the President's Commission on Implementation of United States Space Exploration Policy* (June 4, 2004), and, NASA's *Exploration Systems Architecture Study: Final Report*, November 2005.

<sup>7</sup> ESA, [http://www.esa.int/SPECIALS/Aurora/ESA9LZPV16D\\_0.html](http://www.esa.int/SPECIALS/Aurora/ESA9LZPV16D_0.html)

<sup>8</sup> From Wikipedia :[http://en.wikipedia.org/wiki/Chinese\\_space\\_program](http://en.wikipedia.org/wiki/Chinese_space_program)

<sup>9</sup> *Ibid.*

<sup>10</sup> See, [http://www.jaxa.jp/about/vision\\_missions/long\\_term/jaxa\\_vision\\_e.pdf](http://www.jaxa.jp/about/vision_missions/long_term/jaxa_vision_e.pdf)

<sup>11</sup> <http://en.wikipedia.org/wiki/Hayabusa>

<sup>12</sup> See, <http://en.wikipedia.org/wiki/Chandrayaan>

<sup>13</sup> See, <http://www.globalsecurity.org/space/worldindex.html>

<sup>14</sup> See, Isabelle Sourbès-Verger, "L'espace dans le monde", in: *Géoéconomie*, no. 20, "Géoéconomie de l'espace", hiver 2002, pp. 49-63, for a typology of the space powers according to their traditional motives.

<sup>15</sup> See, Roger Handberg, *Seeking New World Vistas: the Militarization of Space*, (Westport: Praeger Publishers, 2000).

Wide Web facilitates global distribution of space-based images that exert a tightening grip on humankind's increasingly planetary consciousness. Issues such as global warming<sup>16</sup> and possible collisions with comets or asteroids propel both public and private entities to feed the public's growing appetite for knowledge about the earth-space environment, creating also in the process a growing constituency for "outer" space exploration, generating thereby also the scientific, economic and political rewards for those who survive the unforgiving realities of passage into space and its exploration. Inevitably, such highly visible ventures must pass through rigorous legal environments as well. However, prestige advantages for space-faring states is increasingly diluted by the commercialization of space ventures; company logos on the sides of Russian boosters, wealthy tourists tumbling in the zero-G of the International Space Station, or Virgin Galactic selling tickets for spacerides.<sup>17</sup> Immediate political advantages for politicians stemming from space exploration projects spanning decades in planning and years in execution are also diffuse.

We argue that a third factor that combines political and legal motivations deserves analytic scrutiny. In short, space is too important to entrust its development and governance to the profit motives of the commercial space sector. But having gone past the point of no return on the commercialization road, there still exists one space sector where commercial entities fear to tread – high risk, complex technoscientific development programs requiring decades to accomplish.

Both political and legal motivations are fuelling the reappearance of space exploration initiatives, often with inherently

contradictory impulses. While they feed from intense scientific and technological collaborations among the world's research and development communities, space exploration initiatives also operate as factors of political, economic, and military competition<sup>18</sup> in the global arenas of international politics.<sup>19</sup> Thus two impulses shape the development and implementation of the "rules of the road" for space exploration: the largely consensual collaborations among scientists to share information in their common quest to explore new frontiers of knowledge, and the more competitive, largely political, impulses of the space-faring powers to leverage space exploration for an enhanced governmental presence on the high ground of space with concomitant global power and prestige advantages. Finally, our argument points to the key role played by international space law in codifying the commonality of interests between the open and consensual culture of the scientific community operating the space exploration initiatives, with the new-found consensus among space-faring powers that effective governance, i.e., that governmental interests are represented in the space legal regime requires their visible presence.

#### - The Law of Space Politics

Thus, the "legal reflex" of space-faring nations to reduce uncertainty of high-risk exploration endeavours through "rules of the road" conventions is constantly being tested by risk-accepting commercial and political entrepreneurs pursuing their "political (and economic) impulses" for space exploration. Distilled out of the anarchy of a globalizing and commercia-

<sup>16</sup> See, Al Gore, "An Inconvenient Truth," documentary film, 2006, [http://en.wikipedia.org/wiki/An\\_inconvenient\\_truth](http://en.wikipedia.org/wiki/An_inconvenient_truth).

<sup>17</sup> <http://www.virgingalactic.com/en/news.asp>

<sup>18</sup> See, Gabriele Garibaldi, "Guerra nello spazio. Full Spectrum Dominance vs. Shashoujian e i rischi della corsa all'armamento dello spazio tra Stati Uniti e Cina", Lulu, <http://www.lulu.com/content/339923>, 2006.

