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Insurance of Risks in Space Activities

The purpose of this article is to present space activities in the context of the risk and insurance related thereto. In particular, its aim is to identify those fields of space exploration that are subject to specific space law regime and in consequence, to identify the risks related to such an activity which may be classified as 'space risks'. Such an approach, according to the author is necessary to recognize the subject of 'space insurance' and basic terms of insurance contract. In order to achieve this aim, the international and selected national laws have been presented, including also the legal frames of the European Union regulating the exploration of outer space. On the basis of the identified legal framework, the nature of the space hazards was discussed in order to identify such risks as a subject matter of space insurance. Furthermore, the nature of space insurance has been analysed in the context of the basic principles of insurance contract, taking as an example the principle of good faith.

Key words: space risks, space insurance, insurability of space risks, space activity.

1. Outline

Exploration of outer space since its beginnings in the 1950s has continued to be one of the most risky human activities. Nevertheless, it is not an exaggeration to say that the modern life on Earth could hardly be possible without it and that space exploration is vital to our planet. The use of outer space technologies is constantly broadening, bringing many benefits. It enables us to observe changes in climate and the ozone layer, as well as to watch the environment for assessing the risk of natural disasters, or mitigating the effects. Finally, it provides vital assistance for making meteorological forecasts as well as facilitating communication and reducing information gaps around the world, including serving as a tele-education and tele-medicine tool[1]. The oldest, best known and most profitable part of the space industry, is satellite communications[2]. It is, however, only one of many possible applications, of which remote sensing (earth observation) and satellite navigation are gaining in importance and present potential for commercialisation[3].

All the tasks performed by the satellites, are the only "visible" part of their operation, but they could not provide any services without being backed first by launching in orbit, then by manoeuvring, commanding and tracking them, all of which is necessary in order to keep the satellite properly functioning in a dedicated position in the Earth's orbit. All of the above constantly face many challenges, such as small satellites, space tourism, etc., and need not only the legal approach to be coherent on a global level, but also a risk management system, which is no longer local or even regional, but is inherently global and as such should be universal, as any risks produced locally, once result in outer space explo-

[1] World Economic Forum, Bringing Space Down to Earth, March 2015; http://www3.weforum.org/docs/WEF_Bringing_Space_Down_to_Earth.pdf, accessed 27 August 2016.

[2] Annual global sales in communication satellites sector amount to EUR 110 bn as for 2012, Densing R., Reinke N., *The Need for European Independence in Space Applications* in European Autonomy in Space, Springer 2015, p. 132.

[3] Traa-Engelman, van, H.L., *Commercialization of Space Activities: Legal Requirements Constituting a Basic Incentive for Private Enterprise Involvement*, SP O5/1996, p. 122 *et seq*.

ration, gain inevitably a global context. Mentioning the risk aspect of outer space exploration, it is a truism to say that insurance has accompanied various human activities for hundreds of years. It also refers to space activities. As in other big endeavours, insurance plays an important role of a tool enabling to share the risk too big to be borne solely by the brave pioneers of the fledging space industry. It is also obvious that insurance, in order to develop needs a stable legal framework within the branch it is to protect, and the manner of shaping the space activity, its participants, liability, authorisation, influences significantly an important part of the risk factors and insurance coverage thereof.

The aim of this article is to present the space activities in the context of the risk and insurance. As well as identifying those fields of space exploration that are subject to specific space law regime and discussing the risks classified as space risks, it consequently presents the subject of space insurance. In order to achieve this purpose, firstly both international and certain national laws will be shortly presented. In the second part, the nature of space insurance will be discussed in the context of the basic principles of insurance contract.

2. Space Activities and Space Law

2.1. International Space Law

The space activities are accompanied by a regulatory framework adopted at various levels and in various forms, including international and national legislations, both in the form of hard law and soft law. No regulatory framework existed, however, at the moment when the space industry was emerging. The first successes in space exploration were followed by respective legal provisions, first at the international level, then flowing down to the domestic level at a much later stage. These were enacted not earlier than in the 1960s, initiated by the Outer Space Treaty of 1967 (OST)[4] and followed subsequently by four "space treaties": the Liability Convention of 1972 (LC)[5], the Rescue Agreement (RA)[6], the Registration Convention (RC)[7], and the Moon Agreement (MA)[8]. They constitute the most important part of the *corpus juris spatialis*[9]. This regime is supplemented by a number of multilateral and bilateral agreements concluded be-

[4] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, adopted by the General Assembly in its resolution 2222 (XXI), opened for signature on 27 January 1967, entered into force on 10 October 1967 (The "Outer Space Treaty").

[5] Convention on International Liability for Damage Caused by Space Objects, adopted by the General Assembly in its resolution 2777 (XXVI), opened for signature on 29 March 1972, entered into force on 1 September 1972 (The "Liability Convention").

[6] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, adopted by the General Assembly in its resolution 2345 (XXII), opened for signature on 22 April 1968, entered into force on 3 December 1968 (The "Rescue Agreement").

[7] Convention on Registration of Objects Launched into Outer Space, adopted by the General Assembly in its resolution 3235 (XXIX), opened for signature on 14 January 1975, entered into force on 15 September 1976 (The "Registration Convention").

[8] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, adopted by the General Assembly in its resolution 34/68, opened for signature on 18 December 1979, entered into force on 11 July 1984 (The "Moon Agreement").

[9] Smith L.J., *The Principles of International Space Law and their Relevance to Space Industry Contracts*, in: Contracting for Space: Contract Practice in the European Space Sector, L. J. Smith, I. Baumann, eds., 2011, p. 48; Hobe S., *The Impact of New Developments on International Space Law (New Actors, Commercialisation, Privatisation, Increase in the Number*

tween the spacefaring countries with respect to long-term general cooperation or a specific endeavour[10]. Apart from them, the international law organisations, mainly the UN division – UNCOPUOS, have carried out an enormous amount of work, drafting several documents with the aim of helping set out the assumptions and principles included in the space treaties. Though being of soft law character, they certainly play an important role in global system of space law[11] and serve as a pattern on a national level for a binding law, and as time goes by, they may become a part of the international custom and general principles of international law.

