Regulating a revolution : small satellites and the law of outer space

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Chapter 6: Conclusions and Recommendations

1. Introduction

This study examined whether the revolution in industrial and technological domains of space exploration merits a regulatory revolution as well, or at least, specific regulation which may accommodate the case of small satellites operations better than the existing international regulations. More specifically, should small satellites be treated differently than other space objects under international law?

This concluding chapter aims to answer this question, while presenting the findings of this study, making recommendations and justifying them by drawing legal analogies from other branches of international law.

The main conclusion is that *there is a need to treat non-governmental small satellites operations differently than other satellite operations as far as the distribution of treaty obligations relating to State responsibility, liability and registration goes*.

This means that the substantive rights and obligations provided by the space treaties do not have to change in this respect, however, there is a need to change the legal structure that the concept of the 'launching State' creates.

Instead of dividing State responsibility, liability and registration or 'jurisdiction and control' amongst potentially different States, it is suggested to create a new legal structure which gathers all of the above and centralises these legal concepts into one State, which has the strongest *nationality link* to the small satellite operator.

In this sense, it is suggested to primarily rely on *State responsibility* in order to effectively regulate non-governmental small satellites operations, and to legally and conceptually detach the launching activity from ongoing satellite operations in outer space. The author submits that the practical way to achieve this result is by reaching a common understanding between States, on a soft law basis, rather than amending the space treaties.

Section 2 of this chapter shall summarise the findings of this study as elaborated in the previous chapters, while highlighting the most important findings, which are in the core of this study and its conclusions.

Section 3 shall draw an analogy to the case of small satellites from other branches of law, namely, air law and the regulation of small aircraft operators on a supra-national level.

The above leads to the recommendations in section 4. Thereafter, section 5 will encapsulate those recommendations into a proposed Optional Protocol to the Outer Space Treaty. The objective is to promote legal certainty by supplementing treaty provisions on State responsibility, liability and registration in a manner, which will accommodate non-governmental small satellites operations better.

Finally, section 6 shall discuss the future of space law as a legal system in the context of NewSpace activities, going beyond the case of non-governmental small satellites operations.

2. Concluding the Findings of the Study

2.1 Small Satellites Missions and International Space Law

This study found that small satellites are treated under international space law as any other space objects - at least conceptually - since the subject was never formally disputed. There are some legal uncertainties, which relate to the size of very small satellites and to whether there is a legal relevance to the fact that some of them are launched in large numbers as part of constellations.[1] In any case, it is clear that, small satellites are space objects in the meaning of the space treaties.[2]

A different question is whether the operations of 'unguided'[3] or 'non-manoeuvrable' small satellites is a space activity in the meaning of Article VI of the Outer Space Treaty. While there is no legal sense in excluding small satellites operations as a regulated space activity, this matter was a cause for uncertainties in the past.[4]

It is concluded that small satellites, both as space objects and their operation as space activities, are subject to international space law in principle. There are cases where legal lacunae and discrepancies arise. These cases are related to questions of State responsibility, the validity of the concept of the 'launching State' and which entity has actual 'jurisdiction and control' over a non-governmental small satellite mission. These matters will be elaborated in the following sections.

[1] See: chapter 1 subsection 2.6.2; chapter 3 section 3.2; and chapter 5 section.
[2] See: chapter 2 subsection 2.3.3.
[3] See: chapter 3 subsection 2.1.3 and section 3.3.
[4] ibid.

The international space community became aware of small satellites activities in the past years, and most recent developments show that small satellites constellations are identified as a challenge to the long-term sustainability of LEO.[5] While there are no binding legal instruments, which would apply to States in this respect, there are initiatives in international organisations that promote soft law norms and raise awareness to the need to consider the space environment when launching many thousands of small satellites.[6]

2.2 Non-Governmental Small Satellites Missions and the Liable Launching State(s)

The most important finding in this study is that the concept of the 'launching State' and generally, the provisions of the Liability Convention, are not well suited to deal with liability, which may arise from non-governmental small satellite missions.

The treaties include a very traditional assumption, namely, that launch service providers through their national State, are deeply involved with the payloads they launch to outer space. This is so because of the definition of launching States as: '(i) A State which launches or procures the launching of a space object; (ii) A State from whose territory or facility a space object is launched.'[7] *This assumption often becomes invalid when contemplating commercial small satellite missions*.

Many small satellites are launched by foreign launch service providers, whether the latter are governmentally owned or commercial entities. Even though legally, the national State of the launch provider is considered to be a launching State, and a potential State of registry,[8] this study shows that such States do not assume registration obligations, even

[5] See for instance: S Erwin, 'At small satellite conference, frustration about lagging efforts to deal with space junk' (*Space News*, 5 November 2018), available at: https://spacenews.com/at-small-satellite-conference-frustration-about-lagging-efforts-to-deal-with-space-junk/ .

[6] See: chapter 2 section 3.

[7] Article I(c) of the Convention on International Liability for Damage Caused by Space Objects, (1972) 961 *U.N.T.S.* 187 (hereinafter: 'Liability Convention').