<sup>19</sup> See, Cornelia Riess, "International Cooperation Patterns and Trends of Future Space Regulations," in Benkö and Schrogl, *Essential Air and Space Law*, Utrecht: Eleven International Publishing, Inc., 2005, pp. 175-190.

lizing international system, international space law is becoming a “witches’ brew” of customary and codified rules that can only partially reconcile the seemingly intractable tension between legal order and market power.<sup>20</sup>

This tension between the legal and political impulses shaping the international regime for outer space activities, in general, and space exploration initiatives, in particular, is evolving in response to three systemic changes:

- (1) Growing number and diversity of space-faring nations and entities;
- (2) ownership and regulatory liberalization of space high technology sectors; and,
- (3) increasing military utility of space assets.<sup>21</sup>

All three factors are accelerating the breadth and depth of space exploration initiatives into new and unexpected directions, with concomitant pressures to steer adaptations in the space legal regime to meet these new requirements.<sup>22</sup>

While outside the purview of this paper, one can nonetheless observe how the space exploration regime is evolving in a manner closely corresponding to other transnational commons regimes dominated by the scientific and/or technological imperatives,

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<sup>20</sup> See, “Report of the Project 2001 Working Group Report on Privatisation,” *Project 2001 – Legal Framework for the Commercial Use of Outer Space*, University of Cologne, 2002, pp. 405-529.

<sup>21</sup> Riess accurately points out that three trends are shaping future collaborations: (1) space globalization (2) the growing macro economic significance of space, and, (3) the military-security role played by the space sector. *Ibid*, pp. 177-8.

<sup>22</sup> See, *Project 2001: Legal Framework for the Commercial Use of Outer Space*, University of Cologne, 2002.

Antarctica being a very visible example.<sup>23</sup> The evolution of international law governing space exploration provides a scintillating example of the key role played by the scientific community where its ability to legitimize and implement the legal “rules of the road” actually performs an important political function.

The scientific community, which gives an important impulse for the development and operation of space exploration programmes, plays also a central role in developing the legal “rules of the road” for these exploration activities, and, consequently is steering the evolution of the entire space legal regime into a third phase of its evolution.<sup>24</sup>

This paper’s examination of the resurgence of governments into space exploration initiatives and its effect on the evolving international space legal regime will proceed in three steps. Part Two of the paper outlines the legal *status quo*. Part Three explores the political impulse for space exploration and how it forces the legal regime to conform to new realities. Part Four synthesizes the two aspects and gives an outlook on the potential evolution of the international law for outer space.

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<sup>23</sup> See, Larry Martinez, “International Law and the Antarctic: Future for an International Commons Regime,” in K. Tatsuzawa (ed.), *The Law of International Relations*, (Chuogakuin University Press, Japan, 1997), pp. 585-622.

<sup>24</sup> See, Marietta Benkő and Kai-Uwe Schrogl in their introduction to *Space Law: Current Problems and Perspectives for Future Regulations*, Utrecht: Eleven International Publishing, Inc., 2005, who recall that after a first phase during the 1960s and 1970s which saw the elaboration of the fundamental international space law conventions, and a second phase with the adoption of special legal regimes in form of General Assembly resolutions, the development of space law has entered its third phase characterized by a growing diversification, which goes hand-in-hand with a new flexibility in law.

## II. The legal status quo

In order to detect and evaluate systemic change, one must establish a starting point, or *status quo*. It is important to observe during this discussion the underlying tension between those early space-faring powers (i.e., the Soviet Union) recognizing only governmentally-sponsored and operated space systems, in contrast to the position of the United States in advocating a more porous international space regime that would also allow non-governmental space systems. The evolution of international space law over the past three decades has been, to a large degree, the gradual process of adaptation to the growing presence of non-governmental commercial entities operating in the space environment.<sup>25</sup> Consequently, the legal status quo can be divided into the first phase of space exploration law that emphasized legal principles and later legal agreements that addressed the specific concerns of the space scientific community with regard to the activities of non-governmental entities:

The starting point for depicting the legal status quo with regard to space exploration is Articles I, 2 and 3 of the 1967 Outer Space Treaty<sup>26</sup>, which stipulates that

*“Outer space, including the Moon and Other Celestial Bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial*

<sup>25</sup> See, Wayne White, “The Outer Space Treaty,” *Space Exploration and Humanity: A Historical Encyclopedia*, unpublished monograph, January 23, 2006.

<sup>26</sup> The Outer Space Treaty, 610 UNTS 205, was adopted by the UN General Assembly in its resolution 2222 (XXI). It was opened for signature on 27 January 1967 and entered into force on 10 October 1967. As of 1 January 2005, it received 99 ratifications and 27 signatures. Thus, it can be regarded as having universal legal value.