The most important of the above treaties are OST, LC and RC as they set up the basic principles of conducting the activity within the scope of outer space exploration. OST introduces the basic rules followed and specified by the remaining space treaties. In particular, it imposes an obligation on the appropriate state to require authorisation and continuing supervision over the activities of non-governmental entities in outer space and to exercise jurisdiction and control over space objects, and over any personnel, while in outer space[12]. The **Liability Convention** regulates specifically liability for damage caused by space objects and sets out the liability for damage caused at any time in the space object's life, differentiating the principles of liability (absolute or based on fault) depending on where the damageable effects occur[13]. The wording of the LC confirms its universal value and its victim-oriented approach, despite the fact that it has been applied only once since its adoption. It is important to note that the liability for damage is attributed exclusively to the state fulfilling the prerequisites of being the launching state, regardless of whether the damage was caused by the state or by nationals remaining under its jurisdiction. The rules of liability as regulated in the Liability Convention are an important basis for the shape of the national regulations concerning the allocation of liability between the state – internationally liable – and the national space operators. In turn, the subject matter of the **Registration Convention** is setting out the basis for enforcing the liability and responsibility regime through the registration of the space objects by the appropriate states. At the international level, the purpose of the register is to help identify the state that is to bear international liability for damage caused by space objects[14].

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of "Space-faring Nations"), Rev. dr.unif. 2010;Couston M., *Droit Spatial*, Editions Ellipses, Paris 2014, p. 9; Tobjasz I., *Historyczne aspekty i aktualne uwarunkowania działalności w przestrzeni kosmicznej*, w: Obronność. Zeszyty Naukowe 2(10) 2014, p. 167.

[10] Pieńkoś J., *Prawo Międzynarodowe Publiczne*, Zakamycze 2004, p. 611.

[11] The most important examples of soft law are IADC recommendations, code of conduct for ISS, etc. Smith L.J., The principles of international space law and their relevance to space industry contracts, in: Contracting for Space: Contract Practice in the European Space Sector, L. J. Smith, I. Baumann, eds., 2011., p. 49; Dempsey P. S., *National Laws Governing Commercial Space Activities: Legislation, Regulation, & Enforcement*, in Northwestern Journal of International Law & Business, vol. 36, 2016, p. 11; Couston M., *Droit Spatial*, Editions Ellipses, Paris 2014, p. 30.

[12] Marboe I., Hafner F., *Brief Overview over National Authorization Mechanisms in Implementation of the UN International Space Treaties*, in: National Space Legislation in Europe, Martinus Nijhoff Publishers, Leiden/Boston 2011, p. 31; Dempsey P. S., *National Laws Governing Commercial Space Activities: Legislation, Regulation, & Enforcement*, Northwestern Journal of International Law & Business, vol. 36, 2016, pp. 7–9.

[13] According to Art. II of the LC, a launching state is absolutely liable to pay compensation for damage caused by its space object on the surface of the Earth or to aircraft flight.

[14] Registration has two main purposes: (1) it is intended to enable the space object, its component parts or debris to be identified; (2) it places the space object under the jurisdiction and

As results from the space treaties, particular space activities, such as launching, in-orbit satellite operations or manufacturing, are not explicitly distinguished as specific types of activity, though the structure of the treaties, in particular, the Outer Space Treaty and Liability Convention show that launch and satellite operations are the core activities as a subject of the regulation in the space treaties as consisting of exploration of outer space[15]**.** No special provisions included in the treaties concern directly specific satellite services, which means that the application of the treaties does not depend on the service that is rendered, or for which a satellite is used, but on the fact of launching or attempting to launch a satellite and its operation in outer space[16]. Manufacturing seems to fall out of the international space law regime, but is obviously related thereto due to the liability regime for damage caused by space objects. Space treaties and other international instruments, though they cannot have a direct impact on private entities pursuing space activities, as they are addressed exclusively to states, they constitute a foundation of implementing an authorisation and registration regime in national laws.

2.2. Space Law and Space Projects in the European Union

The intensive and increasing activity of the EU within the field of outer space exploration needs a separate note on its legal grounds. The starting point for consideration is the competence of the European Union within the scope of space activities. The current framework is derived from **The Treaty on the Functioning of the European Union**[17], which in the Article 189 empowers the EU "to promote scientific and technical progress, industrial competitiveness and the implementation of its policies". To this end the Union shall draw up a European space policy and promote joint initiatives, support research and technological development, coordinate the efforts needed for the exploration and exploitation of space as well as to "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 Union is also authorised by the Treaty to establish any appropriate relations with the European Space Agency (ESA). As results from the above, the EU authority to act in relation to the national competences of the member states is parallel, which means that the member states preserve their national authority to act within the space sector, even if the EU undertakes actions in the same subject and scope (Article 4.3. TFEU).

Based on the above scope of the competence, the EU is active in the field of various space projects, both in terms of launching and operating satellites and using satellite services, in particular in the field of remote sensing and navigation. Among the priorities of the EU involvement in the space activities and applications are the "flagship"

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control of the launching state; see for example Marboe I., *National Law*, in: Handbook of Space Law, eds. Dunk F.G. von der, Tronchetti F., 2015, p. 133.

[15] See also Review of the concept of the "launching State" Report of the Secretariat where it was stated that "The launching of objects into outer space, and sometimes also an attempted launch, is explicitly listed as a type of space activity under some national laws and is probably implicitly covered by most others" Committee on the Peaceful Uses of Outer Space Review of the concept of the "launching State": http://www.unoosa.org/pdf/reports/ac105/AC105_768E.pdf. Accessed 26 August 2016, p.5

[16] Dunk F.G. von der, Europe and Security Issues in Space: The Institutional Setting, *Space and Defense*, Winter 2010) 4(1).

[17] The Treaty on the Functioning of the European Union signed on 13 December 2007,2012/C 326/01; Official Journal C 326, 26/10/2012 P. 0001 – 0390.

Galileo[18] and EGNOS programmes within navigation, as well as GMES (Global Monitoring for Environment and Security), called Copernicus. Both of these are developed in close cooperation with ESA on a contractual basis[19] and consist of a series of satellites launched and to be launched. The cooperation with ESA, the Member States concerned and the international partners includes also an option to cooperate with the International Space Station (ISS). Within the competencies of the EU, there is also independent access to space, which implicates the ability to pursue missions from Europe's spaceport in Kourou and to undertake other endeavours to this end. Recently, a new stage of the EU space policy commenced, which consists of the decision to insure the space missions of Galileo and Copernicus.