[8] Since Article II of the Convention on Registration of Objects Launched into Outer Space, (1975) 1023 *U.N.T.S.* 15 (hereinafter: 'Registration Convention') stipulates:
'(1) When a space object is launched into earth orbit or beyond, the launching State shall register the space object by means of an entry in an appropriate registry which it shall maintain. Each launching State shall inform the Secretary General of the United Nations of the establishment of such a registry.
(2) Where there are two or more launching States in respect of any such space object, they shall jointly determine which one of them shall register the object in accordance with paragraph 1 of this article, bearing in mind the provisions of article VIII of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, and without prejudice to appropriate agreements concluded or to be concluded among the launching States on jurisdiction and control over the space object and over any personnel thereof.[…]'.

when no other launching State would register the satellite. Since only a launching State can affect registration, this implies reluctance to assume liability for foreign secondary payload.

This situation leads to unregistered small satellites, and worse, to questions regarding the liability of all launching States that are involved in the launch. State practice shows that launch service providers provide information to the UN on the small satellites, which they launch as secondary payloads, but this information lacks any legal outcome, and certainly does not affect registration and assumption of liability.[9]

Other State practice shows that the legal concept of the 'State which procures the launching of a space object' is also a cause for legal uncertainty and confusion. What kind of actions should a State take to demonstrate that it procured the launch of a commercial small satellite, owned by a commercial entity?

In cases where private entities that are incorporated in State X independently procure a commercial launch service for their satellites, with a foreign entity, State X does not have any involvement whatsoever in launch arrangements. This means that the State that is responsible for the small satellite mission is not represented at all in one of the categories that define the liable 'launching State'. This artificial legal fragmentation between State responsibility and liability barely holds in the realm of space treaty law since the English language can accommodate the differences. However, some of the other authentic treaty languages cannot.[10]

The vagueness of the term 'procures the launch' and the lack of a definition in the treaties allows room for different interpretations. And indeed, The Netherlands made a clear expression of its *opinio juris* in this matter, stating that lack of any involvement in arranging for a launch of Dutch small satellites cannot result in the legal assumption of launch procurement.[11] It also coherently demonstrates a State practice where it does not assume international liability or UN registration obligations for purely commercial satellite missions.

On the other hand, this study found opposite State practice as well, and even more apparent when registration obligations are on the line, in the case of the Belgian Government's involvement in the QB50 project.[12]

The one concept, which seems non-controversial, is State responsibility for commercial small satellites missions. The satellite's owner or *operator's nationality* is still the most

[9] See: chapter 5 subsection 4.3.2.
[10] See: chapter 3 section 2.3.
[11] Note verbale dated 29 July 2003 from the Permanent Mission of the Netherlands to the United Nations (Vienna) addressed to the Secretary-General UNGA Doc. A/AC.105/806. See chapter 3, section 2.3 and chapter 4 section 3.5.
[12] See chapter 5 section 4.2.

accurate and important attribution or link between a commercial small satellite, its commercial owner and operator and their State of nationality which assumes the obligations under *Article VI* of the Outer Space Treaty.[13]

Another pressing problem is that 'liability' has different meaning in the context of the launching State in international space law, under general international law, and in the commercial realm. The Liability Convention is designed to only bring claims for the compensation of catastrophic damage out into the daylight. This is not surprising, since it cannot be expected that States will undergo vast diplomatic efforts to resolve minor commercial disputes between commercial small satellite operators. International law, simply, is not suited and should not be suited for this kind of situations, which have very little to do with the States.

The strength of the Liability Convention is in its promise to third party victims who suffered damage caused by a space object and look for compensations. This strength is found in Article II of the Convention, which deals with a situation where a space object causes damage to third parties on the ground or to aircraft in flight. The severity of the moral outcome in these situations calls for absolute liability, or at least, strict liability.[14] These situations are irrelevant to small satellites missions.[15]

Article III of the Convention, which speaks of damage in outer space, applies to small satellite operations. In the cases, which may fall under this provision, even an innocent third party is a space-faring entity, which is aware of space being an ultra-hazardous environment. For this reason, the Convention dictates fault liability in case of damage caused to space objects in outer space.

As mentioned in this study, fault liability in this context remains unclear. None of the space treaties, or any other source of international space law defines what amounts to committing fault in outer space. Scholars have presented different interpretations in this respect.[16]

This uncertain legal environment, which always assumes claims by and between the launching States, is unsuitable to regulate the conduct of commercial entities. When contemplating small and very small satellites in particular, the most probable foreseen damage is at smaller scales when compared to traditional satellites with large dimensions and mass. The scale of the likely damage emphasises the incompatibility of the regulatory environment the Liability Convention creates in the context of small satellites operations. No launching State will bother to present a claim against another launching State, at a

[13] The operator's nationality is set according to the domestic corporate law which applies to the operator.
[14] See: chapter 4 section 3.1.
[15] See: chapter 4 section 3.2.
[16] See: chapter 4 section 3.4.

special claims commission or the ICJ, for small scale damage, which was caused to a commercial entity.[17]

For these considerations, and the fact that the Liability Convention does not stipulate exclusive remedies, the author submits that such potential disputes are better solved in domestic legal proceedings. Domestic legal systems have a better grasp of what would amount to fault under their national applicable laws.

