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The legal and policy framework for the development of a viable domestic space industry in Estonia

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I hereby declare that I have compiled the thesis independently and all works, important standpoints and data by other authors have been properly referenced and the same paper has not been previously presented for grading.
The document length is 10075 words from the introduction to the end of conclusion.

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1. ABSTRACT

Legislation is always adapting and improving to better regulate activities of outer space. Regulating this industry is however difficult since all countries use and operate in the same space, outer space being a territory with no one authority. What is more, a balance needs to be had since research into future technologies and our understanding of the universe depend on these outer space travels. This means cooperation is key between countries and with the era of private outer space flights and expeditions taking place it is so more than ever as each state needs to manage the activities that originate from their soil and also fulfil the obligations on an international level. This thesis looks at what are the key details necessary to make national outer space law work, focusing on Estonia as the country which could implement these key details.

International agreements and principles are analyzed to provide what obligations a nation has on an international level. National outer space laws of Sweden, Finland, and the United Kingdom are analyzed to find ways to implement these obligations into national law. The findings show that the key aspects needed in national outer space law are registration, supervision and responsibility: Registration of a spacecraft being an obligation from the international side needs to be fulfilled with the help of national law. Supervision is needed to maintain the quality of life while conducting space-related activities. Responsibility needs to be ascertained for each activity or situation and ways for settlement need to be put in place.

Keywords: Outer Space Law, Estonian national law of outer space, The regulation of outer space activities

2. INTRODUCTION

Between 1872 and 1876 the first deep-sea exploration was conducted.[1] This marked the starting point of physical oceanography. The expedition of H.M.S. Challenger had two objectives: to conduct an in-depth study of animal life and to observe the physical properties of ocean waters.[2] Almost a century later and the Cold War was in full swing, October 4, 1957 marked the first launch of a man-made object into earth's orbit, a Russian satellite "Sputnik".[3]

These two areas of exploration, even when seemingly world apart, have so much in common. Deep sea exploration was regarded as Earth's final frontier and still is while outer space is now the new mystery to be solved, the final frontier of mankind.[4] Even when according to the US National and Oceanic and Atmospheric Administration (NOAA) more than 80% of the world's ocean is not mapped we already have massive amounts of research being done to further move the boundaries of space travel.[5] It can be said that this research has not been frivolous as just under a year after the first satellite was sent to orbit, the second was added to the collection by the USAs satellite "Explorer 1".[6] Throughout the 50s and 60s space exploration gained pace with animal and manned missions being launched, even moon landing achieved.[7]

Since the Roman empire the notion was that a person who owns a defined territory also owns the air above it, no distinction between airspace and outer space was made. This comes from the Roman Law *Cujus est solum, ejus debet esse usque ad coelum* meaning whose is the soil, his it is

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[1] Aitken, F., &; Foulc, J. N. (2019). From Deep Sea to laboratory 1: The First Explorations of the Deep Sea by H.M.S. Challenger (1872–1876).
[2] Ibid., p. 148.
[3] Brzezinski, Matthew B. (2007). Red Moon Rising: Sputnik and the Hidden Rivalries That Ignited the Space Age, New York, Henry Holt and Co.
[4] The comparisons between the sea and outer space was also done by White, Irvin L. (1970) Decision-making for Space: Law and Politics in Air, Sea, and Outer Space", where the author mainly wants to understand the methodology of how nations mostly do decision making but uses outer space, air and sea to investigate this due to the legal ambiguity involved.
[5] NOAA. How much of the ocean have we explored?. https://oceanservice.noaa.gov/facts/exploration.html. Last accessed 26.02.2021
[6] NASA. Explorer 1 Overview. https://www.nasa.gov/mission_pages/explorer/explorer-overview.html. Last accessed 4.08.2017
[7] Among many other great books talking about the history of space travel there a book by Launius, Roger D. (2018) The Smithsonian History of Space Exploration: From the Ancient World to the Extraterrestrial Future.

up to the sky.[8] This kind of thinking however ended when outer space became more reachable. Agreements, treaties and principles needed to be drafted to agree upon how to govern such activities, to ensure safe passage and cooperation for the good of exploration. [9]From the 1960s all the way into the 1980s was the time when principles were agreed upon. The Outer Space Treaty was adopted, to govern the activities of states in the exploration and use of outer space and its celestial bodies, making it impossible to officially occupy the moon along with other celestial bodies.[10] Moreover, the Rescue agreement of the rescue of astronauts, the return of astronauts and the return of objects launched into outer space was agreed upon.[11] These were just the first ones to be adopted with Liability Conventions, Registration Convention and Moon Agreement following soon after.[12] At the same time principles were drafted that would guide the conduct of outer space travel and research.

