

Long-Term Sustainability of Space Activities *versus* Imminent Danger from Space: Is Space Law Ready to Meet the Challenge?

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The importance of the long-term sustainability of activities in outer space is evident and undoubted: the time is ripe to decide how to provide future generations an opportunity to explore space and face less danger than we do now. What needs to be done is the elimination of adverse consequences of the past and present space operations and provision for the long-term sustainability of space activities – otherwise cosmonautics of the future will be in real danger.

The unpredictable and mysterious outer space sends us warnings (like the notorious meteorite shower in Chelyabinsk) that we are still not ready to respond quickly and efficiently to such emergencies. Both natural and manmade objects can cause dramatic consequences both on Earth, to people's lives, health, property, and in space hindering normal space operations of satellites and the International Space Station.

At present international space law (ISL) does not directly address the problem of the long-term sustainability of space operations. General principles of the ISL, first of all free and non-discriminatory exploration and exploitation of outer space (Article I of the OST) and responsibility of states for all national space activities (Article VI of the OST), form a basis for further elaborations. So far the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) has adopted Space Debris Mitigation Guidelines as the first step of establishing a new regulatory regime of the long-term sustainability in space. At present further work is on-going under the auspices of the UN COPUOS aimed, *inter alia*, at the assessment of the effective national policies, regulatory regimes, standards and other efforts of states in this area, as well as close examination of experience and best practices of non-governmental entities actively participating in space activities, evaluation of urgent needs and ways to combat space threats – which will result in a set of guidelines for the long-term sustainability of space activities.

The work on the guidelines revealed major legal and political problems to be solved for the international space community to establish the global, transparent

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and stable space situational awareness system, whose guarantor shall be a corresponding international legal regime providing for the legal order and stability of space operations.

I. Introduction

The main task of international space law since its inception was to ensure free, unimpeded and non-discriminatory access of mankind into space in order to maintain peace, which substantiated the leading role of sovereign states in the exploration and exploitation of space. However, economic instability resulted in a sharp reduction in government funding of space programs and brought to the fore the need to elaborate new mechanisms to encourage growth of the space industry¹. Such a mechanism turned out to be commercialization of space activities - the main global trend of development of modern space activities. The benefits and adverse effects of space commercialization from the point of view of international space law and with regard to the global initiative to ensure the long-term sustainability of space activities will be discussed in the present paper.

II. Space Activities Imply an Increased Risk

Space activities are associated with a high risk. Emergency situations can happen at any stage of the lifecycle of spacecraft: development and production testing, transportation to the launch pad, launching, orbital insertion, orbital testing and active functioning in orbit. The reasons for this vary from the lack of time and resources for comprehensive testing and to the human factor. Employees of the ground infrastructure producing spacecraft and preparing it for launch into space are facing the highest risk. Damage can be caused to life and health of people, the infrastructure (launch sites, equipment, etc.) as a result of an explosion of spacecraft on the ground or during the launching. Abnormal operation of a carrier rocket or an upper stage can lead to an emergency start, a change of a track of the vehicle and even crash into aircraft. There is also a danger of collision of the launched object with already active satellites and orbital stations. In case of an explosion the risk of collision increases hundreds and even thousands of times - in a direct proportion to the number of fragments of the disintegrated object. These are only a few examples of emergencies, the consequences of which could seriously affect both space actors and third parties, as well as cause irreparable damage to the environment of the Earth and outer

1 Chair D. Commercialization of space. Opportunities and Challenges // King's College London. 2013. URL: <www.mcgill.ca/law/channels/event/commercialisation-space-opportunities-and-challenges-218867> (last visited 01.09.2013); Peeters W. Space commercialization trends and consequences for the workforce. The New Face of Space // *Acta Astronautica*. – 2003. – Vol. 53, Issues 4-10. – P. 833–840.

space, including celestial bodies and their orbits. These examples show that space activities imply an increased risk of adverse consequences and require, first, serious State control, second, strict regulation of liability for damage, and third, effective mechanisms for the protection of victims of such dangerous activities. These measures taken in a complex shall provide for a solid base for the unhindered and stable current and prospective space operations, which has gained a universally recognized name – the long-term sustainability of space activities (LTS).