In this sense it would be preferable to encourage non-governmental entities to pursue claims against other non-governmental entities, that is, without being dependent on any launching States. If State involvement is required to solve the dispute, the Liability Convention can be invoked as a secondary measure.[18] The Convention clearly allows such way of dispute resolution, since it does not stipulate exclusive procedures of dispute resolution relating to damage caused by space objects.[19]

With the expected emergence of Space Traffic Management (STM) rules, it may be easier to define fault liability for damage caused in outer space, since these may specify satellite priority rights in orbit and other 'rules of the road'. Recent leading studies in this field have suggested specific rules for small satellites operations, and a radical change in international space treaty law in general.[20] This mentioned approach, which sees small satellites as a distinct category of space objects, also supports the conclusions of the current study.

2.3 Jurisdiction and Control Over Non-Governmental Small Satellites Missions

The State, which is most likely to have jurisdiction and control over a non-governmental small satellite mission, is the State of *nationality* of the satellite operator, since such State is responsible for the satellite operation and has the duty to authorise and supervise it according to Article VI of the Outer Space Treaty. The satellite's operator, which is usually the owner as well, is bound by the *domestic laws* of such a State, as an incorporated entity or on a personal basis.

Therefore, it makes little sense to link the State, which should retain its jurisdiction and control over the satellite, to the State or States that were involved in its launch. In other words, it would be more logical to link the State of registry which retains jurisdiction and control to the appropriate State which is responsible to license, meaning, authorise and

[17] And indeed, to date, no such claims were presented, not even in the *Iridium-Cosmos* collision which involved a functioning traditional satellite, see chapter 4 section 3.4.2.
[18] See: chapter 4 section 3.6
[19] Liability Convention, Article XI (2).
[20] See: chapter 4 subsection 3.4.1

supervise, the satellite mission. Articles VI and VIII of the Outer Space Treaty should be linked in that respect, as they may point out the State which can exercise jurisdiction over the small satellite operation *in practice*.[21]

Unfortunately, the existing treaty provisions, namely Article II of the Registration Convention, expressly link jurisdiction and control with the launch of the satellite.[22] As explained in section 2.2 regarding the concept of the 'launching State', basic assumptions relating to the actual involvement of the potential launching States in non-governmental small satellites operations are often wrong.[23]

Such assumptions also create a distorted legal concept regarding which State is entitled and obliged to exercise jurisdiction and control over non-governmental small satellites operations.

This study showed that while it is clearly stated in the treaties that the State of registry should be one of the launching States, in practice, some States chose to register small satellites while acknowledging that they are responsible for the operation of the satellites but disclaiming being their liable launching State.[24]

It is unclear what is the legal outcome when a satellite is registered by a State that takes responsibility for its operation but is not its launching State.[25] It is also unclear what is the legal outcome of a situation where a small satellite is not registered by any State.[26]

More specifically, what is the *legal meaning of a domestically licensed commercial small satellite activity, where the satellite is not registered by any State?* Does the responsible State that authorised the space operation *retain its jurisdiction and control even without registration*? If the answer is positive, it is concluded that registration of small satellites carries no legal value. If the answer is negative, it means that national space laws are inadequate to regulate space activities, which completely stands in contradiction with Article VI of the Outer Space Treaty.

It is therefore concluded that *the concept of the 'launching State', although fundamental, cannot adequately regulate non-governmental small satellite operations in a logical and realistic manner*.

[21] See: chapter 5 section 5.
[22] Since it stipulates that the State of registry has to be one of the launching States.
[23] See: chapter 5 section 5.
[24] See: chapter 5 section 4.2.
[25] See: chapter 5 section 5.
[26] ibid.

Accordingly, this study recommends using State responsibility and specifically Article VI of the Outer Space Treaty as the legal basis for international regulation of small satellites missions, as elaborated below.

2.4 Non-Governmental Small Satellites Missions and State Responsibility

It is concluded that State responsibility is the most effective legal concept to internationally regulate non-governmental small satellite missions. This study showed the different interpretations of Article VI of the Outer Space Treaty, which includes a special State responsibility regime for 'national activities in outer space'.[27]

Based on the legal analysis of key international space law and general international law instruments, custom and ICJ cases it was concluded that the *operator's nationality* is the most effective way to attribute space activities to a certain State, in the context of small satellites.[28]

The author submits that while some concepts in Article VI remain vague, establishing the nationality of a small satellite's owner or operator, according to *domestic law*[29] should fairly easily indicate which State is the 'appropriate' *responsible State* for that satellite, in the meaning of Article VI.

It is further submitted that *there is great disadvantage in detaching nationality and State responsibility from liability and registration requirements*. In other words, the current disconnection between international responsibility and liability for non-governmental small satellites operations creates an unsound legal environment.

