universität wien

MASTER THESIS

Titel der Master Thesis / Title of the Master's Thesis

„Legal Regulation of Commercial Activities in Space"

verfasst von / submitted by

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angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of

Master of Laws (LL.M.)

Wien, 2017 / Vienna 2017

Studienkennzahl lt. Studienblatt / Postgraduate programme code as it appears on the student record sheet:	A 992 548
Universitätslehrgang lt. Studienblatt / Postgraduate programme as it appears on the student record sheet:	Europäisches und Internationales Wirtschaftsrecht / European and International Business Law
Betreut von / Supervisor:	Prof. Peter Fischer

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List of Abbreviations

UNOOSA	The United Nations Office for Outer Space Affairs
DLR	The Institute of Air and Space Law of the University of Cologne and the German Aerospace Center
INTELSAT	The International Telecommunications Satellite Organization
ESA	The European Space Agency
COMSAT	The Communications Satellite Corporation
ISS	The International Space Station
EUTELSAT	The European Telecommunications Satellite Organization
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
CSF	The Commercial Spaceflight Federation
NASA	National Aeronautics and Space Administration
Protocol on Space Assets	The Protocol on Space Assets to the Cape Town Convention on International Interest in Mobile Equipment of 2012
IGA	The Intergovernmental Agreement among the ISS Partner States of 1998
LC	Convention on International Liability for Damage Caused by Space Objects of 1971
Agreement on the Rescue of Astronauts	Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space of 1968
OST	The United Nations Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies of 1967

MS	Member States of the EU
The Project 2001	Project 2001 Legal Framework for the Commercial Use of Outer Space
ORA, PCA	Optional Rules for Arbitration prepared by the Permanent Court of Arbitration
ICJ	The International Court of Justice

1. Introduction

When the space exploration had just begun, only a few states were engaged in the use of outer space. In the past three decades commercial space activities have grown significantly and nowadays not only states, state institutions and international governmental organizations, but also many private enterprises as well as non-governmental organizations are involved in commercial activities in outer space. The legal issue here is that this shift is not reflected in the current body of space law, which was developed well before this change and has not undergone major amendments ever since. There is no doubt that the law created in the times when the words 'privatization' or 'commercialization' sounded ridiculous cannot embrace current and potential difficulties stem from advancing commercialization of outer space.

The relevance of the research paper. For the sake of enhancement and further development of commercial use of outer space, it is necessary to clarify the legal framework for such use, because all participants of commercial use of outer space will need this information for their future investments in this field.[1] Such a risky and cumbersome venture as commercial activities related to outer space depends a lot on the feasibility of recollecting investments and making profits, which is ensured through well-drafted and stable laws.

The topic could not be of any more relevance as in 2018 we celebrate the fiftieth anniversary of the first UNISPACE conference held in Vienna in 1968.[2]

Aim of the research paper. The purpose of this paper is to research the issue of how the regulatory framework for private (commercial) aspects of space law evolved since the 'Project 2001 Legal Framework for the Commercial Use of Outer Space', which was prepared by the DLR and identified the most crucial gaps in legal regulation of commercial activities related to space. In order to achieve the stated purpose the following the most principal questions should be answered in this research paper:

1) what is the interplay between international, EU and national space law?
2) is there a need to harmonize national space law and how to do this?
3) how are major space-related terms defined?
4) how are launch and re-entry activities, on-orbit activities regulated and how does liability for space activities work?
5) how do property rights function in space and does the lack of sovereignty in space jeopardize the ability to make profits from private investments?
6) how to create security interest in space assets?

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[1] Louise van Traa-Engelman Hanneke, *Commercial Utilization of Outer Space: Law and Practice* (Martinus Nijhoff 1993).

[2] The UNISPACE+50 conference will take place on June 20-21 2018 <http://www.unoosa.org/oosa/en/ourwork/unispaceplus50/> accessed 20 April 2017.

7) what is (or might be) the legal status of a space tourist?

8) What are the possible ways of settlement of disputes related to space activities?

The following findings are anticipated:

1) there is a firm ground for commercial space activities, but there is still a lot to develop;

2) outer space legal framework is very fragmented, consisting of treaties, UN principles and guidelines, regional regulations and intergovernmental agreements, as well as national guidelines and legislation. There is a need not only in harmonization, but also in unification and codification of commercial aspects of space law;

3) gaps in legal regulation of commercial space activities must be eliminated in order to foster private activities in space.

Selected bibliography. This research paper is based on a number of works of great scholars who have committed immensely to the development and clarification of space law. We are especially grateful to the following authors.

Stephan Hobe, being a key figure in the development of international space law, is an expert almost in any sphere of space law one can think of from the history of the development of space law to the most recent topics such as space tourism.[3]

Frans von der Dunk is another star in the field of space law and has worked on the issues of national space legislation in Europe, insurance, liability, authorization, property rights, space tourism, and many others.[4]

Another significant figure is Louise van Traa-Engelman Hanneke, who assembled in his fundamental work the issues of historical perspective of space law, space transportation, satellite telecommunications, remote sensing, intellectual property rights, insurance, settlement of space disputes and many others.[5]

Susanne U Reif has prepared a comprehensive overview of one of the most important events in the development of the space law science, that is, the Project 2001.[6]

[3] Stephan Hobe, 'The Impact of New Developments on International Space Law (New Actors, Commercialization, Privatization, Increase in Number of "Space-faring Nations", etc.) (2012) UNOOSA <http://www.unoosa.org/pdf/pres/2010/SLW2010/02-12.pdf> accessed 20 April 2017.

[4] Von der Dunk F G and De Rozavel K, 'Liability and Insurance in the Context of National Authorisation' (2011) Space and Telecommunications Law Program Faculty Publications 78 <http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1077&context=spacelaw> accessed 20 April 2017;

[5] Louise van Traa-Engelman Hanneke (no 1).

[6] Susanne U Reif, 'Shaping a Legal Framework for the Commercial Use of Outer Space: Recommendations and Conclusions from Project 2001' (2002) 18(2) Space Policy 157.

José Monserrat Filho should be praised for his capacious yet versatile articles on commercial activities in space law, especially interaction between national and international space law.[7]

Wian Erlank has studied thoroughly the issue of property rights in space and has written the most updated papers (latest was published in 2016).[8]

Philip de Man should be applauded for working on probably the most complicated and the greyest area of space law, that is, exploitation of natural resources in space and property rights to these resources.[9]

Paul Stephen Dempsey has made a comprehensive comparative research of more than twenty states national legislation in relation to the matters of licensing, launching, liability and insurance, environmental protection, registration and enforcement.[10]

Research limitations. This research paper does not deal with military and security issues of the use of outer space and it touches public law aspects only to the extent needed to define the legal framework of commercial use of outer space.

[7] José Monserrat Filho, 'Legal Issues of Commercial Space Activities' (2006) Ukraine Workshop on Space Law Kyiv, Ukraine, 6–9 November 2006 <http://www.sbda.org.br/artigos/anterior/33.htm> accessed 20 April 2017.

[8] Wian Erlank, 'Rethinking Terra Nullius and Property Law in Space' (2015) 18 (7) Potchefstroom Electronic Law Journal <https://ssrn.com/abstract=2753715> accessed 20 April 2017.

[9] Philip de Man, 'The Commercial Exploitation of Outer Space and Celestial Bodies – a Functional Solution to the Natural Resource Challenge' (2010) Working Paper No. 54 <https://ghum.kuleuven.be/ggs/publications/working_papers/new_series/wp51-60/wp54.pdf> accessed 20 April 2017.

[10] Paul Stephen Dempsey, 'National Laws Governing Commercial Space Activities: Legislation, Regulation, & Enforcement' (2016) 36 North Western Journal of International Law & Business <http://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?article=1792&context=njilb> accessed 20 April 2017.

2. Legal Grounds for Commercial Space Activities

2.1. Brief Overview of Privatization and Commercialization of Space

Today outer space has become a prosperous sphere of commercial activities since private sector is now actively providing satellite telecommunication, space launch services, global positioning and remote sensing to its customers. Being historically the first, at present time space telecommunication is the most privatized space activity, that is why it will be the most demonstrative to show the process of privatization and commercialization of space by the example of telecommunication sector, which became the role model for all other potential commercial sectors.[11]

The first experimental commercial satellite American 'Telstar 1' was launched in **1962.** John F. Kennedy, the USA President at that time, said that Telstar 'is an outstanding example of the way in which government and business can cooperate in a most important field of human endeavor'.[12]

In **1964**–**1965** forty-five states set up the International Telecommunications Satellite Consortium which became a predecessor of the International Telecommunications Satellite Organization (hereinafter referred to as '**INTELSAT**'). INTELSAT was privatized in 2001.

In **1962** the COMSAT Corporation was created by the Communications Satellite Act of 1962 and was further incorporated as a publicly traded company in **1963**. COMSAT helped to create and was majority owner in the INTELSAT. It was also responsible for the launching of the 'Intelsat I Early Bird' communications satellite in **1965**, which became the first commercial communications satellite to be placed in geosynchronous orbit and a couple of years after was used to broadcast live shots of the 'Apollo 11' mission and first lunar landing.

In **1980** the first commercial space transportation company Arianespace was created under the French law with the aim to produce, commercialize and launch the rockets 'Ariane' developed by European Space Agency (hereinafter referred to as '**ESA**'). Today Arianespace is the commercial launch services major player.

In **1984** the first commercial space legislation the USA Commercial Space Launch Act was adopted, which included regulation the launch services carried out by private entities.

As it can be seen, the USA has been an unrivaled player in relation to space activities for a long time. Around 1980 the USA began its Space Shuttle Programme, which was threatened a couple of years later when in **1986** the American shuttle 'Challenger' exploded during the

[11] The 2016 State of the Satellite Industry Report (Satellite Industry Association June 2016), <http://www.sia.org/wp-content/uploads/2016/06/SSIR16-Pdf-Copy-for-Website-Compressed.pdf> accessed 20 April 2017.

[12] Statement by the President on the Telstar Communications Satellite of July 11, 1962 (Public Papers of the Presidents of the United States: John F. Kennedy 1962).

launch process and all the crew members died, including a teacher Christa McAuliffe who had to be the first space tourists.

Development of space tourism was boosted by the introduction of the 'Ansari X Prize' in **1996**, a competition where the 'X Prize Foundation' offered a $10,000,000 prize for the first non-government organization to launch a reusable manned spacecraft into space twice within two weeks. The 'Ansari X Prize' was won in **2004**.