2.3. National Legislation

Several States active within the area of outer space exploration have enacted domestic law on outer space activities performed by national entities[20]. The regulatory framework at a national level was introduced initially by Norway in 1969, but within a limited scope, and then, as the first comprehensive legislation, by the US in the Commercial Space Launch Act of 1984[21]. At the moment, there are 27 national space laws and also Poland is working on its regulations within the scope of space activities. These laws aim mostly at setting up the rules under which the launching state may control and supervise the activities within the scope of outer space, undertaken by private entities on a commercial basis[22]. An important part of these rules is also the liability regime and the possibility of shifting the liability borne by the launching state to the entities

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[18] https://ec.europa.eu/growth/sectors/space/galileo_en accessed 15 October 2016; On the beginnings of Galileo, more in: Ferrazzani M., *Le projet Europeen Galileo, entreprise commercial ou services public international*, in: Le droit de l'espace et la privatisation des activites spatiales; Kerrest A., *Le droit de l'espace et la privatisation des activités spatiales*, Pedone, Paris 2003, pp. 72–73. The current status of the Galileo project may be found on the EU website: http://ec.europa.eu/growth/sectors/space/galileo/launches_en; accessed 26 August 2016 (by 2016, 18 satellites are to be placed in orbit); see also Dunk F.G. von der, *Article VI of the Outer Space Treaty in the European Context,* 51 Proc. Int'l Inst. Space L. 547, 2008, p. 552; and Polkowska M., *Prawo kosmiczne w obliczu nowych problemów współczesności*, Wydawnictwo Liber, wyd. I, Warszawa 2011, p. 182.

[19] The European Space Agency has a status that is independent of the European Union and its activity is not limited to its cooperation with the EU, but is to represent the interests of its member states in the performance of various space projects, even if the majority of them are EU member states. It is important to note that ESA acceded to the space treaties, i.e. the Registration Convention, the Rescue Agreement and the Liability Convention and enjoys the status of the launching state, bearing the same responsibility and liability, on the basis of declarations of acceptance submitted in 1975, 1976, 1979 respectively. Basis for relations with the EU is Cooperation Agreement between the European Union and its Member States, of the one part, and the Swiss Confederation, of the other, on the European Satellite Navigation Programmes. See more in Dunk F.G. von der, *Article VI of the Outer Space Treaty 'in the European Context,* 51 Proc. Int'l Inst. Space L. 547 2008, pp. 550–552.

[20] Marboe I., *National Law,* in: Handbook of Space Law, eds. Dunk F.G. von der, Tronchetti F, 2015, pp. 188–204, Dempsey P. S., *National Laws Governing Commercial Space Activities: Legislation, Regulation, & Enforcement*, in: Northwestern Journal of International Law & Business, vol. 36, 2016, p. 15.

[21] Though the first national legal act was enacted by Norway in 1969, it was very vague and general; see also Hermida J., *Legal Basis for a National Space Legislation,* in Space Regulations Library, vol. 3, Kluwer Academic Publishers, New York, Boston, Dordrecht, London, Moscow 2004, p. 78.

[22] Fenema P., *Legal Aspects of Launch Services and Transportation,* in: Handbook of Space Law, eds. Dunk F.G. von der, Tronchetti F., 2015, p. 397.

whose activities have led to the damage. The national laws are essential for the effective protection of public safety, property and the environment, which is also correlative with fulfilling the international duties of the launching states[23].

There are various criteria of applying national laws. Even if the majority of the laws somehow address the principle of nationality and territoriality, still these criteria are not used in a homogenous way[24]. The differences concern the scope of activities to be under the supervision of the state, as well as the risk of liability regime to be borne by the launching state and /or by the entities conducting business within the scope of space exploration. National space acts take various approaches to the subject and scope of the regulation, but regardless of the approach taken, a broad understanding of the space activities is applied. Taking the authorisation requirements as a basic indicator of a given activity being qualified as a space operation falling within the national regime of the space law and the obligation to authorise national space activities, the launch operation must be mentioned. No homogenous requirements exist as to the phase of satellite operation. Some of the laws include only satellite operation in the strictest meaning as a space activity, while others include the regulation of remote sensing and navigation in their scope of application. The vast majority of the national space laws do not, however, apply space law regime to various space applications, but have adopted a separate set of rules regulating telecommunication, remote sensing[25], etc. A common feature in most of the laws is also that the authorised activities usually take the form of services, while the manufacturing of products is excluded, both from the application of the law in general, and specifically from the authorisation requirement[26]. Those included in the space law regime are inherently subject to the space liability regime, leading also to the compulsory insurance in that field.

The analysis of the international, European and national space law framework, leads to the conviction that space activities for purposes of space risks identification and insurance, are those that are included in the specific regime of the space law and authorisation requirements, which in turn are such activities that are inherently and strictly related to the environment of outer space in a functional approach, i.e. which are conducted after leaving the ground with the aim of reaching a level of space not reachable by conventional aircraft. The other factor distinguishing the space law regime is the "upstream" and "downstream" sector, where only the former is subject to space law and the latter, commonly known as 'application of the satellite services,' is regulated on a sectoral basis. An example of the above can be seen in EU law, where the exclusion of the harmonisation measures with

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[23] Dempsey P. S., *National Laws Governing Commercial Space Activities: Legislation, Regulation,* & *Enforcement*, in Northwestern Journal of International Law & Business, vol. 36, 2016, p. 19.

[24] Masson-Zwaan T., *Registration of Small Satellites and the Case of the Netherlands* in, in Small Satellites: regulatory challenges and chances–Brill Academic Publishing, 2016, p. 189.

[25] See, for example, the UK, where, in addition to the licence for the satellite operator under the Space Law, additional licences may be required under the Telecommunications Act of 1984, the Wireless Telegraphy Act of 1949 and the Broadcasting Act of 1996. See Hermida J., *Legal Basis for a National Space Legislation,* in Space Regulations Library, vol. 3, Kluwer Academic Publishers, New York, Boston, Dordrecht, London, Moscow 2004, pp. 130–132.

[26] There are some exceptions in this respect, which may result from the space acts enacted by Russia, Ukraine and Kazakhstan, where broader concepts seemed to be adopted. See for example Dunk F.G. von der, *The Legal Framework for Space Projects in Europe: Aspects of Applicable Law and Dispute Resolution* – Space and Telecommunications Law Program. Faculty Publications 2011, p. 359.

respect to space law does not affect the regulation power in the field of satellite communication and broadcasting. Outside the frames of the space activity set above is also the manufacturing of space objects. Though the legal provisions on the world scale are not homogenous on this issue, such a trend is visible.