*bodies.*

*There shall be freedom of scientific investigation in outer space, including the Moon and Other Celestial Bodies, and States shall facilitate and encourage international cooperation in such investigation.”*

The fundamental freedom to explore outer space encounters numerous boundaries, which are not only those imposed by the classical international space law, but also increasingly those that at first glance cannot be counted among the traditional space law instruments.

The primary limit of the freedom to explore outer space is the *principle of non-appropriation* as enshrined in Article II of the Outer Space Treaty, which is the necessary corollary to the general freedom to use outer space, since the freedom to use outer space is only conceivable if territorial sovereignty is excluded. Any means of appropriation is prohibited by the Outer Space Treaty. The principle of non-appropriation confirms that all nations are vested with equal rights and enjoy an equal access to space resources, regardless of their current degree of technological development.<sup>27</sup>

Apart from legal prohibitions about assertions of national sovereignty or appropriations of the space “commons,” international space law has increasingly focused on the scientific “rules of the road” governing how exploration may proceed. Foremost is the *protection of the space environment*. In this context, regulations exist on quite different levels and with different degrees of intensity. The provisions contained in the classical *corpus iuris spatialis*, above all Articles IX and XI

<sup>27</sup> For a more detailed analysis of the principle of non-appropriation see, Ulrike M. Bohlmann, *Legal Aspects of Space Exploration Initiatives*, in: Benkö and Schrogl, *Essential Air and Space Law*, Utrecht: Eleven International Publishing, Inc., 2005, pp. 215-240, under 2.

of the Outer Space Treaty, remain ambiguous and leave any "appropriate measures" to be adopted by the States Parties to avoid the harmful contamination of celestial bodies and also adverse changes in the environment of the Earth at the sole discretion of the respective Party to the Treaty. The Moon Agreement<sup>28</sup>, especially its Articles 7 and 4 elaborates a bit more on the principles regarding the protection of the extra-terrestrial environment by addressing the well-known issues of forward and backward contamination as well as the principle of intergenerational equity, and reflects thereby the fact that at the time it was written, in the late 1970s, environmental considerations had become a global concern. However, the language of the Moon Agreement remains as anodyne and unspecific as that of the Outer Space Treaty.

Based on the policy statement, that

*"Although the existence of life elsewhere in the solar system may be unlikely, the conduct of scientific investigations of possible extra-terrestrial life forms, precursors, and remnants must not be jeopardized. In addition, the Earth must be protected from the potential hazard posed by extraterrestrial matter carried by a spacecraft returning from another planet."*

COSPAR (Committee on Space Research)<sup>29</sup> has elaborated a detailed

Planetary Protection Policy<sup>30</sup>. In addition to providing specific guidelines, shortly summarised below, the policy recommends that COSPAR members provide information to COSPAR within a reasonable time not to exceed six months after launch about the procedures and computations used for planetary protection for each flight and again within one year after the end of a solar-system exploration mission about the areas of the target(s) which may have been subject to contamination. Five different categories for target body/mission type combinations and respective suggested ranges of requirements are established along the degrees of the interest they represent for the understanding of the process of chemical evolution or the origin of life. Implementation guidelines and category specifications for select solar system bodies, such as Mars or Europa, are spelt out in the appendix to the Policy. The COSPAR Planetary Protection Policy is a very consistent and highly developed system of recommendations by an independent and international body of scientists with a high reputation in the field. Although COSPAR is a non-government organisation lacking an institutionalised authority, it is nonetheless the continuous policy of many actors in the space field to comply with COSPAR's recommendations and even to mould their national planetary protection policies according to the COSPAR standards<sup>31</sup>. However, the price to pay for the specificity and wealth of

<sup>28</sup> Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Opened for signature on 18 December 1979 and entered into force on 11 July 1984, 1364 UNTS 3. However, since the Moon Agreement, has received only twelve ratifications and four additional signatures, as of 1 January 2006, its force and value are rather limited; no customary value can be attributed to its regulations and it is only binding upon its States Parties.

<sup>29</sup> COSPAR, the Committee on Space Research, was established in October 1958 by the International Council of Scientific Unions, ICSU, to continue the co-operative programmes

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of rocket and satellite research undertaken during the International Geophysical Year (1957 – 1958). Its objectives are to promote on an international level scientific research in space, with emphasis on the exchange of results, information and opinions, and to provide a forum, open to all scientists, for the discussion of problems that may affect scientific space research.

<sup>30</sup> The text of this policy can be downloaded at: <<http://www.cosparhq.org/scistr/PPPPolicy.htm>>.

<sup>31</sup> One of the most prominent examples is the NASA Planetary Protection Policy, see: <<http://planetaryprotection.nasa.gov/pp/index.htm>>.

detail of these guidelines is their lack of legal force; they constitute a mere moral kind of obligation.

