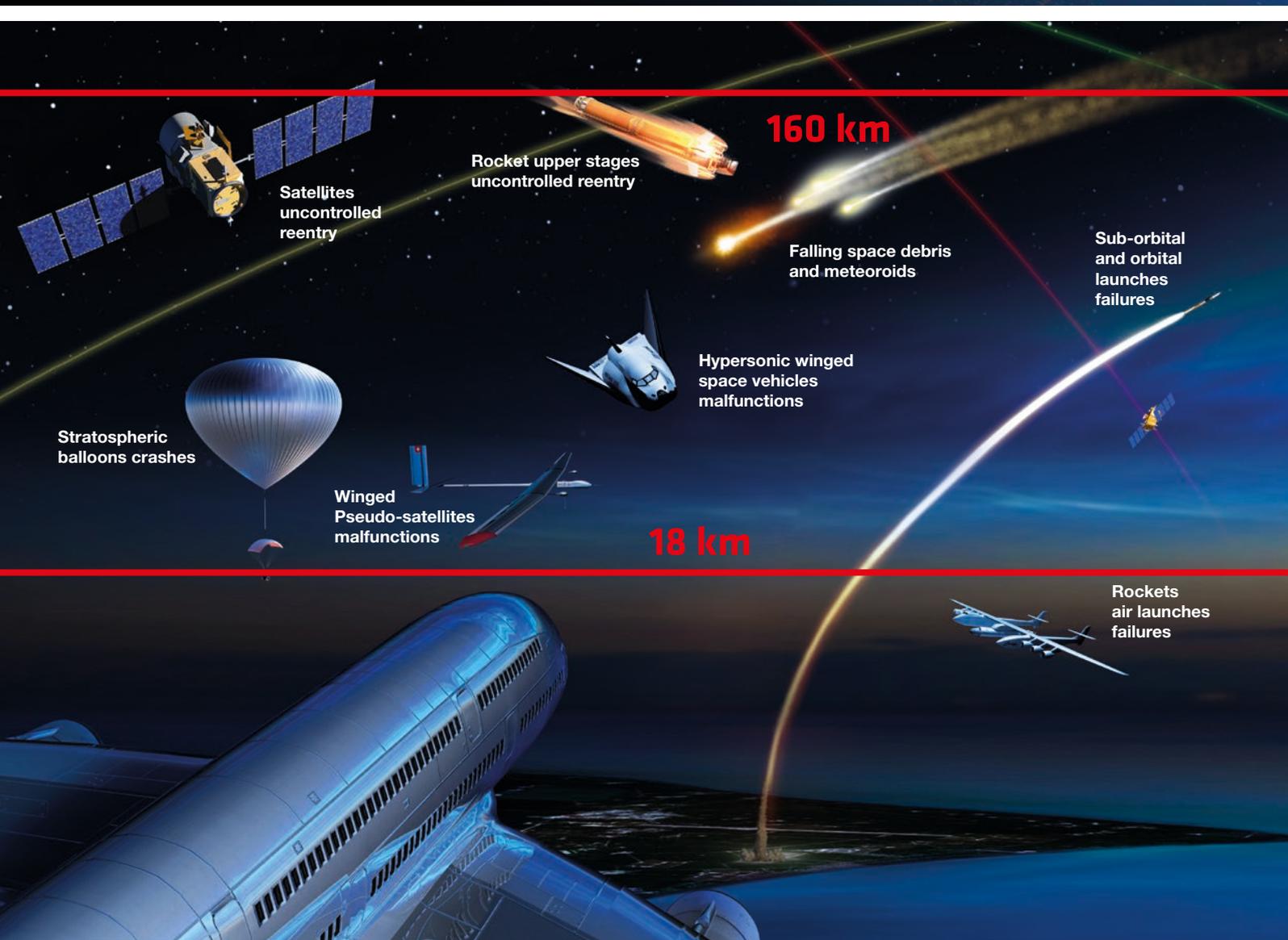




# INTERNATIONAL ASSOCIATION FOR THE ADVANCEMENT OF SPACE SAFETY

# NEAR SPACE THE QUEST FOR A NEW LEGAL FRONTIER



Satellites  
uncontrolled  
reentry

Rocket upper stages  
uncontrolled reentry

160 km

Falling space debris  
and meteoroids

Sub-orbital  
and orbital  
launches  
failures

Stratospheric  
balloons  
crashes



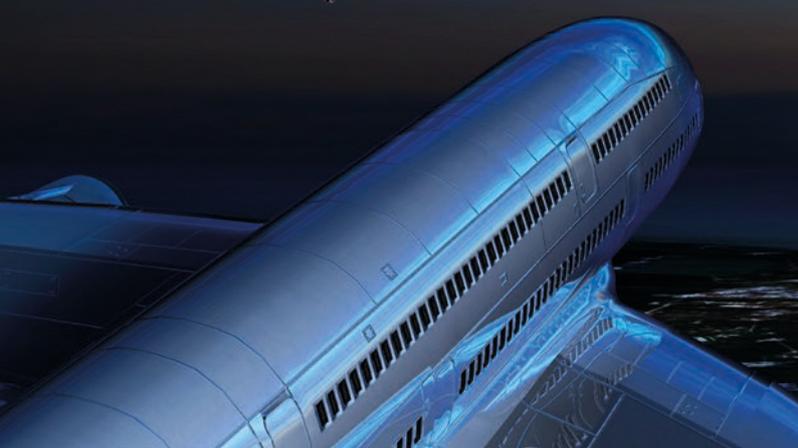
Winged  
Pseudo-satellites  
malfunctions



Hypersonic winged  
space vehicles  
malfunctions

18 km

Rockets  
air launches  
failures





# Near Space - The Quest for a New Legal Frontier

## Introduction

While it's common knowledge that sovereignty of a state extends to its airspace,<sup>1</sup> it is not quite clear where vertically the limit is. Furthermore, while it is accepted that the use and exploration of outer space is the province of all mankind,<sup>2</sup> thus excluding any claims of national appropriation,<sup>3</sup> it is unclear from which lowest end of the Earth's atmosphere such a claim applies.

Even though much activity has taken place in outer space in the past sixty years,<sup>4</sup> it is only recently that the upper layers of the atmosphere have caught the interest of business, and military commands. Suborbital flights, in particular, but also high-altitudinal platforms<sup>5</sup> and stratospheric balloons<sup>6</sup> are some of the systems aimed to exploit the region's capabilities. The region is also environmentally sensitive to the projected increase of rocket launches, destructive re-entries, and suborbital flights because of the effects of some rocket exhaust chemicals on ozone layer depletion, and of the concern that particles generated can by absorption and reflection change the amount of solar energy injected in to the atmosphere.<sup>7-8</sup> Legally however, it is an indistinct region where it is not clear whether the operations that take place are covered by aviation or space conventions and treaties<sup>9</sup>, in particular with reference to the freedom of overflight that applies to space orbital operations.

Referred to by different authors by various names, this region is called Near Space for the purpose of this paper and is tentatively defined as extending from airspace Flight Level 600, approximately 18 km,<sup>10</sup> the practical upper limit of airspace, to 160 km above sea level,<sup>11</sup> the practical lower perigee for an orbiting satellite.