2.4. Contracts in Space Industry

Due to the general nature of the space regulatory frameworks, the contracts play a vital role in specifying and defining the subject and scope of particular space activities and as such are indispensable in identifying the risk to be covered by insurance. However, space law is also silent with respect to particular aspects of contract law, which could be applicable to the space activities. So far, no international contract law instrument of mandatory or optional application has been worked out especially for the use in contracts for the space industry in such areas as satellite procurement contracts, launch services contracts, satellite operation or sale contracts. This leads to a great role of industrial practice resulting in a kind of emerging *Lex Mercatoria*. The source of contractual clauses in space contracts is an established contractual practice that emerged during the years of concluding the space contracts by enterprises active in space industry, eventually with the help of some national bodies, such as NASA and ESA. All the above happened on the national level first, opposite to the ideas expressed in the space treaties, where the international framework gave a kick-off to the national regulations. An important feature of space contracts is that they are subject to various national jurisdictions, mainly those where the launch services providers have their registered offices or, in case of influential satellite operators, where the customers have their registered offices. In spite of a substantial difference in several aspects of the contract law of the civil and common law tradition (such as concepts of good faith in general contract law, consideration, subject-matter of the contract clauses, etc.), the analysis of the space contracts shows that the strong needs of the space industry, international *per se*, to ensure predictable and secure performance of the space operation, led to the creation of the uniform contractual practice in the main aspects of the space contracts[27]. In consequence, they provide the basis for a precise structuring of the whole space mission, reflecting the current technology and regulatory framework. Important part thereof are provisions concerning the risk management and allocation, having a direct impact on the space insurance terms.

Most important types of contract that are indispensable in shaping the insurable interest and subject – matter of insurance are launch services contracts, satellite procurement contracts and satellite operation contracts. Apart from the above, there are a range of contracts for manufacturing the supporting ground equipment as well as for the provision of TT&C services, agreements supporting the application of satellites, such as service level agreements, etc.

3. Space Activities and Space Risks (Property, Liability, Personal)

The well-known rule is that the first thing in proper risk management is to identify the risk. This fully applies to risks related to the exploration of outer space[28]. Though it seems that space risks are associated primarily with "anything outside Earth's atmo-

[27] See also Ravillon L., *Typology of Contracts in the Space Sector*, in Contracting for Space: Contract Practice in the European Space Sector, L. J. Smith, I. Baumann, eds., 2011, p. 161.

[28] For example, Hermida J., *Risk Management in Arianespace space launch agreements*, XXV Ann. Air & Sp. L, 2000.

sphere that can cause harm to people or property"[29], it is obvious that the risk related to space operations is not limited to cosmic risks, but also includes substantial risks that can occur on Earth. This is supported by the broad approach taken by the regulation of space activities included in the legal provisions and contractual practice[30]. All this leads to the conviction that scope of risks related to the launch and satellite operation, as covered by insurance, should also be perceived in a broad context. It is supported by the range of possible damage that may be sustained by the property and persons, mirrored adequately in the category of **property risks and personal risks**. These include the loss, damage or destruction of property related to the space project (i.e. satellite, launch vehicle, ground facilities), as well as property of third parties, such as ships and aircrafts (in case of a collision during the launch) or any other property in case of space object hitting the ground, increased by consequential loss of profits and pure financial loss[31]. Damage to persons includes the manned space flights, persons involved in other way in the space activities (e.g. launch facilities staff) as well as so-called innocent by-standers[32].

There can be no doubt that all activities undertaken in outer space are ultra-hazardous, inherently very risky and potentially so harmful that ordinary person would not regularly take up such activities[33]. Risk in space operations is a mixture of technological, human and nature related perils. There are also various criteria of risk division[34]. The most obvious are threats due to the technology that must be used in order to carry out the space mission. For example, in order to reach the orbit, intense energy must be built up during the launch, and the high velocity of a space object leads to enormous friction with the atmosphere to be traversed, transforming kinetic energy into heat[35]. Technological hazards are mostly related to the use of highly explosive pro-

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[29] Ross S, *Risk Management and Insurance Industry Perspective on Cosmic Hazards*, in: Handbook of Cosmic Hazards and Planetary Defense, 2015, p. 2.

[30] For example, the launch activities as proposed by the UN "shall be defined as those activities undertaken to place or try to place a launch vehicle and any payload in a suborbital trajectory, in Earth orbit in outer space, or otherwise in outer space".

[31] Blassel P., *Space Projects and the Coverage of Associated Risks*, The Geneva Papers on Risk and Insurance, Vol. 10, No 35, 1985, p. 72 – proposes another division, distinguishing separately: loss of property, damage to property, failure to achieve the proper orbit, partial or total failure of satellite or payload and loss of revenues, while according to the author, the above division includes damage as well as risk from the occurrence of which damage results; it means that they should not stand in line.

[32] In total, over 200 people have been killed by rocket explosions. Apart from Challenger, majority of the accidents causing death occurred on ground during the ground processing of the launch operation or during re-entry;. Jakhu S.R, Sgobba T., Dempsey P.S. (2011), *The need for an integrated Regulatory Regime for Aviation and Space,* p. 13.

[33] The notion of the ultra-hazardous activity has been outlined by the Prof C.W. Jenks in: "Liability for Ultra-hazardous Activities in International Law", 1966, cited by Brodecki Z., *Liability in International Law,* Studia Europejskie, Instytut Studiów Europejskich, Gdynia 2000, p.179; Parquet C.A., *Allocation of Potential Liabilities and Risks in Launch Services Agreements*, Project 2001 Plus workshop, pp. 29–30, January 2004; also Soucek A., *International Law*, in: Outer Space in Society, Politics and Law, A. Soucek, Ch. Brunner, Springer Wien–New York 2011, p. 342.

[34] Horl K.U., *Legal Aspects of Risks Involved in Commercial Space Activities*, Montreal 2003, p. 18.

[35] Soucek A., *International Law*, in: Outer Space in Society, Politics and Law, A. Soucek, Ch. Brunner, Springer Wien New York 2011, p. 338.

pellants needed to lift the launch vehicle and place the satellite in orbit[36]. Any accidents related to the release of the propellant during the launch stage are known to cause explosions, debris, fire, and toxic vapour clouds, though of course, the ratio of the above is also determined by the type of propellants. It has been stated that, depending on the circumstances of the case, some of the above hazards may appear competitively or precluding each other, depending on the vehicle design, accident location, including the vicinity of people and property, failure mode, propellant type and amount, as well as environmental conditions. The probability of any of these hazards appearing is dynamic and changes during the space mission phase[37].

