Combining Air and Space or How to Start Regulating Space Navigation at the International Level?

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Abstract

The paper focuses on one of the most crucial issues of International Space Law nowadays – the lack of space navigation regulation. It describes the current state of orbit congestion by the growing number of satellites and proves the critical necessity to modernise the existing regime of outer space. The author suggests the development of a special legal regime for space navigation by drafting the Convention on the Safety of Space Navigation and establishing the International Convent – an intergovernmental organisation responsible to operate and control further evolvement of human extraterrestrial travelling.

1. Introduction

In the middle of the 20th century, humanity made its first steps into space exploration. Since the first satellite launch in 1957, space activities have been dynamically developing and gaining significant popularity. In those times, access to space was the privilege of technologically evolved and economically stable countries, among which, for the most part, were the USSR and the USA. Despite these facts, the times have changed, the role of States in the space sphere has been gradually decreasing lately, and the range of subjects taking part in space exploration is eventually expanding. New players are entering the space activity scene – these are private companies.

Commercialisation is one of the most significant trends of the 21st century in the space industry.[1] The outer space represents no more an exclusive zone for state program performance, it is open for everyone: huge private corporations, ambitious start-ups or even adventurous and daring students.

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1 Hobe S. Aerospace Vehicles: Questions of Registration, Liability and Institutions // XXIX Annals of Air and Space Law. 2004. P. 377.

Respectively, in this regard, the number of spacecraft launches has drastically increased.

According to the Union of Concerned Scientists, which tracks active satellites in orbits: at the beginning of May 2022 more than 5,465 operational satellites floated around the Earth. The majority of satellites (4,700) were in low Earth orbit, 565 satellites took the place in geostationary orbit, 140 pieces occupied medium Earth orbit and only 60 satellites were in an elliptical orbit around the Earth.[2] All above mentioned indicate the current trend of a strongly growing number of space objects launched into space every year.

The reasons for such an intense conquest of the space industry were the rapid development of space technologies and their spread among a fairly wide range of States, as well as socioeconomic and political changes that have occurred since the end of the Cold war. For example, in the United States, the emergence of private programs related to space activities began already in the 1980s. An important milestone in this period was the US Law on Commercial Space Launches of 1984,[3] which became the basis for the development of the commercial direction of extraterrestrial human activity.

Already 30 years later, it paid off – the initiative of commercial space exploration appeared as a fruitful full-fledged industry, which has reached a total of 262 billion US dollars. Among the striking examples of successful commercial space developments is the production of SpaceX return stages, Virgin Galactic's suborbital flight program,[4] what is more, the development of the commercial orbital tourist station concept.[5]

The increase in the actors in space activities and a growing number of types of the latter, moreover, in connection with the booming start-up market, leads to total congestion of the Earth's orbits. The above-mentioned jeopardises the safety of space navigation and, therefore, the prospect of human space activities as a whole. Therefore, it requires the immediate response of the international community to the current situation. In the author's opinion, first of all, it is essential to pay attention to the legal side of the issue. The establishment of a comprehensive international legal regime of outer space and space navigation in particular, brought into life with the realities of

2 UCS Satellite Database, In-depth details on the 5,465 satellites currently orbiting Earth, including their country of origin, purpose, and other operational details, Updated May 1, 2022, URL: https://www.ucsusa.org/resources/satellite-database. (Accessed 29.08.2022).

3 H.R.3942 – Commercial Space Launch Act, 10/30/1984, URL: https://www.congress.gov/bill/98th-congress/house-bill/3942. (Accessed 29.08.2022).

4 By 2021, Commercial Space Travel Could Amount to an Industry Worth over US$1 Billion. URL: http://www.spaceref.com/news/viewpr .html?pid=9436 (дата обращения: 21.08.2022 г.).