First, according to general international law, State responsibility may lead to liability in cases damage is caused pursuant to certain activities.[30]

Second, as mentioned above, some of the authentic languages of the Outer Space Treaty do not distinguish responsibility from liability as English does.[31]

Third, while responsibility can be distinguished from liability in a theoretical manner,[32] it is unclear what are the legal outcomes in case damage was caused by a space object in

[27] See: chapter 3 sections 2 and 3.
[28] See: chapter 3 section 2.
[29] Meaning according to domestic corporate law when the satellite owner or operator is an incorporated entity.
[30] See: International Law Commission, Draft Articles on Responsibility of States for Internationally Wrongful Acts with Commentaries, *Yearbook of the International Law Commission*, vol. II, Part Two (2001) 92 para 8.
[31] See: chapter 3 section 2.3.
[32] ibid.

outer space. In case State X is only *responsible* for a commercial small satellite operation, and State Y is its *liable* launching State[33] and the satellite caused damage in outer space, would only State Y be required to compensate for such damage? What is then the relevance of State responsibility in such a case?

It is argued that there is sense in making the State that authorised and supervised the damaging operation the one which is responsible and liable to compensate for the damage. This is both a moral-theoretical argument and a legal-practical one. A situation where States are free to authorise space activities, which expose other States to liability, simply seems illogical. For this reason, the author puts forward that the State, which is responsible for the operation of the non-governmental small satellite, should be recognised as potentially liable for damage it may cause, jointly with the satellite's launching States.

As mentioned above, it can be challenging to identify a satellite's launching State, and in case there are several launching States, agreements should be made between these States on distribution of liability. This study found that currently, States do not engage in such agreements when it comes to non-governmental small satellites operations.[34] In other words, it would be easier for the party that suffered damage to claim compensation from the *national State of the operator*, rather than investigating on its own who are all the potential launching States of the damaging satellite. The nationality of a corporation is very basic information, which is publicly available. Even if the satellite was registered properly with the UN, there is no requirement to specify who are the launching States of a certain satellite. This means that such information is not publicly available even if all the parties involved observe their treaty obligations.

Similar arguments apply to registration obligations. The national-responsible State has jurisdiction and control over the satellite operation, otherwise it cannot fulfil its authorisation and supervision obligations in Article VI. Since the State of registry *retains*[35] jurisdiction and control, it makes sense that such State would be the State of the operator's nationality, meaning, the responsible State and State of registry should ideally be the same State, which retains jurisdiction and control over the small satellite.[36]

To take the arguments one step further, the conclusion is that *the operator's nationality, which determines which State is responsible for its space activities, should serve as the legal nexus between international space law and non-governmental small satellites missions*.

[33] For the sake of simplicity, it is assumed that only State Y qualified as the launching State although there would potentially be more than one launching States in many cases.
[34] See: chapter 5 section 4.2.
[35] In the meaning of Article VIII of the Outer Space Treaty and the Registration Convention.
[36] See: chapter 5 section 5.

This means that States will have to ensure that their national legislation can effectively regulate non-governmental small satellites missions. As shown in chapter 3, both The Netherlands and Belgium had to amend or expand their domestic space laws in order to include small satellite operations as a regulated activity.[37]

The following third section includes an analogy to the adjustment of regulatory powers between the supra-national and national level in the case of small aircraft operators. The manner in which it is suggested to reaffirm the role of national States with respect to non-governmental small satellites operations will be elaborated in sections 4 and 5 below.

3. The *De Minimis* Principle and Analogies Supporting Special Regulation of Small Satellites Activities

The use of the *de minimis* doctrine in other branches of law illustrates that there is justification to regulate certain small-scale activities in a special manner. This section will present analogies such as the de-regulation of small aircraft operators, small-scale state aid and light drones to show legal practices aimed to simplify regulation of such small-scale activities.

The idea behind the *de minimis* doctrine is to simplify the existing regulation of a certain activity, setting a certain threshold, under which, the existing regulation will not apply to the small-scale activity, or apply in a simplified manner.

The concept of giving more power to national States in order to regulate smaller or less complex objects and activities is not new. The relaxed supra-national regulation of small aircraft is a good analogy to the case of small satellites.

The recent EU Regulation 2018/1139 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, states that:

> It would not be appropriate to subject all aircraft to common rules.[38]

It further provides in its Article 11 that:

> In order to take into account the interests and views of their aeronautical industry and aircraft operators, Member States should be allowed to exempt from this Regulation the design, production, maintenance and operation

[37] See: chapter 3 sections 3.2 and 3.3.
[38] See: Preamble point (4) Regulation (EU) 2018/1139 of the European parliament and council 4 July 2018, available at:
https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R1139&from=EN.

> activities which are performed in respect of certain small aircraft, other than unmanned aircraft […].[39]

All EU member States are primarily subject to the Chicago Convention on Civil Aviation.[40] The EU Regulation does not derogate from any obligations that are included in international law, but it leaves certain regulatory matters to the member States when it comes to small aircraft, in order to facilitate their operation.

