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International Regulation of Space

Summary

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Summary

This briefing provides an overview of the international legal framework that applies to outer space. With an ever-increasing use of space for both military and commercial purposes, the need to take stock of the existing rules and identify the gaps in regulation is higher than ever before.

The main legal issues for space law today include:

- The definition and delimitation of space, including the question of where space begins in law.
- The application of international law and other specific legal regimes in space.
- The regulation of access to space, through the regulation of radio frequency use and orbital slots.
- The legal monitoring of how space is used and what objects are launched into space, through a regime requiring the registration of space objects.
- The issue of liability in space, and the increasing problem of space debris.
- Initiatives to further enhance the international regulation of space, and close the gaps in the current system.

Where does space law begin?

One of the still hotly-debated topics in international law is the exact definition and delimitation of space.

According to international law, states retain sovereignty over the airspace above their territory – subject to certain aviation laws such as the 1944 Convention on International Civil Aviation (the Chicago Convention). Article 1 of the Chicago Convention makes this clear by providing that every state has complete and exclusive sovereignty over the airspace above its territory.

This exclusive sovereignty does not extend to space, because according to Article 2 of the Outer Space Treaty, outer space is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.

But where does sovereignty over airspace stop, and outer space begin? The exact legal boundary of space is not defined in international law. The practice of states may indicate some options for the boundary of space, but these have not always been consistent.

There is also debate about the use of geostationary orbits – orbits where satellites remain in a fixed point in the sky – because they are a scarce

resource, and need to be shared equitably among all states large and small, regardless of their current space capabilities.

International law and space

General international law principles apply in space. But there have been several treaties and conventions adopted to specifically address and regulate the exploration and use of space internationally.

The Outer Space Treaty

The Outer Space Treaty provides the basic framework on international space law, covering legal foundations such as the peaceful use of space, the freedom of exploration of space, and the basic responsibility and liability of state for launching space objects.

The Rescue Agreement

The Rescue agreement provides that states shall take all possible steps to rescue and assist astronauts in distress and promptly return them to the launching state. It also provides that states shall, on request, provide assistance to launching states in recovering space objects that return to Earth outside the territory of the launching state.

The Liability Convention

This Convention provides for absolute liability on the part of a launching state to pay compensation for damage caused by its space objects on the surface of the Earth or to aircraft. It also makes launching states liable for damage in space, based on a fault of that state. The Convention also details provisions of the settlement of disputes.

The Registration Convention

This Convention lays down the rules applicable for the registration of space objects, and the open and free access of these registers.

The Moon Agreement

This Agreement expands on the Outer Space Treaty specifically regarding the Moon and other celestial bodies. It provides that those bodies should be used exclusively for peaceful purposes, that their environments should not be disrupted, and that the UN should be informed about any station established on those bodies. The Agreement also provides that the Moon and its natural resources are the common heritage of mankind.

Other conventions that are relevant to the regulation of space include those establishing international organisations or institutions with functions relevant to outer space. It is not the purpose for this paper to include all of these here, but these treaties are monitored by the UN Office for Outer Space Affairs, which supervises the status of those agreements and the parties to them.

Adapting space law for the future

As discussed in the Library Briefing Paper on the Militarisation of Space, achieving a consensus on regulation has been a challenge for the international community for a long time. As many analysts have noted, there is a perceived preference, on all sides, for regulation that promotes freedom of their own action, while curtailing the activities and aspirations of others. Support for arms control in space is often seen as contradictory to the actions and rhetoric of the states with leading space capabilities, such as the US, China, and Russia.

In December 2021, the UN General Assembly adopted some notable Resolutions on outer space, as it has done each year. This includes one Resolution drafted and championed by the UK to take stock of existing international, legal and other normative frameworks concerning threats arising from state behaviours with respect to outer space, and to encourage responsible behaviours in space.

At the Conference on Disarmament, Russia and China have been pushing for a legally-binding treaty on preventing an arms race in space since 2008, with an updated draft treaty proposed in 2014. As evidenced through the voting of General Assembly Resolution 76/23, the US, the UK and other aligned states do not support this initiative. It remains to be seen whether any progress will be made on this initiative, as the stalemate on developing the treaty seems to persist.

1 Star laws: The frontier of space

1.1 Where does space law begin?

The Kármán line (100km / 62 miles) is used by the Federation Aéronautique Internationale (FAI) when recognising the achievement of becoming an astronaut. But the US use an altitude of 50 miles / around 80km for recognising astronaut spaceflight.

According to international law, states retain sovereignty over the airspace above their territory – subject to certain aviation laws such as the 1944 Convention on International Civil Aviation (the Chicago Convention). Article 1 of the Chicago Convention makes this clear by providing that every state has complete and exclusive sovereignty over the airspace above its territory.

This exclusive sovereignty does not exist in space, because according to Article 2 of the Outer Space Treaty:[1]

> ARTICLE II: Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.

But where does sovereignty over airspace stop, and outer space begin? The exact legal boundary of space is not defined in international law. The practice of states may indicate some options for the boundary of space, but these have not always been consistent.

The most widely accepted boundary of space is the Kármán line – a point above the Earth originally defined by Hungarian physicist Theodore von Kármán, as the altitude where traditional aircraft can no longer effectively fly.[2] Von Kármán's theory has been used widely to suggest an altitude of 100km (or 62 miles) for the edge of space.[3]

The Kármán line (100km) is used by the Federation Aéronautique Internationale (FAI) when recognising the achievement of becoming an astronaut.[4] But the US military Space Force, US civilian agency NASA, and the

1 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. (Adopted on 13 December 1966 in UN General Assembly Resolution 2222 (XXI), opened for signature 27 January 1967, entered into force 10 October 1967).

2 Although Kármán's theory and calculation is used today, Kármán never formally published the work on this idea, but the theory was followed up in research by others such as US lawyer Andrew G Haley. See for further background, Eric Betz, 'The Kármán Line: Where does space begin?', Astronomy [online], 5 March 2021, (accessed 5 January 2022).

3 Ibid.

4 FAI Astronautic Records Commission (ICARE), "100KM Altitude Boundary for Astronautics", Last update: 21 June 2004, (accessed 5 January 2022).

Federal Aviation Administration use an altitude of 50 miles / around 80km for their respective programmes recognising astronaut spaceflight.[5]

Recent research by Astrophysicist Jonathan McDowell, of the Harvard-Smithsonian Center for Astrophysics, reconsidered the history and calculations behind the original Kármán line and suggested that an altitude of 80km (or 50 miles) is a more appropriate line for the 'edge of space'.[6]

In light of this and other research, the FAI released a statement in 2018 suggesting that these recently published analyses presented "a compelling scientific case for reduction in this altitude from 100km to 80km."[7] At the time of writing, no formal change seems to have been made to the FAI's Sporting Code detailing the requirements for human spaceflight.[8]

For now, the exact legal boundary of space remains unresolved, with the delimitation and definition of 'outer space' still on the agenda of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) since 1967.[9]

1.2 Air law vs space law – Is the boundary of space important?

The boundary of space may become increasingly important because air law (governing the airspace and air transit through airspace) and space law (governing conduct in Outer Space) have some important differences in their rules. Legal issues of liability, aircraft control, innocent passage through airspace or overflight, all depend on whether an aircraft or spacecraft is in outer space or not.

These differences have been outlined in detail (PDF) in an academic report submitted to the UN COPUOS by the Space Safety Law & Regulation Committee of the International Association for the Advancement of Space Safety (IAASS).[10] One key difference outlined in this report is the fact that a

5 See, for example, Federal Aviation Administration, "FAA Ends Commercial Space Astronaut Wings Program, Will Recognize Individuals Reaching Space on Website", 10 December 2021, (accessed 5 January 2022).

6 Jonathan C.McDowell, "The edge of space: Revisiting the Karman Line", (2018) 151 Acta Astronautica 668-677.

7 FAI, "Statement About the Karman Line", 20 November 2018.

8 FAI Sporting Code – Section 8: Astronautic Records (Edition 2009) (opens PDF), 31 August 2017.

9 UN COPUOS Legal Subcommittee, "Historical summary on the consideration of the question on the definition and delimitation of outer space", (18 January 2002) UN Doc A/AC.105/769; and UN COPUOS Legal Subcommittee, "Historical summary on the consideration of the question on the definition and delimitation of outer space", (3 February 2020) UN Doc A/AC.105/769/Add.1.

