AD ASTRA

Program badań nad astropolityką i prawem kosmicznym

Nr 1/2021

Konsorcjum Naukowe Ad Astra
INSTYTUT METROPOLITALNY
WYDZIAŁ PRAWA I ADMINISTRACJI UNIWERSYTET GDAŃSKI
WSAiB WYŻSZA SZKOŁA ADMINISTRACJI I BIZNESU IM. E. KWIATKOWSKIEGO W GDYNI
WSAiB STUDENCKI KLASTER MORSKI I KOSMICZNY WYŻSZA SZKOŁA ADMINISTRACJI I BIZNESU IM. E. KWIATKOWSKIEGO W GDYNI

Commercial outer space activities. Who bears civil liability?

DOI: 10.53261/adastra20210101

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„Sending objects and, with time, also people to Mars is not so much the result of some economic calculations, but rather a way of building prestige, and far-reaching vision. SpaceX has consistently been working in this direction. Musk is financing extensive research, investing in the development of new systems, investigating the possibilities of reaching and settling on Mars, as well as being buried there"[1]

1. INTRODUCTION

The commercial space activity of private entities is growing rapidly, while governmental activity is declining. In 2018, the space industry earned approx. $360 bn, of which approx. $277 bn was attributable to purely commercial activity. Spectacular manned flights and space military programs brought the involved enterprises a profit of approx. $80 bn[2]. Although this may not be apparent, the private sector has long been cooperating with the "public" space sector. Both Russian and American missions have received support from the private sector from the very beginning[3]. In 2021, SpaceX is planning to organize the first fully commercial space flight in history. The tickets for the Earth's orbit were purchased by a 37-year-old American billionaire[4].

This paper analyses the issue of civil liability for damages caused during commercial outer space activities. The concepts of responsibility and liability for damages caused by space objects have been debated ever since space law regulations were being developed. These are two important terms in international law pointing to two fundamental principles; space law does not differ in this respect. Thus, *Article VI* of the Outer Space Treaty of 1967 speaks of the international responsibility of states for national activities in space to be in conformity with the treaty, and another article, *Article VII* of the same treaty, of the liability of states for damage towards other states or their nationals or property[5].

This article analyses space law regulations with respect to civil liability. The paper also aims to pinpoint the most pressing issues arising from the lack of solutions at the international level. The general conclusions are meant to contribute to further debate on this complex topic. The applied methods include the formal-dogmatic approach which is most common for legal papers and a comparative legal analysis which was necessary due to the lack of international solutions.

2. SPACE TOURISM

In 2019, Swiss bank UBS released a report estimating space tourism could become a $3bn industry in the next 10 years. SpaceX has already released marketing material for a 40-minute flight from New York City to Shanghai, using its spaceflight technology.

Although seemingly unrealistic now, reaching five million space passengers a year by 2030 is realistic: air tourism exists and it expands every year. On 13 December 2018, a successful suburban flight of Virgin Galactic took place on Virgin Space Ship Unity with two pilots and a manikin. The first commercial flight was planned for March 2019. SpaceX and Blue Origin are also working on commercial flights into space.

SpaceX wants to send two cosmic tourists in a flight around the Moon, who would have a wide loop to miss the Moon, fly deep into space, then turn around and fly back to Earth. SpaceX would use the Falcon Heavy rocket and the Dragon 2 ship which has some activities to do autonomously, under the remote supervision of experts on Earth[6].

The race for offering commercial space flights has already started[7], which in turn raises legal problems related to the scope of responsibility of the space operator and the legal protection of space tourists, including from cyber attacks. Technological progress is much ahead of the adopted international legal regulations, which require analysis in terms of the legal protection of space tourists. Besides, some countries, already equipped with space infrastructure and the most advanced in space tourism are introducing their own regulations regarding the responsibility of the space operator. Due to the already available technology, it is possible to distinguish between orbital and suborbital space tourism as well as intercontinental missile transport.