III. Commercialization, LTS and International Space Law

Private enterprises, in contrast to slow and bureaucratic governmental authorities, have the necessary experience, flexibility and mobility for the successful performance of commercial initiatives in the global space market. States are interested in ensuring technological development, exploiting the potential of advanced space knowledge to provide for strategic leadership in the global aerospace, and from the economic perspective – sustainable development the national economy. That is why the establishment of the best political and legal conditions for the commercial space activities is a top priority. At the same time states are bound by their international obligations established by international space law (ISL) and have to ensure their practical implementation².

ISL and Commercial Space Activities

Law is generally treated as a superstructure of the economic basis³. It is also true for the space area: every activity on exploration, exploitation and utilization of outer space and the benefits derived from space operations needs a minimum regulatory regime as a guarantee of the mission success. Taking into account the especially risky nature of space activities analysed above, their legal regime has to be accordingly enforced. This approach was used in the process of creation of the five fundamental space treaties, the main among them being the 1967 Outer Space Treaty⁴.

For almost half a century international space law ensured the legal order in the space area. However, the shift towards profit-oriented space activities resulting from commercialization has become a challenge to the established legal environment, which reflected in the following aspects.

2 See also Jasentuliyana N. Space Debris and International Law // JSL. – 1998. – Vol. 26, № 2. – P. 143 et seq.

3 See, e.g.: Kolosov Yu.M., Kuznetsov V.I.. International Law. Moscow: International Relations, 2005. P. 7–12; Shumilov V.M. International Law. Moscow: TK Velbi (Russian Foreign Trade Academy), 2004. P. 23–28, etc.

4 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies // UN GA Resolution 2222 (XXI), annex. Adopted on 19 December 1966, opened for signature on 27 January 1967, entered into force on 10 October 1967.

First, the ISL does not govern commercial space activities. Article VI of the OST only imposes on states parties to the Treaty “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* [italics added. – O.V.], and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty”. Nothing is said about the essence, scope, boundaries of and requirements to private space activities. However, the said Article VI also stipulates that states shall authorize and continuously supervise non-governmental space operations, so appropriate control regimes of private space activities have to be at the national level.

Challenges Posed by Commercialization to the ISL

The above analysis shows that the main problem to be solved by the international space community under the conditions of space commercialization is to ensure the balance of public and commercial interests: on the one hand, the need to promote and encourage projects aimed at commercial benefit⁵, and on the other – to ensure strict adherence to the fundamental principles and norms of the ISL, primarily those on the exploration and exploitation of outer space for the benefit and in the interest of all mankind, for peaceful purposes, on the basis of non-discrimination and international cooperation, as well as the new principle of LTS. National space legislation⁶ should be a tool for solving the commercial aspects of the problem, when the international aspect should be a priority on the supra-national level.

Commercialization is a guarantee of quality for further growth and development of space activities around the world. International legal regime for such activities is needed, but it should be as flexible as possible in order to attract private sector participation in space area and stimulate commercial investment. Given the unwillingness of the global space community to reconsider or at least fill in the gaps in the fundamental space treaties, attempts are being made to develop specific international legal instruments regulating the commercial space activities. The most striking example is the 2001 Cape Town Convention on International Interests in Mobile Equipment⁷ and the 2012 Protocol to the Cape Town Convention on Matters specific to Space Assets⁸. Despite the evident ben-

5 For details see, e.g.: von der Dunk F. Fundamental Provisions for National Space Laws // University of Nebraska – Lincoln, Space and Telecommunications Law Program Faculty Publications. 2006. Paper 11. P. 96. URL: <www.digitalcommons.unl.edu/spacelaw/11> (last visited 30.08.2013).

6 For details see, e.g.: Bourély M. The Institutional Framework of Space Activities in Outer Space // Journal of Space Law. – 1998. – Vol. 2, № 1. – P. 1–2.

7 The Convention was adopted on 16 November 2001, entered into force on 1 March 2006. – Bulletin of International Treaties. – 2012. – № 10. – C. 26–50.

