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Private commercial spaceflight: the national space regulatory Sherpas are shaping the path

The 'National Space Regulatory Sherpas' of the United States of America, i.e., its domestic laws, are shaping a completely new stage in the 'Space Age' opened on October 4, 1957, and the example of successful missions such as Polaris Dawn —first private spacewalk— will be echoed in multiple domestic legislations elsewhere in the world. As far as private commercial spaceflights and the delimitation of outer space are concerned, the functionalist approach has the upper hand.

"Private spaceflight also gives rise to a new set of issues,
so far outside the context of those treaties
– and even of space law as a whole"

Frans G. von der Dunk

1. Introduction: Hybrid Commercial Space Activities

In the space industry of the 21st century there is a hybridization of public and private subjects and objects of law.

An example of this is that after the discontinuation of the Space Shuttle in 2011, in 2014, the National Aeronautics and Space Administration (NASA) tendered and entered contracts with private companies SpaceX and Boeing, for 2.6 and 4.2 billion dollars, respectively, to perform commercial spaceflights to and from the International Space Station (ISS).

The aim was to shorten what was called 'The Gap' [1, p. 662] or the time it took the United States of America (USA) to return to providing this type of space services.

The group that had the mission to analyze human spaceflight options after the time NASA had planned to retire the Space Shuttle and coined the term 'The Gap' was The Review of United States Human Space Flight Plans Committee, better known as the HSF Committee.

In that sense, the better option was "to require NASA to rely on private commercial providers. The recertification of the Shuttle would require large increases in or reallocations of NASA's budget and could potentially lead to the same inefficiencies that have plagued NASA throughout its history" [2, p. 664].

These changes in approach and openness to the private sector to carry on commercial spaceflight in the USA made companies become operators and owners of the systems they develop [3, p. 418].

And NASA, from its once main role as the hegemonic protagonist of space activities, has been put in the place of 'client' of these companies that send astronauts to and from the ISS.

Another clear example is that in the early morning of Tuesday, September 10th, 2024, the Polaris Dawn mission was launched from the Kennedy Space Center aboard the Falcon 9 reusable rocket of the private company SpaceX.

On March 18th, 1965, Alexei Leonov performed the first spacewalk with full government funding, but on September 12th, 2024, Jared Isaacman, principal sponsor of the Polaris Dawn mission, along with Sarah Gillis, Scott Poteet and Anna Menon, became the first human to perform a privately funded spacewalk [4].

"Back at home we all have a lot of work to do, but form here, Earth sure looks like a perfect world", said Jared Isaacman on accomplishing this feat that reached 1,400 kilometers from the Earth's surface [5].

The Polaris Dawn mission, after almost five days in orbit, entered the atmosphere and splashed down in the Gulf of Mexico, near Dry Tortugas, Florida. USA. The capsule carrying the crew was successfully protected by the heat shield designed by SpaceX.

Given this scenario of new legal relationships, consisting not only of contracts between State-State or State-Company, but directly between Company-Company, Space Law re-emerges with the need to establish new definitions for commercial orbital flights and commercial suborbital flights.

Does the International Space Law regime cover these new subjects and objects of law? Are the new 'space flight participants' 'envoys of mankind' as the Article V of the Outer Space Treaty says?

The term 'National Space Regulatory Sherpas' may well be used in this paper as an analogy to the current national space laws enacted in the USA like the National Aeronautics and Space Act of 1958 and its amendments, the Commercial Space Launch Act of 1984 and the Commercial Space Launch Act Amendments of 1988, the Commercial Space Launch Amendments Act of 2004, the U.S. Commercial Space Launch Competitiveness Act of 2015, the FAA Reauthorization Act of 2018 and the FAA Reauthorization Act of 2024, as first steps of a more complex private commercial spaceflight regulation.

These 'sherpas' teaching and shaping the path at the foot of the space mountain are being closely observed from different parts of the world and analyzed and will most likely be imitated in the future by other countries.

2. Orbital Spaceflight

An orbital spaceflight can perform at least one orbit in outer space and can reach an altitude of about 400 kilometers (or more) from the Earth's surface.

Performing an orbit means that the spacecraft, once it has reached the desired altitude, must travel at 28,000 kilometers per hour, but not vertically but to one of its sides to 'stay in orbit' and not leave its new trajectory, now circumterrestrial.