5 Jakhu R.S., Sgobba T., Dempsey P.S. The need for an integrated Regulatory Regime for Aviation and Space. ICAO for Space? Wien: Springer – Verlag, 2011.

extraterrestrial human activities of the 21st century, would regulate the existing space activities and prevent escalation of the issue in the future. This article will develop the idea of international space law modernisation necessity for the benefit of future generations and will compare possible ways to reach it.

2. The current state of space navigation regulation

The current regime of outer space was developed at the very beginning of the space flight era in the 1950s. At that moment, no one could have imagined that in 50 years' space activities would be so widely diversified: starting from Tesla flights with astronauts on board peacefully passing by the Moon, ending with nano-, pico-, femto-satellites and their constellations.

The basis of International Space Law (ISL) represents five fundamental treaties: the Outer Space Treaty of 1967,[6] signed a year after the Rescue Agreement of 1968,[7] the Liability Convention concluded in 1972,[8] the Registration Convention of 1975[9] and, finally, adopted in 1979 the Moon Agreement.[10] However, they stipulate only core principles of the exploration and use of outer space.[11]

6 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. URL: https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html. (Accessed 10.08.2022).

7 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into 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. URL: https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/rescueagreement.html. (Accessed 10.08.2022).

8 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. URL: https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/liability-convention.html. (Accessed 10.08.2022).

9 Convention on Registration of Objects Launched into Outer Space, adopted by the general assembly in its resolution 3235 (XXIX), opened for signature on 1 January 1975, entered into force on 15 September 1976. URL: https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/registration-convention.html. (Accessed 10.08.2022).

10 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, adopted by the general assembly in its resolution 36/68, opened for signature on 18 December 1979, entered into force on 11 July 1984. URL: https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/moon-agreement.html. (Accessed 10.08.2022).

11 Jakhu R.S., Sgobba T., Dempsey P.S. The need for an integrated Regulatory Regime for Aviation and Space. ICAO for Space? Wien: Springer – Verlag, 2011. P.51.

Drafting the Magna Carta of ISL, no one assumed the need for specific international legal regulation ensuring the safety of space navigation or certification of spacecraft and many other issues. Most particular and narrow issues were regulated based on bilateral agreements between States.

Nevertheless, the level of the space industry and its growth pace have changed, and the absence of a universal legal regime for space navigation significantly affects the possibility of further development in the field. It slows down not only States in performing space programs but negatively affects the private sector too.[12] Ensuring the future promotion of space activities is impossible without a detailed international legal regime of flights in extraterrestrial space.

The modern doctrine has already evolved approaches to space navigation regulation creation and its conflict-free implementation into the existing ISL regime. The closest neighbour functionally and technologically to the outer space regime is airspace regulation. Comparing the former, air law is more detailed and practical. Basic principles of air space regulation are formalised in the Chicago Convention of 1944,[13] international aviation regulations and bylaws, and some other international legal documents.

Guided by this logic, N. Jasentuliyana suggested defining the legal basis of space navigation within the framework of an international document developed by COPUOS. By analogy with international standards and recommended practices adopted by ICAO, COPUOS would develop international space standards and prepare a universal Convention that would become the fundamental regulation for space flights.[14] In this case, it is assumed that the standards for space flights would be represented as annexes to the main Convention and, as in the case of the Chicago Convention, the participating States should maintain the maximum possible uniformity of their own rules in this area and the rules established by the Convention. In cases of discrepancy between the rules developed by a certain State and international standards of space navigation, the State would be obliged to notify COPUOS about this.

In this regard, various approaches to this issue are proposed. There are three options: ICAO, COPUOS and the UN General Assembly.[15]

12 Nesgos P. Commercial Space Transportation: A new Industry Emerges // XVI Annals of Space Law. 1991. P. 393.

13 Ryabinkin Ch. Let There Be Flight: It's time to Reform the Regulation of Commercial Space Travel // Journal of Air Law and Commerce/ 2004. No 69. P. 101.