10 Paul Stephen Dempsey and Maria Manoli, "Suborbital flights and the delimitation of air space vis-à-vis outer space: functionalism, spatialism and state sovereignty", 29 March 2018, UN Doc A/AC.105/C.2/2018/CRP.9 (Link opens PDF).

right of innocent passage through territorial airspace for ascending or descending space objects has not been established under international law.[11]

This means that any state who seeks to launch an object to space, and needs to fly through the sovereign airspace of another state, is subject to air law rather than space law before the object reaches outer space, and as the object or spacecraft descends back to Earth. While the International Air Services Transit Agreement does provide for some freedom of overflight, this does not have universal acceptance.[12]

The IAASS report also succinctly outlines the key differences and similarities between air law and space law:

Main Differences between air law and space law Regimes

Air Law	Space Law
Applies to "air space"	Applies to "outer space"
Applies to "aircraft"	Applies to "space objects"
States enjoy "complete and exclusive sovereignty" over their territorial air space	State sovereignty over outer space is prohibited
Imposes liability on the airline, or the aircraft operator	Imposes liability and oversight responsibility upon the state
Requires states to certify and register aircraft	Creates an international registration regime
Requires states to regulate safety, navigation, and security	No universal safety, navigation or security standards
Requires States to regulate noise and emissions	Environmental standards are found in guidelines and non-binding commitments

Source: Paul Stephen Dempsey and Maria Manoli, "Suborbital flights and the delimitation of air space vis-à-vis outer space: functionalism, spatialism and state sovereignty", 29 March 2018, UN Doc A/AC.105/C.2/2018/CRP.9 (Link opens PDF), p 10.

11 Ibid, at 22.

12 Jae Woon Lee, "Revisiting Freedom of Overflight in International Air Law: Minimum Multilateralism in International Air Transport", 38(4) Air and Space Law 351.

Key terms

Space tourism:
Private companies offering space flights for leisure. E.g. Virgin Galactic and Blue Origin

Suborbital flights:
Spaceflight in which the spacecraft reaches outer space but does not reach an altitude or speed to enter Earth's orbit.

Land-locked states:
States with only land boarders with other states, making spaceflight from their territory may enter the airspace of a neighbouring state.

The different approaches to these issues in air law vs space law have become more important to be aware of in recent years because of several advancements in space operations internationally, including space tourism flights, increasing numbers of 'suborbital' flights, and developments in the ability of land-locked states to launch their own space objects.

The US has previously opposed any definition or delimitation of outer space in international law, believing there to be no real issues without a set boundary. In 2001, the US told COPUOS that:

> Our position continues to be that defining or delimiting outer space is not necessary. No legal or practical problems have arisen in the absence of such a definition. On the contrary, the differing legal regimes applicable in respect of airspace and outer space have operated well in their respective spheres. The lack of a definition or delimitation of outer space has not impeded the development of activities in either sphere.[13]

The US argued that if any practical problems do arise, then any definition of the boundary of space is limited by the state of technology at that time. The US pointed to advances in aircraft technology allowing increased altitudes of sustained flight, and advancements in spacecraft that have lowered the height of orbital flight, urging that "the Legal Subcommittee should not take on this issue until practical problems have been identified so as to make it absolutely necessary to do so."[14]

While the US noted these advancements in technology as a reason not to define the edge of space, experts have pointed to these advancements as a reason for requiring legal certainty.[15] In the UK's 2010 submission to COPUOS, the representative said that the UK:

> … anticipate that the development of space transportation systems functioning seamlessly between airspace and outer space, relying on lift to fly through the air for part of their flight profile, will create uncertainties about the legal regime applicable to them. In particular, the distinct liability regimes applicable to each may be conflicting.[16]

On the other hand, the IAASS has indicated that even with a defined boundary of space at 100km / 62 miles, this would not resolve some of the problems raised by the differences between air law and space law, especially for

13 US Department of State (2009-2017), "U.S. Statement, Definition and Delimitation of Outer Space And The Character And Utilization Of The Geostationary Orbit, Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space at its 40th Session in Vienna from April", Archived Content (accessed 5 January 2022). The author has not found any clear public US statement on this position since.

14 Ibid.

15 Paul Stephen Dempsey and Maria Manoli, "Suborbital flights and the delimitation of air space vis-à-vis outer space: functionalism, spatialism and state sovereignty", 29 March 2018, UN Doc A/AC.105/C.2/2018/CRP.9 (Link opens PDF), 24-25.

16 UN COPUOS, "Questions on the definition and delimitation of outer space: replies from Member States", 9 December 2010, UN Doc A/AC.105/889/Add.8.

smaller and land-locked states.[17] This is because, the IAASS argues, these states would have issues with launching space missions or suborbital transportation, because this could mean that these missions would be at the discretion of any state whose airspace the spacecraft may fly through.[18]

For this, and other reasons, the IAASS and other experts suggest alternative ways of regulating the overlapping issues between sovereign airspace and space. This alternative suggestion includes arguments to regulate 'near space'[19] in international law. During the last session in COPUOS, however, some states did express the view that no "grey zone" between airspace and outer space should be established, including for the benefit of suborbital flights.[20]

1.3 Geostationary orbits

Geostationary Orbit: When satellites are placed into an orbit above the equator where they effectively remain above the same place above the Earth.

Another disagreement over the boundaries of space law is over the use of geostationary orbits. Geostationary orbits are orbits that allow a satellite to remain in a fixed point above the Earth. Such an orbit is only possible above the equator, at a height of 22,236 miles (35,786 km). There are therefore only a limited number of satellites that can be in such an orbit, especially when the safety of other satellites and the need to avoid radio interference is considered.

Some equatorial states have previously claimed geostationary orbits to be part of their national resources, and claimed that their sovereignty extends to such orbits. Because a satellite would remain above that state permanently, those states claim to have exclusive control over any satellites placed above their state in such an orbit.

In 1976, the equatorial states of Brazil, Colombia, Congo, Ecuador, Indonesia, Kenya, Uganda, and Zaire (now Democratic Republic of the Congo), agreed the Bogotá Declaration on geostationary orbits.[21] In this Declaration, the states claimed the following:

- That geostationary orbit is a 'physical fact' of the Earth because of its exclusive dependence on Earth's gravity;
- That, because of this, geostationary orbit **must not be considered part of Outer Space**;
- That these orbits are a **scarce natural resource**;

17 Ibid, 24.
18 Ibid, 24-25.
19 This would be the regulation of operations or missions that take place above commercial airspace but below a set 'Outer Space'.
20 UN COPUOS, Report of the Legal Subcommittee on its sixtieth session, held in Vienna from 31 May to 11 June 2021, (24 June 2021) UN Doc A/AC.105/1243, para 73.
21 The text of the Declaration has been reproduced by the Japanese Space Agency, JAXA: Declaration of the First Meeting of Equatorial Countries, 3 December 1976, (accessed 5 January 2022).

- That the segments of geostationary orbit above these states **are part of the territory of those Equatorial states and their national sovereignty**.

The starkest arguments from this declaration is that geostationary orbits are not part of Outer Space, and the states' claims of national sovereignty over those orbits. The declaration argues that there is "no valid or satisfactory definition of outer space" which may be advanced to support the argument that the geostationary orbit is part of outer space.[22]

The response of the international community to this Declaration is covered in detail in academic research from that time.[23] In general, the Declaration was largely rejected in the international community, and is not considered to reflect international law.[24]

Some states and authors also suggest that this attempted claim of sovereignty is clearly incompatible with Article 2 of the 1967 Outer Space Treaty which clearly states that outer space "is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[25]

These claims over geostationary orbits do not seem to have been repeated in the same way by Equatorial states since, but some states have still called for equitable access to the orbit as a natural resource.[26]

The use of geostationary orbits has been a regular issue on the agenda of the UN COPUOS, where the Legal Subcommittee of that body has the mandate to consider ways and means to ensure the rational and equitable use of the geostationary orbit without prejudice to the role of the International Telecommunication Union (ITU).[27] The role of the ITU in ensuring the safety and equality of orbits is set out further below.

22 Ibid.

23 See, for example, Stephen Gorove, "The Geostationary Orbit: Issues of Law and Policy", 73(3) American Journal of International Law 444.