One example to the relaxed regulation of small aircraft is found in Article 74:

> The fees and charges levied by the Agency should be set in a transparent, fair, non-discriminatory and uniform manner. They should not jeopardise the competitiveness of the Union's industry concerned. Furthermore, they should be established on a basis which takes due account of the ability of the legal or natural persons concerned to pay, *in particular regarding small and medium-sized enterprises*.[41]

This provision recognises the need to avoid over-burdening small aircraft operators with fees and charges, expressing the idea that institutional discretion is needed when regulating different aircraft operators. The rationale is to allow small aircraft operators to pursue their business as part of the industry in a way, which is feasible to these operators.

The *de minimis* tool is used with regards to state aid regulation as well, in different industries. For example, EU Regulation 1407/2013 on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to de minimis aid[42] encapsulates the idea that small amounts of aid are unlikely to distort the competition in a certain market, and sets criteria on aid which is considered *de minimis* and thus is allowed and has different reporting duties compared to other cases of state aid.

Article 3(2) sets the maximal aid amount that is considered as *de minimis* aid:

> The total amount of de minimis aid granted per Member State to a single undertaking shall not exceed EUR 200 000 over any period of three fiscal years.

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[39] Regulation (EU) 2018/1139 of the European parliament and council 4 July 2018, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R1139&from=EN.
[40] Convention on International Civil Aviation, (1944) 15 *U.N.T.S.* 295.
[41] Regulation (EU) 2018/1139 of the European parliament and council 4 July 2018, emphasis added, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R1139&from=EN.
[42] Regulation (EU) 1407/2013 of 18 December 2013 on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to de minimis aid, available at: http://ec.europa.eu/competition/state_aid/legislation/de_minimis_regulation_en.pdf .

> The total amount of de minimis aid granted per Member State to a single undertaking performing road freight transport for hire or reward shall not exceed EUR 100 000 over any period of three fiscal years. This de minimis aid shall not be used for the acquisition of road freight transport vehicles.

And Article 3(1) clarifies that:

> Aid measures shall be deemed not to meet all the criteria in Article 107(1) of the Treaty, and shall therefore be exempt from the notification requirement in Article 108(3) of the Treaty, if they fulfil the conditions laid down in this Regulation.

While this regulation is general, the EU has regulated *de minimis* aid for specific sectors as well, for instance, agriculture. EU regulation 1408/2013 on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to de minimis aid in the agriculture sector[43] sets a different *de minimis* aid amount.

While Article 3(1) of the regulation is similar to Article 3(1) in the general regulation mentioned above, Article 3(2) stipulates that:

> The total amount of de minimis aid granted per Member State to a single undertaking shall not exceed EUR 15 000 over any period of 3 fiscal years.

These examples show the need to treat specific sectors differently when it comes to competition regulation. Small amounts of state aid will not be scrutinised as large amounts in general, and the exact amount that is considered to be de minimis may change according to specific markets.

The concept of *de minimis* is not unique to EU regulations. For instance, Canada uses the *de minimis* principle to regulate the operation of drones of different categories. According to Section 3(1) to the Interim Order No. 9 Respecting the Use of Model Aircraft of the Aeronautics Act, an individual flying a drone that weighs less than 250 grams, for recreational purposes, does not need to obtain a permit or to follow a set of safety measures.[44]

[43] Regulation (EU) 1408/2013 of 18 December 2013 on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to de minimis aid in the agriculture sector, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R1408&from=en .

[44] Canada Gazette, Part I, Volume 152, Number 24: Government Notices, Interim Order No. 9 Respecting the Use of Model Aircraft (31 May 2018), available at: http://www.gazette.gc.ca/rp-pr/p1/2018/2018-06-16/html/notice-avis-eng.html#ne6 .

This means that the Canadian authorities consider the potential damage caused by a drone with such light weight as *de minimis.* The operation of drones weighing more than 250 grams and less than 35 kilograms are subject to the Interim Order and safety measures.[45]

The regulatory practice of *de minimis* is in line with the suggested approach in this study, since small satellites operators should be subject to a simplified regime relating to authorisation in the meaning of State responsibility, international liability and registration. All as suggested in the recommendations section and Optional Protocol below.

4. Recommendations

Following the findings of this study, it is recommended to create a clearer and simpler legal regime, which supplements the classic treaty provisions on State responsibility, liability and matters related to jurisdiction and control in a more modern, efficient and holistic manner. This should be done to increase legal certainty with respect to the different concepts in the space treaties while considering non-governmental small satellites activities.

The author will present a specific concept in the form of an Optional Protocol to the Outer Space Treaty, aimed towards States parties to the treaty, in section 5 below. Such Protocol, will encapsulate the general recommendations in this section, in particular terms.

The form of a Protocol was chosen since the author believes this is the most suited legal instrument to supplement the basic provisions of the Outer Space Treaty in the narrow context of non-governmental small satellites operation.