The satellite operation is also subject to many other risks that do not end with the launch success, but only begin then, lasting until the satellite is functional, and even thereafter, where the obligation to de-orbit and the risk of re-entry comes into question. It faces all the time another important type of risk, i.e. environmental one. It is common knowledge that operations in outer space are performed in extreme environmental conditions. It is an inherent feature of this type of activity that cannot be avoided and may be mitigated only to a certain extent. There is no doubt that the environment of outer space is a hostile one to satellites: carrying extreme temperatures, cosmic radiation and electromagnetic fields, vacuum, etc. all causing a significant challenge to the lifetime of a satellite[38]. Satellites are designed to operate for approximately 15 years and are affected throughout this time by the above-mentioned harsh conditions. As time goes by, they may gradually lose their resistance to electromagnetic radiation, which can start to penetrate and degrade the satellite's electronic components, thereby disturbing the performance. Debris is an example of the hazard of the growing importance, which can affect the space mission at any stage. There may be space debris located at the Earth's orbit, or even debris created at the launch phase as a result of jettisoning subsequent stages of a launch vehicle. It is estimated that there are more than 22,000 objects, qualified as debris, being tracked[39]. Collisions only with the trackable category of debris can destroy the satellite and additionally may produce more consequential debris[40]. Apart from that, new types of risks should be taken into account and distinguished, especially in the satellite operation stage. These may mostly concern in-

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[36] The propellants are also used during the satellite operations stage, but in significantly lower quantities, which also lowers the probability of technology-related failures. That is also why the risk related to the use of propellant decreases along with the flight time and the its consumption.

[37] Hazard Analysis Of Commercial Space Transportation, DOT Office of Commercial Space Transportation 1995, pp. 4–1. https://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/media/hazard.pdf; accessed 27 August 2016, pp. 5– 4 *et seq*.

[38] In this respect, there are at least three types of radiation that are taken into account and which may vary, depending on the orbit. These are van Allen belts – captured by the Earth's magnetic field, particles sent by the sun during solar storms and galactic cosmic rays; Kleiman J., Lamie J. K., Carminati M-V., *The Law of Spaceflight, A Guidebook for New Space Lawyers, 2012*, p. 20; Pelton J., *Satellite Communications,* Springer Science & Business Media, Arlington 2011, p.30.; also A. Soucek, International Law in: Outer Space in Society, Politics and Law, A. Soucek, Ch. Brunner, 2011, p. 337.

[39] ESA 2015, CLEANSAT: New satellite technologies for cleaner low orbits.

[40] i.e. the so-called Kessler syndrome (space-asset destructive chain reaction) following the name of a NASA's expert Donald Kessler who in 1978 for the first time discussed the potential of orbital debris becoming self-perpetuating, It was concluded that collisions of satellites and spent rocket bodies would eventually form the dominant source of orbital debris in LEO. It was predicted that debris coming from collisions would collide with other satellites and rocket bodies and create even more debris. As a result of this chain reaction, the risk to satellites in

tentional interference and cyber-attacks. No doubt, the space industry is also exposed to legal, political, commercial, operational and other risks related to any business activity[41]. Due to the transboundary character of space activities and the strong involvement of the states, these risks seem to be more internationally correlated than in other types of business activity.

Severity of risk associated with the space activity entails a specific allocation of the risks among the space operation participants, so as to diminish the burden of the risk being imposed on one entity, limit the need to insure difficult and expensive risks as well as avoid the costly disputes between the parties to the space operations. The way such an allocation is made, based on legal (for example in France and US) and contractual provisions, has an impact on insurance, i.e. the insurable interest and the type of insurance coverage applicable[42]. The system of **allocation of risk in space activities requires application of the criteria of the entities involved in the launch operations, according to which there are first party, second party and third party risks**.

Third party risk can be easily defined from a legal point of view and is subject to national and international legislation in the context of ensuring the best possible protection of the victims of space activities. The possibility of contractual shaping the allocation of the third party risk is limited and may have effect only between the parties to the contract, while the innocent and not related victims are protected by the strict provisions of the international and national (where enacted) laws. As regards the third party risk, it is obvious that the space activity may inflict serious damage to third parties, both in terms of property damage as well as personal injuries. **This possibility exists with respect to each phase of space activity, i.e. starting from the launch of space objects in outer space, during the operational phase and their re-entry. Third party risk has been regulated by the obligatory provisions of law, deriving primarily from the outer space treaties (namely the LC and OST), and implemented in almost all the national acts regulating commercial activity in space**. Undoubtedly, the regulation of government control over space activity is inherently related to the need to protect third parties against the risk of damage resulting therefrom, and the need to introduce a mechanism of imposing responsibility and liability over the entities gaining profits from space activity[43] in such a way that the government of the launching state has the possibility of shifting the burden of financial liability for damage caused, which is imposed on the state by the space treaties.

The second party risk in space projects is perceived in the context of the liability of the participants of the space mission towards the other partici-

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certain regions of space would increase exponentially with time, even without further launches into those regions. In a 1991 paper, Kessler used the term "collisional cascading" to describe this process. This has created the widely used term "Kessler syndrome"; see for example EU (2013) MEMO/13/149.

[41] More on various types of risks related to business activity, Kwiecień I., *Ubezpieczenie w zarządzaniu ryzykiem działalności gospodarczej*, C.H Beck, Warszawa 2010, pp. 28–38.

[42] Mendes de Leon P., van Traa H., *The Practice of Shared Responsibility and Liability in Space Law,* Amsterdam Center for International Law, Shares Research Paper 70, 2015, pp. 19–23, available at.www.sharesproject.nl, accessed 18 August 2016.

[43] Kerrest A., *UN Treaties on Outer Space, L.C. and Licensing Regimes* in: Actions at National Level, UN Korea Workshop, pp. 236–249.

pants. This type of risk refers to and is mainly regulated by the legal and contractual provisions binding upon the parties involved[44], though it must be stressed that it is understood in a broad way – apart from the contractors to the same contract, the second party risk usually also involves the government, which, even in case it does not participate directly in the space activity, is also exposed to risk[45]. The identification of second party risks, though to some extent depending on the legal regulations imposed by national laws, will mostly derive from the organisational structure of the launch and satellite operations, including ownership issues, and contractual relations between all the parties involved in the launch activities[46]. In turn, **first party risks** are typically those risks that are absorbed by the respective parties to the space operation in such a way that each one assumes the risk of the loss of its own property, and all the consequences resulting therefrom, without the possibility of shifting it to other parties of the space project via the contractual liability clauses or claims in tort, thus limiting substantially the scope of second party risks.