The elements of general international environmental law, which need to be mentioned in this paper, are Principle 21 of the Stockholm Declaration<sup>32</sup>, Principle 15 of the Rio Declaration<sup>33</sup> and the Convention on Biological Diversity<sup>34</sup>.

According to Principle 21 of the Stockholm Declaration:

*"States have, in accordance with the Charter of the United Nations and the principles of international law, [...] 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."*

Thus, the environment of outer space as one of the areas beyond the limits of national jurisdiction is protected by this principle. The United Nations General Assembly Resolution 2996 (XXVII) 1972 asserts that Principle 21 [and 22] of the Stockholm Declaration 'lay down the basic rules governing the matter'.<sup>35</sup> Principle 2 of Rio Declaration and Article 3 of the Convention on Biological Diversity repeat the Principle, so that – although the Stockholm Declaration has no legally binding character – at least Principle 21 may be regarded as

reflecting customary international law. Principle 15 of the Rio Declaration elaborates further on the so-called precautionary approach<sup>36</sup> but is significantly weakened by the reference to the respective States' capabilities. The essence of the precautionary approach as contained in Principle 15 of the Rio Declaration is best described by P. Birnie and A. Boyle<sup>37</sup>: in performing their obligations of environmental protection states cannot rely on scientific uncertainty to justify a lack of action when there is enough evidence to establish the possibility of a risk of serious harm, even if there is as yet no proof of harm.

Article 8 (h) of the Convention on Biological Diversity provides that

*"Each Contracting Party shall, as far as possible and as appropriate prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species"*.

According to Article 4 of the Convention, its provisions apply, in relation to each Contracting Party, regardless of where the effects of activities occur, when carried out under the jurisdiction or control of a Contracting Party, within the area of its national jurisdiction or beyond the limits of national jurisdiction. Thus, it is also applicable to outer space activities carried on by Contracting Parties<sup>38</sup>. Accordingly, the issues of forward and backward

<sup>32</sup> Declaration of the United Nations Conference on the Human Environment, adopted in Stockholm on 16 June 1972, 11 ILM 1416.

<sup>33</sup> Declaration of the United Nations Conference on Environment and Development, adopted in Rio de Janeiro on 12 August 1992, 31 ILM 874.

<sup>34</sup> 31 ILM 818 (1992), opened to signature on 22 May 1992 and entered into force on 29 December 1993.

<sup>35</sup> 112 States voted in favour of this resolution, none opposed, the then Eastern Bloc States abstained on Res. 2996, but have supported subsequent treaties recognising the normative character of Principle 21.

<sup>36</sup> The Principle reads: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

<sup>37</sup> International Law and the Environment, 2<sup>nd</sup> ed. Oxford 2002, pp. 120.

<sup>38</sup> With the exception of the United States of America, all space-faring nations are Party to the Convention.



contamination are dealt with by the Convention; the potentially harmful introduction of species that are foreign to a given environment, be it terrestrial or extra-terrestrial, is to be prevented, or at least controlled or eradicated. This obligation is, however, limited to “as far as possible and as appropriate”.

For a number of technical reasons, nuclear power sources, *NPS*, constitute the only viable option for power supply for most exploration missions, a fact that is already recognised in the preamble of the “Principles Relevant to the Use of Nuclear Power Sources in Outer Space”<sup>39</sup>. According to Principle 3, individuals, populations, and the biosphere are to be protected against radiological hazards and the contamination of outer space is to be avoided.<sup>40</sup> Principle 4 stipulates that a

launching State has to ensure that a thorough and comprehensive safety assessment is conducted. The results of this assessment shall be made publicly available prior to each launch. Furthermore, the Principles contain provisions as to the notification in case of re-entry of satellites with nuclear power sources on board, Principle 5.<sup>41</sup> Principle 9 concretises Article VII of the Outer Space Treaty and the Liability Convention: it affirms that international liability fully applies to cases where a space object carries a nuclear power source.<sup>42</sup> The Principles Relevant to the Use of Nuclear Power Sources in Outer Space are currently under review.<sup>43</sup>

<sup>39</sup> They were adopted unanimously by the UN General Assembly in its Resolution 47/68 of 14 December 1992 thereby obtaining universal acceptance, even though they do not create binding commitments under public international law. For a general overview of international law regarding nuclear energy, see: *M. Elbaradei, E. Nwogugu, J. Rames: International law and nuclear energy: overview of the legal framework*, available at: <http://ecolunfo.unige.ch/colloques/Chernobyl/pages/Opelz.html>, where the authors also sketch the picture of a mix of legally binding rules and agreements on the one hand and advisory standards and regulations on the other hand. The authors describe the evolution of non-binding standards to binding commitments.