The cheapest and most probable alternative to space tourism are suborbital flights. During such a flight, the spacecraft reaches space but its trajectory intersects the atmosphere or surface of the gravitational body, as a result of which it is unable to perform full orbital rotation. After an altitude of 100-200 km is reached and the engines are switched off, passengers may experience the feeling of weightlessness for 3-6 minutes, and subsequently the spaceship re-enters the atmosphere and returns to Earth. There are two types of vehicles that could be used in such an operation. Firstly, a vehicle modelled after SpaceShipOne, which uses an aircraft to lift a space cabin to a certain altitude. Then the cabin separates from the aircraft and continues its suborbital flight to higher altitudes. Both devices have the characteristics of an aircraft until the separation. It is therefore possible to distinguish between a spacecraft (space law) and an aircraft (aviation law)[8]. There are two possibilities for returning. One is when the space vehicle returns to where it started from and in the second, it returns to a different location on Earth ("space transportation")[9]. The second vehicle type, modelled on the "Delta Clipper Experimental", uses a rocket with a space capsule on top which is launched. The capsule separates from the rocket at a certain altitude. The passengers of the space capsule are exposed to Zero-G gravity and both vehicles return to Earth independent from each other[10].

3. THE OBJECTIFICATION OF CIVIL LIABILITY

The fault principle has been the basic principle of liability since the Roman times. Both the Polish (article 415) and Spanish (article 1902) civil code provide that "*the person who causes damage to another through a fault of his own is obligated to repair that which has been damaged*". The basic principle of liability in Napoleon's code of 1806 is also the fault principle (article 1382 *code civil*)[11].

Due to an enormous increase in occupational accidents in the 19th century[12], as well as following the development of astronautics and nuclear energy use, the notion of objectifying liability emerged[13].

Anyone who profits from carrying out a particular (dangerous) activity should take the liability risk into account. This also involves the important issue of the distribution of the burden of proof. According to the general principle of civil law, the burden of proof of a fact is placed on the person who seeks to rely on the fact. In the case of the fault principle, it is the injured party that is required to prove all conditions of liability. Objective liability, on the other hand, is triggered somewhat automatically. In such situations it is incumbent on the perpetrator to prove the existence of one of the premises for the exclusion of liability (exonerating circumstances) in order to escape liability. Therefore, the idea of providing an easier way (by shifting the burden of proof) for the "weaker" party of the obligation relationship to obtain compensation may be another reason behind the objectification of liability. Moreover, it may also involve the protection from damage due to another entity's activity that is "associated with an increased risk of causing damages"[14].

The main feature of objective liability is the fact that it is triggered independently of investigating the perpetrator's fault. To avoid liability, the perpetrator must prove the existence of at least one exonerating condition. The catalogue of such conditions may vary greatly. Finally, regulations stipulate particular situations in which entities become "objectively" liable.

The strictest form of objective liability is absolute liability. The obligation of the entity indicated in the regulation to repair damage arises due to the very fact that the damage occurred (with a causal relationship between the event causing the damage and the damage itself). The entity may not be discharged of liability[15]. The absolute liability principle is stipulated only in space law

4. SPACE LAW: OVERVIEW OF LIABILITY ISSUES

International space law does not keep pace with technological development, and the existing conventions were created at a time when space tourism was still in the realm of dreams[16]. In these treaties, there is no concept of a passenger, and the envisaged protection of human life refers to the notion of a cosmonaut, a term that has not been defined either.

The Outer Space Treaty[17] states in its Article VI that "the activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty" and that States Parties shall bear international responsibility for national space activities whether carried out by governmental or non-governmental entities. According to the space law doctrine, a state will bear responsibility under this article for the actions of commercial entities only if the object was released at the request of that state[18]. tate liability should be distinguished from international state responsibility[19]. The premise necessary to assign liability for damages will be the mere fact of the occurrence of a damage defined on the basis of international space law, and thus it will not be necessary to have an indication of violation of an international obligation[20]. It should be pointed out that the principles of liability for damages laid down in Article VII only cover damages caused by the state to another country.

Article 2 of the Liability Convention 1972 (with 92 ratifications) foresees absolute liability for damages caused on the surface of the Earth or to aircraft in flight. There is fault-based liability for damages other than on the surface of the Earth. Damages excluded from the "Liability Convention" include:

- damage caused by a space object of a launching State to nationals of that launching State;
- damage caused by a space object of a launching State to foreign nationals during such time as they are participating in the operation of that space object from the time of its launching or at any stage thereafter until its descent, or during such time as they are in the immediate vicinity of a planned launching or recovery area as the result of an invitation by that launching State.