The UNCOPOUS legal subcommittee has been preoccupied with the issue of delimitation of airspace and outer space since the beginning of public interest for suborbital space tourism.<sup>12</sup> The debate has been revived between "spatialist" and "functionalist" approach - that is, whether a flying object should be considered an aircraft or spacecraft<sup>13</sup> based on where it operates or on its function<sup>14</sup> respectively. The Von Karman line at 100 km,<sup>15</sup> a theoretical line above which aerodynamic attitude control of a rocket is no longer possible, has been one contender as spatialist demarcation line.<sup>16</sup> It has been recently endorsed in United States as defining the sphere of competences of the Air Force and of the newly established Space Force.<sup>17</sup> Space legislations in Australia,<sup>18</sup> Denmark<sup>19</sup> and Kazakhstan<sup>20</sup> have also demarcated

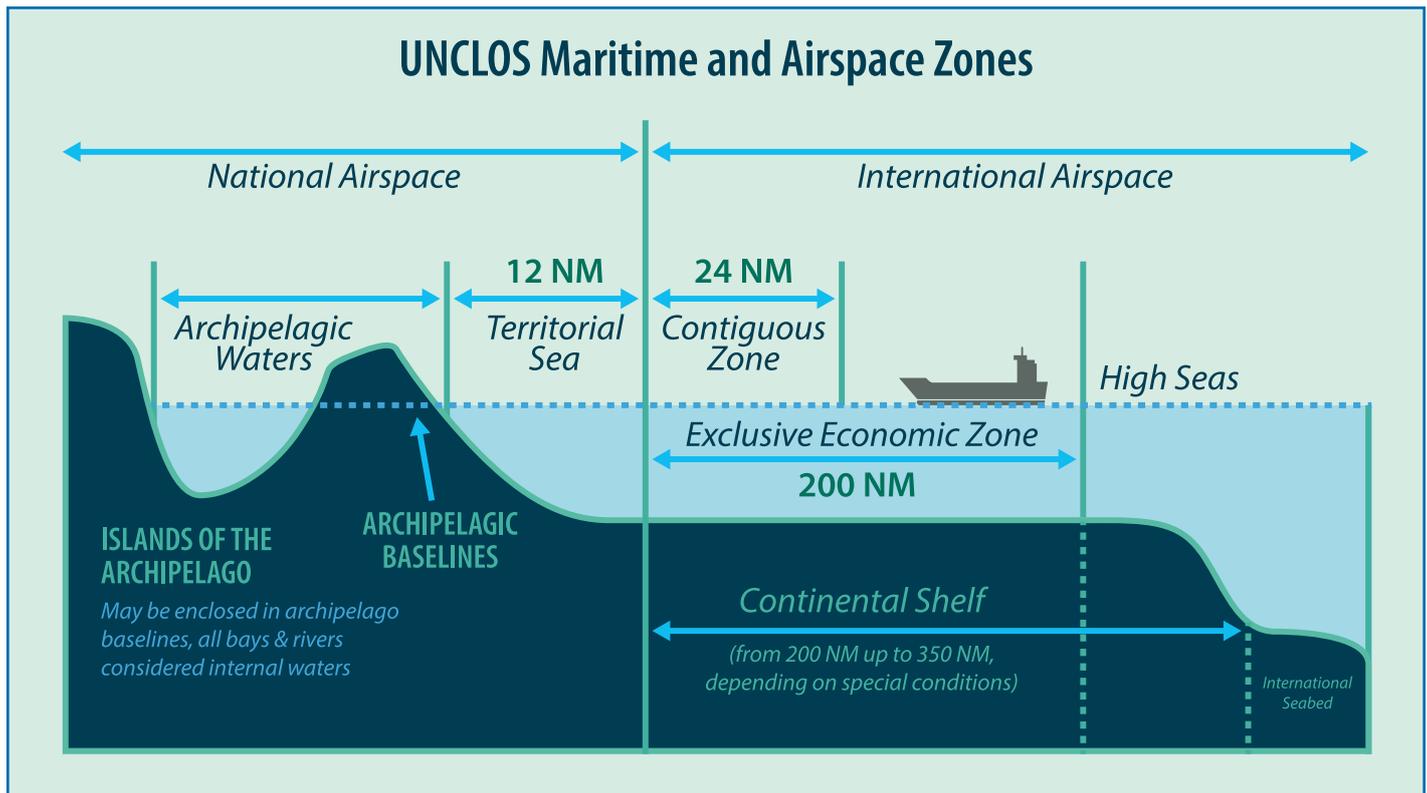
the beginning of space at 100 km. In any case, spurred by the interest for suborbital space tourism<sup>21</sup>, and for possible future point-to-point hypersonic and suborbital transportation, the debate about the legal regime applicable to those vehicles and operations is still very much open. It seemed pertinent to many of those involved that there should be such a border line defining where state sovereignty ends and outer space extraterritorial regime begins. However, there have been few authors, (discussed in more detail below) who have questioned the idea of such an abrupt end to state sovereignty. They have proposed an intermediate region in which state sovereignty is reduced rather than coming to an abrupt end. The aims are on one side to prevent that overflight safety risk of foreign population due to launch, re-entry, and point-to-point operations are managed unilaterally without international harmonization, and on the other side to recognize the economic (and military) interest of the subjacent State to control stationary or quasi-stationary overflying operations. The proposed intermediate region is what we call in this paper Near Space. Some authors have proposed to call it "protozone"<sup>22</sup>, which is a bit misleading term because in ancient Greek *protos* (πρῶτος) means *first in time*, or to call it Exclusive Economic Utilization Space<sup>23</sup>, which does not reflect the safety/security issues.