24 Ibid.

25 See, for example, US Department of State (2009-2017), "U.S. Statement, Definition and Delimitation of Outer Space And The Character And Utilization Of The Geostationary Orbit, Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space at its 40th Session in Vienna from April", Archived Content (accessed 5 January 2022).

26 UN COPUOS, Report of the Legal Subcommittee on its sixtieth session, held in Vienna from 31 May to 11 June 2021, (24 June 2021) UN Doc A/AC.105/1243, para 79-84.

27 Ibid.

2 International Law in space

2.1 Sources of space law

As outlined below, general international law principles apply in space. However there have been several treaties and conventions adopted to specifically address and regulate the exploration and use of space internationally.

- The Outer Space Treaty[28]

  The Outer Space Treaty provides the basic framework on international space law, covering legal foundations such as the peaceful use of space, the freedom of exploration of space, and the basic responsibility and liability of states for launching space objects.

- The Rescue Agreement[29]

  The Rescue agreement provides that states shall take all possible steps to rescue and assist astronauts in distress and promptly return them to the launching state. It also provides that states shall, on request, provide assistance to launching states in recovering space objects that return to Earth outside the territory of the launching state.

- The Liability Convention[30]

  This Convention provides for absolute liability on the part of a 'launching state' to pay compensation for damage caused by its space objects on the surface of the Earth, or to aircraft. It also makes launching states liable for damage in space, based on a fault

[28] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. (Adopted on 13 December 1966 in UN General Assembly Resolution 2222 (XXI), opened for signature 27 January 1967, entered into force 10 October 1967).

[29] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (adopted in UNGA Res 2345 (XXII), opened for signature on 22 April 1968, entered into force on 3 December 1968).

[30] Convention on International Liability for Damage Caused by Space Objects (adopted in UNGA Resolution 2777 (XXVI), opened for signature on 29 March 1972, entered into force on 1 September 1972) 961 UNTS 187.

of that state. The Convention also details provisions of the settlement of disputes.

- The Registration Convention[31]

  This Convention lays down the rules applicable for the registration of space objects, and the open and free access of these registers.

- The Moon Agreement[32]

  This Agreement expands on the Outer Space Treaty specifically regarding the Moon and other celestial bodies. It provides that those bodies should be used exclusively for peaceful purposes, that their environments should not be disrupted, and that the UN should be informed about any station established on those bodies. The Agreement also provides that the Moon and its natural resources are the common heritage of mankind.

Other conventions that are relevant to the regulation of space include those establishing international organisations or institutions with functions relevant to outer space. It is not the purpose for this paper to include all of these here, but these treaties are overseen by the UN Office for Outer Space Affairs, who monitors the status of those agreements and the parties to them.[33]

31 Convention on Registration of Objects Launched into Outer Space, (adopted in UNGA Res 3235 (XXIX), opened for signature on 14 January 1975, entered into force on 15 September 1975), 1023 UNTS 15.

32 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, (adopted 5 December 1979 in UNGA Res 34/68, entered into force 11 July 1984).

33 UN Office for Outer Space Affairs, Status of International Agreements relating to Activities in Outer Space, accessed 5 January 2022.

2.2 General principles in space

A customary rule of international law is a rule that may or may not be in a treaty, and is based on two elements: the consistent practice of states (state practice) and their belief that such practices amount to a legal obligation or right (opinio juris).

Once an object crosses the boundary of space, most general customary rules of international law apply. The UN General Assembly adopted Resolution 1721 (XVI) in 1961, which stated two general principles:

- International law, including the Charter of the United Nations, applies to outer space and celestial bodies;
- Outer space and celestial bodies are free for exploration and use by all States in conformity with international law and are not subject to national appropriation.

This was later reiterated in Articles II and III of the Outer Space Treaty:[34]

- **ARTICLE II**: Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.
- **ARTICLE III**: States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international co-operation and understanding.

2.3 Law and the militarisation of space

The growing militarisation of space has been covered in detail in the Library Briefing Paper on the Militarisation of Space.[35]

In terms of the rules applicable to the militarisation of space, the general principles outlined above mean that any customary international law principles that apply to the use of force and use of weapons on Earth would also apply in space, including the general prohibition of force in international law (in Article 2(4) of the UN Charter) and principles of international humanitarian law.

While these principles may prevent unprovoked or illegal military action from space, or in space, between states, they do not provide for the complete demilitarisation of space altogether. The right of self-defence in Article 51 of the UN Charter may well apply in space too.

[34] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. (Adopted on 13 December 1966 in UN General Assembly Resolution 2222 (XXI), opened for signature 27 January 1967, entered into force 10 October 1967).

[35] Commons Library Research Briefing CBP-9261, The militarisation of space, 14 June 2021.

There are also regulations for space law concerning militarisation of specific parts of space and the use of specific weapons. For example, Article IV of the Outer Space Treaty provides that **the moon and other celestial bodies** shall only be used exclusively for **peaceful purposes**:

> The moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the moon and other celestial bodies shall also not be prohibited.

The treaty does not define what is meant by 'peaceful purposes'. This was clarified in part by Article III of the Moon Agreement,[36] which prohibits threats or uses of force from the moon, and the placing of nuclear weapons in orbit around the moon:

1. The moon shall be used by all States Parties exclusively for peaceful purposes.

2. Any threat or use of force or any other hostile act or threat of hostile act on the moon is prohibited. It is likewise prohibited to use the moon in order to commit any such act or to engage in any such threat in relation to the earth, the moon, spacecraft, the personnel of spacecraft or man-made space objects.

3. States Parties shall not place in orbit around or other trajectory to or around the moon objects carrying nuclear weapons or any other kinds of weapons of mass destruction or place or use such weapons on or in the moon.

4. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on the moon shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration and use of the moon shall also not be prohibited.

However, there are only 18 parties to the Moon Agreement, and these notably exclude the UK, the US, Russia, and China.

But when it comes to placing weapons or military equipment into orbit around the earth, the restrictions on militarisation are limited. **Article IV** of the Outer Space Treaty Provides:

[36] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, (adopted 5 December 1979 in UNGA Res 34/68, entered into force 11 July 1984).

> States Parties to the Treaty undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.

This means that currently only nuclear weapons must not be placed into orbit around the earth. Space law still covers the general prohibition of force from satellites in orbit, but it does not seem to prohibit the placing of other weapons and military equipment into orbit.

2.4 Resolutions on legal principles on space

As well as the treaties and principles of international law, the international community has on occasion adopted Resolutions within the UN General Assembly outlining key principles relevant to outer space. These include:

- The Declaration of Legal Principles[37]
  - Outlining that existing general principles of international law and customary international law apply in outer space.
- Broadcasting Principles[38]
  - Details principles on international direct television broadcasting by satellite, including on international cooperation, state responsibility, and copyright.
  - Also covers and encourages promoting the free dissemination and mutual exchange of information and knowledge in cultural and scientific fields; assisting in educational, social and economic development, particularly in the developing countries; and enhancing the qualities of life of all peoples.
  - Upholds sovereignty, and due respect to the political and cultural integrity of states.
- Remote Sensing Principles[39]
  - Outlines that remote sensing activities shall be carried out for the benefit and in the interests of all countries.
  - Promotes international cooperation and data sharing, where appropriate.

Remote Sensing: the use of satellite technology to monitor and detect occurrences on the Earth surface or atmosphere. Can include the taking of high-resolution pictures, or use of advanced sensing technology.

[37] UNGA Res 1962(XVIII), Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space, 13 December 1963.

[38] UNGA Res37/92, The Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting, 10 December 1982.

[39] UNGA Res 41/65, The Principles Relating to Remote Sensing of the Earth from Outer Space, 3 December 1986.

  - Promotes the protection of the Earth's environment, the detection and monitoring of natural disasters, and the needs of developing countries in this regard.
  - Does not cover military / dual use remote sensing technology.

- Nuclear Power Sources Principles[40]

  - Details principles applicable to activities involving the use of nuclear power sources in outer space.
  - Includes, primarily, that the use of nuclear power sources in outer space shall be restricted to those space missions which cannot be operated by non-nuclear energy sources in a reasonable way.