<sup>40</sup> Sections 2 and 3 of Principle 3 establish specific rules for the use of nuclear reactors on the one hand and radioisotope generators on the other hand. Principle 3 Section 2 thus allows - with some further restrictions as to the fuel to be used, the design, and the construction of the reactor - the operation of nuclear reactors on interplanetary missions, in sufficiently high orbits and in low-Earth orbits, if the reactor is stored in a sufficiently high orbit after the operational part of the mission. Principle 3 Section 3 allows the use of radioisotope generators - under certain technical and design conditions - for interplanetary missions and other missions leaving the gravity field of the Earth. They may also be used in Earth orbit if, after the conclusion of the operational part of

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their mission, they are stored in a high orbit. In any case, ultimate disposal is necessary.

<sup>41</sup> These provisions complete the stipulations of the Convention on Early Notification of a Nuclear Accident, ENNA, which entered into force on 27 October 1986. Very detailed on the relationship between the NPS Principles and the Convention, see *M. Benkö, Nuklearenergie im Weltraum*, in: *K.-H. Böckstiegel* (ed.) *Handbuch des Weltraumrechts*, Köln, Berlin, Bonn, München 1991, pp. 457, 475. Other authors are of opinion that the NPS Principles are in conflict with the ENNA Convention, see *A. D. Terekhov, The 1986 IAEA Conventions on Nuclear Accidents and the Considerations of the Use of Nuclear Power Sources in Outer Space in the Legal Subcommittee of COPUOS*, in: *IISL, Proceedings of the 30th Colloquium on the Law of Outer Space*, 10 - 17 Oct 1987, Brighton, United Kingdom, pp. 403; *G. M. Danilenko, Outer Space and the Multilateral Treaty-Making Process*, available at: <http://www.Law.Berkeley.edu/journals/btlj/articles/vol4/Danilenko/HTML/text.html>.

<sup>42</sup> Concerning compensation, it provides that such compensation shall be determined in accordance with international law and the principles of justice and equity, in order to provide such reparation in respect of damages to restore the person, natural or juridical, State or international organization on whose behalf a claim is presented to the condition which would have existed if the damage had not occurred. Compensation includes reimbursement of the duly substantiated expenses for search, recovery and clean-up operations.

<sup>43</sup> The Scientific and Technical Subcommittee of the UN COPUOS is working on the development of goals and recommendations for the safety of NPS applications in outer space.

Due to the huge ambitions connected with space exploration initiatives, *international cooperation* will be a key issue in their implementation. Article I, 1 of the Outer Space Treaty, declaring the exploration and use of outer space, as the 'province of all mankind' that shall be carried out for the benefit and in the interest of all countries has been condensed as inducing the change in the orientation of public international law from a law of mere co-existence to a law aiming at cooperation.<sup>44</sup> This formulation rightly highlights a notion of solidarity, which embraces: a prohibition of monopolisation of products resulting from space activities for national purposes; the striving for the establishment of equal possibilities to use outer space, and the postulate to implement space activities by means of co-operation wherever possible<sup>45</sup>. However, most authors in contemporary space law agree that this provision does not constitute the basis for specific claims regarding participation but is to be understood as a programmatic principle. To complete this cursory overview, we also need to mention the *Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, taking into Particular Account the Needs of Developing Countries*<sup>46</sup>, which underlines in its second

operational paragraph the freedom of the States to cooperate and to determine all aspects of such cooperation as well as the requirement to organise cooperation in an equitable manner and emphasises in its third operational paragraph that international cooperation shall take place on a basis that is acceptable for all Parties concerned.

This cursory synopsis of the legal status quo with regard to public international law addressing space exploration initiatives<sup>47</sup> illustrates that existing rules and regulations reflect a compromise between opposite and conflicting positions. They attempt to strike a balance between the general freedom to explore and use outer space by the current space powers, and, the wish to guarantee those same freedoms to States not yet capable to exercise these legal freedoms, as well as to ensure the benefits of such activities to future generations.

As the space sector diversifies, so too does the legal regime designed to govern its access and use. The mélange of binding Treaties and Agreements with deliberately imprecise and vague language on the one hand and detailed and very specific non-binding standards and guidelines, creates important discretionary prerogatives to the policy- and lawmakers around the globe to respond to different political impulses driving space exploration initiatives or deriving from them. Most crucially, the shift in emphasis to science-based "rules of the road" indicates that states are unwilling to abandon regulation of outer space

<sup>44</sup> S. Hobe, Die rechtlichen Rahmenbedingungen der wirtschaftlichen Nutzung des Weltraums, Berlin 1992, pp. 112.