8 Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets (Berlin, 09.03.2012). – UNIDROIT. URL:

efits of the instruments⁹, the proposed imperative regime of commercial space operations has not gained much support of governments and space industry¹⁰. The work on the Protocol is carried on and, what is essential, is monitored by the UN COPUOS. The results of this work will show whether the balance of public and private interests is practically feasible¹¹. Simultaneously COPUOS is developing optional, non-binding instruments of a general nature as guiding provisions for states and their private national enterprises on the way to LTS.

IV. UN COPUOS Project on the LTS

The concept of LTS is being developed by the Scientific and Technical Subcommittee of UN COPUOS with the aim to propose non-binding guidelines that could be implemented by all space actors on a voluntary basis to promote the long-term sustainability of space activities¹². In order to elaborate a multifaceted and comprehensive solution to the problem the work is carried out by a specifically established Working Group within the framework of the Subcommittee, which in its turn is subdivided into four Expert Groups:

- Expert Group A: Sustainable Space Utilization supporting Sustainable Development on Earth;
- Expert Group B: Space Debris, Space Operations and Tools to support Collaborative Space Situational Awareness;
- Expert Group C: Space Weather;
- Expert Group D: Regulatory Regimes and Guidance for Actors in the Space Arena.

<www.unidroit.org/english/workprogramme/study072/spaceprotocol/conference/main.htm> (last visited 30.08.2013).

- 9 See, e.g.: Stanford M.J. The preliminary Draft Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets. – United Nations/Thailand Workshop on Space Law «Activities of sates in outer space in light of new developments: meeting international responsibilities and establishing national legal and policy frameworks». Bangkok, 16-19 Nov. 2010.
- 10 Letter to UNIDROIT // ESOA, URL: <www.esoa.net/upload/files/news/unidroit/20111209industryletter.pdf> (last visited 29.08.2013).
- 11 For more details on the history of the Space Protocol see, e.g.: Stanford M.J. The preliminary Draft Protocol... *ibid.* at 8; Ribbelink O. The draft Protocol on Matters Specific to Space Assets and the (Unidroit) Convention on International Interests in Mobile Equipment // ST/SPACE/14 OOSA. Proceedings of the United Nations/International Institute of Air and Space Law Workshop on Capacity Building in Space Law. NY, 2003. P. 84-100; Volynskaya O.A., Desyatov A.A. Berlin Space Assets Protocol in theory and practice [in Russian] // Moscow Journal of International Law. – 2012. – № 4. – P. 75–85.
- 12 UN Document A/AC.105/L.286 of 29.04.2013.

Each of the groups consists of eminent experts in the areas of space science, technology, policy and law. The big task of them is to assess the current state of each direction, reveal the most effective best practices which have been or are being applied in the world by any space actors in order to ensure LTS. Given the dynamic growth of the global space market and diversification of commercial space activities all over the world, special attention is paid to the said experience and possible input of private entities.

However, the present state of the work on the project does not fully correspond to the initial aims. First of all, there is an evident lack of coordination and cooperation among the Expert Groups, each of them developing separate guidelines but not actually knowing about the progress of neighbouring groups. It is clear, that such an approach is complicating the process and will result in multiple misunderstandings, dual interpretation of the same terms and events, non-coherence in the form and essence of the guidelines. Interaction among experts is a compulsory requirement for the stable, purpose-oriented step-by-step process of establishing the new prospective regulatory regime.

Then, the LTS problem is important for each and every state, as well as their nationals either directly or indirectly involved in space activity or endangered because of its increased risk. That is why the future LTS principles should not be limited only to the reflection of separate national practices, but also provide for international mechanisms of interaction and exchange of information to ensure truly global space situational awareness. Only then the proposed guidelines will become an effective and practical instrument to ensure LTS.

And the third problematic moment is the non-binding nature of the drafted document which does not provide for any methods to guarantee observance of the LTS principles by all states, which is evidently an impediment on the way to stability, transparency and long-term sustainability of space exploration and exploitation. A responsible approach of all states to the problem of LTS is still to be developed, which definitely takes time.