In **2007** another competition was announced – the 'Google Lunar XPRIZE', which offers $30,000,000 prize for private companies to land a privately funded robotic spacecraft on the Moon.

Among the contemporary private space law firms the following worth mention: 'World View'[13], 'Blue Origin'[14], 'SpaceX'[15], 'Excalibur Almaz'[16], and 'Virgin Galactic'[17].[18]

2.2. Definitions of the Most Common Terms Related to Private Space Activities

There are many legal gaps regarding terms and definitions related to commercial activities in space. It is enough to mention that there is no uniform understanding of what constitutes '**outer space**'.

The most commonly accepted point of view is proposed by the 'Fédération Aéronautique Internationale' and uses the 'von Karman line', which runs at 62 mile (a little less than 100 km) above sea level.[19] Australia is the only state that officially embedded in its national space legislation this figure.[20] The EU also refers to this figure when giving the definition to 'space qualified'. On the contrary, the USA avoids any demarcation figures in its commercial space legislation by applying technical and functional definitions. The reason behind such a long hesitation to define 'outer space' is that any definite delimitation might implicate national security, military and political interests.

It is not therefore surprising that no uniform definition of a '**space asset**' exists. The 1972 Liability Convention provides a vague definition of a close term '**space object**' which 'includes component parts of a space object as well as its launch vehicle and parts thereof' (art. I).

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[13] World View <http://www.worldview.space/about/> accessed 20 April 2017.

[14] Blue Origin <https://www.blueorigin.com/> accessed 20 April 2017.

[15] SpaceX <http://www.spacex.com/> accessed 20 April 2017.

[16] Excalibur Almaz < http://www.excaliburalmaz.com/> accessed 20 April 2017.

[17] Virgin Galactic < http://www.virgingalactic.com/> accessed 20 April 2017.

[18] For the whole list of private space companies see the website of the Commercial Spaceflight Federation <http://www.commercialspaceflight.org/members/> accessed 20 April 2017.

[19] For discussion on the delimitation of air and space see M. Gerhard, 'Space Tourism – The Authorisation of Suborbital Space Transportation' in Frans G von der Dunk (ed), *National Space Legislation in Europe* (vol. 6 Brill 2011).

[20] Australian space activities act 1998, s. 8.

M. Gerhard defines '**activity in space**' as "an activity that makes outer space accessible, explorable or usable".[21]

Another commonly used term is '**space faring nations**' which denotes first and the most mighty nations engaged in space exploration from its beginning such as Russia, the USA, France, Australia, China, and India.

The concept of the '**launching state**' is defined in both the LC and the Registration Convention:

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.

The concept of the 'launching state' will be considered in detail further.

Of paramount importance is the naming of '**astronauts**' as there is a need to distinguish between professionals and nonprofessionals due to their different contractual roles, consent procedures, liabilities, training and safety requirements. For instance, in the Agreement on Rescue of Astronauts the term 'personnel of spacecraft' is used, making it unclear whether personnel means staff or just any person). The terms 'astronaut' and 'cosmonaut' both come from Greek and mean 'star sailor and 'sailor of the universe', respectively. The terms 'astronaut' and 'cosmonaut' are the most common, yet the term 'astronaut' has more official 'weight' as it used in fundamental treaties embracing human activities in space, which are referred to as '**corpus iuris spatialis**'.[22] Art. V of the OST proposes probably the most ceremonial and at the same time the vaguest definition of the term 'astronauts' as the '**envoys of mankind**'.

There is no unanimously accepted definition of '**commercial space activities**' either. José Monserrat Filho defines them as 'actions involving buying, selling and exchanging of space goods and services'.[23] Stephen Doyle gives a broader definition: 'These activities extend from the design, development and manufacturing of satellites, launch vehicles, Earth stations, and another ground support equipment, components of these products, and consulting and engineering services to support them, to the operation of launch systems and spacecraft, to provide products and services for governments, businesses, or the using public'.[24] Meanwhile, James A Vedda distinguishes the following features of space commercial activities: 'private capital is at risk in development and operations; there are existing or potential non-governmental

[21] M. Gerhard, 'Space Tourism – The Authorisation of Suborbital Space Transportation' in Frans G von der Dunk (ed), *National Space Legislation in Europe* (vol. 6 Brill 2011).

[22] See, for instance, Tanja Masson-Zwaan and Steven Freeland, 'Between Heaven and Earth: The Legal Challenges of Human Space Travel' (2010) 66 Acta Astronautica 1597.

[23] Filho J M (no 7).

[24] Stephen Doyle, 'Legal Aspects of Space Commercialization' in Nandasiri Jasentuliyana (ed.), *Space Law: Development and Scope* (Praeger, 1992) 127.

customers; market forces, such as demand and competition, ultimately determine viability; and primary responsibility and management resides with the private sector'.[25]

It is important to clarify that mere location of the parties or objects in outer space does not turn commercial activities into space commercial activities as the special object is needed for the relationships to be qualified as commercial space activities. For instance, if two astronauts conclude on board ISS a sale-purchase agreement of a car, such agreement has nothing to do with commercial space law. On the other hand, a contract for manufacture of a satellite that takes place on the Earth is indeed commercial space activity.

Commercial activities related to space may be conducted by states, international organizations and private entities. In this respect the borderline between the terms '**privatization of space activities**' and '**commercialization of space activities**' should be drawn: privatization means the transition of space goods and services from government ownership or control to private ownership and operation, while commercialization 'denotes the rendering or selling of services such as satellite communications, remote sensing, the launching of space objects, etc., as well as the manufacture, transfer, or exchange of space products for remuneration'.[26] Today commercial space activities are conducted by governments, private entities and in joint ventures. These two processes go hand by hand.

'**Space tourism**' was described by Stephan Hobe as 'any commercial activity offering customers direct or indirect experience with space travel'. [27]

To sum up, many terms important for commercial utilization of space remain indefinite. More efforts at the international level should be taken in order to assure the unanimous understanding of these terms.

The first compilation of space law terms is the '**Space age dictionary**' by Charles MacLaughlin published in 1963[28]. A great work was done by Liana X Yung, Daniel V Osborne. Leaded by Professor Henry R Hertzfeld, who made a draft of a guide to space law terms, which is opened to commentaries and amendments. It contains definitions of the most common space law terms divided into the following categories: I. Simple Definition, II. Laws & Treaties, III. Legal Dictionary, IV. Standard English Dictionary, V. Other U.S. Government Documents, VI. Other Sources, VII. Language and Translation Differences.

[25] James A Vedda, 'Space Commerce' in Eligar Sadeh (ed.), *Space Politics and Policy – An Evolutionary Perspective* (Kluwer Academic Publishers 2002) 202.

[26] He Qizhi, 'Essays on International Law and Space Law' China Institute of Space Law 298.

[27] Stephan Hobe, 'The Legal Regime for Private Space Tourism Activities. An Overview' (2010) 66 Acta Astronautica 1593.

[28] Space Age Dictionary <https://swfound.org/media/99172/guide_to_space_law_terms.pdf> accessed 20 April 2017.

2.3. Regulatory Framework ('Corpus Iuris Spatialis')

As Paul Stephen Dempsey points out, 'space law consists of a growing number of international, multilateral, and bilateral agreements and conventions, the UN resolutions, decrees by international organizations, national legislation and regulations, and court decisions'.[29]

The body of legislation regulating activities in space is sometimes referred to as the 'corpus iuris spatialis' as a reminiscent of the comprehensive codification of the Roman law 'Corpus iuris civilis'. The 'Corpus iuris spatialis' is certainly not even close to be the same well-structured as the 'Corpus iuris civilis', but it might play similar role in generation of the international space law as the 'Corpus iuris civilis' did for the whole Romano-Germanic system of law.

It is clear that regulation of commercial activities in space should rest upon regulation of activities in space in general, just as in air law or law of the seas. In order to define the framework for commercial activities in space we need to look into all the international treaties, regulations and non-binding resolutions concerning space. Stephan Hobe suggests distinguishing three phases of development of the international space law.[30]

The first phase from 1960s to the end of the 1970s is marked by adoption under the auspices of the UN Committee on the Peaceful Uses of Outer Space (hereinafter referred to as '**UNCOPUOS**') established in 1958 of five fundamental treaties on space law, namely:

1) the Outer Space Treaty of 1967;
2) the Rescue Agreement of 1968;
3) the Liability Convention of 1972;
4) the Registration Convention of 1975;
5) the Moon Agreement of 1979.

Transition to **the second phase in the early 1980s** was marked by softening of the international space law towards less binding legal commitments. After the end of the first phase of space law-making not a single multilateral international agreement of general or specific nature of using space resources has been agreed upon. Instead, there was a good number of non-binding UN General Assembly Resolutions:

1) on Space Benefits in 1996;
2) on the Use of Direct Broadcasting Satellites in 1982;
3) on the Use of Remote Sensing in 1986;
4) on the Launching State in 2004;
5) on the Practice of States in the Registration of Space Objects in 2007.

[29] Paul Stephen Dempsey (no 10).
[30] Stephan Hobe (no 3).

The third phase began in 2007 with the adoption of the United Nations Space Debris Mitigation Guidelines based on an agreement of the Interagency Space Debris Coordination Committee. Stephan Hobe commented that 'now a severe problem like the one of the environmental protection of outer space and possible consequences of accidents caused by space debris is dealt with on an interagency basis with the explicit requirement that these Guidelines should not be legally binding on States'.[31] Some multilateral organizations such as Committee on Earth Observation Satellites, the International Committee on Global Navigation Satellite Systems the Global Exploration Strategy can also be regarded as a way to avoid binding international rules.

In addition to what Stephan Hobe mentioned as transitional events is the development of the international space law the following events merit mention. First of all, the 'Project 2001 Legal Framework for the Commercial Use of Outer Space' (hereinafter referred to as '**Project 2001**'), which became a turning point in the development of scholar thought in relations to space law. Secondly, the adoption of PCA Rules for Arbitration in 2007 and, thirdly, the adoption in 2012 of the Protocol on Space Assets to the Cape Town Convention on International Interest in Mobile Equipment (hereinafter referred to as '**Protocol on Space Assets**').