While defining an extra legal regime might be seen as a complication and perhaps limiting business innovation, in the case of suborbital flights and other stratospheric activity, it actually would serve the purpose to enhance business growth by unequivocally establishing the applicable legal regime.<sup>24</sup> The absence of a univocal legal regime for liability is keeping business sceptical.

Originally an IAASS proposal to UNCOPOUS inspired by the law of the sea there have been several studies to refine the concept of such new legal frontier of Near Space.<sup>25</sup> Most notably, the work of Joseph Pelton,<sup>26</sup> Ram Jakhu,<sup>27</sup> Paul Stephen Dempsey and Maria Manoli,<sup>28</sup> and more recently of Hao Liu and Fabio Tronchetti.<sup>29</sup>

## The Law of the Sea Analogy

For a long time, under the law of the sea, there only existed the territorial sea and the international waters.<sup>30</sup> However a two-fold problem was identified - firstly there was the issue of safety and security of the coastal state,<sup>31</sup> secondly there were various economic resources in the



areas adjacent to the territorial waters, which were being misused by belonging to the global commons of international waters.<sup>32</sup> To solve those problems greater responsibility and benefits, were ascribed to the coastal states with creation of Continental Shelf, Contiguous Zone and Exclusive Economic Zone (EEZ).<sup>33</sup> Contiguous Zone is the zone, extending from 24 nautical miles from the coast,<sup>34</sup> in which the coastal States can impose 'its customs, fiscal, immigration or sanitary laws'.<sup>35</sup> The EEZ on the other hand In the EEZ, the coastal state is awarded sovereign rights over the natural resources in the zone for the purposes of '...exploring and exploiting, conserving and managing the natural resources, whether living or non-living'.<sup>36</sup> These rights also have the corresponding obligation to 'conserve the resources, utilise them, and cooperate with other countries to those ends'.<sup>37</sup>

## Proposal for a Legal Regime for Near Space

The issue of demarcation between airspace and outer space is strictly connected to overflight and territorial sovereignty. Generally, rockets fly straight up vertically only for few seconds at launch. Then, having cleared the launch pad, the rocket performs a pitch over maneuver thus climbing to space with an angle that varies.<sup>38</sup> Currently, rockets overflight risk of foreign territories is covered only in terms of liability by space treaties. The issue

was debated at the beginning of the space activities and then left undecided for decades until it was resumed at the start of development of winged vehicles for commercial suborbital spaceflight. An interesting (official) summary of the early debate is in the excerpt here below from the U.S. Congress hearings in 1966 of the NASA Administrator J. Webb as part the NASA authorization for 1967<sup>39</sup>:

*"Question 6. Mr. Webb, has NASA prepared any reports on the legal problems of air space and outer space? All countries exercise the right of overflight in orbit. Does the United States consider it has that same right during the preorbital phase of the flight? What is the policy of the United States on overflight of foreign lands during the preorbital flight phase (launch phase)?*

*Answer:... The term "overflight" means flight through the air space of a subjacent state. In fact, NASA space vehicles do not traverse foreign territory, short of an abort situation, until the space vehicle has attained a height of at least 200,000 feet (over 35 miles), again with the possible exception of Grand Bahama. Although no precise definition of where outer space begins and the air space ends has been agreed upon, there would be little contest that 200,000 feet (over 35 miles) is in outer space. Since the principle that outer space is free for exploration and use by all and is not subject to national appropriation (or national sovereignty, jurisdiction, or control) has been unanimously adopted at the U.N., no agreement from a subjacent state is required before its territory can be traversed by a space vehicle in outer space. The abort*



*or orbital decay situation where fragments might enter a subjacent state's airspace and impact the Earth gives rise to two questions currently the subject of negotiation before the U.N. (the Legal Subcommittee of the Outer Space Committee). One question relates to liability for damage caused by the return of objects launched into outer space, the other involves the obligation to return such objects."*

In near future, there will be various kind of systems, like suborbital vehicles, that will make frequent use of Near Space or reside over there, which further complicate the safety issue of safety of overflight by space bound and returning systems. Clearly it is the underlying State that has the greatest economic and safety and security interest in controlling the Near Space above its territory. Thus, a specific legal regime for Near Space is needed. This legal regime should centre around limited sovereignty<sup>40</sup> but full jurisdiction<sup>41</sup> of the underlying State. The new legal regime would hope to illuminate how the conscious economic exploitation of Near Space can lead to greater sharing of economic and environmental benefits with the public at large.<sup>42</sup>

This paper takes a step further the work of the academicians cited above by drafting a "Convention on Regulation of Near Space" here below as a strawman to support further analysis and discussion.

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10. Hao Liu & Fabio Tronchetti, "Regulating Near-Space Activities: Using the Precedent of the Exclusive Economic Zone as a Model?", *Ocean Development & International Law*, (2019), at p. 91 <https://doi.org/10.1080/00908320.2018.1548452>. New Zealand has enacted The Outer Space and High-Altitude Activities Act, 2017 which defines high-altitude as flight level 600.
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12. The Delimitation question has been a permanent item of discussion in the legal sub-committee since 1967. *Letter from the Chairman of the Committee on the Peaceful Uses of Outer Space addressed to the Chairman of the Scientific and Legal Sub-Committee*, <https://www.unoosa.org/oosa/en/ourwork/copuos/lsc/ddos/index.html>. In order to understand the different positions of countries on the issue, one can look at the NASA Authorization for Fiscal Year, 1967 that keeps the delimitation of outer space at 56 km [https://babel.hathitrust.org/cgi/pt?id=uc1.\\$b642827&view=1up&seq=7](https://babel.hathitrust.org/cgi/pt?id=uc1.$b642827&view=1up&seq=7), while the Soviet Union submission before the UN COPOUS was 110 km [https://www.unoosa.org/pdf/limited/l/AC105\\_L168E.pdf](https://www.unoosa.org/pdf/limited/l/AC105_L168E.pdf).
13. For a discussion of the spatialist approach see Paul Stephen Dempsey and Maria Manoli, *Supra* note 10, at p. 216.
14. For a discussion about the functionalist approach see Paul Stephen Dempsey and Maria Manoli, *Supra* note 10, at p. 206.
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- the Sea* (Brill Nijhoff, Leiden, 2015), p. 265.
32. *Supra* note 29.
33. UN Convention on the Law of the Sea, 1982.
34. Article 33, UN Convention on the Law of the Sea, 1982.
35. *Ibid* and *Supra* note 10, p.232.
36. Article 56, UN Convention on Law of the Sea, 1982.
37. *Supra* note 29, p. 5.
38. [https://en.wikipedia.org/wiki/Gravity\\_turn](https://en.wikipedia.org/wiki/Gravity_turn) (last viewed March 23, 2020).
39. *Hearings before the Committee on Aeronautical and Space Sciences*, United States Senate, Eighty-Ninth Second Congress, S 2909, February, March 1,2,3 and 4 1966.
40. *Supra* note 9 at p. 563 and *Supra* note 15 at p. 26.
41. *Supra* note 15 at p. 134.
42. An example is that of Norway, which has benefitted significantly from the creation of an EEZ, Alf Håkon Hoel, "The Performance of Exclusive Economic Zones - The Case of Norway" in *Supra* note 29, p. 33.