- The Benefits Declaration[41]

  - Provides for principles that the exploration of space shall be carried out for the benefit and in the interest of all States, irrespective of their degree of economic, social or scientific and technological development, and shall be the province of all mankind. Particular account should be taken of the needs of developing countries.

[40] UNGA Res 47/68, The Principles Relevant to the Use of Nuclear Power Sources in Outer Space, 14 December 1992.

[41] UNGA Res 51/122, The Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries, 13 December 1996.

3 Regulating access to space

3.1 Role of the International Telecommunication Union

The International Telecommunication Union (ITU) has a role in controlling and regulating the use of radio communication and orbits for satellites around the Earth. The ITU Constitution sets out that the regulation of radiocommunications should "ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including those using the geostationary-satellite or other satellite orbits".[42] In doing so, the ITU must bear in mind "the particular concerns of developing countries."

Article 44 of the ITU Constitution goes further to oblige Member States to prioritise use of radio frequencies and spectrum to be used to "the minimum essential" to provide the necessary services, and apply technical advances in these technologies as soon as possible. Article 44 also requires Member States to keep in mind the following:

- That radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources;
- That these resources must be used rationally, efficiently, and economically;
- That this be done so that groups of countries may have equitable access to these orbits and frequencies;
- That the special needs of developing countries and the geographical situations of particular countries be taken into account.[43]

The ITU governs these technical aspects though the Radio Regulations, which provide the rules and procedures for allocating and utilising certain radio frequencies and orbits in space, and maintaining a record of the assigned frequencies on the **Master International Frequency Register (MIFR)**.[44] Planned and existing satellite orbits are included on the **Space Network List (SNL).**

[42] ITU Constitution, Article 12(1).

[43] ITU Constitution, Article 44.

[44] A document on the ITU website provides an overview of the Regulatory Framework for satellites: ITU, "ITU Radio Regulatory Framework for Space Services", undated (accessed 5 January 2021), (link opens PDF); see also, Joanne Wheeler, "The Space Law Review: International Telecommunication Union and Access to Spectrum", *The Law Reviews,* 9 December 2021.

Geostationary satellites are largely the main orbit and frequencies used by national telecommunication and broadcasting operators.

In the 1985 and 1989 meetings of the ITU's Radiocommunications Conference, a series of changes did reserve, for every state internationally, frequencies and the right to predetermined geostationary orbit slots.[45] This planning procedure has been set out by the ITU:

> The progressive exploitation of the orbit/frequency resources and the resulting likelihood of congestion of the geostationary-satellite orbit prompted ITU Member countries to consider more and more seriously the question of equitable access in respect of the orbit/spectrum resources. This resulted in the establishment (and introduction into the ITU regulatory regime) of frequency/orbital position plans in which a certain amount of frequency spectrum is set aside for future use by all countries, particularly those which are not in a position, at present, to make use of these resources. These plans, in which each country has a predetermined GSO orbital position associated with the free use, at any time, of a certain amount of frequency spectrum, together with the associated procedures, guarantee for each country equitable access to the spectrum/orbit resources, thereby safeguarding their basic rights. Such plans govern a considerable part of the frequency bands available for the space communication services.[46]

However, the majority of ITU's allocations are still made largely on a first come, first served basis,[47] subject to requirements of coordination and advance notification depending on the circumstances.[48] Some states and academics have pointed out that this could undermine the strive for equitable access to space for developing states because larger states will be able to access these resources more quickly than states without their own space capabilities.[49] Indeed, the previous approach of the ITU was cited by Equatorial states in the Bogotá Declaration as a reason for seeking their own sovereignty over geostationary orbits.[50]

Domestic operators must apply for frequency and orbital allocations through their respective national administrator, such as OFCOM in the UK.[51]

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45 The number of orbital positions allocated depends on the type of satellite system, and the size of the state concerned. See, ITU, Space Plans, (accessed 5 January 2022).

46 ITU, "ITU Radio Regulatory Framework for Space Services", undated (accessed 5 January 2021), p2, (link opens PDF).

47 See, for example, Chloe Billing, "There's a parking crisis in space – and you should be worried about it", The Conversation [online], 29 September 2017; ITU, "ITU Radio Regulatory Framework for Space Services", undated (accessed 5 January 2021), p4, (link opens PDF).

48 Coordination is a requirement to enter negotiations with the national administrations concerned. See further, Joanne Wheeler, "The Space Law Review: International Telecommunication Union and Access to Spectrum", *The Law Reviews,* 9 December 2021.

49 Njeri Purity, "Spectrum & Orbital Slotting – A case for African Countries", Space in Africa [online], 3 December 2020; Iulia-Diana Galeriu, "'Paper Satellites' and the Free Use of Outer Space", GlobaLex, April 2018.

50 Reproduced by the Japanese Space Agency, JAXA: Declaration of the First Meeting of Equatorial Countries, 3 December 1976, (accessed 5 January 2022).

51 OFCOM, Satellite filings (accessed 5 January 2022).

The ITU framework explicitly excludes military radio installations under **Article 48**, and therefore also military satellites, subject to the limitation that these installations must, so far as possible, observe the ITU's rules on giving assistance in case of distress and on measures to be taken to prevent harmful interference.[52]

Paper satellites: The Tonga example

The practice of allocating 'paper satellites' is where an application for orbital positions is made purely to reserve those orbits without any real intention to use them.

In 1990, the Tongan Government applied for 16 geostationary orbital positions with the ITU and, after reducing its request, was allocated 6 positions in 1991.[53] Tonga did not have any real plan to actually launch satellites of its own, and instead allowed a private company to rent slots to a US-based company, and auctioned off the remaining slots for $2 million per year. [54]

The actions of the Tongan government came under heavy criticism from some states. For example, Colombia argued that Tonga was undermining the principles underlying the ITU's regulations at that time, and that this was "a transparent attempt to secure as many orbital slots as possible to trade as a commodity for pecuniary gain."[55] Intelsat,[56] an international organisation at the time, claimed that Tonga's conduct was tantamount to "financial speculation in the geostationary orbit," in violation of the ITU regulations.[57] Tonga insisted the government acted within the rules.[58]

The ITU reviewed its internal processes for allotting orbital slots in 1995-1997,[59] and has made a number of changes to try to tackle the problem of 'paper satellites'.[60] One notable substantive change to the rules came when

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52 ITU Constitution, Article 48: "Member States retain their entire freedom with regard to military radio installations."

53 This incident is covered in detail in: Jannat C. Thompson, "Space for Rent: The International Telecommunications Union, Space Law, and Orbit/Spectrum Leasing", (1996) 62(1) Journal of Air Law and Commerce 279.

54 Ibid, p280-281.

55 As quoted in: Jannat C. Thompson, "Space for Rent: The International Telecommunications Union, Space Law, and Orbit/Spectrum Leasing", (1996) 62(1) Journal of Air Law and Commerce 279, p281-282.

56 Intelsat was, at the time, a treaty-based international organisation (the International Telecommunications Satellite Organisation) until it was privatised in 2001: see, Greg Wood, "Satellite service set for privatisation", BBC News [online], 19 July 2001.

57 As quoted in: Jannat C. Thompson, "Space for Rent: The International Telecommunications Union, Space Law, and Orbit/Spectrum Leasing", (1996) 62(1) Journal of Air Law and Commerce 279, p281.

58 Ibid.

59 Ibid, p282-283.

60 See further: Iulia-Diana Galeriu, "'Paper Satellites' and the Free Use of Outer Space", GlobaLex, April 2018.

the 2019 ITU World Radiocommunication Conference (WRC-19) adopted a new regulatory approach to satellite constellations (see below).

3.2 Satellite constellations

Because of the need to preserve the limited number of geostationary orbital slots, some states and private operators have developed satellite networks that can operate at either Medium Earth Orbit, or Low Earth Orbit. This essentially means that the satellites will not remain in a fixed point above the Earth, but will move through the sky on their orbits. To maintain constant contact with the satellite network from the ground, this would require multiple satellites (a constellation) to be launched to maintain continuous contact or coverage.

These types of satellite networks are currently being used, for example, to provide global internet coverage from a network of satellites. Examples include: SpaceX's Starlink, OneWeb, and Amazon's Project Kuiper.