The 'Project 2001' was a legal research project conducted by the University of Cologne's Institute of Air and Space Law and the German Aerospace Center (hereinafter referred to as '**DLR**') and directed by Prof. Dr. Karl-Heinz Böckstiegel. Six international expert working groups (hereinafter referred to as '**WG**') studied international and national laws in order to identify gaps and suggest improvements to the current legal framework for private space activities. These six groups were: 1) Launch and Associated Services, 2) Space Stations, 3) Privatization, 4) Remote Sensing, 5) Telecommunications, and 6) National Space Legislation.[32]

1) Launch and Associated Services WG made the following proposals: 1. possible gaps in the liability system of the space treaties should be filled by national licensing procedures; 2. on the export control issue, the WG criticized the qualification of almost all satellites as 'arms'. It suggested monitoring regulations and measures in this field to ensure that a clear distinction is made between security concerns on the one hand and trade considerations on the other; 3. in relation to launch and services agreements change the concept of 'a successful delivery' into 'delivery-in-orbit contracts' in order to lower the direct risk of launch failure for the customer and facilitate the financing of a satellite project.

2) Space Stations WG suggested the following: 1. establishment of clear dispute settlement procedures, especially with regard to commercial activities on board the ISS; 2.

[31] Stephan Hobe (no 3).
[32] Susanne U Reif (no 6).

examination of the rules, especially the Code of Conduct for ISS Crews, applicable to crew members that are not astronauts; 3. complementation of the art. 21 of the Intergovernmental Agreement among the ISS Partner States of 1998 (hereinafter referred to as '**IGA**') through contractual provisions between the ISS Partners and customers in order to mitigate the risk of intellectual property disputes.

3) The WG on privatization proposed the following: 1. implementation of a coordinated procedure for exercise of authorization and supervision in Europe in order to avoid multiple varied authorization and supervision procedures for private entities active in more than one European State; 2. formulation of international technical and safety standards for space activities in order to reduce technical risks and to avoid 'flags of convenience'; 3. further improvement of the dispute settlement mechanism; 4. harmonization of the law on security interests in high-value mobile equipment such as space assets.

4) Remote Sensing WG decided that there is a need for harmonization of state licensing policies and procedures for commercial remote sensing operations.

5) Telecommunications WG recommended: 1. further reform of the ITU and enlargement of ITU's dispute settlement and enforcement powers; 2. development of universal licensing procedures.

6) National Space Legislation WG came to the following conclusions: 1. development of national space law is vital and the national space legislation should contain provisions regarding at least authorization and supervision of space activities, registration of space objects and indemnification provisions for the case of international liability claims against the respective State. Additional regulations may concern insurance requirements, patent law, international security rights, transport law, and dispute settlement; 2. national space laws should be further harmonized; 3. provisions on limits regarding liability indemnification and insurance conditions for the admissibility of private space activities should be harmonised in order to provide fair conditions for companies from different nations and avoid 'licence-shopping'.

These were the findings and suggestions of the 'Project 2001'. It can be clearly seen that throughout the report issues of the development of national space law and its harmonization as well as establishment of reliable and binding dispute settlement procedures were emphasized by all WGs.

2.3.1. International Space Legislation

Although the five fundamental treaties should be commended for their comprehensive coverage of potential human activities in outer space, they were created during the Cold War boosted by motivations of international peace and security and could not anticipate to the full extent that humankind would engage in commercial space activities. Nevertheless, the

predominant scholar opinion is that fundamental space law treaties contain firm ground for commercial space activities.

Article I of the OST stipulates that '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 majority of scholars believe that when art. I of the OST mentions 'exploration and use of outer space', it implies its commercial use too.[33]

There is no territorial jurisdiction in space and **art. II of the OST** sets forth the non-appropriation principle that reads as follows: 'Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means'. Therefore, art. I and II should be read in conjunction.

Article VI of the OST was also drafted in favour of commercial space activities: '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'. Thus, it attributes the private space activities to national activities and establishes the international responsibility for them of the respective state. The appropriate state is also internationally responsible for activities carried out by its non-governmental entities provided that it authorizes and supervises such activities.

Hanneke Louise Van Traa-Engelman ascertains that since 'space activities by private sector automatically introduce the commercial aspect, which is not the case with governmental activities, the creation of this Article has to be considered as one of the strongest incentives of an overall recognition of commercial utilization within the general framework of the Treaty'.[34]

Article VII of the OST and its extension – the LC, also promotes commercial activities in space as it guarantees that damage will be reimbursed. **Article VII** of the OST stipulates that each state which is the party to the OST that launches or procures the launching of an object into outer space, as well as each state which is the party to the OST from whose territory or facility an object is launched, is internationally liable for damage to another state party to the OST or to its natural or juridical persons.

Article VIII of the OST sets forth that a state party to the OST 'on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body' and clarifies that

[33] Philip de Man (no 9).
[34] Hanneke Louise Van Traa-Engelman (no 1).

'ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth'.

Thus, the concept of a 'launching state' finds the ownership irrelevant and even if the title to space object is transferred, the originally liable state will, under the LC, remain liable until the space object under consideration ceases to exist ('once a liable state, always a liable state'[35]). Nevertheless, liability can be avoided by incorporating derogation clauses into the contract of sale, but such constructions might be cumbersome.

The OST, as well as the LC, only addresses liability at the level of the States involved. 'Second-party or contractual liability refers to liability of the operator towards passengers and cargo, while third-party or non-contractual (tort) liability refers to liability for damage to persons or property on the ground, who have no contractual relations with the activities of the operators'.[36] The OST and the Liability Convention are silent on one of the most essential topics for private operators, namely their exposure to second- or third-party liability. There is no cap on liability of operators, and no opportunity for passengers or third parties to present direct claims for compensation.

The latest tendency in relation to the distribution of the financial risks of international space projects is the usage of a so-called cross-waiver of liability that means that each party of the space project assumes risks of damaging its own property and nationals, the consequences of such risks and the waiver of the right to bring a claim against other parties.

According to the LC 'damage' shall mean '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 organizations' (art. I (a)). The concept of 'damage' was reconsidered in relation to the crash of soviet satellite 'Cosmos 954' in 1978 and subsequent contamination of the part of the atmosphere and of the Earth surface. It turned out that the initial concept was too narrow and did not embrace damage to ecological system of the Earth and of outer space, including celestial bodies.

The liability issue became the center of scholar attention again after the massive collision between the American satellite 'Iridium-33' and the Russian non-functioning satellite 'Cosmos 2251' on 10 February 2009. This case was thoroughly analyzed by Tanja Masson-Zwaan[37]. The USA procured the launch of the 'Iridium-33', while the launch itself formally took

[35] Henry R Hertzfeld and Frans G von der Dunk, 'Bringing Space Law into the Commercial World: Property Rights without Sovereignty' (2005–2006) 6 Chicago Journal of International Law 81 80.

[36] Tanja Masson-Zwaan and Steven Freeland (no 22).

[37] Tanja Masson-Zwaan, 'Space Law and the Satellite Collision of 10 February 2009' (2009) 174 Space Research Today COSPAR`s Information Bulletin 4.

place in Russia as the Kazakh government has leased the Baikonur facility to Russia. Therefore, two states could be regarded as launching states, while 'Cosmos 2251' was owned by Russia and was launched from its territory.

Article IX of the OST sets forth 'the principle of cooperation and mutual assistance' and stipulates that the states-parties to the OST 'shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty'.

Article XI of the OST reminds that space activities are subject to the highest scrutiny of regulatory organs and public in general and sets forth that states-parties to the OST 'agree to inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and results of such activities'.

The 2012 Protocol on Space Assets. The Convention on Mobile Equipment deals with three kinds of high-valuable mobile equipment in three respective Protocols: (a) airframes, aircraft engines and helicopters; (b) railway rolling stock; and (c) space assets. The Convention on Mobile Equipment and the Aircraft Protocol have entered into force, while the Railway Protocol and the Space Assets Protocol are pending. Ten ratifications or accessions shall be enough to trigger the entry into force of the Protocol on Space Assets.

A '**space asset**' is defined in art. I (k) as:

means any man-made uniquely identifiable asset in space or designed to be launched into space, and comprising:

(i) a spacecraft, such as a satellite, space station, space module, space capsule, space vehicle or reusable launch vehicle, whether or not including a space asset falling within (ii) or (iii) below;

(ii) a payload (whether telecommunications, navigation, observation, scientific or otherwise) in respect of which a separate registration may be effected in accordance with the regulations; or

(iii) a part of a spacecraft or payload such as a transponder, in respect of which a separate registration may be effected in accordance with the regulations,

together with all installed, incorporated or attached accessories, parts and equipment and all data, manuals and records relating thereto.

This definition of 'space asset' overlaps with the definition of 'space object' given in the OST, but it does not embrace non-reusable launch vehicles. A distinction between a space asset and an aircraft object may also be cumbersome.

The main issue with mobile equipment stems from its very nature that creates potential choice-of-law issues when the object crosses the borders. Before the adoption of the Space Protocol, the validity of security interest depended on the existence of bilateral arrangements between states and choice-of-law provisions contained in contracts such as in the Financial Leasing Convention. The adoption of the Protocol on Space Assets is a great achievement in the field of harmonization of international space law and will certainly contribute to enhancement of private investments.

2.3.2. The EU Space Legislation

There are two basic provisions in primary EU legislation related to space activities. Article 4 (3) of TFEU provides for that: 'In the areas of research, technological development and space, the Union shall have competence to carry out activities, in particular to define and implement programmes; however, the exercise of that competence shall not result in Member States being prevented from exercising theirs'.

The second provision is art. 189(1) TFEU, which stipulates that:

1. To promote scientific and technical progress, industrial competitiveness and the implementation of its policies, the Union shall draw up a European space policy. To this end, it may promote joint initiatives, support research and technological development and coordinate the efforts needed for the exploration and exploitation of space.

2. To contribute to attaining the objectives referred to in paragraph 1, the European Parliament and the Council, acting in accordance with the ordinary legislative procedure, shall establish the necessary measures, which may take the form of a European space programme, excluding any harmonisation of the laws and regulations of the Member States.

The majority of scholars asserts that the wording of art. 189(1) TFEU prohibits outright harmonization of space legislation of MSs, but at the same time gives leeway for a number of other measures, namely: approximation of laws, open method of coordination, flexibility clause (art. 352 TFEU), enhanced cooperation and non-binding measures.[38] This issue will be discussed further.