<sup>45</sup> It is interesting to note that here again, the Moon Agreement goes some steps further and shows a higher degree of concretisation, see the last but one sentence of its Article 6.2 "*States Parties shall have regard to the desirability of making a portion of such samples available to other interested States Parties and the international scientific community for scientific investigation.*" Article 5 of the Moon Agreement aims at securing a flow of mutual information and suitable coordination of simultaneously planned activities.

<sup>46</sup> Adopted by the UN General Assembly on 13 December 1996, UN Doc. A/RES/51/122, available at: <http://www.oosa.unvienna.org/SpaceLaw/gares/index.html>. See also on the

foregoing developments: S. Hobe, Common Heritage of Mankind - an outdated Concept in International Space Law ?, in: IISL, Proceedings of the 41st Colloquium on the Law of Outer Space, 28 Sept. - 02 Oct 1998, Melbourne, Australia, pp. 271, 278.

<sup>47</sup> A more comprehensive analysis can be found by Ulrike M. Bohlmann, Legal Aspects of Space Exploration Initiatives, in: Benkő and Schrogl, *Essential Air and Space Law*, Utrecht: Eleven International Publishing, Inc., 2005, pp. 215-240

completely to marketplace mechanisms. Stirring the pot as well, are growing numbers of statutes emanating from sub-national legislatures that address space activities<sup>48</sup>.

It is precisely here, in this mélange, that the evolution of the international legal regime is taking place, largely in response to political impulses among space powers confronting an increasingly diverse, and most importantly, commercialized, space sector.

### III. The Political Impulse

In Part I, we reviewed the factors that may explain the recent resurgence in governmental space exploration initiatives. In Part II, we examined the relevant aspects of space law governing space exploration initiatives, and how it has evolved to take into account the changed cast of actors and their activities in the space environment. In Part III, our attention turns to a more theoretical scrutiny of how the motives for space exploration have evolved and adapted to the increasing commercialization of the space environment.

To explain the resurgence of space exploration requires investigations into the motives and decision-making calculi of states.<sup>49</sup> These coalesce into three broad theoretical approaches for explaining and

predicting state behavior and changes in the international system in general, and the formation and maintenance of legal regimes in particular.

Axiomatic to *Realist theories* of international politics is that States are motivated to undertake actions perceived as promoting their national interests of survival and power maximization.<sup>50</sup> The first era of space exploration corresponds closely to the realist view of superpower competition conducted as a “space race” using or adapting dual-use military launch vehicles and spacecraft. Just as Sputnik in 1957 invoked the credibility crisis for the U.S. strategic doctrine of massive retaliation, the Soviet Union's problems to develop a manned moon exploration capability with the United States also mirrored the country's military limitations in space-based technologies, manifesting itself in the 1980s with the single flight of the Soviet *Buran* re-usable space shuttle in 1988.<sup>51</sup>

The *Liberalism theories* of the international system pose positive-sum outcomes in contrast to the realists' zero-sum gamesmanship. By the late-1960s, communications satellites were creating massive new broadcast and telecommunications markets as globalizing business and entertainment sectors sought real-time connectivity between continents. Hybrid intergovernmental and commercial consortia such as INTELSAT, INMARSAT, EUTELSAT, ARABSAT, and even INTERSPUTNIK demonstrated the benefits of collaboration and the positive network effects of ubiquitous satellite connectivity on a worldwide basis. Just as the vast majority of communications satellites were owned and operated by governmental monopolists, space exploration, too, was almost

<sup>48</sup> For example, Virgin Galactic has formed a consortium with the U.S. state of New Mexico, while the California legislature in 2003 passed the “Space Enterprise Development Act (Assembly Bill 1532) which tasked the California Spaceport Authority to facilitate commercial, scientific and technology development in California, See, <http://www.californiaspaceauthority.org/html/spaceport-authority.html#topofpageanchor>.

<sup>49</sup> Increasingly, the motives and actions of intergovernmental organizations must be taken into account as well. See, Paul Diehl (ed.), *Politics of International Organizations: Patterns and Insights*, (Chicago: Dorsey Press, 1989).

<sup>50</sup> See, John Mearsheimer, *The Tragedy of Great Power Politics*, (New York: W.W. Norton & Company, 2001).

<sup>51</sup> [http://en.wikipedia.org/wiki/Shuttle\\_Buran](http://en.wikipedia.org/wiki/Shuttle_Buran) (August 14, 2006).

exclusively a governmental activity, albeit with growing international collaborations, as seen for example in the establishment of the European Space Agency in 1975, and multi-national experiments developed for the Galileo and Cassini-Huygens spacecraft to Jupiter and Saturn, respectively.