But the use of potentially thousands of satellites to provide such services also means that numbers of available orbital slots are reducing. Some experts have therefore raised the question as to how these constellations fit within the current regulatory framework.[61]

The 2019 ITU World Radiocommunication Conference (WRC-19) adopted a new regulatory approach to satellite constellations. Under this approach, the satellite constellation must be deployed within set timeframes and phases, and if the operators fail to launch enough satellites by these milestones, then they will have more limited rights for utilising the relevant radio spectrum / orbits.[62] The ITU says that this approach to satellite constellations will:

- help ensure that ITU's Master International Frequency Register (MIFR) reasonably reflects the actual deployment of such satellite systems;
- help to prevent 'spectrum warehousing', i.e. determine which applicants are actually using the spectrum and orbital slots they request.[63]

61 See, for example, Damian M. Bielicki, "Legal Aspects of Satellite Constellations", (2020) 45(3) Air and Space Law 245.

62 Ibid, p255.

63 ITU Press Release, "ITU World Radiocommunication Conference adopts new regulatory procedures for non-geostationary satellites", 20 November 2019.

4 Monitoring the use of space: Registration of space objects

Apart from the regulation and allocation of orbital slots and frequencies by the ITU, international law also requires the registration of all objects launched into space.

Initially, UN General Assembly Resolution 1721 (XVI) in 1961 called upon states launching objects into orbit or beyond to register these launches with the UN Committee on the Peaceful Uses of Outer Space. It also requested the UN Secretary General to maintain a public register of such launches.[64]

Eventually, after some years of discussion between states, the Convention on Registration of Objects Launched into Outer Space (the Registration Convention) was adopted by the General Assembly in November 1974.[65] As of January 2022, the Convention had 71 states parties.[66]

Under the Convention, a 'launching state' must maintain a registry of space objects that it launches. This state must then provide the UN SecretaryGeneral with specific information about the space object as soon as practicable.[67] The launching state must also inform the Secretary General about any space object that leaves its orbit of the Earth.[68]

A 'launching state' is:

- A state which launches or procures the launching of a space object;
- A state from whose territory or facility a space object is launched.[69]

If there is more than one launching state then, according to Article II, they shall jointly determine which one of them shall register the object. This determination does not affect, and is without prejudice to, agreements between those states as to the jurisdiction and control over the space object and its personnel. This is to be read in light of Article VIII of the Outer Space Treaty which provides that the state of registry "shall retain jurisdiction and

64 UNGA Res 1721 (XVI), International Co-operation in the Peaceful Uses of Outer Space, 20 December 1961, Section B.

65 Convention on Registration of Objects Launched into Outer Space, (adopted in UNGA Res 3235 (XXIX), opened for signature on 14 January 1975, entered into force on 15 September 1975), 1023 UNTS 15.

66 Ibid, UNTS Record.

67 Registration Convention, Article IV.

68 Registration Convention, Article II(2).

69 Registration Convention, Article I.

control over such object, and over any personnel thereof, while in outer space or on a celestial body."

Space objects are then maintained on a public and open access register, the UN Register of Objects Launched into Outer Space, responsibility for which the UN Secretary General delegated to the UN Office for Outer Space Affairs.[70] The Outer Space Objects Index is a tool that provides access to this register, and also includes objects that have not yet been registered with the United Nations.[71]

The UK maintains a national registry of space objects where the UK has taken the role of the 'launching state', as required by the Registration Convention and also s.7 of the Outer Space Act 1986.[72]

The Registration Convention does not yet have universal acceptance by states – but the main states who could be considered 'launching states' are parties to the Convention. Some states who do have space activities, but are not parties to the Registration Convention, have still submitted information to register their space objects based on the initial General Assembly Resolution 1721 (XVI) from 1961.[73]

A more recent study on the effectiveness of the Registration Convention noted that satellites are usually registered within one to two years of launch, but there have been over 100 examples of space objects that have been registered after a delay of 10 years or longer.[74] This study argues:

> The combination of late and infrequent submission, and long delays within the UN system before public accessibility, must be seen as seriously compromising the effectiveness of the Convention. In the era of the Internet, "as soon as practicable" should be a matter of hours or days, not months or years.[75]

4.1 Definition of space objects

The only definition provided for 'space object' in Article I of the Registration Convention is that a 'space object' includes "component parts of a space object as well as its launch vehicle and parts thereof."

Importantly, the Convention makes no distinction between space objects launched for space exploration, and space objects launched for military purposes. According to the broad wording of the Convention, all space

70 UN Office for Outer Space Affairs, UN Register of Objects Launched into Outer Space.
71 UN Office for Outer Space Affairs, Outer Space Objects Index.
72 UK Space Agency, UK Registry of Space Objects, accessed 5 January 2022.
73 Ram S. Jakhu, Bhupendra Jasani, Jonathan McDowell, "Critical issues related to registration of space objects and transparency of space activities", (2017) 143 Acta Astronautica 406.
74 Ibid, p409 (p10 in deposited document).
75 Ibid, p410 (p10 in deposited document).

objects should be registered, and include information as to the 'general function' of the object (Article IV(1)(e)).

This particular requirement seems to be the most abused obligation under the Convention, because research has revealed that military and intelligence satellites are rarely acknowledged as such.[77]

"States have often provided very vague or sometimes misleading information, which may conceal or obfuscate the real, actual or main purpose of the space object."[76]

Practice of registration of military and intelligence satellites[78]

Some states have registered satellites that are reported to have military or intelligence-gathering purposes, but the purpose given when registering the object does not always acknowledge this.

For example, a US satellite launched in August 2013 was reportedly a military reconnaissance satellite, and the registered purpose of this satellite by the US was "spacecraft engaged in practical applications and uses of space technology such as weather or communications."[79] The registration of US satellites that are classified or secret also seem to have a pattern of being registered with their initial orbital parameters, rather than the actual orbit that the satellites eventually use – one example, took 24 years for the US to acknowledge its existence, and was registered without the orbital information as required.[80] Some space objects were also registered by the US as 'space debris', but were observed by experts to be capable of manoeuvring.[81]

Russia tends to register its military or intelligence satellites as "Intended for assignments on behalf of the Ministry of Defence of the Russian Federation." One notable example includes the Cosmos-2542 / Kosmos-2542 satellite, which is again registered as a Russian Ministry of Defence satellite. This satellite has been reported by the MIT Technology Review as closely shadowing a US spy satellite, at less than 186 miles (300 km) apart, with some experts speculating that it could be trying to determine the aperture and resolution of the cameras on the US satellite, and possibly even the computer processing on the US satellite.[82]

76 Ibid, p412 (p16 in deposited document).
77 Ibid, p411 (p14 in deposited document).
78 This information is based upon research in: Ram S. Jakhu, Bhupendra Jasani, Jonathan McDowell, "Critical issues related to registration of space objects and transparency of space activities", (2017) 143 Acta Astronautica 406.
79 Ibid.
80 Ibid, p411 (p16 in deposited document).
81 Ibid, p411 (p14 in deposited document).
82 Neel V. Patel, "A Russian satellite is probably stalking a US spy satellite in orbit", MIT Technology Review [online], 3 February 2020.

In some other examples, Chine has registered suspected intelligence satellites as simply for "remote sensing",[83] while France openly registered its Electronic Intelligence Satellite (ELISA) as a "listening system microsatellite".[84]

Small and very small satellites

Increasingly, launching states have sent payloads of very small satellites into space. Small satellites – also called mini, nano, pico, or femto satellites depending on their size – can be as small as only a few centimetres wide, and as light as 100-200g.[85] The challenge with these satellites is not only the fact that they can be difficult to track because they are so small, but also the danger they could pose to larger satellites if not properly planned and monitored. Each small satellite could also be considered an individual 'space object' for the purposes of the Registration Convention.

In 2015, the UN Office for Outer Space Affairs and the International Telecommunication Union jointly released guidance on the registration and management of such small satellites.[86]

Registration of satellite constellations

Similarly, for 'satellite constellations' as outlined above, Bielicki notes that the practice of states in registering these constellations has been inconsistent.[87] Some states have registered each satellite in the constellation individually, whereas others have simply registered the cluster jointly.[88]

The UN General Assembly had addressed the issue of joint launches of space objects in Resolution 62/101, where it recommended that in cases of joint launches of space objects, each space object should be registered separately and space objects should be included in the appropriate registry of the state responsible for the operation of the space object under article VI of the Outer Space Treaty.[89]

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83 See, for example, Chine, Note verbale dated 19 May 2014 from the Permanent Mission of China to the United Nations (Vienna) addressed to the Secretary-General, 15 July 2014, UN Doc ST/SG/SER.E/714.