A direct amendment to the treaty is not realistic for political and procedural reasons, and further, it makes no sense to amend the very general and time-proof treaty text for a specific space activity. Instead, the Protocol, which is addressed to the States parties to the treaty, will supplement its basic provisions, and offer a chance to adapt and modernise such provisions to increase common understanding between subscribing States regarding the operation of non-governmental small satellites in outer space. It is also a practice in international law to draft protocols in order to allow implementation of a general treaty-regime in more specific fields and terms.[46]

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[45] Transport Canada- Rules for recreational drone users: https://www.tc.gc.ca/en/services/aviation/documents/rules-recreational-drones.pdf.

[46] As explained by the UN with respect to the Optional Protocol to the Convention on the Elimination of All Forms of Discrimination against Women *U.N.T.S.*, vol. 2131, p. 83: 'Very often, human rights treaties are followed by "Optional Protocols" which may either provide for procedures with regard to the treaty or address a substantive area related to the treaty. Optional Protocols to human rights treaties are treaties in their own

Other types of legal instruments, which may promote the implementation of this study's conclusions, are soft law instruments. An international Code of Conduct on the operation of non-governmental small satellites can serve as a legal non-binding alternative to the Protocol. It is difficult to assess the potential success of such a Code. The IADC Space Debris Mitigation Guidelines[47] are a good example to a case where a topic that is not included in the space treaties is supplemented by a soft law instrument, in a successful manner.[48] Since the conclusions of this study directly relate to the space treaties, the author maintains that the Protocol is a more appropriate legal tool in the case of small satellites. Nevertheless, the author appreciates that soft law may be suitable to modernise and supplement international space law, as scholars agree that soft law instruments are suitable for the development of international space law.[49]

Another form of non-binding legal instrument that was considered is a UN General Assembly Resolution text, much like the previous resolutions regarding the concept of the launching state, and registration of space objects.[50] The author appreciates the value of discussions at UN COPUOS which may lead to such a resolution, however, argues that with the advancement of the industry there is an urgent need to create more legal certainty on an international level, regarding non-governmental small satellites operations. The procedure and timeframe, which may lead to a resolution, and its non-binding status, are two great shortcomings in the context of this study.

Therefore, the recommendations of this study, which are elaborated below, are organised as a suggested Optional Protocol to the Outer Space Treaty, attached in section 5 below.

The core recommendation is to supplement the regime in the space treaties with respect to State responsibility, liability and registration in the sense of 'jurisdiction and control', in

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right, and are open to signature, accession or ratification by countries who are party to the main treaty.' http://www.un.org/womenwatch/daw/cedaw/protocol/whatis.htm .
The practice of optional protocols is common to other fields of international law, for example: Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets (Berlin, 9 March 2012); and the Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, U.N. Doc FCCC/CP/1997/7/Add.1, 37 I.L.M. 22 (1998).

[47] Inter-Agency Space Debris Coordination Committee (IADC), Space Debris Mitigation Guidelines (2002, as revised in 2007), IADC-02-01, Revision 1.

[48] I Marboe, 'The Importance of Guidelines and Codes of Conduct for Liability of States and Private Actors' in I Marboe (ed), *Soft Law in Outer Space: The function of Non-binding Norms in International Space Law* (Brill Nijhoff 2012) 119-144.

[49] K-U Schrogl, 'The Launching State and the Registration Practice Resolutions as 'Kick Off' for a New Phase in Space (Soft) Law Development' in I Marboe (ed), *Soft Law in Outer Space: The function of Non-binding Norms in International Space Law* (Brill Nijhoff 2012) 195-204. In the context of small satellites see: W Balogh 'The Role of Binding and Non-binding Norms in the Implementation of Small Satellites Programmes' in I Marboe (ed), *Soft Law in Outer Space: The function of Non-binding Norms in International Space Law* (Brill Nijhoff 2012) 325-342.

[50] UNGA Res. 59/115 Application of the Concept of 'Launching State' (25 January 2005); UNGA Res. 62/101 Recommendations on Enhancing the Practice of States and International Intergovernmental Organizations in Registering space Objects (17 December 2007).

the context of non-governmental small satellites operations. All with the aim of increasing legal certainty and international understanding which will benefit both States and industry.

Each space activity in this context should be identified as a national activity of a certain State. The criteria of establishing nationality are domestic corporate or personal law. The idea is to identify which entity controls the satellite operation and find to which laws the entity is subject. The national laws according to which the entity legally exists should be the same nationality of the space activity and small satellite.

That *national State should be named responsible* for the non-governmental small satellite operation. The same State will also *assume the obligations* in Article VIII of the Outer Space Treaty relating to *jurisdiction and control in case the small satellite in question was not registered by any State*. In this way, *when a small satellite is not registered it will be clear that its responsible State has retained its jurisdiction and control, even if registration was not properly done*. This solution will help to eliminate some of the legal uncertainties in case of non-registration. It will also accommodate the planned small satellite swarms and constellations better, in case States struggle to register these many satellites.