# **IAASS STUDY DRAFT**

## **Convention on the Regulation of Near Space**

A Convention to establish Near Space in international air and space law

### **CONTENTS**

#### **PREAMBLE**

#### **PART I INTRODUCTION**

- Article 1 Scope
- Article 2 Definitions

#### **PART II NEAR SPACE DELIMITATION**

- Article 3 Definition of Near Space
- Article 4 Delimitation of Near Space
- Article 5 Breadth of Near Space above an Underlying State
- Article 6 Territorial Status of Near Space
- Article 7 Near Space is not part of National Airspace
- Article 8 Near Space is not part of Outer Space

#### **PART III RIGHTS OF UNDERLYING STATE IN NEAR SPACE**

- Article 9 Non-Permissible Activities
- Article 10 State Sovereignty in Airspace not Compromised
- Article 11 Jurisdiction of the Underlying State
- Article 12 Jurisdiction over the High Seas
- Article 13 Distinction between Domestic and International Near Space Activities
- Article 14 Underlying State to have a right to use and administer
- Article 15 Freedoms in Near Space
- Article 16 Right of Stationary or Hovering Objects

**PART IV PRIVATE ACTIVITIES IN NEAR SPACE**

- Article 17 Control over Private Actors
- Article 18 Conditions for Inclusion of Operator
- Article 19 Licensing of Objects Launched in Near Space
- Article 20 Terms for Deployment of Aero-space Objects
- Article 21 Aero-space Objects of Foreign Operators
- Article 22 Liability

**PART V MISCELLANEOUS**

- Article 23 Principles Governing State Action in Near Space
- Article 24 Protection of Life and Property on Surface
- Article 25 Traffic Management of Near Space
- Article 26 Uncontrolled Destructive Re-entry
- Article 27 Settlement of Disputes
- Article 28 Environmental Pollution

**PREAMBLE**

*The States party to this Convention:*

Recalling the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967, the Convention on International Liability for Damage Caused by Space Objects, 1972, the Convention on Registration of Objects Launched into Outer Space, 1974 and the Chicago Convention, 1944.

Recognising the need to define a legal demarcation between air space and outer space.

Acknowledging the projected increase of emerging stratospheric and suborbital activities, by means of suborbital vehicles, high altitudinal platforms, hypersonic aircrafts, pseudo-satellites, and stratospheric balloons.

Recognizing that national airspace functionally has not been legislated beyond 400,000 feet level and that there is a need for harmonious national legislations to ensure the safety of operations above that level, including space bound and returning traffic.

Recognising the need of ensuring freedom of access to space for all nations of the world, and equity in the exploitation of upcoming stratospheric and suborbital technologies.



Recognising that the re-entry phase of space objects through the upper layers of the atmosphere, can pose a risk for aviation traffic underneath and the environment, and that the density of the upper layers of the atmosphere is subjected to wide diurnal, seasonal and geographical variations.

Understanding that the demarcation between air space and outer space is improved by providing for a transition region of partial national sovereignty, instead of a simple border line.