With the advent of the globalizing information age in the late 1980s, a third group of international relations theories focused on how the international system is a “construct” of political, economic and military “discourse” between states. The *Constructivist theories* explain the international system’s structure and functioning as a manifestation of states’ perceptions of the opportunities and challenges inherent in the system’s anarchic nature.<sup>52</sup> The growing diversification of formerly governmental space activities to include inter-governmental, governmental-military, governmental-civilian, and commercial sponsoring entities, coincided also with the emergence of a commercialized information economy and society, where decentralized Internet network architectures are replacing centrally-controlled governmental network monopolists. In space, just as in cyberspace, traditional governmental monopolistic roles are being supplanted by deployments of commercial space technologies, including space tourism to the International Space Station (ISS), and in cyberspace with emergence of the “blogosphere” as a user-controlled news networks.

As part of the World Wide Web, commercializing space activities have become an almost transparent discourse between spacecraft (including astronauts) and Internet-connected viewers, in much the same way exploration of the earth’s systems - environmental, political, economic, military, and most importantly,

cultural - are also evolving to direct discourse between users on the global information grid, with diminishing roles for governments and media organizations. Just as Russian launchers carry commercial logos into earth orbit, space exploration provides immense publicity and prestige benefits to those entities creating worldwide space experiences for millions of Internet users. As a result, images of space-related explorations have gained vast worldwide audiences with near-real time imaging of bouncing Mars rovers or crashing comet probes flashing simultaneously on millions of computer screens. Monitoring of the earth from space or from earth to space is now possible in ways that underline the challenge these activities pose to traditional tenets of international legal supervision, required under the Outer Space Treaty.

The table below summarizes the three theoretical approaches with their primary focus for space exploration:

Theoretical Approach	National Interest Paradigm	Space Exploration	Actor
Realism	Zero-Sum; Relative Advantage	Military Competition	Governments
Liberalism	Positive-Sum; Absolute Advantage	International Cooperation	Multilateral Governmental Organizations
Constructivism	Self-Defined	Prestige/Profit	Commercial-Governmental Partnerships

The international law of space exploration is the result of states pursuing *national interests*<sup>53</sup> in the anarchic international system. Analyzing these interests provides

<sup>52</sup> See, Alexander Wendt, “Anarchy is what states make of it: the social construction of power politics” in *International Organization*, vol. 46, no. 2, 1992.

<sup>53</sup> Indeed, the very concept of national interest requires careful redefinition, according to Professor Joseph Nye of Harvard University: “Can one define interests conventionally in the information age? The “national interest” is a slippery concept, used to describe as well as prescribe foreign policy. Hence the considerable debate about it. Some scholars have even regretted the waning of the very idea of a “national” interest today”, see: Joseph Nye, “Redefining the National Interest,” *Foreign Affairs*, July-August 1999, pp. 22-35.

important clues about the structure and function of international law. The aggregation of these interests with respect to actions of states in the exploration of space constitutes the “political impulse.” To paraphrase Professor Joseph Nye of Harvard University, who points out, that in the post-Cold War era, these interests can be categorized into three groupings according to the respective threat they correspond to:

A-List Threats: These threaten the survival of States.

B-List Threats: Conflicts that may negatively affect the national interests of States, but do not threaten their survival.

C-List Threats: Issues that indirectly affect a State’s security, but do not directly threaten a state’s national interests.

Space has migrated from its original A-List priority to a C-List interest, largely due to the growing commercialization and diversification of space exploration initiatives away from their original military dual-use applications. Or to put it even more bluntly, states increasingly find themselves *volens volens* in a C-List, constructivist international system, where - to a certain extent - they abandon control in a globalizing and commercializing marketplace of technologies and actors. Although ranked lower in terms of the threat posed to national survival or long term national interests, C-List issues are, in many respects, more visible as they represent important cultural and prestige elements that play a leading role in post-modern international politics.<sup>54</sup>

<sup>54</sup> For example, the United States is arguing for continuing the classification of Pluto as a planet at the 2006 International Astronomical Union meeting in Prague, ostensibly because it is the only “planet” discovered by an American, See, Matt Stearns, “Pluto’s Predicament: Solar System’s ninth planet faces demotion at astro-

Divorced from its previous dependency on military motives, States in the 21<sup>st</sup> Century undertake space exploration initiatives increasingly for the intrinsic boost to their scientific and technological sectors<sup>55</sup>, and, predominately for the prestige and visibility such ventures provide to their sponsors. Beagle II was slated to unwrap itself on the surface of Mars on Christmas Day, just as Pathfinder bounced to fame on July 4<sup>th</sup>, or NEAR rendezvoused with *Eros* on Valentine’s Day. Within the constructivist analytical framework, such actions by States create their own political reality, closely corresponding to the parameters of “soft power” argued by Joseph Nye to be the currency of the global agora.