Space-related competence of the EU is not included in the exhaustive list of shared competences of the second paragraph of art. 4 TFEU, which suggests that it has different nature. Tanja Masson-Zwaan points out that with the traditional shared competences the Member State's competence is additional to the EU competence.[39] This means that the MS may only exercise its

[38] Dimitri Linden, 'The Impact of National Space Legislation in Private Space Undertakings: A Regulatory Competition Between States?' (2015) International Institute of Space Law <http://www.sciencepolicyjournal.org/uploads/5/4/3/4/5434385/linden_nationalspacelegislation.pdf> accessed 20 April 2017.

[39] Tanja Masson-Zwaan and Steven Freeland (no 22).

competence if the EU does not make use of its competence. On the contrary, Tanja Masson-Zwaan argues that the space-related competencies of EU and that of the MSs 'co-exist', meaning that the MS does not have to sit and wait for the EU to decide whether it will undertake action or not.[40] Thus, space-related competencies are regarded as 'parallel competencies'.

The EU and the ESA. The central issue with the EU space-related competencies is how the interplay between the EU and the European Space Agency (hereinafter referred to as '**ESA**') is organized. ESA is an intergovernmental organization, acting under the Convention of establishment of the ESA. The ESA has 22 MSs. Not all MSs of the EU are members of the ESA as well as not all ESA members are members of the EU. For instance, the ESA's members Norway and Switzerland are members of the ESA, but not MSs of the EU. The United Kingdom is a member of the ESA, but will soon be not the MS of the EU anymore.

When the UK finalizes its exit from the EU it will have to negotiate an agreement with the ESA as a third party like Norway and Switzerland did.

The ESA is an independent from the EU organization and cooperates with the EU through an ESA/EC Framework Agreement. The EU and the ESA work together on a joint European Strategy for Space and on the European Space Policy. The ESA/EC Framework Agreement entered into force in May 2004. Cooperation between two organizations is conducted through the Joint Secretariat. Members of the EU and of the ESA meet at ministerial level in the Space Council prepared by Member States representatives in the High-level Space Policy Group.[41]

In 2012 the EU Commission issued a communication to clarify the relations between the EU and the European Space Agency[42] and in 2016 a new Space Strategy for Europe was adopted by the EU Commission.[43] Due to the UK exit from the EU the European Commision is likely to postpone funding for reusable rockets until 2020.[44]

The EU and the ISS. Another important issue is the interplay between the EU and the ISS. The ISS is a joint project between five partners (USA, Europe, Russia, Japan and Canada)

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[40] Ibid.

[41] ESA and the EU website <http://www.esa.int/About_Us/Welcome_to_ESA/ESA_and_the_EU> accessed 20 April 2017.

[42] Communication from the Commission to the Council and the European Parliament Establishing appropriate relations between the EU and the European Space Agency /* COM/2012/0671 final */ [2012] <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52012DC0671> accessed 20 April 2017.

[43] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions [2016] <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2016:705:FIN> accessed 20 April 2017.

[44] Jorge Valero 'Europe to Enter New Space Race…after 2020' *EURACTIV* (26 January 2017) <http://www.euractiv.com/section/transport/news/europe-to-enter-new-space-race-after-2020/?nl_ref=29833824> accessed 20 April 2017.

that acts under the IGA signed on 28 January 1998 and bilateral Memoranda of Understanding between NASA and each of the four associated space agencies.[45]

The basic rule is that 'each partner shall retain jurisdiction and control over the elements it registers and over personnel in or on the Space Station who are its nationals' (art. 5 of the IGA). Curious legal fiction is that the ESA acts in the ISS activities on behalf of all its members as the 'European Partner'. Therefore, an activity that occurs on board the ESA module is deemed to have taken place in all the European Partner States simultaneously. The International Partner States retain a portion of their national jurisdiction on the ISS elements in orbit in relation to criminal, liability and protection of intellectual property rights issues.[46]

Only Germany and Italy have incorporated the whole text of the IGA into their national legislation. They have also made sure that their national intellectual property laws would apply to the inventions created on board the ESA module.

Stephan Hobe and Thomas Reuter examine the question whether the EU could exercise its jurisdiction on board of the ISS.[47] Authors come to the conclusion that MSs exercising their jurisdiction on board the ISS will have to implement the relevant EU provisions. Besides, in case of competing jurisdictions territorial jurisdiction shall prevail over personal jurisdiction.

2.3.3. National Space Legislation

National space legislation have complementary character in relation to international and to the EU space law. Nevertheless, it is just as important since the development of the national space legislation is an issue of sovereignty and of prestige. To be more precise, the reasons for drafting of the national space law are the following:

1) restatement of international norms and principles and international space customs related to space regulation;

2) assuming of responsibility for space activities, in particular establishment of national register of all objects a state launches into outer space;

3) creation of mechanisms for dispute resolution;

4) regulation of exports control, environmental, IP rights and insurance matters;

5) promotion of space tourism.

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[45] Memorandum of Understanding between the National concerning Cooperation on the Civil International Space Station Aeronautics and Space Administration of the USA and the Russian Space Agency <https://www.nasa.gov/mission_pages/station/structure/elements/nasa_rsa.html> accessed 20 April 2017.

[46] Agreement between the USA and Other Governments 1998 <https://www.state.gov/documents/organization/107683.pdf> accessed 20 April 2017.

[47] Stephan Hobe and Thomas Reuter, 'The EU Constitutional Treaty and Space: towards EU Jurisdiction on Board a Space Station' in Frans von der Dunk and Marcel Brus (eds), *The International Space Station* (Brill 2006).

José Monserrat Filho name the possibility to oblige private entities engaged in space-related activities to get insured as one of the main reasons for developing national space law, because otherwise the launching state bears the risk that a possible recourse against the private enterprise may not be satisfactory and then the governmental funds will shrink.[48]

Liability and insurance issues indeed take their place in national legislation. Single satellite project can cost upward of $500 million and can take up to three years from the conclusion of the manufacturing contract to the moment of launch[49]. Taking into account that the Liability Convention and the OST impose international liability on launching states for potential damages, states are encouraged to create efficient security mechanism for coverage of such damages. That is why liability issues are reflected in the majority of national space legislation.[50]

Space insurance comes in various types covering all stages of a space project. Satellite/Launch vehicle first party property insurance includes satellite/launch vehicle pre-launch insurance, satellite launch insurance and satellite in-orbit insurance.[51] 'Third party liability insurance protects operators and all other participants in space operations from claims from third parties for bodily injury and/or property damages arising due to their space-related activities, whether during the pre-launch, launch or in-orbit operations phases'.[52] Other types of space insurance include launch risk guarantee, satellite operations loss of revenue, satellite manufacture incentive payment, astronauts` insurance and potential space tourism insurance.

Paul Stephen Dempsey adds the following: 'ordinarily, the insurer of the satellite vendor covers liability prior to the intentional ignition of the launch vehicle, while the insurer of the satellite purchaser covers liability thereafter. In order to promote commercial development of space, some States cap liability, in effect backing such development with the financial resources of the national treasury'.[53]

Space insurance market has been steadily expanding. In 2013 38 launches were insured (around 46% of all launches), while in 2016 over 250 were insured (more than 58%)[54].

To what extent should national space legislation be harmonized? Slight divergences in national space legislation can be justified by peculiarities of space market characteristics of a

[48] José Monserrat Filho (no 7).

[49] Aon Risk Solutions. Insuring Space Activities. October 2016. http://www.aon.com/russia/files/Insuring_Space_Activities_whitepaper.pdf > accessed 20 April 2017.

[50] For the overview of national provisions on liability see Paul Stephen Dempsey (no 10); see also the database of national space legislation see National Space Law Collection of UNOOSA http://www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw/index.html accessed 20 April 2017.

[51] Aon Risk Solutions (no 49).

[52] Ibid.

[53] Paul Stephen Dempsey (no 10).

[54] Aon Risk Solutions (no 49).

particular country. Such matters as liability and insurance, authorization should be left to the states` discretion.

At the same time, states should cooperate[55] when developing national space legislation in order to ensure uniform minimal standards of commercial space law to avoid the 'flags of convenience' and create a 'fair and competitive environment for all space operators'[56]. harmonized national space legislation would benefit the interpretation of international space law.

Dimitri Linden warns that 'harmonisation should be understood in a looser way, to ensure compatibility between national space laws, rather than to create uniformity or similarity'.[57]

[55] One of the examples of such cooperation is The European Cooperation for Space Standardization. <http://ecss.nl/> accessed 20 April 2017.

[56] Dimitri Linden (no 38).

[57] Ibid 10.

3. Property Rights in Space Law

The interest of private sector in commercial space activities is boosted by the possibility of claiming ownership in space objects, otherwise huge investments are hardly recouped. But how does the possibility of claiming ownership in space objects correspond to the non-appropriation principle laid down in art art. II of the OST?

It will be a good starting point to compare the regime of celestial bodies and that of outer space to the concept of res nullius ('things belonging to nobody') and of terra nullius ('land belonging to nobody'). Having said that, the res nullius concept refers to things that are capable of appropriation, but which do not belong to anyone at a particular moment of time. Therefore, the principal question is whether parts of outer space and celestial bodies are capable of being owned.

Articles I and II of the OST set forth that no one shall appropriate space and celestial bodies. Articles 11 (2) and 11 (3) of the Moon Agreement contain the same principle of non-appropriation, though the Moon Agreement has not been ratified and therefore is of minor importance.

Wian Erlank enumerates five criteria that may clarify the issue of whether one should recognize property rights in space: impersonality; tangibility, independence, susceptibility to control, and the usefulness and value for mankind.[58] The scholar comes to conclusion that celestial bodies can be regarded as objects of property law falling within commerce provided that the mentioned characteristics are present.[59]

The principal question here is whether outer space and space objects are things that are in commerce (res in commercium) that can be traded and sold or things that are outside of commerce (res extra commercium). Historically, celestial bodies were defined as objects of property law that constituted the res communes omnium ('common heritage of mankind'), that is they fell outside of commerce and were not capable of appropriation by private individuals. In order to fall into commerce the object must be subject to human control. Thus, free flowing water and the air were classified as being outside of commerce. The same logic applied to celestial bodies as no one could think at that time that a man would be able to exert control over a celestial body. Today it is possible, therefore in theory some sort of property right or interest in a space object should be recognized.

[58] Wian Erlank (no 8).
[59] Ibid.