At this speed, a complete orbit to Earth takes approximately 90 minutes.

Currently, the private companies SpaceX, with the partially reusable orbital cargo spacecraft 'Dragon 2', and Boeing, with the reusable orbital cargo spacecraft 'CST-100 Starliner', are providers of this type of spaceflight to the ISS.

'Soyuz', Roscosmos' non-reusable orbital cargo spacecraft, also provides this type of service.

3. **Suborbital Spaceflight**

On the other hand, suborbital spaceflight is characterized by not making an orbit around the Earth. It is a seesaw. That is, the rocket is launched, the engine travels at approximately 300 kilometers per hour, burns up after 2 or 3 minutes, reaches a certain point, usually between 80 and 100 kilometers high, and then descends.

If suborbital flights are manned, the people on board experience approximately 3 minutes of weightlessness before returning to the earth's surface.

It is worth mentioning that suborbital flights can also cross the 100 km altitude line, widely known as the 'Von-Karman Line', and thus even 'reach' outer space, so this fact does not differentiate them from orbital flights.

Takeoff can be vertical, normally applied for missions that need to mobilize heavier payloads and crew, as in the case of the suborbital flight service provided by Jeff Bezos' private company Blue Origin, or horizontal flights, as is done by Richard Branson's private company Virgin Galactic.

The most important difference is that orbital flights 'maintain' a complete orbit around the Earth and suborbital flights, although they can also "reach" outer space if the mission requires it, 'do not maintain' a complete orbit.

4. **'National Space Regulatory Sherpas'**

According to the Cambridge Dictionary, 'sherpa' means "a member of a Himalayan people who are skilled mountain climbers and who are often employed to help visiting climbers" [6]

So, the analogy between the space domestic laws of the USA and these skilled mountain climbers from the Himalaya is a way to recognize the work done for decades by the U.S. space industry, the knowledge acquired and the inherent difficulty in getting crew to and from outer space in a healthy and safe manner.

"The only State that has so far taken substantive steps to address private spaceflight, including private suborbital spaceflight and space tourism, is the United States" [7, p. 187].

In the context of the USA this dates to the National Aeronautics and Space Act of 1958 and its amendments, but more precisely to the era of President Ronald Reagan, as in 1984 the Commercial Space Launch Act was created, which brought the private sector into space launches, and among its purposes was "to promote economic growth and entrepreneurial activity through utilization of the space environment for peaceful purposes" [8]. Its 1988 Commercial Space Launch Amendments Act was also centered in unmanned private launches.

The Commercial Space Launch Act of 1984 and the Commercial Space Launch Amendments Act of 1988 became true 'National Space Regulatory Sherpas' that gave the initial kick-start to the introduction of the private sector in unmanned space launch services and that today serve as a model for other countries to generate their own legislation on these issues.

Years later, to address the regulation of private manned commercial spaceflight, the Commercial Space Launch Amendments Act of 2004, in its Sec. 2, regarding amendments, paragraph 15 of 'Findings and Purposes', establish: "the regulatory standards governing human space flight must evolve as the industry matures so that regulations neither stifle technology development nor expose crew or spaceflight participants to avoidable risks as the public comes to expect greater safety for crew and space flight participants from the industry" [9].

The same Sec. 2, regarding amendments, paragraph 17 of 'Definitions' created a new actor in space activities: the 'spaceflight participant'. By this Act, this term means "an individual, who is not crew, carried within a launch vehicle or reentry vehicle" [10].

In the 'Commercial Human Spaceflight' section, it says: "the space flight participant has provided written informed consent to participate in the launch and reentry and written certification of compliance" [11].

In the 'Safety Regulations' paragraph it says: "Beginning 8 years after the date of enactment of the Commercial Space Launch Amendments Act of 2004, the Secretary may propose regulations under this subsection" [12].

In summary, "Congress granted the Secretary of Transportation authority to oversee the safety of the emerging commercial human space flight industry but limited the Federal Aviation Administration's (FAA) rulemaking authority" [13].

So, currently there is a 'learning period', also known as 'moratorium', absent death, serious injury, or close call, to enact health and safety regulations for 'spaceflight participants' that will expire on January 1, 2025 [14].