LTS and the Space Debris Problem

Space debris is one of the major threats that space is posing to the Earth. The problem of anthropogenic contamination of outer space, especially low Earth orbit, is critical and requires immediate solution.

Historically the ISL was several steps ahead of the practical space exploration¹³. With the beginning of the commercial space era the development of technology came to the fore substantially outpacing the ISL. But when it comes to space debris, practice shows that neither law, nor technology is ready to meet the challenge.

It is still unclear whether space law provides for the legal status of space debris. The term “space object” contained in para. “d” Article I of the 1972 Liability

13 See G.P. Zhukov. International Space Law and the Challenges of the XXI Century. To the 50th Anniversary of the flight by Yuri Gagarin in outer space. Moscow: RUDN, 2011. P. 4–7.

Convention¹⁴ is not defined, so it is hard to substantiate the applicability of this term to non-functional spacecraft, space debris fragments and particulate¹⁵. On the one hand, such uncontrolled objects and their parts definitely endanger the safety of space operations, and on the other – it is because of this inability to control there is no possibility to place the responsibility for any damage caused by a non-functional spacecraft to a State that is launching in its respect and registered it in accordance with para. 1 of Article II of the 1975 Registration Convention¹⁶. As to fragments and particulate, most of the pieces are too small to determine their affiliation to a particular registered spacecraft. Even the most advanced technologies of monitoring the near-Earth space are unable to identify the smallest particles of debris (which are no less dangerous than the larger ones), to reveal their origin and provide for their removal from orbit or disposal in another way.

States tend to reflect various definitions of “space object” in national space legislations with the aim to set boundaries of their jurisdiction and absolve themselves of international liability for damage caused by objects which do not fall under the established definition. It is also one of the incentives for the UN COPUOS as the main international authority responsible for coordination of space activities¹⁷ to elaborate comprehensive imperative supra-national regulation of space debris to harmonize the existing national regimes, as well as promote and boost the technical and technological solution of the problem.

V. Conclusions

The above analysis has showed that space activities, connected with an increased risk and a potential danger to human life and health, property, the environment of the Earth and space, require a comprehensive international regu-

14 Convention on International Liability for Damage Caused by Space Objects // UN GA Resolution 2777 (XXVI), annex. Adopted on 29 November 1971, opened for signature on 29 March 1972, entered into force on 1 September 1972.

15 For more detail see, e.g.: Jasentuliyana N. Space Debris... *ibid.* at 2. P. 141; von der Dunk F. Space Debris and the Law // University of Nebraska – Lincoln, Space and Telecommunications Law Program Faculty Publications. 2001. Paper 4. P. 2-7. URL: <<http://digitalcommons.unl.edu/spacelaw/4>> (last visited 30.08.2013); Hertzfeld H. National Space Legislation as an Enhancer of Space Policies and Activities // Presentation at the 2010 IISL / ECSL Colloquium «National space legislation – crafting legal engines for the growth of space activities». Vienna, 22 March 2010. URL: <www.oosa.unvienna.org/pdf/pres/lsc2010/symp02.pdf> (last visited 19.08.2013); Kerrest A., Smith L.J. on Article VII of the Liability Convention / Cologne Commentary on Space Law. Vol. 2. P. 140.

16 Convention on Registration of Objects Launched into Outer Space // UN GA Resolution 3235 (XXIX), annex. Adopted on 12 November 1974, opened for signature on 14 January 1975, entered into force on 15 September 1976.

17 UN GA Resolution 1472 (XIV) of 12 December 1959.

lation in order to ensure stability, predictability, transparency and efficiency of all operations in outer space – that is the long-term sustainability of space activities. A whole range of international legal aspects should be reconsidered to form a solid base for the new environment – from the general terms and definitions up to complex issues of registration and state responsibility and liability in the course of space activities. The main factor to be considered is space commercialization, a global and irrevocable process challenging the whole established system of International Space Law. The ISL should ensure harmonization of national regimes governing private space operations, provide for the balance of public and commercial interests in the exploration and use of space. The problem of space debris as the major threat to the LTS should be a priority not only of separate states, but of the international space society as a whole.