However, after the scandal with bad-faith businesses like 'Lunar Embassy'[60] that sold land plots on the Moon[61], the International Institute of Space Law (hereinafter referred to as '**IISL**') has issued in 2009 a statement regarding claims to property rights in space: 'International law establishes a number of unambiguous principles, according to which the exploration and use of outer space, including the Moon and other celestial bodies, is permitted for the benefit of mankind, but any purported attempt to claim ownership of any part of outer space, including the Moon and other celestial bodies, or authorization of such claims by national legislation, is forbidden as following from the explicit prohibition of appropriation, and consequently is prohibited and unlawful'.[62]

Moreover, Wian Erlank argues that 'even though someone is able to reach a celestial object, is the first to land there and to plant a flag, this does not mean that the person / country / company will acquire any ownership or property rights to the object'.[63] On the contrary, 'if one made the investment of money or effort to get to an object in space, can exert control over it and can exclude other people from access to that object or area, then one would have ownership'.[64]

Let us halt for a moment and think whether we really need to dwell on the property rights in space. Business argues that the lack of sovereignty in space jeopardizes the ability to make profits from private investment. However, Henry R Hertzfeld and Frans von der Dunk doubt those claims, arguing that 'most property rights exist in space and that the lack of sovereignty does not pose current or near-term problems for the types of business ventures likely to be developed in space'.[65]

The authors clarify their statement as follows. 'Anything that is launched into space is deemed to be owned by the launching party or state, including the launch vehicle, its components, and the payload'.[66] Moreover, 'anything taken from space and returned to the earth becomes the property of the person, company, or government that performs the action'.[67] In the same vein, anything constructed in space will vest in the company. In the end, orbital slots are allocated by the ITU (art. 1).

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[60] Lunar Embassy. <http://www.lunarregistry.com/info/embassy> accessed 20 April 2017.

[61] For more bad-faith businesses selling land plots on celestial bodies see Henry R Hertzfeld and Frans G von der Dunk, 'Bringing Space Law into the Commercial World: Property Rights without Sovereignty' (2005–2006) 6 Chicago Journal of International Law 81 91–92.

[62] Statement of the Board of Directors of the International Institute of Space Law (IISL) 22 March 2009 < http://www.iislweb.org/html/20090322_news.html> accessed 20 April 2017.

[63] Wian Erlank (no 8).

[64] Ibid.

[65] Henry R Hertzfeld and Frans G von der Dunk, 'Bringing Space Law into the Commercial World: Property Rights without Sovereignty' (2005–2006) 6 Chicago Journal of International Law 81.

[66] Ibid 82.

[67] Ibid 81.

3.1 Property Rights in Natural Resources in Outer Space

The Moon Agreement is the only one of the five UN space treaties that explicitly addresses exploitation of natural resources in space. However, its provisions are vague and controversial and as a result it has not obtained enough ratifications to enter into force[68].

The sticking point was the concept of the 'common heritage of mankind' expressed in art. 11 of the Moon Agreement with regard to which developed and developing countries tended to hold opposing views. Article 5 para 5 provides for that 'States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible'. Article 11 para 7 (d) further elaborates that one of the main purposes of such international regime to be established is 'an equitable sharing by all States Parties in the benefits derived from those resources'. Developed countries believed that terms 'common heritage of mankind' and 'equitable sharing' do not suggest that developed countries shall share their benefits with developing countries so that benefits will be equal for all states, claiming that opposing interpretation of the provisions would be detrimental to private actors seeking to exploit natural resources. In the opinion of developed countries, 'equitable' sharing should rather mean 'proportionate' sharing. It is all natural that developing countries, not having enough resources to prepare space missions and exploit natural resources of space themselves, interpreted the provisions of art. 11 in their favour as requiring all states to share their benefits.

In addition to controversies regarding interpretation of the concept of 'common heritage of mankind' the Moon Agreement can be considered as a failed treaty also because of the fact that it does not establish the legal framework within which space actors should take advantage of natural resources in space. Art. 11 para 5 merely reflects the intention of the parties to set up such a regime 'as such exploitation is about to become feasible'. But how can the exploitation become feasible if there is no legal regime governing it?

There are also opposing views towards the issue whether before the international regime regulating exploitation of natural resources in space is established states are allowed to use them with no requirement to share the benefits.

[68] As of January 2017, 17 states ratified and 4 states signed the Moon Agreement. United Nations Office for Outer Space Affairs, Status of International Agreements Relating to Activities in Outer Space <http://www.oosa.unvienna.org/oosa/en/SpaceLaw/treatystatus/index.html> accessed 21 April 2017.

Parallels for the regime governing the exploration and exploitation of the Moon can be found in the law of the seas regime[69] and in the Antarctica regime.[70] For instance, the law of the seas regime also provides for the term 'common heritage of mankind' concerning resources of the deep seabed. Taking into account that the Moon Agreement is undersubscribed and is unlikely to be ratified in the neatest future due to political disagreements between developed and developing countries one should look for fallback provisions concerning the regulation of exploitation of natural resources in space. And one finds them in the OST, but they are too general. Thus, there is an urgent need to negotiate a new legal instrument to govern exploitation of natural resources in space.

Now let us deal with more specific issues. One of the most complicated matters related to property rights in space is a possibility of the distinction between outer space and celestial bodies, which are not subject to appropriation according to art. II OST, and natural resources that may or may not be subject to appropriation. Philip de Man has identified two school of thoughts regarding this issue[71]. The first argues that the wording of art. II OST embodies natural resources and therefore they are not subject to appropriation. Proponents of the second school of thoughts claim that the applicability of the non-appropriation principle to natural resources depends on the type of the resources concerned.

Philip De Man argues that any part of outer space can in theory be regarded as a natural resource 'provided that a particular phenomenon in space produce an economic value upon transformation through human use in order to be considered a space resource'.[72] Alongside the economic value feature of a space resource stands scarcity of space resources.

Philip De Man concludes that 'the exploitation of natural resources is an allowable use of outer space and celestial bodies, the appropriation of which is not prohibited per se'.[73] If natural resources have been removed from the Moon, then property rights can be created in these resources.

Art. 44 (2) of the ITU Constitution qualifies radio frequencies and any associated orbits as limited natural resources.[74] At the same time, it is absolutely not possible to claim property

[69] For comparative analysis of the law of the sea and space law see Melanie Walker, 'Suborbital Space Tourism Flights: An Overview of Some Regulatory Issues at the Interface of Air and Space Law' (2007) 33 (2) Journal of Space Law 395.

[70] For comparative analysis of the law of the sea, Antarctic regime, Antarctica regime and space law see Henry R Hertzfeld and Frans G von der Dunk (no 65); see also Tanja Masson Zwaan, 'Current Issues & Prospects of International Space Law' (2010) 25 (1) The Korean Journal of Air and Space Law 247.

[71] Philip de Man (no 9).

[72] Ibid 19.

[73] Ibid 17.

[74] The ITU Convention and Constitution <http://search.itu.int/history/HistoryDigitalCollectionDocLibrary/5.17.61.en.100.pdf> accessed 20 April 2017.

rights to frequencies and orbital slots as the ITU imperatively effects allocation of bands of the radio-frequency spectrum, the allotment of radio frequencies and the registration of radiofrequency assignments and … in order to avoid harmful interference between radio stations of different countries' (art. 1).

Henry R Hertzfeld and Frans G von der Dunk assume that 'there will have to be some form of intermediary established to guarantee the right to use the territory' of outer space. However, 'debating the form and type of agreements needed for an intermediary should be reserved for the future time, when more is known about the types and value of the space resources in question', because 'only then can a meaningful arrangement be worked out'.[75] In other words, there is no need to hurry with the property rights on natural space resources.

3.2. Intellectual Property Rights in Space Law

Following on from the discussion on general property rights in space, let us dwell on intellectual property rights in space. The fundamental issue with the intellectual property rights in space is that intellectual property rights depend on national legislation and have territorial nature, while space law rests upon the non-territoriality principle. This contradiction affects first and foremost patent law and copyright law.

Article 21 of the IGA provides for that 'for purposes of intellectual property law, an activity occurring in or on a Space Station flight element shall be deemed to have occurred only in the territory of the Partner State of that element's registry, except that for ESA-registered elements any European Partner State may deem the activity to have occurred within its territory'[76], in other words, each element of the ISS registered by a state-partner to the IGA qualifies as its 'quasi-territory'.

Although so far only the USA[77] and Germany have extended their patent protection to the inventions made onboard respective parts of the ISS, the issue of protection of inventions onboard the ISS is relatively clear. On the contrary, the IGA has not shed light on the issue of patent protection of inventions made in outer space, but not onboard the ISS, for instance on Alpha Centauri. Another unresolved issue concerns the joint inventions in space and the rights of co-inventors. The ESA has also done not so much to clarify the issue of intellectual property rights in space.[78]

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[75] Henry R Hertzfeld and Frans G von der Dunk (no 65).

[76] Agreement between the USA and Other Governments 1998 <https://www.state.gov/documents/organization/107683.pdf> accessed 20 April 2017.

[77] The USA Patents in Outer Space Act, Pub L No 101-580,104 State 2863 (1990) § 105 <http://uscode.house.gov/statutes/pl/101/580.pdf> accessed 20 April 2017.

[78] General Clauses and Conditions for ESA Contracts ESA/C/290, rev. 6 as resulting from ESA/C (2003)103 <http://emits.sso.esa.int/emits-doc/ESRIN/e_support/290rev6-Engl.pdf> accessed 20 April 2017; http://www.esa.int/About_Us/ECSL_European_Centre_for_Space_Law/Intellectual_Property_Rights_in_Outer_Space accessed 20 April 2017.

In his work Yun Zhao studies the issues of creation, use, transfer and ownership of patents related to space activities.[79] According to Yun Zhao five groups of 'space patents' have been assembled: 1) inventions made on earth for space application, 2) inventions made on earth for terrestrial application as a result of space activities, 3) inventions made in outer space for terrestrial application, 4) inventions made in outer space for spatial applications, and 5) inventions patented on earth for use in outer space.[80] The author believes that the priority period based on the first-to-file principle should be extended beyond six months, since the staff stays onboard the ISS for several months and therefore is unable to file the application for patent protection immediately. The scholar concludes that there is no need in drafting another treaty particularly for space patents, but rather there is a need in formation of space patent office that will have expertise in space law.

Copyright law issues arise in relation to earth observation and remote sensing data. The first principle of The Principles Relating to Remote Sensing of the Earth from Outer Space differentiates between three categories of earth observation and remote sensing data depending on the degree of processing, namely: primary data, processed data and analysed information.[81] Primary data is similar to the machinery source code in a way that is cannot be perceived by humans. Hence, primary data is not protected by copyright law.[82] Nevertheless, processed data and analysed information are subject to copyright protection provided for the criterion of creativity and fixation are met.