These regulations were born because of the first space tourists, such as Dennis Tito in 2001 or Mark Shuttleworth in 2002, who started to participate in these private spaceflights as they were able to pay out of pocket large costs to be transported to and from the ISS. In other words, a new market was created.

As mentioned, other subsequent amendments, such as the Commercial Space Launch Amendments Act of 2004 or the U.S. Commercial Space Launch Competitiveness Act of 2015, conceived the need to regulate private commercial spaceflight and even started to create definitions where the International Space Treaties left the field open to the practice and need of States in the exploration and use of outer space, as long as their general principles are followed.

These domestic legislations gave life to the terms 'space flight participant', 'suborbital rocket', 'suborbital trajectory', 'government astronaut' and even with the FAA Reauthorization Act of 2018 there is a definition for 'spaceport' [15]. All in search of good steps for building a thriving space industry, with a focus on the private sector.

For the Commercial Space Launch Amendments Act of 2004, 'suborbital rocket' means "a vehicle, rocket-propelled in whole or in part, intended for flight on

a suborbital trajectory, and the thrust of which is greater than its lift for the majority of the rocket-powered portion of its ascent" [16].

Then it defines "suborbital trajectory" as "the intentional flight path of a launch vehicle, reentry vehicle, or any portion thereof, whose vacuum instantaneous impact point does not leave the surface of the Earth" [17].

The U.S. Commercial Space Launch Competitiveness Act of 2015 introduced 'government astronaut' as a new term, which means:

"An individual who is designated by the National Aeronautics and Space Administration" and "is carried within a launch vehicle or reentry vehicle in the course of his or her employment, which may include performance of activities directly relating to the launch, reentry, or other operation of the launch vehicle or reentry vehicle" [18].

And "is either an employee of the United States Government, including the uniformed services, engaged in the performance of a federal function under authority of law or an Executive act; or an international partner astronaut" [19].

By means of this Act, international 'partner astronaut' is "an individual designated under Article 11 of the International Space Station Intergovernmental Agreement, by a partner to that agreement other than the United States, as qualified to serve as an International Space Station crew member" [20].

5. 'Envoys of mankind'?

Art. V of the 1967 Space Treaty grants 'astronauts' the status of 'envoys of mankind' and provides for their safe and prompt return to the State of Registry of their space vehicle.

This connects immediately with Art. VIII and the jurisdiction and control retained by the State of Registry and the quasi-territoriality [21, p. 271] applied over the space object and all personnel on it.

The 1968 Rescue Agreement mentions the word 'astronaut' in its title and in its Preamble, but in the rest of the articles it refers to 'crew of a spacecraft' and does not provide further specifications or definitions.

However, with these commercial activities and applications, as is also the case with the commercial Polaris Dawn mission and with the new definitions created by the 'National Space Regulatory Sherpas', the following questions arise:

Are these new type of space passengers 'envoys of mankind'? Do they seek 'the benefit of all mankind' as the Article I of the 1967 OST says? Do they fit into the space concepts and principles and their respective international conventions?

The develop of domestic space legislation, especially in those areas in which the International Space Treaties did not establish clear or specific definitions, as in the case of space tourism or space mining, shows that international and national Space Law has the duty to accompany the technical space fact side by side and, although the decision to generate regulatory frameworks, it is not coming anymore from the United Nations institutions, but from the thrust of entrepreneurs and the USA government who are generating new concepts for the progress of the commercial space industry.

6. UNISPACE IV in 2027

Perhaps a good opportunity to debate the definitions and concepts within UNCOPUOS regarding private commercial spaceflight would be the fourth United Nations Conference on the Peaceful Exploration of Outer Space (UNISPACE IV) in 2027 [22].

The idea of realizing UNISPACE IV in 2027 has been promoted in the 'Action 56' of the recent 'Pact for the Future' of the 79th United Nations General Assembly (UNGA79). The resolution was A/RES/79/1 and released on the 22nd of September of 2024.

The document contains The Pact for the Future and two annexes: 1) The 'Global Digital Compact' and 2) The 'Declaration on Future Generations' [18]. All of them were an outcome of the Summit of the Future, held in New York between the 20-21 (Action Days) and the 22-23 (Summit) of September of 2024.