84 See, for example, France, Note verbale dated 28 February 2012 from the Permanent Mission of France to the United Nations (Vienna) addressed to the Secretary-General, 26 July 2012, UN Doc ST/SG/SER.E/643.

85 Ram S. Jakhu, Bhupendra Jasani, Jonathan McDowell, "Critical issues related to registration of space objects and transparency of space activities", (2017) 143 Acta Astronautica 406, p413 (p19 in deposited document).

86 UN COPUOS, Guidance on Space Object Registration and Frequency Management for Small and Very Small Satellites, 13 April 2015, UN Doc A/AC.105/C.2/2015/CRP.17.

87 Damian M. Bielicki, "Legal Aspects of Satellite Constellations", (2020) 45(3) Air and Space Law 245, p.254.

88 Ibid.

89 UNGA Res 62/101, Recommendations on enhancing the practice of States and international intergovernmental organizations in registering space object, 10 January 2008, UN Doc A/RES/62/101, para 3(c).

5 Space debris and liability

5.1 Responsibility vs liability

Key terms

State Responsibility

The international legal framework for determining when a state is legally responsible for internationally wrongful acts. Includes the rights and remedies available for injured states to invoke responsibility.

Internationally wrongful acts

Defined in international law as a breach of an international obligation.

International law provides two avenues for holding a state to account for wrongful acts committed in, or from, space, or damage caused by a launching state's space objects.

One avenue is via international **responsibility** – the general international rules outlining when states will be legally responsible for internationally wrongful acts.

Another avenue is via rules of **liability** – specific rules providing for those who will be liable for damages caused by a space object.

Article VI of the Outer Space Treaty provides for the **international responsibility** of states in outer space, with the following rules:

- States bear international responsibility for national activities in outer space, whether such activities are carried out by governmental agencies or by non-governmental entities.
- States are also responsible for assuring that national activities are carried out in conformity with the treaty.
- The activities of non-governmental entities in outer space, including the moon and other celestial bodies, shall require authorisation and continuing supervision by the appropriate State Party to the Treaty.
- When activities are carried out in outer space by an international organisation, responsibility for compliance with this Treaty shall be borne both by the international organisation and by the member states of that organisation.

On the other hand, the Outer Space Treaty also provides for **liability** in **Article VII**, where it states that each launching state is "internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air or in outer space, including the moon and other celestial bodies."

Liability for damage by space objects has been further regulated in the Liability Convention of 1972.[90] In this Convention, **Article II** stipulates:

[90] Convention on International Liability for Damage Caused by Space Objects (Adopted in UNGA Resolution 2777 (XXVI), opened for signature on 29 March 1972, entered into force on 1 September 1972) 961 UNTS 187.

> A launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the earth or to aircraft flight.

This absolute liability applies to damage caused either **on earth, or to aircraft not in outer space.** The term 'launching state' has the same meaning as in the Registration Convention. Under **Article I** of the Liability Convention, a 'launching state' is:

- A state which launches or procures the launching of a space object;
- A state from whose territory or facility a space object is launched.

For damage caused beyond earth, in outer space, **Article III** provides that liability is not absolute, but is based on fault – only if the damage is due to the state's fault or the fault of persons for whom it is responsible.

The key difference between responsibility and liability is that **responsibility** is based on the **national activities** of a state in outer space, whereas **liability** is based on **damage caused** by a space object of a launching state.[91]

While liability provides the need for compensation to be paid to the party who has suffered damaged by a space object, the general principles of international responsibility provide a number of consequences and remedies available for an internationally wrongful act. These consequences have been outlined in detail in the Library Briefing Paper on the Principles of International Law, and include:

- An obligation to cease the act;
- An obligation to offer guarantees of non-repetition, if appropriate;
- The following remedies, where appropriate in each situation:
  - **Restitution:** to re-establish the situation that existed before the breach, so long as this is not impossible or disproportionate;
  - **Compensation:** to pay compensation for financially assessable damage;
  - **Satisfaction:** an acknowledgement of the breach, an apology, or another appropriate alternative to the satisfaction of the victim state or party.
  - **Countermeasures**: a legal right of the victim state or party to take action that may normally be illegal in order to induce the wrongdoing state to adhere to its obligations. This usually includes the use of sanctions, but comes with a number of **safeguards** to prevent the abuse of this avenue.[92]

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91 Damian M. Bielicki, "Legal Aspects of Satellite Constellations", (2020) 45(3) Air and Space Law 245, p250-251.

92 Commons Library Research Briefing CBP-9010, Principles of International Law: a brief guide, 21 September 2020.

Liability example: USSR Cosmos 954 debris over Canada

Kosmos 954 / Cosmos 954 was a Soviet nuclear reconnaissance satellite, powered by a nuclear reactor working on enriched uranium. On 24 January 1978 the satellite decayed out of orbit, and entered Earth's atmosphere, spreading radioactive debris across Canadian territory.

Canada initially claimed $6 million (CAD) compensation from the Soviet Union. It based its claim on the Liability Convention, and also the general principles of international law.

But the incident did not ultimately go through the dispute settlement process outlined in the Liability Convention. Eventually, Canada and the Soviet Union settled the claim, with the Soviet Union agreeing compensation of $3 million (CAD).

Source: Canada, Settlement of Claim between Canada and the Union of Soviet Socialist Republics for Damage Caused by "Cosmos 954" (Released on 2 April , 1981), as reproduced by the Japanese Space Agency, JAXA.

One of the future challenges for the regulation of liability in space is the increasing use of suborbital flights – often used by private companies offering space flights for leisure, for example Virgin Galactic and Blue Origin. Depending on the definitive legal boundary of space, as outlined above, some of these suborbital flights may actually never reach 'outer space', and therefore would fall under the liability rules of air law, rather than space law.[93]

This is important because in air law, depending on the circumstances, liability can be on the airline, or the aircraft operator, whereas space law places liability for damage on the state.[94]

5.2 The problem of space debris

Space debris refers to the growing problem of debris in space, orbiting the Earth, and creating hazards for functioning satellites and other equipment in outer space. The UK Space Agency estimates that there are 900,000 pieces of space debris including old satellites, spent rocket bodies and even tools

93 See further on this issue, Paul Stephen Dempsey and Maria Manoli, "Suborbital flights and the delimitation of air space vis-à-vis outer space: functionalism, spatialism and state sovereignty", 29 March 2018, UN Doc A/AC.105/C.2/2018/CRP.9 (Link opens PDF).

94 Ibid, p4-10.

dropped by astronauts orbiting Earth.[95] One of the biggest dangers is that space debris could cause the so-called Kessler Syndrome, a phenomenon where space debris would continue to collide with existing space objects and cause more and more debris, to the extent that even launching new satellites could be dangerous.[96]

The responsibility and liability regime above creates a system that allows for states to be held to account where their national activities in space, or the space objects they launch, result in space debris that causes damage or other wrongful acts that could give rise to the responsibility of a state. This, of course, relies on the state responsible for this space debris being known. But there is no international legal regime preventing the creation of such space debris in the first place, or creating any safety mechanisms to help prevent this.[97]

The Inter-Agency Space Debris Coordination Committee (IADC), an intergovernmental forum of national and international space agencies, initially produced Space Debris Mitigation Guidelines in 2002, revised in 2020 and 2021, aimed at "limiting the generation of space debris in the environment."[98] This was followed by the 2007 UN COPUOS Space Debris Mitigation Guidelines, which were based on the technical content and the basic definitions of the IADC guidelines.[99] This further led to the development of other national and international standards to prevent space debris.[100]

The UN COPUOS Legal Subcommittee has had the "legal mechanisms relating to space debris" as an item on its agenda, where states exchange views on the international legal framework and space debris. In the 2021 session of the Legal Subcommittee, some states expressed the view that there was a need for a rules-based international system for addressing the space debris problem.[101] States supporting international regulation also argued that:

> having binding guidance at the international level would bring predictability, create conditions for tackling global problems in a coherent manner and ensure the uniform development of space law.[102]

95 UK Space Agency, "UK working with global partners to clear up dangerous space debris", 26 October 2021.

96 Mike Wall, "Kessler Syndrome and the space debris problem", Space [online], 15 November 2021.

97 See, for example, Timiebi Aganaba, "If a satellite falls on your house, space law protects you – but there are no legal penalties for leaving junk in orbit", The Conversation [online], 17 May 2021.