Understanding that harmonious regulations at national level for the transition region between air space and outer space would encourage the economic development and ensure safety of operations.

*Have agreed as follows:*

...

## PART I INTRODUCTION

### **Article 1** **Scope**

States party to the Convention hereunder specify the use of near space for civil and commercial purposes of space exploration and scientific research.

### **Article 2** **Definitions**

Aero-space Object means 'any object created for operation in Near Space, including suborbital vehicle'.

The Convention refers to 'the IASS Study Draft Convention on Near Space'.

Underlying State is 'the State above whose territory, territorial sea, contiguous zone or exclusive economic zone the Near Space is being referred'. In case of an overlap of territory Underlying the Near Space, the rules relating to territorial demarcation provided under law of the sea shall be referred to.

Damage means and includes 'loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations'

Suborbital Flight is 'a rocket-powered flight up to any altitude during which the vehicle does not reach orbital velocity.'



## **PART II**

### **NEAR SPACE DELIMITATION**

#### ***Article 3*** ***Definition of Near Space***

Near space is a region above and adjacent to the national airspace, subject to the specific legal regime provided under this Convention. The rights and jurisdiction of the Underlying State and the rights and freedoms of other States are governed by the relevant provisions of this Convention.

#### ***Article 4*** ***Delimitation of Near Space***

Near Space extends from 18 km above sea level up to 160 km above sea level.

#### ***Article 5*** ***Breadth of Near Space above an Underlying State***

Near Space belonging to a State extends over the territory, territorial sea, contiguous zone and exclusive economic zone of a State. In case of an overlap of territory Underlying the Near Space, the rules relating to territorial demarcation provided under United Nations Convention on the Law of the Sea, 1982 shall be referred to.

#### ***Article 6*** ***Territorial Status of Near Space***

Near Space is not part of the territory of a State.

#### ***Article 7*** ***Near Space is not part of National Airspace***

Near space is not part of the national airspace but a separate legal entity. The provisions under the Chicago Convention, 1944 apply to near space only when specifically mentioned.

#### ***Article 8*** ***Near Space is not part of Outer Space***

Near Space is not part of outer space, thus it is not governed by Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967.

## **PART III**

### **RIGHTS OF UNDERLYING STATE IN NEAR SPACE**

#### ***Article 9*** ***Non-Permissible Activities***

States Parties to the Treat undertake to not place in Near Space of their territory or the territory of another State any objects carrying nuclear weapons or any other kinds of weapons of mass destruction.



**Article 10**  
***State Sovereignty in Airspace not Compromised***

Nothing contained in this Convention, undermines Article 1 of the Chicago Convention, 1944 dealing with the sovereignty of a State in its national airspace.

**Article 11**  
***Jurisdiction of the Underlying State***

The jurisdiction of a State extends to Near Space above its territory, territorial seas, contiguous zone and exclusive economic zone.

**Article 12**  
***Jurisdiction over the High Seas***

Over the high seas, the jurisdiction over Near Space is to be exercised by the International Civil Aviation Organisation.

**Article 13**  
***Distinction between Domestic and International Near Space Activities***

In case where an Aero-space Object starts and ends its journey entirely within the territory of one State, it is known as a domestic Near Space activity. Any activity that is not domestic shall be termed as international Near Space activity.

Provided where an Aero-space Object lands at high seas and is transported to the territory of a State, it shall be considered a domestic near space activity.

**Article 14**  
***Underlying State to have a Right to Use and Administer***

State Underlying Near Space shall have a right to use and administer the Near Space to the exclusion of other States party to the Convention.

**Article 15**  
***Freedoms in Near Space***

The States party to the Convention will have the following freedoms in the Near Space of other State parties –

- a. innocent passage for civil and/or commercial activities to be freely allowed, provided that the safety measure for the mitigation of risk for over-flown population comply with internationally agreed standards and recommended practices.
- b. Over-flights not falling within sub-clause (a) above shall require authorization by the overflown countries.