The contractual system of risk allocation consists of inter-party waivers of liability, accompanied by hold harmless clauses, and flow-down provisions, applied jointly. It results mostly from the standard launch contracts, as international and national legal regulations apart from very few exceptions (US and France) do not regulate the risk allocation schemes. A typical launch contract, regardless of jurisdiction, includes similar clauses regardless of whether the contracting parties are the launch company and satellite operator, or the satellite manufacturer providing turn-key services by delivering the satellite into orbit[47]. **Due to the above risk allocation regime, first party risks are said to be the core of the satellite insurance**.

4. Insurance of Space Risks

It is claimed that insurance "has considerably helped the space application sectors to develop," as it "provides coverage for risks which space ventures are unable to reduce or eliminate by other means"[48]. The common saying is that there is no space project without financing, and there is no financing without insurance[49]. An effective insurance coverage in place is a condition precedent of many financial schemes as, in fact, it is perceived as a stabilising factor for risky commercial space activity. Even for the governments as well as for the EU, the external financing and insurance of space

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[44] A similar context of second party risks was presented by Prof T. Tanja Masson-Zwaan – *Liability & Insurance in Air & Space Law; Regulation of Suborbital Flights in Europe* – ICAO/UNOOSA Aerospace Symposium, Montreal Canada, 18–20 March 2015.

[45] Hermida, J., *Commercial Space Launch Services Contracts in France and the United States of America*, Rev. dr. unif. 2004-3, p. 541.

[46] See also Kayser V., *Launching Space Objects: Issues of Liability and Future Prospects*, in Space Regulations Library, vol. 1, Kluwer Academic Publishers, New York, Boston, Dordrecht, London, Moscow 2001, pp. 7–8.

[47] Beer T, *Launch Services Agreements – Anything New, Launch Services Agreement,* in :, Project 2001, Legal Framework for the Commercial Use of Outer Space: Karl-Heinz Böckstiegel (Ed.); Carl Heymans Verlag, Cologne, 2002, p. 129.

[48] Blassel P., *Space Projects and the Coverage of Associated Risks*, The Geneva Papers on Risk and Insurance, Vol. 10, No 35, 1985, p. 80.

[49] Meredith P., *Space Insurance Law – with a Special Focus on Satellite Launch and In-Orbit Policies* – the Air & Space Lawyer Volume 21, No.4, 2008; Diederiks-Verschoor I.H. P., *Financing and Insurance Aspects of Spacecraft*, J.S.L vol. 24, Nos 1&2, 1996, p. 99 *et seq*.

projects is becoming an increasingly important tool of risk management, in spite of its costs[50]. The insurance of space risks is very often a part of the financing scheme for the whole space mission[51]. The first space insurance contract was concluded in 1965 for COMSAT's Early Bird satellite with coverage of pre-launch insurance and third party liability insurance, written by marine insurers[52]. The coverage of launch and in-orbit risks began in 1968 with insuring an Intelsat fleet of satellites.

Space insurance is a highly specialised branch of the insurance law and from a regulatory point view it still seems to be a kind of novelty on the insurance market. Taking the EU law approach as an example, there is no regulation explicitly concerning space risks, which for the time being can only be classified as a type of transport insurance (see appendix 1 to the Solvency II Directive). The question is also whether space third party liability insurance suits the features of aviation third party liability insurance, due to the specific liability regime established in the LC, being quite different from the liability in the aviation transportation. Nevertheless, in each case it seems that the space insurance should be categorised as a large risk insurance[53], being based on the definition of the large risks as included in Directive 2009/138/EC (Article 13, point 27). It refers to the types of the risks and features of the policyholder, as it is rather obvious that the latter prerequisites are met by most of the launch/ satellite operators[54], but also due to the possible qualification of the space risks as transport risks.

Moreover**, the other criteria for distinguishing space insurance types are not homogenous**. In a broader sense, they include all the stages of the space project, since the production phase until the end of the space project (the end of the satellite's life-time). However, such a typology stresses the fact that the pre-launch coverage, until lift off, is often provided not by the space insurers, but by the cargo, marine and other insurers offering similar coverage. This is due to the fact that all the risks related to the ground activity, even if connected with outer space have, in fact, much in common with other insurance of ultra-hazardous activities, and as such are more similar in dealing with such risks (as in nuclear and chemical industry) than with outer space. According to this concept, **space insurance starts not earlier**

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[50] Insurance coverage constitutes a third cost of the space project; Harrington A. J., *Legal and Regulatory Challenges to Leveraging Insurance for Commercial Space* – 31st Space Symposium, Technical Track, Colorado Springs, Colorado, United States of America Presented on 13–14 April 2015; Sundahl, M., Financing Space Ventures, in: Handbook of space law, 2015, p. 875.

[51] See Iridium report of 2015 and Catalano Sgrosso G., *Insurance Implications about Commercial and Industrial Activities in Outer Space* – Citation: 36 Proc. On L. Outer Space 187, 1993, p. 192.

[52] Reeth van G., *Space and Insurance*, International Business Law, vol.12, 1984, p. 127; Pagnanelli B., *Tracking Take-off of Space Insurance*, 2007; www.pagnanellirs.com/downloads/id281107.pdf *accessed 27. August. 2016*; Kuskuvelis I.I., *The Space Risk and Commercial Space Insurance,* Space Policy, May 1993 – different (stated that it covered also launch insurance).

[53] Catalano-Sgrosso, G., *International Space Law*, 2011, p. 500.

[54] i.e. when the limits of at least two of the following criteria are exceeded: a balance-sheet total of EUR 6.2 million; a net turnover, within the meaning of Fourth Council Directive 78/660/EEC of 25 July 1978 based on Article 54(3)(g) of the Treaty on the annual accounts of certain types of companies, of EUR 12.8 million; an average number of 250 employees during financial year. More about the criteria of large risks, Kropka M., *Kolizyjnoprawna regulacja umowy ubezpieczenia w rozporządzeniu Rzym I*, Prace Naukowe Uniwersytetu Śląskiego, Katowice 2010, pp. 128–139.

than with the lift off of the launch vehicle and lasts for the duration of the entire satellite life[55]**.**

Having said so, the insurance market practice divides the space risks according to the phases of the space project and distinguishes the "launch", "early in orbit" and "in orbit" insurance. This refers to the fact that risk in each subsequent phase of the space mission is very different. The most substantial risk is during the launch phase, and this diminishes during the subsequent stages. The time of the cover is not equal, as the launch phase lasts no longer than one hour (depending on the type of the launch vehicle and intended orbit), the early in orbit phase (depending on the type of the satellite) may last several weeks up to several months (in the case of all-electric satellites) and the operational stage may exceed 15 years. The specialised space insurers offer combined coverage for typical space risks, i.e. launch, early in-orbit and in-orbit. The reason for structuring combined space insurance products is the difficulty in drawing a distinction between subsequent phases of the space operation, as it can be even more difficult to discover the moment when the covered risk occurred and the moment when the loss manifests itself, depending on the policy wording. **Whatever the criteria within these two types of cover, it is important to note that it starts not earlier than the launch,** i.e. at the point of no return when the rocket lift off becomes irreversible. It means that it does not include the hazards of the ground operations, as these are included in the pre-launch cover[56].