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nomical conference in Prague,” McClatchy News Service, published in Santa Barbara *News-Press*, August 12, 2006, B-5. NASA said Pluto’s downgrade would not affect its \$700 million *New Horizons* spacecraft mission, which this year began its 9-1/2 year journey to the oddball object to unearth (*sic*) more of its secrets. ... But mission head Alan Stern said he was “embarrassed” by Pluto’s undoing and predicted that the vote would not end the debate. William J. Kole, “International Astronomical Union reclassifies Pluto as dwarf-planet,” Santa Barbara *News-Press*, August 25, 2006, A-1.

<sup>55</sup> President Bush announced his vision for space exploration as intending to rally the US behind an ambitious technological challenge, and in the process strengthen the US economy and national security. While the vision “to explore space and extend human presence across the solar system” declares discovery to be the goal of the space exploration program, there are also some benefits sought on Earth. The advancement of US scientific, security, and economic interests through a robust space exploration programme are explicitly mentioned. The text can be found at: [http://www.whitehouse.gov/space/renewed\\_spirit.html](http://www.whitehouse.gov/space/renewed_spirit.html). Europe’s strategy for space, which was endorsed by the European Union Council of Research and the ESA Council in 2001 calls for Europe to explore the solar system and the Universe, stimulate new technology, and inspire the young people of Europe to take a greater interest in science and technology. The text is available at: [http://europa.eu.int/eur-lex/pri/en/oj/dat/2000/c\\_371/c\\_37120001223en00020003.pdf](http://europa.eu.int/eur-lex/pri/en/oj/dat/2000/c_371/c_37120001223en00020003.pdf).

Being 'high-risk, complex techno-scientific programmes undertaken by national and international entities to extend human infrastructure into the solar system and beyond,' space exploration initiatives are exclusively the bailiwick of the state, which alone among the other space sector actors, has the capacity to conduct such activities.

#### IV. Synthesis and Outlook

Why the sudden surge in space exploration initiatives? Our proto-theory would posit that space powers gradually abandoning their quasi-hegemonic control over other space sectors may perceive highly visible and prestigious space exploration initiatives as a means for re-asserting their national interest prerogatives.<sup>56</sup> Their hegemonic role in the space exploration sector also acts to legitimize their rule-making on an almost exclusive basis, emphasizing the role of science as the primary motive. By way of illustration, Europe and the United States can look back on a long history of cooperative governmental space ventures that have benefited both, directly as prescribed by the outer space treaties, and exemplified by the successful joint Cassini-Huygens mission to explore the Saturnian system. Closer to Earth, Europe and the United States have, however, experienced some complications to deploy and operate satellite navigation systems, where commercial entities and multiple user communities project their interests into an

intergovernmental dialogue about a space technology with far-reaching military, economic and political effects. In other words, governments have been abandoning parts of their ability to shape the discourse over some space activities for the sake of an increasingly diversified and commercialized space sector. Such a development has not occurred in the context of space exploration.

Where does this perception lead us with regard to the future development of the law applicable to space exploration initiatives? *The resurgence of the space-faring powers into the space exploration sector will have the effect of demarcating the space exploration regime as an increasingly distinct legal-political arena.* This allows the space-faring powers to regain their decision-making roles partly abandoned as growing numbers of other nations follow their own political impulses into the near earth-space environment with concomitant demands for expansion of decision-making mechanisms and fora. Curiously, the shift of the political impulse from hard to soft power also creates an opportunity for the development of a scientifically-based legal regime, as opposed to the earlier military-political-economic treaties. What we witness today is the tendency of States to voluntarily accept non-binding international standards and guidelines as a basis for their own national policy and legislation. The NASA Planetary Protection Policy based on the COSPAR model may be cited as a prominent example.

<sup>56</sup> As an example, one may look at the resistance posed by NASA to the use of the International Space Station by its Russian partners as a visiting hotel by fee-paying space tourists ferried up by Russian spacecraft, each paying \$20 million for the privilege. Some of the arguments pointed out that hosting *pauschal* tourists on a taxpayer-funded public works project muddies the discourse when seeking budget authority in front of the U.S. Congress. See, CNN LIVE TODAY: U.S. and Russian Officials Feuding Over Space Tourist, Aired April 27, 2001 - 13:21 ET, <http://transcripts.cnn.com/TRANSCRIPTS/0104/27/tt.03.html>.

In sum, the evolution of space exploration law towards a scientific focus reflects the shift of space-faring powers back into space exploration. This shift is motivated by numerous factors, among which the more obvious ones are the quest for scientific knowledge, the advancement of technology, the stimulation of the economy and, not to be neglected: the prestige factor. In the process, governments may also re-assert their role as the major actors in the space arena.