98 IADS, IADC Space Debris Mitigation Guidelines, June 2021, Doc IADC-02-01 Rev. 3, p.

99 UN Office for Outer Space Affairs, Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, 2010. (Link opens PDF)

100 See, for example, European Space Agency, Mitigating space debris generation, accessed 5 January 2022; see further, HC Deb 14 July 2021 vol 699 c176WH.

101 UN COPUOS, Report of the Legal Subcommittee on its sixtieth session, held in Vienna from 31 May to 11 June 2021, (24 June 2021) UN Doc A/AC.105/1243, para 151.

102 Ibid.

Further gaps in the current legal regime were also discussed by delegations at the Legal Subcommittee,[103] with some highlighting the need for regulating issues such as:

- The legal definition of space debris.
- The legal status of space debris fragments.
- The role of the state of registry.
- Jurisdiction and control over the space objects to be declared as space debris.
- Procedures in the case of unregistered debris objects.
- Modalities for the identification, tracking and characterization of space debris objects, as well as for sharing relevant information.
- Clear obligations for space debris mitigation, remediation and on-orbit maintenance activities.
- Conditions and modalities under which disposal and maintenance operations may be lawfully carried out; and technical standards for carrying out remediation or maintenance work.[104]

One delegation further suggested that states should develop rules on:

- A legal definition of space debris as a subcategory of space objects.
- Determining the legal status of space debris fragments not registered in any national register or in the Register of Objects Launched into Outer Space.
- Harmonizing international and national law on the regulation of property rights in relation to space objects, not only spacecraft.
- Coordinating international procedures for identifying space debris objects and their trajectory characteristics and for assessing the safety of removing such objects from orbit.[105]

[103] The summaries and reports of the Legal Subcommittee do not specify which states hold these positions or views.

[104] Ibid, para 165-166.

[105] Ibid, para 167.

Space Debris: Missle strikes against satellites

The issue of space debris has more recently gained international attention following Russia's missile test against one of its own satellites in November 2021.

As part of an ASAT (anti-satellite) missile test, Russia struck the Soviet-era Cosmos 1408 / Kosmos 1408 satellite,[106] creating a field of debris so large and dangerous, the astronauts on board the International Space Station were forced to take shelter as a precaution.[107] While Russia dismissed concerns of space debris, the strike against the satellite created over 1,500 pieces of trackable debris, with some estimates indicating that some of the debris will remain in orbit well into the 2040s.[108]

The US called the strike reckless and irresponsible, and warned that it could threaten vital technology in space.[109] UK Defence Secretary Ben Wallace said that the strike "shows a complete disregard for the security, safety and sustainability of space."[110] He also warned that the debris "will remain in orbit putting satellites and human spaceflight at risk for years to come."[111]

But this was not the first time a state struck one of its own satellites and created potentially dangerous debris. In 2007 China launched an ASAT missile against its own weather satellite. Reports suggested that the impact left more than 100,000 pieces of debris orbiting the planet, according to NASA's estimates, with 2,600 of them more than 4 inches across.[112] Other reports suggested 1,600 pieces of debris could be tracked orbiting the Earth.[113] The US and UK criticised China's launch at the time.[114]

In 2008, the US confirmed that it had launched a strike against "a falling and potentially dangerous defense intelligence satellite" that had a "1,000 pound tank of toxic hydrazine fuel." The US suggested that the strike created 80

106 "Russian anti-satellite missile test draws condemnation", BBC News [online], 16 November 2021.

107 Kuan-Wei Chen, Bayar Goswami, and Ram S. Jakhu, "Russia's attack on its own satellite is reckless and endangers us all", The Conversation [online], 18 November 2021.

108 Ibid. See also, Erin Pobjie, "The Threat from Outer Space: Russia Tests Kinetic DA-ASAT Weapon", Just Security [online], 23 November 2021.

109 US Department of State, "Russia Conducts Destructive Anti-Satellite Missile Test", 15 November 2021.

110 Costas Pitas, "UK says Russian anti-satellite missile test shows disregard for space security", Reuters [online], 15 November 2021; see also, UK Space Agency, Athene Gadsby, "Russia ASAT Test: UK Space Agency response and analysis of the debris", 24 November 2021.

111 Ibid.

112 "Pentagon confident satellite's toxic fuel destroyed", CNN [online], 21 February 2008.

113 Michael R. Gordon and David S. Cloud, "U.S. Knew of China's Missile Test, but Kept Silent", The New York Times [online], 23 April 2007.

114 Ibid; see also, James Randerson and Mark Tran, "China accuses US of double standards over satellite strike", The Guardian [online], 21 February 2008.

pieces of detectable debris.[115] China accused the US of double standards after this incident.[116]

In March 2019, India became only the fourth country to successfully test a direct ascent ASAT missile.[117] After reaching low earth orbit, it successfully intercepted an Indian satellite that had been launched earlier in 2019. The test provoked international concern, but Indian Prime Minister, Narendra Modi, hailed the test as an "unprecedented achievement", confirming that India has "established itself as a space power".[118]

115 US Air Force, "AEDC-tested Navy Standard Missile destroys errant satellite", 22 February 2008.

116 James Randerson and Mark Tran, "China accuses US of double standards over satellite strike", The Guardian [online], 21 February 2008.

117 "Modi hails India as military space power after anti-satellite missile test", Reuters, 27 March 2019.

118 Ibid.

6 Initiatives for further regulation of space

6.1 Initiatives at the United Nations

As discussed in the Library Briefing Paper on the Militarisation of Space,[119] achieving a consensus on regulation has been a challenge for the international community for a long time. The world's leading space powers, such as the US, China, and Russia, have their own interpretation of what regulation should look like and what it should achieve. As many analysts have noted, there is a perceived preference, on all sides, for regulation that promotes freedom of their own action, while curtailing the activities and aspirations of others. Support for arms control in space is often seen as contradictory to the actions and rhetoric of the leading states.

In December 2021, the UN General Assembly adopted a number of notable Resolutions on outer space, as it has done each year, including one Resolution drafted and championed by the UK. These Resolutions were debated and developed in the Assembly's First Committee (on Disarmament), and the same voting patterns of previous years became clear, as outlined in the First Committee's Report.[120]

UNGA Resolution 76/22 - Prevention of an arms race in outer space

UNGA Resolution 76/22[121] was adopted by the Assembly without a vote. The Resolution called upon all states to contribute to the objective of the peaceful use of outer space and the prevention of an arms race, further calling on states to refrain from actions contrary to that objective. The Resolution also invites the Conference on Disarmament to establish a working group on this issue, and for states to cooperate with this initiative by informing the body of any progress states are making in their own bilateral or multilateral negotiations.[122]

119 Commons Library Research Briefing CBP-9261, The militarisation of space, 14 June 2021.

120 For an overview, see, UNGA First Committee, "Prevention of an arms race in outer space: Report of the First Committee", 12 November 2021, UN Doc A/76/442.

121 UNGA Res 76/22, 6 December 2021, UN Doc A/RES/76/22.

122 For a summary, see: UN, "Adopting 55 First Committee Texts, General Assembly Addresses Myriad Security Threats, Urging Joint Action to Advance Stalled Denuclearization, Disarmament Efforts", 6 December 2021, GA/12392.

UNGA Resolution 76/23 - No first placement of weapons in outer space

The Assembly's Resolution 76/23[123] was divisive, with several votes taking place on elements within the Resolution.[124] One point of contention was a paragraph where the General Assembly welcomed the draft treaty introduced by China and Russia at the Conference on Disarmament in 2008, and its updated version in 2014. This was adopted by a recorded vote of 123 in favour to 48 against, with four abstentions – those states voting against the statement included the US, the UK, and France.