The liability principles established based on these treaties essentially apply only to those states that are potentially liable for the activity of commercial entities established in these states; these principles raise doubts also in terms of doctrine due to the applied phrasing that refers to a state's international liability and liability for damages[21]. Moreover, states engaging in space activity have consistently refrained from invoking the provisions of these conventions which could consequently, due to their long-term non-application, be discontinued from legal transactions as a result of desuetude[22].

If international or European regimes were not applicable, there would be a need to check for special regulations on civil liability in national space laws or to consider whether the general national rules on civil liability would be appropriate in such a case.

How do states protect themselves in their domestic legislation through indemnification and insurance requirements in the licensing of launch sites, launch vehicles, and launches and re-entry?[23]

Usually, regulations require that the licensee carry adequate insurance to cover death, injury or property damage. Some states cap liability (promoting the commercial development of space). China, France and Russia introduced a two-tier system with unlimited third party indemnification over the initial insurance required by commercial launch companies[24].

There are several European countries that have already adapted their law to the needs of the commercial space market[5]. The Space Industry Act, including suborbital flights, was adopted by the United Kingdom, which, modelled on US solutions, implemented "informed consent" for natural persons participating in the spacecraft mission[27]. A similar solution was created by Spain in a legislative project that regulates commercial aerospace activity. The draft of this regulation takes into account the performance of suborbital flights and provides for solutions based on American regulations referring to "informed consent", which will have to be expressed by all participants of such a flight. As a consequence, they will take over the risk involved in making the flight and will not be able to pursue claims against the operator, let alone the Spanish government. The operator will therefore be released from liability for damage caused to flight participants in connection with participation in the flight, except in cases where the damage is caused by gross negligence or wilful misconduct[28]. Taking into account the present threats of cyber attacks, the Author presupposes that in such case the operator would not escape liability since it should be treated as a gross negligence.

To sum up, since space tourism is still not regulated neither on international nor on regional (EU) levels, the solution needs to be sought in existing national laws[29] or new law needs to be created but still on the national level.

5. *DE LEGE FERENDA* FINDINGS

The results of the study are the following. First of all, international space law treaties concern the responsibility and liability of states and not private companies. Second, according to an analysis of existing international space law regulations, these are not adjusted to the needs of the developing market of space flights. There is no international legal instrument protecting space tourists' rights. Third, the very limited application of national law does not solve the problem as it follows international principles. Fourth, there is a desire for a new international treaty which would be adjusted to states' activity associated with aerospace use which has changed considerably since the last legal acts were adopted at the international level. Finally, while awaiting an international compromise, it is worth considering a temporary solution which could provide a standard for insurance contracts within national law.

[1] https://wiadomosci.onet.pl/swiat/wywiad-z-dr-markiem-czajkowskim-komercyjny-podboj-kosmosu/7sts4mz [accessed 23.04.2021].

[2] Id.

[3] https://iviter.pl/artykuly/komercyjne-loty-w-kosmos-stan-na-dzien-dzisiejszy/ [accessed 23.04.2021].

[4] https://businessinsider.com.pl/firmy/spacex-rusza-z-turystyka-kosmiczna-zabierze-w-kosmos-czterech-astronautow-amatorow/gx6ngkp [accessed 23.04.2021].

[5] For more, see Frans G. von der Dunk, *Liability versus Responsibility in Space Law: Misconception or Misconstruction?*, Space, Cyber, and Telecommunications Law Program Faculty Publications 1992, p. 21.

[6] Dave Mosher, *Elon Musk znów zaskakuje. Wyśle dwóch kosmicznych turystów w lot "poza Księżyc"* [*Elon Musk surprises again. He will send two cosmic tourists on a flight "beyond the Moon"*], BusinessInsider.com 27.02.2017: https://businessinsider.com.pl/technologie/nowe-technologie/spacex-kosmiczna-turystyka-lot-pod-koniec-2018-r/mqzl5m8 [accessed 22.12.2018].

[7] See R. Jakhu, J. Pelton, *Private Commercial Space Enterprises and Global Governance System* (DOP:10.1007/978-3-319-54364-2_5) and J. Loizou, *Turning space tourism into commercial reality,* Space Policy 2006, no. 22, pp. 289-290 (DOI:10.1016/j.spacepol.2006.08.005) and U. Apel, *Space tourism. A promising future?*, Space Policy 1997, no. 13, pp. 279-284 (DOI:10.1016/S0265-9646(97)00033-7).