Catherine Doldirina points out that 'too much protection leads to locking up of valuable EO data, while too little protection may become a hindrance to the launch of new EO satellites'. [83] Therefore, a balance of interests of different actors in the earth observation data industry must be found for the sake of further development of commercial satellite industry.

[79] Yun Zhao, 'Protection of Intellectual Property Rights in Outer Space' (2006) American Institute of Aeronautics and Astronautics 160 <http://www.iislweb.org/docs/Diederiks2006.pdf> accessed 20 April 2017.

[80] Ibid 166.

[81] UN GA Resolution 41/65 of 3 December 1986 The Principles Relating to Remote Sensing of the Earth from Outer Space.

[82] WIPO Copyright Treaty 1996.

[83] Catherine Doldirina, 'A Rightly Balanced Intellectual Property Rights Regime as a Mechanism to Enhance Commercial Earth Observation Activities' in Jorgenson C M, 'Proceedings of the International Institute of Space Law: 57th Colloquium on the Law of Outer Space' (2009) American Institute of Aeronautics and Astronautics <https://iislweb.org/docs/Diederiks2009.pdf> accessed 20 April 2017.

We would like to end the chapter on property rights in space with the wise words of Henry R Hertzfeld and Frans G von der Dunk:

Sovereignty <…> is not the issue. Many ways have been used to overcome the lack of property ownership. Profits are the issue, and unless and until a way of assuring private enterprises that their investments in research and development, equipment, and operations in space can be recovered, the insecurity and risks of not having an operating mechanism for establishing these rights will impede the fast growth of commercial space.[84]

[84] Henry R Hertzfeld and Frans G von der Dunk (no 65) 97.

4. Space Tourism

Stephan Hobe defines space tourism as 'any commercial activity that offers customers direct or indirect experience with space travel'.[85] Legal framework for space tourism consists of such issues as air and space delimitation, jurisdiction, legal status of a space tourist (in particular whether the Rescue Agreement extends to space tourists), space tourists liability and private remedies, ethical issues, traffic management, authorization and registration.

Space tourism comes in two forms of sub-orbital and orbital flights. A sub-orbital spaceflight means that a spacecraft reaches space, but its velocity is not enough to complete one orbital revolution. In this regards, an issue arises whether sub-orbital spaceflight should be regarded as an aviation activity or as a space activity, and which law applies to it.

As there is great controversy in determination of air and space boundaries, there is also a great uncertainty in relation to which law should apply to a single space journey: space law, air law or both (dual approach)? To be more precise, two issues should be dealt with: the delimitation of air and outer space and the status of the vehicle in question.

Two approaches have been proposed to clarify the issue. The first one is a 'functionalist' approach, which 'regards a fixed altitude boundary to be irrelevant to the issue, concentrating instead on the criterion of the nature or purpose of a given activity in determining which legal regime should apply'. Hence, even if the vehicle crosses air and does not reach orbit, the flight should be regarded as space flight. To the contrary, 'if the purpose of the flight is to connect two points on earth by flying through outer space, air law should apply'.[86] The second one is a 'spatialism' approach, 'which divides the applicable regime along the line of a strict altitude boundary"[87] and thus does not really solve the problem. Tanja Mason-Zwaan refers to a third contractual approach that 'proposes the creation of a specific regime by agreement amongst states, in order to adapt the existing rules of air and space law to aerospace planes'.[88]

Tanja Masson-Zwaan and Steven Freeland point out that 'air law emphasises State sovereignty and exclusive territorial jurisdiction, and is bolstered by the large corpus of international and national legislation typical of a well-established field of the law. Conversely, space law highlights non-appropriation, jurisdiction on the basis of registration and launching, and State liability for damage caused. It is also one of the youngest fields of international law, and correspondingly, one of the fields without a comprehensive legal framework'.[89]

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[85] Stephan Hobe, 'The Legal Regime for Private Space Tourism Activities. An Overview' (2010) 66 Acta Astronautica 1593.

[86] Tanja Masson-Zwaan and Steven Freeland (no 22).

[87] Stephan Hobe, Gérardine Meishan and Goh Julia Neumann, 'Space Tourism Activities – Emerging Challenges to Air and Space Law?' (2007) 33 (2) Journal of Space Law 359.

[88] Tanja Masson-Zwaan and Steven Freeland (no 22).

[89] Stephan Hobe, Gérardine Meishan and Goh Julia Neumann (no 87).

Due to technical limitations, the only possible destination for space tourists so far is the Russian segment of the ISS. So far there have been seven space tourists: Dennis Tito in 2001, Mark Shuttleworth in 2002, Gregory Olsen in 2005, Anousheh Ansari in 2006, Charles Simonyi two times in 2007 and in 2009, Richard Garriott in 2008 and Guy Laliberté in 2009. In 2015 Sarah Brightman was expected to fly, but she postponed her flight.

The price for space tourism is constantly rising. In 2001 Dennis Tito paid $20,000,000 for his journey, in 2008 Richard Garriott paid 30,000,000, Guy Laliberté in 2009 paid $40,000,000 and Sarah Brightman was expected to pay $52,000,000. Taking into account not only these significant sums of money, but also a stiff selection process, hard training that space tourists should undergo and various tasks they are given onboard alongside professional astronauts, the majority of space tourists preferred a more professional term than 'space tourism' that will reflect the solemnity of the flight and emphasize that this is not a leisure activity. For instance, Commercial Spaceflight Federation[90] coined a term 'personal spaceflight', while the Citizens in Space project coined a term 'citizen space exploration'.[91]

[90] The website of Commercial Spaceflight Federation <http://www.commercialspaceflight.org/> accessed 20 April 2017.

[91] The website of Citizens in Space project <http://www.citizensinspace.org/> 20 April 2017.

5. Resolution of Disputes Relating to Outer Space Activities

Rapid commercialization and privatization of space, which we have been observing during the last three decades, determine the need in efficient dispute resolution mechanisms able to deal professionally with both contractual and tortious claims related to space law.

Back in 1978 Karl-Heinz Böckstiegel ascertained that space law is not sufficiently equipped with the tools to solve disputes relating to outer space activities.[92] In 1998 international community realized that the ICJ will not respond adequately to challenges related to space law disputes and prepared the project on various methods of dispute resolution. It suggested three possible methods, namely introduction of the permanent chamber of the ICJ that would deal specifically with commercial space disputes, introduction of an international tribunal on space law and international arbitration.[93]

A number of approaches to solving space law disputes became again the subject of consideration at the second session of the 56th colloquium on the law of outer space that took place in 2013, the focus being on Optional Rules for Arbitration (hereinafter referred to as '**ORA**') prepared by the Permanent Court of Arbitration (hereinafter referred to as '**PCA**'). At this session participants proposed creation of the optional rules for arbitration, introduction of an arbitral tribunal under the ITU Radio Regulations Board or an arbitral tribunal under ESA review board. [94]

Although there is a good range of options available, arbitration is regarded as the most appropriate way of settling not only contractual disputes related to space law, but also tortious claims, which have earlier been resolved predominantly through diplomatic means. Before we move to consideration of these approaches, it is worth reminding that there is a possibility of dealing with disputes ex ante through preventive mechanisms. For instance, in relation to space accidents with satellites and space debris certain rules of space traffic, just as terrestrial transport traffic rules, might be introduced.

Since the very beginning of the space era settlement of space disputes has been regarded as **government-to government matter** and therefore the disputes have been resolved through

[92] Karl-Heinz Böckstiegel, 'Arbitration and Adjudication Regarding Activities in Outer Space' (1978) 6 (1) Journal of Space Law 3 http://www.spacelaw.olemiss.edu/jsl/pdfs/back-issues/jsl-6-1.pdf accessed 20 April 2017.

[93] Report of the 68th Conference of the International Law Association Taipei, 1998 < http://frederickabbott.com.webmatrix-appliedi.net/Portals/0/Documents/ILA%20Trade%20Law%20Committee%20Report%20from%20the%2068th%20Conference.pdf> accessed 20 April 2017.

[94] Report of the 56th Colloquium on the Law of Outer Space Beijing, China, 2013 <http://iislweb.org/docs/2013ColloquiumReport.pdf > accessed 20 April 2017.

diplomatic means. The amicable resolution in 1979 of Canada's compensation claims for the damage caused by the crash of soviet satellite 'Cosmos 954' is a case in point.[95]

Diplomatic means of space dispute resolution has clear advantages: it saves time and litigation costs and the parties are free to agree on the most appropriate solution without interference of the third parties. Moreover, contrary to other fields of international law, international space law does not set forth a cap for compensation for damages. However, one major drawback is that diplomatic means of space disputes resolution can not apply to private parties.

A claimant-state brings a claim against launching state through diplomatic means within state of limitation of one year that begins: 1) at the date when the damage was caused and the launching state was at that time already familiar; 2) at the date when the launching state was determined; at the date when a claimant-state knew or reasonably ought to have known that the damage had been caused or could determine the launching state (art. X of the LC).

As of the moment the aggrieved party makes a notice to the respondent the diplomatic stage of dispute resolution is deemed to begin, that is also limited by one-year period. In case this statute of limitation expires and the parties do not come to the agreement, any of the parties is entitled to call the Claims Commission under the art. XIV of the LC. From that moment the adjudication stage begins.

Many space conventions contain special provisions on **adjudication** of space-related disputes by international bodies. For instance, the LC provides for the adjudication of space disputes by the Claims Commission through procedures established in art. XIV-XX. Contrary to the traditional international law approach, the LC does not require the exhaustion of all national remedies in order to apply (art. XI), which is certainly an advantage of this method of dispute resolution. Moreover, if an aggrieved party is natural or juridical persons (and not a state) a maximum protection is guaranteed to these persons since three categories of parties are entitled to bring a claim on their behalf, that is: 1) state of which the persons are nationals; 2) state where the damage was caused; 3) state where these persons have permanent residence (art. VIII). Having said that, the LC has limited material scope, covering only claims for physical damages

[95] Settlement of Claim between Canada and the Union of Soviet Socialist Republics for Damage Caused by 'Cosmos 954' released on April 2, 1981 http://www.jaxa.jp/library/space_law/chapter_3/3-2-2-1_e.html accessed 20 April 2017; Protocol between the Government of Canada and the Government of the Union of Soviet Socialist Republics of 2 April 1981 UNOOSA <http://www.unoosa.org/oosa/SpaceLaw/multi_bi/can_ussr_001.html> accessed 20 April 2017.