Apart from the above, the classical division for property (first party risk) and third party liability is made, where the latter is usually a compulsory type of insurance under national legal authorisation regime and is related to the necessity of shifting the liability borne by the state for space activities of the national space entrepreneurs. The second party insurance, known in transport insurance as insurance of liability towards passengers and in a more general sense, the liability towards related parties as a rule practically does not exist in the space insurance sector, mainly due to the common application of cross-waivers in the space industry between the participants of the space missions, as well as due to the lack of regulations on the second party liability in the Liability Convention[57].

Third party space liability insurance, as a compulsory one, is one of the few aspects regulated in law specifically with respect to space insurance. Nonetheless, the obligation to insure does not result from international law, where the treaties are silent about insurance and are limited only to the rules of liability imposed on the launching states. Only the UN resolutions include suggestions on regulating the compulsory third party liability insurance in the national space laws. Thus, the obligation to insure is present in the domestic space laws enacted by spacefaring states, and one

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[55] Kunstadter C., *Space Insurance Market Overview,* AIAA Workshop, 2013.

[56] Pre-launch period (including manufacturing, testing and transportation phase, as well as the preparatory actions at the launch site), though included commonly to space insurance in a broad meaning, in fact is insured by insurers specialising in more general types of insurance, e.g. transportation, marine, or large corporations with a substantial capacity (e.g. AXA or Munich Re) based on the rules specific to all other branches of industry, even if taking into account their ultra-hazardous nature; Schöffski O., Wegener A.G., *Risk Management and Insurance Solutions for Space and Satellites Projects,* 24 The Geneva Papers on Risk and Insurance, 1999, p. 205.

[57] Masson-Zwaan T., *Liability & Insurance in Air & Space Law; Regulation Of Suborbital Flights In Europe*, Montreal, 18 March 2015, ICAO/ UNOOSA Aerospace Symposium; the second parties explicitly excluded from the 'space liability regime' (i.e. astronauts, passengers, etc.).

of its aims is to secure the international liability of the state for space activity conducted by national entities[58]. In a number of states, the insurance obligation has not been reflected explicitly in the law, but constitutes a condition to obtain a licence to conduct space activities. The obligation to have insurance is nowadays perceived as one of the most important issues of national space legislation and is present in all the proposals concerning the harmonisation of domestic space laws[59]. It can also be noticed that all newer laws on space activities include the explicit obligation to have insurance, covering risk of damage that may be sustained by third party[60]. In view of the above, it may be said that, although the national laws are not homogenous in terms of the scope and terms of insurance obligations, on the whole they reflect the basic principles distinguished by academics for compulsory insurance, which consists of (1) the private character of the compulsory insurance contract, (2) the indemnity character of a compulsory insurance contract; (3) the liability type of compulsory insurance, usually including the coverage of legal costs; (4) the obligation of insurance to be decisive, i.e. resulting from a statute, or international agreement, and (5) the basic features of the compulsory insurance being specified by the law[61].

As regards the insurance contract law perspective, space insurance and space risks are not defined in insurance laws. This is why, the space insurance contracts must in terms of the subject-matter of risks and its features rely on the space regulations and contractual practice. **Considering the space insurance in the context of basic principles of insurance, the principle of party's autonomy, principle of good faith, principle of indemnity and reasonableness could be taken into account as a basis for comparing the "classic" types of insurance and space insurance. Due to the limited frames of this article, the principle of good faith in the context of space insurance will be presented, as it is claimed to be one of the most important concepts standing at the root of insurance.** Traditionally it is linked to the policyholder's information duties, which are material for effective insurance protection at the conclusion of the insurance contract and during the risk assessment in the underwriting process, but also during the contract term and finally after the occurrence of the event insured. Also, in space insurance, though involving very experienced insurers with a vast knowledge on space technology, it is the policyholder who is familiar with the purpose and criteria of the space project, and determines the success or failure criteria, as well as the reliability factors. In addition, in the event of a loss, it is the insured alone who is able to state whether the malfunction is permanent or can be remedied, and he alone is able to provide the proof of loss. The full control on the subject of insurance and knowledge of the relevant circumstances is in the hands of the insured. This cannot be substituted solely by the insurer's space technology expertise. Thus, though insurers quite often participate in the space project from its beginnings, they still have to rely on information provided by the insured.

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[58] Horl K. U., *Legal Aspects of Risks Involved in Commercial Space Activities*, Montreal 2003, p. 152.

[59] See for example Gerhard M., Schrogl K-U, *Report of the Project 2001 Working Group on National Space Legislation*, in: Project 2001 Legal Framework for the Commercial Use of Outer Space: Karl-Heinz Böckstiegel (Ed.), p. 557; and Sophia model law.

[60] See, for example, also the Polish draft space law. One of the drafts, i.e. the Sofia model law on space insurance, also includes proposed provisions on liability and compulsory liability insurance.

[61] Orlicki M., *Ubezpieczenia obowiązkowe*, Warszawa: Wolters Kluwer 2011, p. 163.

The above is very important and well reflected in the underwriting process which in space insurance must be based on an individualistic approach to the risk assessment and must work on "technology-based engineering analysis", rather than base on the typical methods of risk measurement and statistics[62]. This situation is due to the low quantity of risks of high value, i.e. the limited number of launches and satellites, which do not allow really meaningful statistics to be developed, increased by the diverse range of launch vehicles and satellites, which further narrow the possibility to act on the rules of probability[63]. This issue is related to a broader aspect of the insurability of space risks in the context of the general criteria of insurability developed by insurance doctrine[64]. The fact that in spite of these difficulties in meeting insurability criteria, space risks have been subject to insurance for several years means that space insurance may also be considered valuable as it contributes to the development of the theory of modern insurance. It may cause that new, emerging risks can cease to be uninsurable, but may enjoy insurance coverage, as in the case of the difficult space risks, which may enable the kick-off of emerging industries. This is often a matter of discussion whether in modern times uninsurable risks exist at all, and space risks are one of the best to consider the limits of the insurability[65].