**Article 16**  
***Right of Stationary or Hovering Objects***

States party to the Convention shall have the right to allow placement of stationary or hovering Aero-space Objects in the Near Space above their territory or with the permission of the Underlying State in the Near Space of another State.



## **PART IV**

### **PRIVATE ACTIVITIES IN NEAR SPACE**

#### ***Article 17*** ***Control over Private Actors***

Private activities in the Near Space are encouraged. Each Contracting State however shall be required to take appropriate measures to prohibit the deliberate use of any Aero-space Object registered in that State or operated by an operator, who has his principal place of business or permanent residence in that State, for any purpose inconsistent with the aims of the Convention.

#### ***Article 18*** ***Conditions for Inclusion of Operator***

States party to the Convention are required to create national rules, regulations and procedures to specify conditions for the inclusion of the operator of an Aero-space Object in Near Space activities.

Each Contracting State is required to take appropriate measures to prohibit the deliberate use of any Aero-space Object registered in that State or operated by an operator who has his principal place of business or permanent residence in that State, for any purpose inconsistent with the aims of the Convention.

#### ***Article 19*** ***Licensing of Objects Operated in Near Space***

The Underlying State has a duty of continued supervision and authorisation of activities in its Near Space.

The underlying State shall determine the registration, certification, licensing, astronaut licensing, insurance and operational requirements of Aero-space Objects whose operator is a permanent resident of the said State or has its principal place of business in the State.

#### ***Article 20*** ***Terms for Deployment of Aero-space Objects***

The deployment of Aero-space Objects in Near Space shall be agreed to upon between the Underlying State and the operator, prior to commencement of operation.

#### ***Article 21*** ***Aero-space Objects of Foreign Operators***

Underlying State shall prescribe rules to provide for the Aero-space Objects of foreign operators to operate within its Near Space. Procedures relating to prior notification, approval and duration of deployment in the foreign Near Space shall be prescribed.

In case of a perceived threat to the national safety or security of the Underlying State the permission for deployment of a foreign Aero-space Object shall be denied.

#### ***Article 22*** ***Liability***

In case of damage to the uninvolved public, the operator of the Aero-space Object shall be absolutely liable to a limit to be specified, unless there is proof of gross negligence on the part of the claimant.



## PART V MISCELLANEOUS

### **Article 23** ***Principles Governing State Action in Near Space***

States party to the Convention agree to provide to the extent feasible universal access, highest degree of safety and security, uniformity of standards and international cooperation in the activities relating to their respective Near Space.

### **Article 24** ***Protection of Life and Property on Surface***

With respect to activities in the Near Space, necessary measures shall be taken to ensure effective protection of human life and property on the surface of the Earth and in the airspace. To this end the State parties shall adopt appropriate rules, regulations and procedures to supplement existing national regulations.

### **Article 25** ***Uncontrolled Destructive Re-entry***

The States party to the Convention agree to international coordination, under the supervision of International Civil Aviation Organisation, to provide for rules and principles to mitigate the risk of uncontrolled destructive re-entry of space objects through the Near Space above the international airspace.

### **Article 26** ***Traffic Management of Near Space***

Traffic management of Near Space is to be integrated with the existing air traffic management by the International Civil Aviation Organisation.

States party to the Convention are obliged to develop and de-classify technologies needed to position objects at Near Space levels.

### **Article 27** ***Settlement of Disputes***

Any dispute resulting from the application of this Convention shall be resolved through the established procedures for the peaceful settlement of disputes.

### **Article 28** ***Environmental Pollution***

All States party to the Convention shall take necessary measures to reduce environmental pollution in Near Space and shall adopt appropriate rules, regulations, and procedures for the same. States parties shall also invest the resources to investigate technologies for mitigating pollution due to civil and commercial activities in Near Space.