See also on the issue Alexander F. Cohen, 'Cosmos 954 and the International Law of Satellite Accidents' (1984) 10 (1) The Yale Journal of International Law 78 <http://digitalcommons.law.yale.edu/cgi/viewcontent.cgi?article=1316&context=yjil> accessed 20 April 2017.

caused by space objects. Non-binding nature of the decisions of the Claims Commission might also be the reason for that it has so far never been assembled.

Article IX of the OST sets forth **international consultations** in case a 'State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies'. However, it has never specified how these consultations should proceed.

The **ICJ** is the first after diplomatic means institution that comes to mind considering space law disputes. Unfortunately, its jurisdiction is not open to disputes between private parties and thus it is not an appealing option, taking into account the commercialization and privatization trend. For the same reason, arbitration procedures provided for by art. 41 of the ITU Convention, the Optional Protocol on the Compulsory Settlement of Disputes Relating to ITU regulatory regime, the LC, the founding convention of the ESA, do not represent a real solution.

Litigation in the national courts is yet another approach to resolving space-related disputes. Although it is open to private parties, again, it has some major drawbacks: 1) the defendant state might claim sovereign immunity; 2) government might not allow such litigation to proceed; 3) it might be cumbersome to obtain international recognition of the judgment; 4) a recourse to a tribunal or to a court of a launching state makes it impossible to bring a claim in respect of the same damage in a national court (art. XI (2) LC). Just as other means of dispute settlement litigation has not been highly demanded, which explains why there is no special court or tribunal devoted exclusively to space law cases.

At the other extreme of the range of the methods of dispute resolution is the most informal (after negotiations) way of solving space-related disputes through **mediation** (for instance, through the offices of the United Nations Secretary General, as was done in the case of New Zealand's claims against France arising from the deliberate sinking of the ship 'Rainbow Warrior' in 1985). [96] Mediation is actively engrained in the Russian Federation. In November 2016 Katerina Haritonceva, head of legal department of state corporation 'Roskosmos', revealed that all necessary documents have been prepared and personnel might soon begin relevant education[97]. Personnel of 'Roskosmos' will act as mediators in disputes between space-related businesses. She pointed out that businesses are themselves interested in reaching compromises

[96] Case concerning the differences between New Zealand and France arising from the Rainbow Warrior affair (1986) XIX Reports of International Arbitral Awards 199 http://legal.un.org/riaa/cases/vol_XIX/199-221.pdf accessed 20 April 2017.

[97] Interview with Katerina Haritonceva 19 November 2016 <https://www.roscosmos.ru/22941/> accessed 20 April 2017.

and their subsequent voluntary enforcement without recourse to coercive measures of executory process. Besides, even if the agreement is not reached, parties keep the right to go to court as statute of limitations is stayed during the mediation proceedings. It was planned to make mediation of space-related disputes mandatory by the end of 2016, but no information has so far been available.

Now let us finally consider the most promising way of the settlement of space-related disputes, namely **international arbitration**. Provisions for arbitration procedures are embedded, inter alia, in the ITU Convention, the ESA Convention, the UN Convention on the Law of the Seas and in the WTO Convention, the EUMETSAT Convention and the EUTELSAT convention. The Intelsat and Inmarsat Treaties, before they became private companies, also contained arbitration clauses. Although the mere provision of arbitration clauses should be applauded, their efficiency is undermined by the fact that all these clauses are very diverse. There is a clear need in harmonization of such provisions.

In 2011 the PCA has published special rules for space-related disputes.[98,99] Optional character of these rules is hardly an obstacle to the successful use of arbitration in settlement of space-related disputes. Nevertheless, it must be admitted that so far there has been no recourse to these rules.

Henry R Hertzfeld and Timothy G Nelson name two possible ways of developing arbitration infrastructure[100]. The first one is through a new space law treaty or an amendment of the LC, the latter being hardly possible given that there are more than eighty parties to the LC. The second one is through national laws, 'making it a standard condition of any launch license that the launching party agree in advance to: 1) accept international arbitration of any collision claims involving any private or public actor which is also engaged in space-faring activity; and 2) publishes its consent to arbitration so as to notify potential claimants of the availability of arbitration'.[101]

The ORA are mostly demanded in the telecommunication sphere. The ITU might become a forum for discussion of the implementation of the PCA Rules that might be implemented within the ITU regulatory framework 'at two different levels: (1) either directly by

[98] Permanent Court of Arbitration Optional Rules for Arbitration of Disputes Relating to Outer Space Activities Effective December 6, 2011 https://pca-cpa.org/wp-content/uploads/sites/175/2016/01/Permanent-Court-of-Arbitration-Optional-Rules-for-Arbitration-of-Disputes-Relating-to-Outer-Space-Activities.pdf accessed 20 April 2017.

[99] On the process of preparation of the ORA see Fausto Pocar, 'An Introduction to the PCA's Optional Rules for Arbitration of Disputes Relating to Outer Space Activities' (2012) 38 Journal of Space Law 171.

[100] Henry R Hertzfeld and Timothy G Nelson, 'Binding Arbitration as an Effective Means of Dispute Settlement for Accidents in Outer Space' (2013) 56th Colloquium on Outer Space Session 2 Settlement of Space-Related Disputes 129.

[101] Ibid 137.

changing the ITU instruments to include these Rules for use either on an optional or mandatory basis, or (2) indirectly, whereby States and satellite service operators could include in their service agreements, leases, or contracts specific provisions mandating the use of the PCA's Space Rules to resolve conflicts that occur as a result of their activities in Outer Space'.[102]

Furthermore, Victor Veshchunov and Elina Morozova argue that there is a need in establishing the specialized arbitration tribunal for resolving disputes related to radio frequency slots.[103] They justify this need by 'the scarcity of the radio frequency spectrum and the existing high demand for such spectrum, primarily due to an increase in commercial uses of the geostationary and other satellite orbits' that 'resulted in many disputes related to the status of frequency assignments, coordination, notification and recording of satellite networks, and other issues concerning the use of the radio frequency spectrum'.[104]

Alexis Mourre comes to the opposite conclusion that 'disputes stemming from space contracts are not so specific that they cannot be dealt with by large, non-specialized institutions'.[105] In his work he pays special attention to the complexities of contracts relating to the manufacturing, launching and operation of satellites and to the respective challenges of the resolution of disputes arising from these activities. In fact, there are three types of satellite industry disputes: 1) disputes concerning the design and manufacture of satellites, 2) disputes concerning their launch, and 3) disputes concerning their operation in space.

The first group is about the relationship between operators and manufacturers in relation to procurement contracts. Limitation or exclusion of liability of a manufacturer clauses and price adjustment mechanisms dependent on the satellite's performance in orbit are a particular feature of such contracts.

The second group of contracts is characterized by the high probability of failure due to the extreme conditions of a satellite launch into outer space. This objective risk explains the duty of 'best efforts'[106] that the launching company undertakes in contrast to the duty to indeed fulfil the purpose of the launching contract – to place successfully the satellite in orbit.

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[102] Juliana Macedo Scavuzzi dos Santo, 'The PCA's Optional Rules for the Arbitration of Disputes Relating to Outer Space Activities and Dispute Resolution in the ITU Regulatory System' (2013) 56th Colloquium on Outer Space Session 2 Settlement of Space-Related Disputes 157 174.

[103] Victor Veshchunov and Elina Morozova, 'Establishment of a Specialized Tribunal under the International Telecommunication Union to Adjudicate Disputes as a Means to Improve the Efficiency of the Management of the Radio Frequency Spectrum' (2013) 56th Colloquium on Outer Space Session 2 Settlement of Space-Related Disputes 151.

[104] Ibid 153.

[105] Alexis Mourre, 'Arbitration in Space Contracts' (2005) 21 (1) Arbitration International 37 52.

[106] For the elaboration of the duty of 'best efforts' see Bernard Schmidt-Tedd, 'Best Efforts Principle and Terms of Contract in Space Business' (1988) 31 International Institute of Space Law 330; Julian Hermida, 'Commercial Space Launch Services Contracts in France and the United States of America' (2004) 9 Uniform Law Review 537.

Disputes arising from contracts relating to the manufacturing, launching and operation of satellites have often been referred to international arbitration as well as national litigation, in particular to the USA courts. Alexis Mourre ascertains that 'the specificity of disputes relating to aerospace contracts is linked more to the complexity of the technical matters at issue, and to the fundamental importance of the rules of evidence, than to their legal regime.'[107] Indeed, the majority of cases from the satellite industry concerned the validity or the exclusion of liability clauses, which is an interdisciplinary matter.

Arbitration under the ORA seems to be an optimal way of resolving disputes related to space due to numerous advantages:

1) arbitration prevents parties from going to their national courts;

2) in contrast to litigation in national courts, parties may not claim sovereign immunity from the ORA, since an agreement to use the ORA is considered as a waiver of any immunity (art. 1);

3) the rules are open for all parties and well suited for cases between private parties and foreign government entities;

4) just as any specially designed institution, arbitral tribunal may consist of experts in space law as opposed to regular judges in national courts;

5) the awards are final and binding;

6) they are internationally recognized by the New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards of 1958, in contrast, for instance, to the recommendatory nature of decisions under the LC;

7) the PCA is empowered to regard both contractual and non-contractual disputes. The characterization of the dispute as relating to outer space is not necessary for jurisdiction where parties have agreed to settle a specific dispute under the ORA (art. 1);

8) article 35 (3) of the ORA provides for that 'the arbitral tribunal shall decide in accordance with the terms of the contract, if any, and shall take into account any usage of trade applicable to the transaction'. This wording lets parties develop their own commercial practices;

9) discovery and the evidence taking procedure may be adapted to the needs of the parties.[108]

The biggest concern of the opponents of arbitrating the space-related disputes is the likely unwillingness of companies to disclose commercially sensitive information to potential competitors as well as unwillingness of states to submit classified information to an arbitral tribunal. That does not count as a valid argument as the ORA contain special provisions on

[107] Alexis Mourre (no 105) 57.

[108] For the elaboration on mentioned advantages see Fausto Pocar (no 99).

protection of confidential information. Hearings shall be held in camera unless the parties agree otherwise (art. 28) and the award need not be published (art. 34 (5)). Moreover, the ORA provide for the option of appointing a confidentiality adviser who would report to the tribunal and to the other party or parties without disclosing confidential information (art. 17 (6-8)).