14 Jasentuliyana N. International Space Law and the United Nations. The Hague: Kluwer Law International, 1999. P. 380.

15 Schwetje F.K. Managing outer space traffic in the future: a challenge to legal and technical experts. Montreal: McGill University, 1985. P. 244.

3. Three paths of development of space navigation

ICAO, as a specialised agency of the UN, is authorized to deal with civil aviation issues. The extension of the ICAO jurisdiction to space activities would be inefficient in the author's opinion since ICAO employees do not have the necessary technical knowledge and skills in the field of organising and providing space navigation.

The UN General Assembly carries out its activities in accordance with the UN Charter and has universal competence in all areas of interstate relations. However, it is not called upon to deal with technical issues, so the author of the paper assumes that vesting the UN General Assembly with the obligation to focus specifically on the space sector, establish a space navigation regime and then monitor space flight activity would not become the best practice.

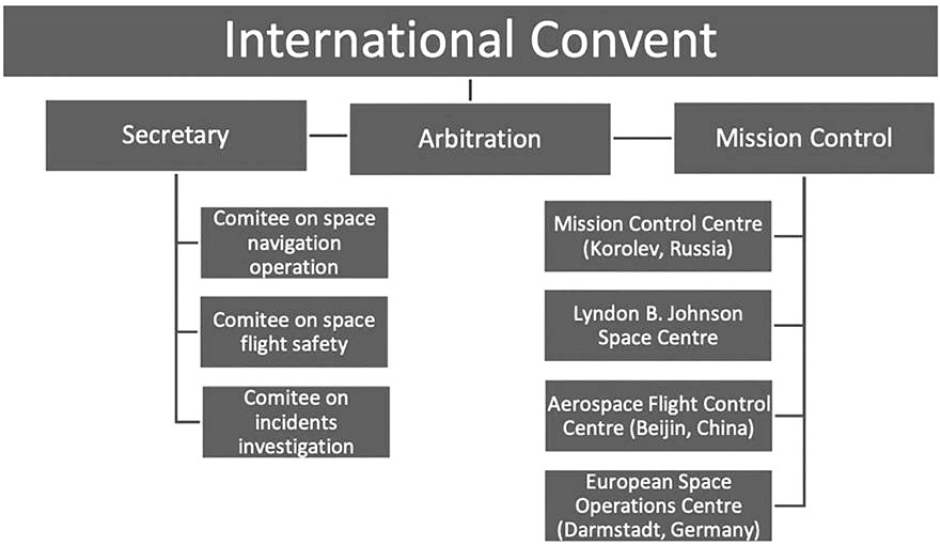
Regarding COPUOS candidate for the role of space navigation specialised organization, it is worth mentioning that it has been a specialised UN committee for 43 years, but its last significant result of the law-making process was in the 1979 treaty – concluding the Moon Agreement. Since then it could not come to a consensus among its participants and bring crucial modernisation to the ISL. Thus, based on the previous practice, it seems inefficacious to transfer the task of developing a draft universal Convention on the safety of space navigation to the COPUOS.

Space flight is unique; it differs from civil aviation at least by technical characteristics of the vehicle and flight territory. Therefore, the author considers the most appropriate option for space navigation development is to establish a separate package of documents under the auspices of a new international organisation – the International Convent on the Safety of Space Navigation, the main purpose of which would be space flight safety and space navigation control.

An international intergovernmental organisation in the field of space navigation regulation is supposed to combine both administrative (ensuring safe development of aerospace activity worldwide, monitoring and coordinating international cooperation in the field of space flights) and operational functions (flight operation, traffic control).

4. International Convent on the Safety of Space Navigation and Convention of Space Navigation

The proposed structure of the International Convent on the Safety of Space Navigation is as follows:



One of the main challenges engaged in the proposed international organisation activities would be the drafting of a universal treaty (proposed name "the Convention on the Safety of Space Navigation"). The Convention would consolidate the basic principles of the legal regime of space flights, where its annexes would create a detailed uniform and comprehensive approach to aerospace traffic management, flight safety, certification of spacecraft and other issues related to space navigation.