It is also recommended to encourage States to domestically regulate the operations of non-governmental small satellites under their responsibility and jurisdiction. This recommendation is in line with the UN recommendations regarding national legislation relating to space activities in general.[51] When regulating such activities States will ensure that private entities have sufficient funds in order to provide compensations in case they cause damage in outer space, or alternatively, ensure that proper insurance arrangements are made to cover such scenarios.

Further, it is recommended that States will encourage private small satellites operators under their jurisdiction to resolve commercial liability related disputes, in competent domestic tribunals which are experienced in similar commercial disputes, when both parties to such a dispute are non-governmental small satellites operators. This recommendation is in line with Article VII of the Outer Space Treaty and Article XI of the Liability Convention, which allow parties to settle their disputes in domestic proceedings, since these treaties do not stipulate an exclusive dispute resolution procedure.

In addition, it is recommended to emphasise the role of the responsible national State in promoting the long-term sustainability of outer space, since it is the one that has the legal power to authorise the launch and operation of any small satellites' constellations. Currently, the space treaties do not address the need to keep outer space sustainable, and minimise the creation of space debris. This gives a golden opportunity to use the Protocol

[51] See: chapter 5 subsection 2.2.5.

as a tool, which 'imports' very general understandings among the international community, into a legally binding instrument.

Finally, it is recommended to bring the results of this study to the awareness of the international space community, by its publication and by promoting a discussion on its findings and recommendations in international forums, such as UN COPUOS.

Since the recommendations are encapsulated in the proposed Optional Protocol, and since UN COPUOS Legal Subcommittee is currently discussing the applicability of international space law to small satellites operations, the author hopes that this study and its end result, the Protocol, may be helpful to States which are currently participating in the discussions at COPUOS.

5. Optional Protocol

The Non-governmental Small Satellites Optional Protocol to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies

The Parties to this Protocol,

Being Parties to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereinafter referred to as the Outer Space Treaty),

Conscious of the need to adapt the Outer Space Treaty to meet the particular demand for and the utility of small satellites, in particular when operated by non-governmental entities,

In pursuit of the ultimate objectives of the Outer Space Treaty as stated in its Article I,

Being guided by Articles VI, VII and VIII of the Outer Space Treaty, and

In pursuit of reaching common international understanding with respect to the operation of non-governmental small satellites in outer space, and promoting legal certainty in this respect,

Have agreed as follows:

1. Definitions

   The following definitions shall apply to this Protocol:

   (a) Small satellite- means, a satellite which qualifies as a small satellite according to scientific and industry standards, and in any case, does not exceed 1,000 kilograms by mass.
   (b) Non-governmental small satellite- means, a small satellite as defined in Article 1(a), which is made and operated by a non-governmental entity which is pursuing non-governmental activities in outer space.
   (c) Responsible State- shall have the meaning as defined in Article 3(a) of this Protocol.
   (d) Parties- means the States which are parties to this Protocol.
   (e) Outer Space Treaty- means 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.
   (f) Liability Convention- means, the Convention on International Liability for Damage Caused by Space Objects, 1972.
   (g) Launching State- means, (i) A State which launches or procures the launching of a small satellite; (ii) A State from whose territory or facility a small satellite is launched.

2. Scope

   This Protocol shall apply solely to the operation of non-governmental small satellites in outer space.

3. State Responsibility

   (a) The State in which, and according to whose domestic laws, an entity is engaging in the operation of non-governmental small satellites, is internationally responsible for such operation in outer space (the 'Responsible State'). The Responsible State shall assume the rights and obligations provided for in Article VI of the Outer Space Treaty.

(b) The Responsible State shall authorize and continually supervise non-governmental small satellites operations in outer space, whether by enacting appropriate domestic laws, or otherwise.

4. State Liability

(a) The Responsible State shall bind the operator and/or owner of the small satellite in a legal arrangement relating to liability potentially arising from the non-governmental small satellites operation in outer space. It shall do so by enacting appropriate domestic laws, or otherwise.

(b) With respect to potential liability claims originating from third parties, meaning, any entities or individuals which are not the nationals of the Responsible State or the launching States, the Responsible State shall assume international liability pursuant to Article VII of the Outer Space Treaty, jointly with any other launching State or States.

(c) Observing Article VII of the Outer Space Treaty and Article XI of the Liability Convention, the Parties shall encourage non-governmental small satellite operators to resolve liability related disputes of a commercial nature, with other non-governmental small satellites operators, by domestic proceedings of their choice which do not require the involvement of any Responsible and/or launching States.

5. Registration

(a) Where possible, the registration of the non-governmental small satellite with the UN shall be done according to Article VIII OST, by one of the launching States of the satellite or by the Responsible State for its operations under Article VI OST, in case the satellite is not registered by any of its launching States.

(b) In case registration was not carried out by any of the mentioned States in this Article, it shall be assumed that the Responsible State has retained its jurisdiction and control over the operation of the non-governmental small satellite.

6. Long-term Sustainability of Outer Space

When authorizing small satellite activities, and especially in the case of large swarms and constellations, the Responsible State shall take into account any developments in international law, referring to the long-term sustainability of outer space in general and space debris mitigation and remediation in particular.