Although the drafting of laws can sometimes be behind the advancements of technology and the possibilities that mankind possesses, laws should, even need to, go hand in hand with these advancements, even when the future-minded approach of the Geneva convention, adding a list of futuristic weapons to the "*prohibited in war*" section with protocol IV, is not always possible.[13] Today the laws of outer space have far outreached the basic principles that were set in the early days of space travel. Space agencies were created to better manage cooperation between governments, each government has agencies of their own to handle the administrative tasks that come with outer space-related activities. For example, in the US the Department of Transportation has a branch responsible for space-related activities, the Federal Aviation Administration (FAA), which expanded their administrative reach from aerospace to orbit.[14] However, they do have an independent agency, the National Aeronautics and Space Administration (NASA), that is responsible for the civil space program.[15] In Canada on the other hand, the task of regulating and promoting is in the hands of the Canadian Space Agency (CSA),

[8] McNair. (1953). The Law of the Air. 2nd Ed. Stevens & Sons Limited. Atlanti. p. 31.
[9] The development of international law in space and the first thoughts when the world was starting to think about space travel in general was explained in great detail by Nyman-Metcalf, Katrin M. (1999). Activities in Space - Appropriation or Use? Iustus Förlag. Upsala. Chapter 4, p. 104; in general.
[10] RES 2222 (XXI). 1966. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. Art. I - IV.
[11] RES 2345 (XXII). 1967. Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.
[12] United Nations Office of Outer Space Affairs (UNOOSA). 2017. International Space Law: United Nations Instruments. Part 1.
[13] 1980 Convention (Geneva Convention). 13 October 1995. Protocol IV: Protocol on Blinding Laser Weapons.
[14] The FAA created a branch Commercial Space Transportation that deals with the commercial use of space within the us. FAA. https://www.faa.gov/space/compliance_enforcement_mishap. Site accessed 07.11.2022.
[15] NASA. https://www.nasa.gov/about/index.html. Site accessed 07.11.2022.

under the Canadian Space Agency Act, which reports to the Minister of Innovation, Science and Industry.[16] Finland`s space policy on the other hand comes from the Ministry of Economic Affairs and Employment.[17] When looking at intergovernmental organizations the European Space Agency (ESA) is one of the largest with 22 member states and 3 associated members.[18] It has the purpose of ensuring investments in space exploration and the development of Europe`s space capability for the benefit of its citizens and the world. On national levels the work of better regulating is still even with these advancements only continuing, some just adding national laws regarding space within the last few years; Finland being one of them, passing the Act of Space Activities in 2018.[19] Some however have still not enacted a law that would govern outer space on a national level, resorting to analyzing and approving activities on a case-by-case basis, Estonia is one of them where only the once-adopted treaty and internationally accepted principles guide the decision making to this day.[20]

The various levels of regulations throughout the world really show that outer space is still in its infancy when it comes to laws and policy frameworks. With so much potential to learn but also to take advantage of, it can be difficult to regulate in a way that can create a prosperous yet relatively safe medium for mankind to prosper and advance into the space age that was dreamt of for decades.

2.1. Research question and methodology

As the thesis topic suggests the aim is to gather enough information to create a workable framework that would benefit the outer space industry in Estonia by boosting development and

[16] Government of Canada. https://www.asc-csa.gc.ca/eng/about/csa-organization.asp. 08.11.2021.
[17] Finland Ministry of Economic Affairs and Employment. https://tem.fi/en/space Site accessed 07.11.2022.
[18] ESA. https://www.esa.int/About_Us/Corporate_news/Member_States_Cooperating_States, Site accessed 07.11.2022.
[19] Laki avaruustoiminnasta (63/2018). Finland.
[20] European Center for Space Law (ECSL), a branch of ESA wrote an article on their website about the 2018 ECSL summer school where TalTech was mentioned and a short overview was given regarding the situation for Estonian national space law at the time: ECSL. 20.12.2018. ECSL NPoC in Estonia - The Institute of Law at Tallinn University of Technology. https://www.esa.int/About_Us/ECSL_-_European_Centre_for_Space_Law/ECSL_NPoC_in_Estonia_-_The_Institute_of_Law_at_Tallinn_University_of_Technology; The need for national outer space law was also emhizised in an article of the Estonian national news agency Eesti Rahvusringhääling (ERR). 07.11.2017. EISC chair: Estonia should consider necessity of space law. https://news.err.ee/641223/eisc-chair-estonia-should-consider-necessity-of-space-law.