Earlier, there was an attempt to systematise navigation in outer space by the concept of creating an Information Center for monitoring near-Earth (within the framework of the working document "Long-term sustainability of space activities").[16]

The Russian Federation provided the idea of creating a united Info centre responsible for monitoring near-Earth space and developed the concept of the international legal framework for its operation. The main purpose of the Info centre is to organise and maintain an international database of objects and events in outer space.

In the author's opinion, the establishment of an international space monitoring centre is an important element of building a space flight legal framework because this mechanism provides the opportunity for the urgent distribution of critical information about dangerous situations in space. At

16 Working paper submitted by the Russian Federation to the UN General Assembly dated 04.03.2014 "Long-term sustainability of space activities (the main elements of the concept of creating an Information Center for monitoring near-Earth outer space under the auspices of the United Nations and current aspects of the topic)" Doc A/AC.105/L.290.

the same time, this initiative does not apply to problem-solving the collisions in outer space, for example, the situation with SpaceX's internet-beaming Starlink satellites and the Chinese space station.[17]

The approach to ensure the safety of space navigation should be comprehensive, i.e. it is not enough only to have an international organisation for the exchange of information, it is necessary to have an international organisation directly managing the navigation of objects in outer space. Thus, the Info centre might become one of the structural links of the proposed international organisation but could not solve the major problem.

The primer use of aviation was for military or exclusively governmental purposes, with technological development, commercial aviation has emerged and taken over the aviation market; By analogy with international air law, the further development of space activities is inextricably linked with the commercialisation of space activities.

The further prosperity of space flights is only possible under the condition of duly undertaken updates of the existing legal regime of outer space and its adaptation to the reality of modern human extraterrestrial activities. First of all, these modifications are supposed to concern the issue of registration of space objects launched into outer space.

According to Article II of the Registration Convention: "When a space object is launched into earth orbit or beyond, the launching State shall register the space object by means of an entry in an appropriate registry which it shall maintain. Each launching State shall inform the Secretary-General of the United Nations of the establishment of such a registry".

However, nowadays, SpaceX has developed a reusable rocket "Falcon 9" which already performed 111 refights within 172 launches in total.[18] Following the logic of the Registration Convention, every launch of Falcon 9 ought to be registered despite the fact it is the same launching vehicle. Such registration practice regarding reusable spacecraft seems cumbersome, bureaucratic and outdated. The author of the article suggests modifying the registration system and introducing the obligation to register only the first launch of the spacecraft. Moreover, the author assumes that the information on the registration should be transferred to the UN General Assembly as well as to the proposed International organisation on the Safety of Space Navigation. It would allow for an increase in the efficiency of cooperation and reduce the time for data processing.

17 Note verbale dated 3 December 2021 from the Permanent Mission of China to the United Nations (Vienna) addressed to the Secretary-General, A/AC.105/1262, issues on 10 December 2021. URL: https://www.unoosa.org/oosa/en/oosadoc/data/documen ts/2021/aac.105/aac.1051262_0.html. (Accessed 18.08.2022).

18 Falcon 9 characteristics and statistics, SpaceX, Official Website, URL: https://www.spacex.com/vehicles/falcon-9/>. (Accessed 18.08.2022).

As mentioned above, there are many unsolved issues concerning space navigation. To solve them, it is necessary to develop, in addition to the Convention on the Safety of Space Navigation, Annexes to it on certain aspects. They would have the status of international standards, again by analogy with air space law.[19]

The Chicago Convention represents one of the most successful universal treaties. The main reason for it is the method of using Annexes to detail regulations instead of amending the main text of the Treaty. The success of ICAO in law-making has largely become possible due to the differentiation of political and technical aspects of civil aviation. It is assumed to be a great practice to use in International Space Law: divide politics, law and technologies.