To sum up, diplomatic means, adjudication by international bodies, litigation in national courts are all limited in their personal and/or material scope, lack specific expertise, the first two are not available to private entities, while international arbitration brings numerous advantages to the parties to space-related disputes.

International space law is an independent body of international law and it deserves its own binding mechanisms of dispute resolution that will be versatile and available to all participants of commercial space activities.

6. Conclusion

Within the three past decades outer space has become a prosperous sphere of commercial activities since private sector has being actively providing satellite telecommunication, space launch services, global positioning and remote sensing to its customers. Nevertheless, the legal shift towards privatization and commercialization of space has not been fully reflected in the current body of space law.

In this research paper we have looked into the history of the development of space law, analyzed national, supranational and international space legislation and studied the works of space law experts on the issues of definitions of the key space law terms, delimitation of air space and outer space, interaction between various layers of space law, liability and insurance, functioning of property rights in space, including intellectual property rights, and various mechanisms of settlement of space law disputes. We have also mentioned key regulatory bodies and private space actors.

Legal regulation of commercial activities in space embraces issues of a number of legal fields and practices such as public space law, air law, general and intellectual property law, environmental law, telecommunications law, insurance law, investment law, competition law, secured financing and dispute resolution.

The main findings of this research paper are the following. **Firstly**, many terms important for commercial utilization of space remain indefinite. More efforts at the international level should be taken in order to assure the unanimous understanding of these terms.

Secondly, as Paul Stephen Dempsey has pointed out, 'space law consists of a growing number of international, multilateral, and bilateral agreements and conventions, the UN resolutions, decrees by international organizations, national legislation and regulations, and court decisions'.[109] This body of legal instruments is referred to as the 'corpus iuris spatialis'.

Thirdly, regarding the interplay between various layers of space law, international space law is responsible for laying down basic provisions aimed at wise and peaceful exploration and use of outer space.

The EU and the MSs space-related competencies are regarded as 'parallel competencies', which means that a MS can exercise its competence if the EU does not make use of its competence, but the MS does not have to wait for the EU to decide whether it will undertake action or not. MSs exercising their jurisdiction on board the ISS will have to implement the relevant EU provisions. Besides, in case of competing jurisdictions territorial jurisdiction shall prevail over personal jurisdiction.

[109] Paul Stephen Dempsey (no 10).

National space legislation have complementary character in relation to international and to the EU space law. Nevertheless, it is just as important since the development of the national space legislation is an issue of sovereignty and of prestige. Development of national space law is vital and the national space legislation should contain provisions regarding at least authorization and supervision of space activities, registration of space objects and indemnification provisions for the case of international liability claims against the respective state. Additional regulations may concern insurance requirements, patent law, international security rights, transport law, and dispute settlement.

Fourthly, states should cooperate when developing national space legislation in order to ensure uniform minimal standards of commercial space law to avoid the 'flags of convenience' and create a 'fair and competitive environment for all space operators'.[110] Moreover, harmonized national space legislation would benefit the interpretation of international space law. At the same time, slight divergences in national space legislation can be justified by peculiarities of space market characteristics of a particular country. Such matters as liability and insurance, authorization should be left to the states` discretion.

Fifthly, we have identified the juxtaposition between the suggestions of working groups on the 'Project 2001' and further developments of space law.

On the one hand, there has been a match regarding the following. Legal gaps in the liability system of the space treaties has been filled by national licensing procedures. Reliable and binding dispute settlement procedure has begun to develop with the adoption of the PCA rules. Harmonization of the law on security interests in high-value mobile equipment such as space assets has been achieved by way of the adoption of the Protocol on Space Assets in 2012.

On the other hand, the following issues have not been addressed. National space laws have not yet been harmonized. International technical and safety standards for space activities in order to reduce technical risks and to avoid 'flags of convenience' have not been formulated. A coordinated procedure for exercise of authorization and supervision of space launches in order to avoid multiple varied authorization and supervision procedures for private entities has not been implemented.

Sixthly, the principal idea that can be derived from this work is that there is in fact enough space legislation to conduct commercial activities in space and there is no urgent need in its revision. One exception would be the Moon Agreement which is a failed treaty and cannot be repaired even through revision, in other words there is a need in the negotiations of a wholly new

[110] Dimitri Linden (no 39).

international legal agreement. Other than this, it is harmonization of national laws and cooperation between states that is indeed crucial.

Seventhly, we believe that some kind of codification of existing body of space law is needed as it will facilitate its application by current practitioners and its study by future space law experts. The structure of this research paper may be considered as an example: 1) legal framework for commercial activities in space, 2) functioning of property rights in space, 3) particular types of commercial activities in space, 4) resolution of disputes related to commercial space activities.

Eighthly, regarding the property rights in space Henry R Hertzfeld and Frans G von der Dunk ascertained that 'sovereignty <…> is not the issue. <…> Profits are the issue, and unless and until a way of assuring private enterprises that their investments in research and development, equipment, and operations in space can be recovered, the insecurity and risks of not having an operating mechanism for establishing these rights will impede the fast growth of commercial space.[111]

Ninthly, international space law is an independent body of international law and it deserves its own binding mechanisms of dispute resolution that will be versatile and available to all participants of commercial space activities. As to the international arbitration of disputes related to space activities, which seems to be the most efficient way of dispute settlement, there are well drafted arbitration rules as well as great space law experts, we only need case practice and it will inevitably form when commercial activities sufficiently expand.

There are still many technical limitations the mankind strives to overcome before it truly begins commercial exploitation of space and its resources, therefore there is still enough time to draft comprehensive, high quality space legislation and non-binding legal instruments such as codes of conduct. What we should all have in mind is the words of Andrew G. Haley who at the very first colloquium on the law of outer space stated that 'law must precede man into space'[112] as well as the words of Stephan Hobe who wrote that 'the rule of law must prevail in the exploration and use of outer space'.[113]

[111] Henry R Hertzfeld and Frans G von der Dunk (no 65) 97.

[112] Andrew G Haley, 'Space Age Presents Immediate Legal Problems' (1959) Proceedings of the First Colloquium on the Law of Outer Space 5.

[113] Stephan Hobe, Gérardine Meishan and Goh Julia Neumann (no 87) 374.

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Annex

Abstract

Over the past three decades outer space has become a prosperous sphere of commercial activities since private sector has been actively providing satellite telecommunication, space launch services, global positioning and remote sensing to its customers. Nevertheless, the legal shift towards privatization and commercialization of space has not been fully reflected in the current body of space law. The present research paper studies the history of the development of space law; analyzes international, supranational and national space legislation; considers the works of space law experts on the issues of definitions of the key space law terms, delimitation of air space and outer space, interaction between various layers of space law, liability and insurance, functioning of property rights in space, and various mechanisms of settlement of space law disputes. The principal idea that can be derived from this research paper is that there is in fact enough space legislation to conduct commercial activities in space, and there is no urgent need in its revision. One exception would be the Moon Agreement which is regarded as a failed treaty and cannot be repaired even through revision; in other words, there is a need in the negotiations of a wholly new international legal agreement. Other than this, it is harmonization of national laws and cooperation between states that is indeed crucial in order to ensure uniform minimal standards of commercial space law to avoid the 'flags of convenience'. There are still many technical limitations the mankind strives to overcome before it truly begins commercial exploitation of space and its resources; therefore, there is still enough time to draft comprehensive, high quality space legislation and non-binding legal instruments, such as codes of conduct. International arbitration of disputes related to space activities seems to be the most efficient way of dispute settlement. Well drafted arbitration rules as well as great space law experts already exist; we only need case practice, and it will inevitably form as soon as commercial activities expand sufficiently.

Zusammenfassung

Innerhalb der drei vergangenen Jahrzehnte ist der Weltraum zu einer wohlhabenden Sphäre der kommerziellen Aktivitäten geworden, da der private Sektor seinen Kunden aktiv Satelliten-Telekommunikation, Raumfahrt-Dienstleistungen, globale Positionierung und Fernerkundung zur Verfügung stellt. Dennoch hat sich die gesetzliche Verlagerung auf Privatisierung und Kommerzialisierung des Weltraums nicht vollständig in den aktuellen Raum des Weltraumgesetzes widergespiegelt. Die vorliegende Forschungsarbeit untersucht die Geschichte der Entwicklung des Raumrechts, analysiert internationale, supranationale und nationale Weltraumgesetzgebungen, betrachtet die Werke der Weltraumgesetzsexperten zu den Fragen der Definitionen der Schlüsselraumgesetzbegriffe, Abgrenzung von Luftraum und Weltraum, Interaktion zwischen verschiedenen Ebenen des Weltraumgesetzes, Haftung und Versicherung, Funktionierung der Eigentumsrechte im Weltraum und verschiedene Mechanismen von Abwicklung von Weltraumstreitigkeiten. Die Hauptidee, die aus dieser Forschungsarbeit abgeleitet werden kann, ist, dass es in der Tat genügend Weltraumgesetze gibt, um kommerzielle Tätigkeiten im Weltraum durchzuführen, und es gibt keinen dringenden Bedarf in ihrer Revision. Eine Ausnahme wäre den Mondvertrag, der als fehlgeschlagener Vertrag angesehen wird und auch durch Revision nicht repariert werden kann. Also werden die Verhandlungen über einen völlig neuen internationalen Rechtsvertrag in diesem Fall nötig. Außerdem scheinen die Harmonisierung der nationalen Gesetze und die Zusammenarbeit zwischen den Staaten bei der Entwicklung der nationalen Raumfahrtgesetzgebung entscheidend, um einheitliche Mindestnormen des gewerblichen Raumrechts zu gewährleisten und dadurch „Flags of Convenience“ zu vermeiden. Es gibt noch viele technische Einschränkungen, die die Menschheit zu überwinden versucht, bevor sie wirklich die kommerzielle Ausbeutung des Weltraums und seiner Ressourcen beginnt. Daher gibt es noch genügend Zeit, umfassende, hochqualitative Raumgesetzgebung und unverbindliche Rechtsinstrumente, wie Verhaltensregeln, zu erstellen. Das internationale Schiedsverfahren von Streitigkeiten im Zusammenhang mit den Weltraumaktivitäten scheint die effizienteste Art der Streitbeilegung zu sein. Nicht nur gut ausgearbeitete Schiedsgerichtsregeln als auch ausgezeichnete große Raumfahrt-Experten bereits existieren; wir brauchen nur Fallpraxis, und es wird unweigerlich entstehen, sobald kommerzielle Aktivitäten ausreichend sich verbreiten.