But in the Pact for the Future, there were only three issues that were pointed in 'Action 56' regarding the creation of 'new frameworks' within UNCOPUOS: space traffic, space debris and space resources [23].

There were no frameworks proposed for private commercial spaceflights. The only cryptic phrase that could be attributed to it is in 'Action 56' (b): "Invite the engagement of relevant private sector, civil society and other relevant stakeholders, where appropriate and applicable, to contribute to intergovernmental processes related to the increased safety and sustainability of outer space" [24].

Perhaps UNISPACE IV is the opportunity to regain predictability, founding characteristic of Space Law as a discipline, and address the issue of private commercial spaceflight.

7. Delimitation of Outer Space to Develop Private Commercial Spaceflight… Is it a Need?

"The international space treaties, as augmented by national space legislation, regulation and governance still essentially sufficed to properly contain private space activities" [25, p. 146].

However, it would seem correct for the development of commercial activities in outer space that an international delimitation between the space domain and airspace be established.

"It is essential that the question of boundary between airspace and outer space should be clearly defined by a treaty, as well as the position of space objects which, either by design or by accident, find themselves in or in transit through foreign airspace" [26, p. 678].

Moreover, "the absence of international regulation permits States to authorize unilateral delimitation of the frontier between airspace and outer space through domestic legislation" [27, p. 47].

Although, in cases such as the USA the delimitation of outer space has been "consistently refused even to have the subject discussed" [28, p. 676].

Thus, the success of the Polaris Dawn mission strengthens the classic functionalist position historically held by the USA in international forums such as UNCOPUOS.

The functionalist school believes "that all one has to do is to regulate space activities. According to them, one need not, or even should not, try to define where outer space begins, as is advocated by the so-called 'spatialists' who believe that the boundary question between national airspace and outer space should be settled as a matter of priority" [29, p. 676].

8. Conclusions

The 'National Space Regulatory Sherpas' of the United States of America, i.e., its domestic laws, built step by step since 1958, are now fundamental inputs of a completely new stage in the 'Space Age' opened on October 4th, 1957, and with the example of missions like Polaris Dawn there will be echoes of them in multiple domestic legislations elsewhere in the world.

The decision to generate new legal definitions and regulatory frameworks for private commercial spaceflight is not coming anymore from the United Nations institutions, but from the thrust of entrepreneurs and the USA government who are generating new concepts for the progress of the commercial space industry.

In other words, without the need to have previously established a delimitation between airspace and outer space, the 'National Space Regulatory Sherpas' have managed to regulate things that the Space Treaties did not mention and, at the same time, brought the private sector into the game.

The tendency to create domestic space legislations that establish their own definitions and conditions will increase among spacefaring nations, using the 'National Space Regulatory Sherpas' as a model.

Although some opinions could consider these domestic legislations light because they lack elements to preserve the health and safety of space flight participants and although they have to sign a 'confirmed consent' where they know the risks to their physical integrity and even their lives, this type of situations that make an ultra-risky activity such as spaceflight, at a certain point are tolerable if the main purpose is to develop more complex regulations as the activity becomes more consolidated.

Although the Pact for the Future expressed in its 'Action 56': "We are living through an age of increased access to and activities in outer space", the only three issues that were encouraged by this document to establish new frameworks through the UNCOPUOS were space traffic, space debris and space resources. But the private commercial spaceflights did not appear as a topic.

There is an opportunity to regain predictability, a foundational characteristic of Space Law, at UNISPACE IV in 2027, where discussing the issue of private commercial spaceflight will be a great chance for the 'comunis opinio generalis', fundamental for the creative task of Space Law.

Perhaps the logic of 'universal consensus' for the creation of international instruments from within UNCOPUOS to regulate new commercial space activities as

the private commercial spaceflight and even integrate de private sector in the decisions is, for now, far away from becoming a reality.

But if you pay a 'sherpa' take you to the top of the mountain, in this case a space mountain: Would you be willing to do what it takes to reach it?