7. Signature, ratification, acceptance, approval or accession

   (a) This Protocol shall be open for signature in _____ on _____ by States participating in the diplomatic Conference for the adoption of the draft Protocol to the Outer Space Treaty. After _____ this Protocol shall be open to all States for signature at _____ until it enters into force in accordance with Article 9.

   (b) This Protocol shall be subject to ratification, acceptance or approval by States which have signed it.

   (c) Any State which does not sign this Protocol may accede to it at any time.

   (d) Ratification, acceptance, approval or accession is effected by the deposit of a formal instrument to that effect with the Depositary.

   (e) A State may not become a Party to this Protocol unless it is or becomes also a Party to the Outer Space Treaty.

8. Amendments and Reviews

   (a) Any State Party to the Protocol may propose amendments to this Protocol. Amendments shall enter into force for each State Party to the Protocol accepting the amendments upon their acceptance by a majority of the States Parties to the Protocol and thereafter for each remaining State Party to the Protocol on the date of acceptance by it.

   (b) Ten years after the entry into force of this Protocol, the question of the review of this Protocol shall be included in the provisional agenda of the United Nations General Assembly in order to consider, in the light of past application of the Protocol, whether it requires revision. However, at any time after the Protocol has been in force for five years, and at the request of one third of the States Parties to the Protocol, and with the concurrence of the majority of the States Parties, a conference of the States Parties shall be convened to review this Protocol.

9. Entry into Force

   This Protocol shall enter into force upon the deposit of instruments of ratification by five Governments.

10. Depositary

(a) Instruments of ratification, acceptance, approval or accession shall be deposited with _____, which is hereby designated the Depositary.

(b) The Depositary shall:

(i) inform all States Parties of:

(1) each new signature or deposit of an instrument of ratification, acceptance, approval or accession, together with the date thereof;

(2) the date of entry into force of this Protocol;

(3) each declaration made in accordance with this Protocol, together with the date thereof;

(4) the withdrawal or amendment of any declaration, together with the date thereof; and

(5) the notification of any denunciation of this Protocol together with the date thereof and the date on which it takes effect;

(ii) transmit certified true copies of this Protocol to all States Parties;

(iii) perform such other functions customary for depositaries.

IN WITNESS WHEREOF the undersigned, duly authorized, have signed this Protocol.

DONE in ____, at _____, this _____ day of _____.

6. Beyond Small Satellites, States, Corporations and our World

> Space law is an essential element of international cooperation and security. It is time for states to regain control on it and for the academic community to come up with pragmatic solutions.[52]

This chapter has begun with the realisation, based on this study, that there is a justification to treat non-governmental small satellites activities differently under international space law. Through the comparison with small aircraft regulation, it was pointed out that there is precedence in treating such operators differently. Likewise, this study recommends to supplement some of the UN space treaties' obligations in a way which leaves no doubt as to the regulatory powers and responsibility of States whose nationals are engaged in small satellites operations. State responsibility should be regarded as the nexus between the non-governmental activity and the State. This may also encourage States to regulate these activities on a national level, where regulation is not yet in place.

The author hopes that the international space community will become aware of the matters analysed in this study and will consider the recommendations and suggested Optional Protocol as a possible solution to effectively regulate the upcoming commercial small satellites missions. Even if this study only pushes stakeholders to consider any kind of legal instruments in order to fill some of the lacunae in the space treaties, this would be a welcome progress.

'Space law' often seems detached from other legal systems. Relying solely on space law as *lex specialis* with respect to non-governmental and commercial NewSpace activities creates an uncertain and unworkable legal environment, because of the lack of jurisprudence and customary law.

The space treaties cannot comprehensively accommodate commercial space activities on their own, as they were never drafted for such a purpose. The use of vague terms and many lacunae is one of the reasons for the legal uncertainty surrounding 'commercial space law'.

The study concludes that there is an urgent need to integrate space law, other branches of public international law and commercial domestic regulation in order to create a legal system, which could provide all stakeholders involved with sufficient legal certainty for pioneering activities outside of our world.

The author believes that the need to regulate novel space activities will become more and more relevant as time passes and human capabilities in outer space become more complex.

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[52] JF Mayence, 'QB50: Legal Aspects of a Multinational Small Satellites Initiative' in I Marboe (ed), *Small Satellites: Regulatory Challenges and Chances* (Brill Nijhoff 2016) 195, 210.

The author also believes that non-governmental entities are key players in the development of space activities.

For now, the regulatory system can still be based on classic international law, meaning treaties and agreements between States joint with customary law, general legal principles and scholarly work. Perhaps in the future there will be a need to create a new system, which sees different entities as equals, depending on the type of activities they carry out in outer space, rather than on their binary distinction between ‘States’ and ‘non-governmental’ entities.

Until then, the international community must enhance regulatory practices that allow for industry growth on the one hand, and ensure that outer space is subject to responsible utilisation and use on the other hand. This includes the assurance that space will continue to be accessible to humans on the long-term, for the sake of future generations.