Similarly to the accepted air law procedures, States parties to the proposed Convention would seek to bring their national legislation in compliance with the Annexes to the document as much as possible. Otherwise, when it is impossible to make national legislation in full compliance with the Convention, States parties would notify other States and the International Convent Secretary. Based on a study conducted in ICAO in the 1990s, it was revealed that only 25% of States reported that it was impossible to transform international standards and recommended practices of ICAO,[20] therefore, this method works considerably successfully and would highly likely be efficient in the space traffic regulation.

However, it is worth noting that space technologies are more demanding and more expensive than aviation, so it is expected that the percentage of States that will not bring domestic legislation in line with international standards and recommended practices will be higher. In this regard, States should strongly encourage the transformation of the requirements of the Annexes into national legal systems by the system of political and economic stimulations.

The issues of certification of cosmodrome personnel (technicians, engineers, mechanics) would be reflected in the Annexe devoted to the certification of the entire space flight support system. In addition, the specific Annex would reflect the requirements for the flight crew of space vehicles, operators and managers of the space traffic control centre, etc.

The Annex may also contain the following standards: certification procedure, design, code designation of cosmodromes, other cosmodromes data (dimensions, the strength of artificial coverings, control points, rescue systems, firefighting, evacuation of space vehicles, etc.), physical characteristics of cosmodromes, parameters of visual markings of lanes,

19 Jasentuliyana N. International Space Law and the United Nations.The Hague: Kluwer Law International, 1999. P. 381.

20 Vissepo V. Reusable Launch Vehicles: Crossroads between Air and Space Law. Montreal: McGill University, 2003. P. 39.

launch pads, safety zones, operational zones, obstacles, equipment, facilities of cosmodromes, equipment and installations necessary for the cosmodrome operation, maintenance of cosmodromes etc.
The issues of certification of spacecraft themselves also need to be worked out, since according to statistics, almost all space disasters occur due to failure or unstable operation of equipment. The certification of SC would represent a certain mechanism for verifying compliance with specific safety requirements of any spacecraft to be launched. In air law, the certification of aircraft is carried out by the national authorities of States based on procedures laid down in domestic legislation. At the same time, national legislation is based on international standards and recommended practices of ICAO. This regime could apply to space law as such: there would be established specialised national authorities responsible for spacecraft examination and certification according to international standards.
To ensure the safety of space flights, it is necessary to develop a separate Annex "Flight Rules" to the Convention on the Safety of Space Flights. This application should include, by analogy with air law: rules for drawing up flight plans, parameters of routes for space flights, and the procedure for establishing functional safety spaces for spacecraft.

5. Conclusions

Therefore, in the author's opinion, one of the most prospective ways to regulate space navigation is to use approved by years of practice of air navigation, modifying it accordingly to suit the specifics of space activities.
All in all, in the conditions of increasing intensity of flights in space, the trend of commercialisation of space activities, and considerable growth of the number of subjects launching spacecraft, it is necessary to draft a universal comprehensive treaty stipulating rules for space navigation ensuring the safety of space traffic and human extraterrestrial activity in general. In this regard, there is a need to adopt a universal Convention on the Safety of Space Navigation with its Annexes in the format of international standards and recommended practices by analogy with the international air law regime. The Convention would become the result of international cooperation under the auspices of the established specialised International Convent on Safety of Space Navigation and would be due to regulating spacecraft certification, cosmodromes characteristics, safety zones, cosmodrome personnel management, launching vehicles required characteristics, detailed flight rules etc.
The establishment of a such detailed regime of space navigation is since the number of spacecraft in orbit grows every month sharply, space around the Earth is quite congested and there are reasonable concerns that soon enough there will be no space in space. Without a strict and meticulous approach to regulating every movement in outer space, humanity risks losing the possibility to explore space at all.