References

1. See for details Brannen, T., Private Commercial Space Transportation's Dependence on Space Tourism and NASA's Responsibility to Both (pp. 639-668), in *Journal of Air Law and Commerce*, Volume 3. Issue 3, Article 5, University Park, Dallas, Texas, US, 2010
2. Ibidem.
3. See for details Hermida, J. La Explotación Comercial del Espacio Exterior y de la Luna (pp. 407-419), in *Nuevos Enfoques del Derecho Aeronáutico y Espacial*, Marcial Pons, Madrid, España, 2015, 584 pages.
4. See *SpaceX's Polaris Dawn crew conducts first all-civilian spacewalk*, cbsnews.com (Sep. 12, 2024), https://www.cbsnews.com/news/polaris-dawn-crew-gears-up-for-first-commercial-non-government-spacewalk/
5. See *"Looks Like A Perfect World" SpaceX Polaris Dawn Commander Jared Isaacman*, The Launch Pad channel (Sep. 12, 2024), https://youtu.be/jYZTxGAdrrM?si=SQw8sV-qpAwTdAce
6. See Cambridge Dictionary, meaning of 'sherpa', available at: https://dictionary.cambridge.org/dictionary/english/sherpa
7. See for details von der Dunk, F.G., The Regulation of Space Tourism (pp.177-199), in *Space Tourism: The Elusive Dream*, Volume 25, Erik Cohen and Sam Spector, of the Tourism Social Science Series, Emerald Publishing Limited, Bingley, UK, 2019, 337 pages. (Article of free and open access by the DigitalCommons@University of Nebraska – Lincoln).
8. See Commercial Space Launch Act, 1984, Sec. 3, Purposes, https://www.congress.gov/bill/98th-congress/house-bill/3942/text
9. See Commercial Space Launch Act, 2004, Sec. 2, Amendments, (a) Findings and Purposes, https://www.congress.gov/bill/108th-congress/house-bill/5382/text
10. See Commercial Space Launch Act, 2004, Sec. 2, Amendments, (b) Definitions, https://www.congress.gov/bill/108th-congress/house-bill/5382/text
11. See Commercial Space Launch Act, 2004, Sec. 2, Amendments, (c) Commercial Human Space Flight, https://www.congress.gov/bill/108th-congress/house-bill/5382/text
12. Ibidem.
13. See Federal Aviation Administration (FAA), Human Space Flight Occupant Safety Aerospace Rulemaking Committee Charter, 2023, https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/Final-ARM-220523-001_S1%20Signed.pdf
14. See FAA Reauthorization Act of 2024, Sec. 1111, Learning Period, https://www.congress.gov/bill/118th-congress/house-bill/3935/text

15. See FAA Reauthorization Act of 2018, Sec. 599D, Spaceports, https://www.congress.gov/bill/115th-congress/house-bill/4/text

16. See Commercial Space Launch Act, 2004, Sec. 2, Amendments, (b) Definitions, https://www.congress.gov/bill/108th-congress/house-bill/5382/text

17. Ibidem.

18. U.S. Commercial Space Launch Competitiveness Act, Sec. 112, (c) Definition of Government Astronaut, https://www.congress.gov/bill/114th-congress/house-bill/2262/text

19. Ibidem.

20. Ibidem.

21. See for details Cheng, B., The 1967 Space Treaty (pp. 259-315), in *Studies in International Space Law*, Clarendon Press Oxford, University of Oxford, UK, 1997, 844 pages.

22. See UNGA A/RES/79/1, The Pact for the Future, Global Digital Compact and Declaration on Future Generations, September, 2024, https://documents.un.org/doc/undoc/gen/n24/272/22/pdf/n2427222.pdf

23. Ibidem.

24. Ibidem.

25. See for details von der Dunk, F.G., Space Tourism, Private Spaceflight and the Law: Key Aspects (pp.146-152), in *Space Policy*, Elsevier, 2011. (Article of free and open access by the DigitalCommons@University of Nebraska – Lincoln).

26. See for details Cheng, B., The Commercial Development of Space: the Need for New Treaties (pp. 673-700), in *Studies in International Space Law*, Clarendon Press Oxford, University of Oxford, UK, 1997, 844 pages.

27. See for details de Oliveira Bittencourt Neto, O., Delimitation of Outer Space and Earth Orbits (pp. 43-54), in *Outer Space Law: Legal Policy and Practice*, Globe Law and Business Ltd., London, UK, 2017, 390 pages.

28. See for details Cheng, B., op. cit., p. 676.

29. Ibidem.