[8] See also S. Moens, *The regulation of suborbital flights. Proceedings of the International Astronautical Congress,* IAC 2014, no. 14, pp. 10128-10137 and R. Jakhu, T. Sgobba, S. P. Dempsey, *The Need for an Integrated Regulatory Regime for Aviation and Space: ICAO for Space?* 2011, no. 10 (DOI:1007/978-3-7091-0718-8).

[9] S. Hobe, Legal Aspects of Space Tourism, Neb. L. Rev. 2007, no 86 and S. Hobe, *The legal regime for private space tourism activities. An overview*, Acta Astronautica 2010, no. 66, pp. 1593-1596 (DOI:10.1016/j.actaastro.2009.08.019).

[10] *Ibidem*.

[11] A. Konert, *Odpowiedzialność obiektywna w hiszpańskim prawie cywilnym*, Ius Novum 2010, no. 3.

[12] J. A. Alvarez Caperochipi, *Curso de derecho de obligaciones,* Madrid 2000, p. 249.

[13] M. Kaliński, *Szkoda na mieniu i jej naprawienie*, Warszawa 2008, p. 98. Cited in A. Konert, *Odpowiedzialność obiektywna w hiszpańskim prawie cywilnym*, Ius Novum 2010, no. 3.

[14] *Ibidem*. p. 126.

[15] For more, see J. Kuźmicka-Sulikowska, *Zasady odpowiedzialności deliktowej w świetle nowych tendencji w ustawodawstwie polskim*, Warszawa 2011.

[16] A. Konert, A. Kunert-Diallo, *Odpowiedzialność operatora kosmicznego względem turystów kosmicznych*, Państwo i Prawo 2019, no. 6.

[17] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (published in the Polish Journal Dz.U. of 1968, no 14. item 82).

[18] C. Albert, *Liability in International Law and the Ramifications on Commercial Space Launches and Space*, Loyola of Los Angeles International and Comparative Law Review, 11-1-2014, p. 245.

[19] See F. von der Dunk, *Liability versus Responsibility in Space Law: Misconception or Misconstruction*, Space, Cyber, and Telecommunications Law Program Faculty Publications, 1992, no. 21, p. 366.

[20] A. Konert, A. Kunert-Diallo, *op. cit*.

[21] For a detailed analysis of a state's liability for damages in outer space, see A. Konert, A. Kunert, *op.cit*.

[22] Fore more, see J. Radwan, *Liability in Outer Space: the Question of Admissibility,* Folia Iuridica Universitatis Wratislaviensis 2018, vol. 7 (1), p. 197.

[23] For a detailed analysis of the issue see P.S. Dempsey , *Liability for Damage Caused By Space Objects Under International and National Law*, Annals of Air & Space Law (October 4) 2011, vol. XXXVII, pp. 333-369.

[24] For more on indemnification programmes, see A. Konert, A. Kunert-Diallo, *Odpowiedzialność operatora kosmicznego względem turystów kosmicznych*, Państwo i Prawo 2019, no. 6. See also Z. Brodecki, K. Malinowska, *Regulacja odpowiedzialności za szkodę i jej ubezpieczenia w przyszłym polskim ustawodawstwie kosmicznym*, Państwo i Prawo 2019, no. 2.

[25] See also A. Forganni, *The potential of space tourism for space popularisation: An opportunity for the EU Space Policy?*, Space Policy 2017 (DOI:41.10.1016/j.spacepol.2017.04.005).

[26] http://www.legislation.gov.uk/ukpga/2018/5/contents/enacted [accessed 24.12.2018].See also R. Moro-Aguilar, *National Regulation of Private Suborbital Flights: A Fresh View*, FIU Law Review 2018, vol. 10, no 2, pp. 706-708.

[27] R. Moro-Aguilar, *National Regulation of Private Suborbital Flights: A Fresh View,* FIU Law Review 2018, vol. 10, no 2, pp. 706-708.

[28] A. Konert, A. Kunert-Diallo, op. cit.

[29] One might also consider applying national tourism law to space tourists. See F. von der Dunk, *Space Tourism, Private Spaceflight and the Law: Key Aspects,* Space Policy 2011, no. 27 (DOI:146-152. 10.1016/j.spacepol.2011.04.015).