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[62] E.g. Blassel P., *Space Projects and the Coverage of Associated Risks*, The Geneva Papers on Risk and Insurance, Vol. 10, No 35, 1985, p. 64 "assessment of the risk of correct satellite operation over a given period of time is a complex matter, which does not lend itself exclusively to a mathematical or statistical analysis." Meredith, P., Robinson G., *Space Law: A Case Study for the Practitioner : Implementing a Telecommunications Satellite Business Concept*, Amsterdam: Martinus Nijhoff Publishers, 1992, p. 337; the individualistic approach is adopted in the case of atypical risks, where assets are of high value, for example in vessels on the high sea, Williams C.A. et al., *Risk Management and Insurance*, 2002, p. 158; Ronka-Chmielowiec W., *Ubezpieczenia. Rynek i Ryzyko,* Polskie Wydawnictwo Ekonomiczne, 2002, p. 172.

[63] Kuskuvelis I.I., *The Space Risk and Commercial Space Insurance,* Space Policy, May 1993, p. 111. Another factor making the underwriting endeavour difficult is limited access to data on space projects that were not insured, which may not have any direct influence on rates on the space insurance market, but does further limit the database for developing meaningful statistics. Finally, national statutory impediments are imposed on the transfer of data concerning space assets, the best known of which is ITAR binding in US. Its provisions require insurers from outside the US to obtain a licence in order to be able to see data necessary for the risk assessment, since it is recognised as an export of technical data. See alsoWhearty R., *Intro to Space Insurance. First party* – Marsh Space Projects a History of Leadership and Innovation, August 2015; Bender R.G., *International Arbitration – Satellite Communications: Arbitrator Perspective*, in: International Commercial Arbitration Practice: 21st Century Perspectives, Warszawa:LexisNexis, 2010.

[64] Kowalewski E., *Prawo ubezpieczeń gospodarczych,* Bydgoszcz–Toruń: Oficyna Wydawnicza Branta 2006, p. 41 (where it is emphasised that the insurable risk should be measured by statistical methods; risk measured only with probability methods is uninsurable and the risk measured by estimations is conditionally insurable); also Kwiecień I., *Ubezpieczenie w zarządzaniu ryzykiem działalności gospodarczej*, C.H Beck, Warszawa 2010, p. 125. Kunstadter C., *Space Insurance Market Overview,* AIAA Workshop, 2013; Space insurance market overview, Masson-Zwaan T., *Liability & Insurance In Air & Space Law; Regulation Of Suborbital Flights In Europe*, Montreal, 18 March 2015, ICAO/ UNOOSA Aerospace Symposium.

[65] Magno P., Schifoni E., *Space Activities and Insurance*, Proc. Of the 20th Coll. On the Law of Outer Space, Prague, 1977, pp. 330–332, where the authors stressed that "in reality, insurance technique has attuned its operational instruments, and those of management, to today's needs so well that, apart from catastrophic risks, it may be said that technically uninsurable events do not exist, even should the premium turn out to be an approximation or be extremely high". Still the insurability (in particular TPL risks) was expected to be possibly on PML.

5. Conclusions

Getting through the jungle of the norms that regulate risks of space operations, potential perils, technical regulations, licensing requirements, we cannot forget the ideas that stand behind them. The core notion of insurance is the risk, as insurance is one of the methods of handling the risk, important but not the only one. Insurance constitutes an inherent part of the whole system developed by the space industry, aimed at handling the risks that cannot be avoided and can barely be mitigated. Insuring the hardly insurable space risks is possible only due to the exceptional knowledge of space insurers forced to use an individual approach to assess space risks without sufficient statistics to act as "the law of large numbers." It is possibly the best example of how an in-depth knowledge and obeying the basic principles of insurance may overcome the obstacles and make feasible even the most improbable and risky endeavours.

Space insurance at this stage presents rather a homogenous picture as it covers mostly the technological aspects of the space activity and technological risks. This is due to the fact that so far no personal injuries on a large scale have occurred that would affect third party space liability insurance, as well as the fact that space tourism is still in *statu nascendi*, and no insurance market for this type of risks really exists. In addition, apart from the US (federal and state) laws, no legal regulations exist that would specifically regulate space tourism, in particular when it will take place only on suborbital trajectory, possibly leading to uncertainties in particular as to which law regime should be applicable: space or air law, etc. Certainly, suborbital tourism will create new types of risks and will require a new type of legal environment that would allow the insurers to operate in, this being necessary even for the individualistic approach to the risk assessment.

The frames of the above article, were far too narrow to present a complete and coherent picture of the space insurance. Nevertheless, the reflections included therein aimed at showing how much the space risks are inherently related to the rules of the space industry and what the impact of such a relation is on the features of the space insurance. The result of the author's research is that although the space insurance is not a distinguished type of insurance risk (class) from the regulatory point of view, there is no doubt that the space insurance contracts are in line with the main insurance principles, including the principle of indemnity and good faith.

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Ubezpieczenie ryzyk w działalności kosmicznej

Przedmiotem artykułu jest przedstawienie działalności w zakresie eksploracji przestrzeni kosmicznej w kontekście związanych z nią ryzyk i możliwości ich ubezpieczenia. W szczególności celem rozważań jest identyfikacja tych aspektów działalności, które są przedmiotem reżimu prawa kosmicznego. Ma to znaczenie dla identyfikacji ryzyk związanych z eksploracją kosmosu, które mogą zostać zakwalifikowane jako „ryzyka kosmiczne" dla potrzeb zarządzania nimi i ubezpieczenia. Takie podejście jest konieczne, zdaniem autorki, do skonstruowania przedmiotu „ubezpieczenia kosmicznego" i podstawowych warunków umowy ubezpieczenia. Aby osiągnąć zakładany cel, przedstawiono podstawowe instrumenty prawa międzynarodowego w dziedzinie eksploracji przestrzeni kosmicznej, jak i wybrane reżimy krajowe, w tym także ramy prawne działalności Unii Europejskiej w tej dziedzinie. Na podstawie zidentyfikowanego reżimu prawa kosmicznego i rodzaju działalności nim objętych, omówiono naturę zagrożeń związanych z działalnością kosmiczną, a w konsekwencji – rodzaj ryzyk ujmowany jako przedmiot ubezpieczenia kosmicznego. Natura ubezpieczenia ryzyk kosmicznych została przedstawiona na tle podstawowych zasad umowy ubezpieczenia, w szczególności na przykładzie zasady dobrej wiary.

Słowa kluczowe: ryzyka kosmiczne, ubezpieczenie kosmiczne, ubezpieczalność ryzyk kosmicznych, działalność kosmiczna.