The Resolution as a whole was adopted by a recorded vote of 130 in favour to 35 against, with 20 abstentions. The Resolution itself urged an early commencement of substantive work based on the updated draft treaty introduced by China and Russia.[125]

UNGA Resolution 76/230 - Further practical measures for the prevention of an arms race in outer space

Another divisive initiative was Resolution 76/230.[126] Once again, there were some votes on particular elements of the Resolution.[127]

The Resolution itself did a number of things, including:

- Declaring that the exclusion of outer space from the sphere of the arms race and the preservation of outer space for peaceful purposes **should become a mandatory norm** of state policy and a **generally recognised international obligation**;
- Calling on states **to take urgent measures to prevent** for all time t**he placement of weapons in outer space** and the threat or use of force in outer space, from space against Earth and from Earth against objects in outer space;
- Calling on states to adopt legally binding multilateral agreements;
- Urging the Conference on Disarmament to n**egotiate an international legally binding instrument on the prevention of an arms race in outer space**, including on the prevention of the placement of weapons in outer space and of the threat or use of force in outer space.

123 UNGA Res 76/23, 6 December 2021, A/RES/76/23.

124 For a summary, see: UN, "Adopting 55 First Committee Texts, General Assembly Addresses Myriad Security Threats, Urging Joint Action to Advance Stalled Denuclearization, Disarmament Efforts", 6 December 2021, GA/12392.

125 See below on the China-Russia proposed treaty.

126 UNGA Res 76/230, 24 December 2021, UN Doc A/RES/76/230.

127 For a summary, see: UN, "Approving $3.12 Billion Programme Budget, General Assembly Adopts 26 Resolutions, 2 Decisions, as Main Part of Seventy-Sixth Session Concludes", 24 December 2021, GA/12398.

The General Assembly adopted this Resolution by a vote of 114 in favour to nine against (Australia, Canada, France, Israel, Japan, Marshall Islands, Ukraine, United Kingdom and the United States), with 44 abstentions.

UK-sponsored UNGA Resolution 76/231 - Reducing space threats through norms, rules and principles of responsible behaviours

The final resolution was a UK-sponsored initiative to reconfigure how discussions on the principles relating to outer space are approached. Resolution 76/231,[128] however, did not have unanimous support.[129]

The Resolution decided to convene, from 2022, an open-ended working group to take stock of existing international, legal and other normative frameworks concerning threats arising from state behaviours with respect to outer space. This working group will consider current and future threats by states to space systems. The Resolution further decided that this working group will make recommendations on possible norms, rules and principles of responsible behaviours relating to threats by states to space systems

The Resolution also called upon all states to conduct their activities in the exploration and use of outer space in conformity with international law, including the Charter of the United Nations, and urged Member States to take this into account when formulating their space policies. It encouraged those states that have not yet become parties to the international treaties governing the exploration and use of outer space, to consider ratifying or acceding to those treaties in accordance with their national law, as well as incorporating them into their national legislation.

The Assembly adopted the Resolution by a vote of 150 in favour to eight against (China, Cuba, Democratic People's Republic of Korea, Iran, Nicaragua, Russian Federation, Syria and Venezuela) with seven abstentions (Armenia, Belarus, Central African Republic, India, Israel, Pakistan and Tajikistan).[130]

The UK ambassador and Permanent Representative to the Conference on Disarmament, Aidan Liddle, described the UK's initiative in an official blog post in January 2022:

> This resolution builds on the UN Secretary-General's report commissioned by the 2021 resolution, by establishing an Open-Ended Working Group of

[128] UNGA Res 76/231, 24 December 2021, UN Doc A/RES/76/231.

[129] For a summary, see: UN, "Approving $3.12 Billion Programme Budget, General Assembly Adopts 26 Resolutions, 2 Decisions, as Main Part of Seventy-Sixth Session Concludes", 24 December 2021, GA/12398.

[130] Ibid.

> all UN Member States to examine the question further. The OEWG will meet in four sessions over two years in Geneva, starting in February.[131]

Previously, Ambassador Liddle had outlined four main ideas underpinning the UK's approach to this, and a previous UK-sponsored Resolution:

> First, that we need a broader discussion of outer space security that looks at the whole range of threats emanating from States (as opposed to hazards inherent in the space environment, which are the business of the Committee on the Peaceful Uses of Outer Space in Vienna). Second, that we need to consider space systems in their totality – the elements in space and on the ground, and the data links between them. Third, that considering behaviours, rather than weapons, might break the deadlock. And fourth, that we need a more inclusive, more organic process, recognising that the security of space systems affects all states. The resolution called on Member States to consider how a behaviour-based approach could help reduce threats to space systems and prevent an arms race in outer space, and submit their views to the UN Secretary-General, who will compile a report to be considered at the next First Committee in October.[132]

Liddle also stressed that there was appetite in the UN to continue this approach and, "Whether that's a legally binding instrument or something else is entirely open, and supporting this approach doesn't mean giving up supporting proposals for legally binding treaties."[133]

The UK's National Space Strategy repeated the preference for 'responsible state behaviours' when it said:

> Government will lead work with international partners at the United Nations to establish the framework for internationally recognised responsible space behaviours that would increase the security of space systems. Building on the successful 2020 UK-led resolution at the United Nations General Assembly and subsequent UN Secretary General report, we will run a further resolution to set up a UN working group to discuss the building blocks and details of responsible space behaviours. We will support global stability through arms-control and non-proliferation regimes and will work with allies to deter hostile activity against space systems including the use of weapons in space. Space sustainability and space security must be considered alongside each other, so the UK will work coherently across the United Nations Committee on the Peaceful Uses of Outer Space, the Disarmament Commission, and the Conference on Disarmament. Government will meet the challenges of an increasingly contested and congested environment in space through targeted and robust diplomacy.[134]

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131 UK FCDO, Aidan Liddle, "Disarmament blog: looking back and forwards", 11 January 2022.

132 UK, FCDO, Aidan Liddle, "Responsible behaviours in outer space: towards UNGA 76", 8 June 2021.

133 Ibid.

134 UK Ministry of Defence, National Space Strategy, 27 September 2021.

Indeed, the UK also seems to have the support from the US in this, after the new Biden Administration appears to have dropped the US's long-standing opposition to developing international law in space. One of the US's stated objectives in its Defense Space Strategy 2020 is to "uphold internationally accepted standards of responsible behaviour as a good steward of space…" and to "align with allies and partners to develop and promote standards and norms of appropriate behaviour in space to reduce the potential for miscalculations".[135]

6.2 Proposed Prevention of an Arms Race in Space Treaty

At the Conference on Disarmament, Russia and China have been pushing for a legally-binding treaty on preventing an arms race in space since 2008, with an updated draft treaty proposed in 2014.[136] The proposals, in short, attempt to prohibit states from:

- Placing any weapons in outer space.
- Resorting to the threat or use of force against outer space objects of states.
- Engaging in outer space activities, as part of international cooperation, inconsistent with the subject matter and the purpose of the treaty.
- Assisting or inciting others to do the same.

While some experts believe this would prevent even ground-based anti-satellite launches against a state's own satellites,[137] others disagree and read the treaty more narrowly.[138] In any case, the treaty still excludes the inherent right of self-defence for states under Article 51 of the UN Charter, which allows necessary and proportionate force in response to an armed attack, and so the treaty does not completely exclude the use of weapons in space altogether.

As evidenced through the voting of General Assembly Resolution 76/23, outlined above, the US, the UK and other aligned states do not support this initiative. It remains to be seen whether any progress will continue on this initiative, but for now the stalemate on developing the treaty seems to persist.

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135 US, Department of Defence, Defence Space Strategy Summary, June 2020, at 2, 4, and 8. (Link opens PDF)

136 For background, see: NTI, "PAROS Treaty: Proposed Prevention of an Arms Race in Space (PAROS) Treaty", accessed 5 January 2022.

137 Kuan-Wei Chen, Bayar Goswami, and Ram S. Jakhu, "Russia's attack on its own satellite is reckless and endangers us all", The Conversation [online], 18 November 2021.

138 Erin Pobjie, "The Threat from Outer Space: Russia Tests Kinetic DA-ASAT Weapon", Just Security [online], 23 November 2021.

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- Commons Library Research Briefing CBP-9010, Principles of International Law: a brief guide, 21 September 2020.

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- Jae Woon Lee, "Revisiting Freedom of Overflight in International Air Law: Minimum Multilateralism in International Air Transport", (2013) 38(4) Air and Space Law 351
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