giving a transparent view of what is needed from the private entities starting outer space activities. To provide a clear goal and support the aim of this thesis a research question will be raised. This research question will be: What are the key issues that the Estonian national law needs in order to efficiently regulate outer space activities and fulfill its obligations on an international level? This research question is to only find the key elements which would be necessary for a well-governing outer space law. Although all elements of the law are important the scope of this research would be too wide for the inclusion of everything. Therefore, the aim is to only focus on the key aspects that are the most important without which national law can not function. The framework itself is fundamental to creating an atmosphere of legal certainty, giving a more transparent view, as stated before, and helping attract investments into this sector.

The methodology to accurately provide a clear answer and fulfill the aim of this thesis is to use the analytical method, to analyse relevan treaties principles and national laws of chosen countries, and use the comparative method to compare relevant national laws of other nations. To go into more detail, The analysis of the agreements and conventions that are agreed upon on an international level, even recommendations that give insight into how nations should govern their outer space travel need to be done first. This is for the purpose of effectively creating a framework of international obligations in which national law can be placed to govern on a national level and guarantee the fulfillment of these obligations. Next, countries with national outer space laws in place are also analyzed to give insight into how countries have managed their international obligations and shaped the industry. Sweden, the United Kingdom, and Finland are mainly looked at for this purpose as these countries have a national laws for outer space activities. Sweden and Finland are mainly chosen because of their geographical closeness which provides insight into how outer space activities are managed in this region. United Kingdom is added as well since it has close ties with the EU and is a major party in outer space activities. By combining the analysis of international parts and other nations, key details can be gathered on what should be implemented in Estonian National law and how it should be done. The answer to the research question, concluding the results of this thesis, can then be given by drafting a proposal on what those key details are for outer space national law and how they should be implemented.

3. INTERNATIONAL LEGISLATION

The backbone of outer space law comes from the treaties and principles that are laid down on the international forums which are agreed upon by nationals and largely create the framework that is outer space law. The main body of space treaties - Corpus Juris Spatialis, are the five treaties that regulate most of the aspects of outer space law. The treaties are binding and throughout their existence no country has tried to undermine or outright violate these agreements.

In addition to the treaties, there are also principles that serve as recommendations to all countries conducting space-related activities. These are not binding in the sense that there is no real obligation to adhere to these but they do provide a good standard of practice.

Since these internationally recognized treaties and principles are so essential to the workings of outer space law in a way that these create the framework that the national law can fill it is paramount to understand them. To create a better understanding these framework pieces need to be analyzed for their purpose, limiting factors and key factors where national law could supplement.

3.1. Principles

The legal principles that act as recommendations for all countries conducting outer space activities are developed by the Committee on the Peaceful Uses of Outer Space (COPUOS) which is the forum for outer space-related discussions under the United Nations branch of Office for Outer Space Affairs (OOSA). These recommendations are then adopted as resolutions by the UN General Assembly. It can be argued that COPUOS is a highly important forum for debate because of its non-binding nature although the treaties have more power amending and developing new treaties is almost impossible because of the political landscape it needs to survive.[21]

[21] the difficulty of developing and amending new treaties was also handled in the article: The Wilson Center. 1.10.2021. The Global Legal Landscape of Space: Who Writes the Rules on the Final Frontier?. https://www.wilsoncenter.org/article/global-legal-landscape-space-who-writes-rules-final-frontier. Site accessed 11.12.2022.

The key Principles are:

1. The Declaration of Legal Principles.[22] This declaration aims to promote cooperation, and peaceful use of outer space and most of all reinforce the aspects brought out within the treaties.
2. The Broadcasting Principles.[23] This seeks to promote that activities of international television broadcasting by satellite should be carried out in a way that is compatible with the rights of States and the right to seek, receive and impart information, as well as, with the principle of non-intervention in mind. mutual exchange of information and knowledge in cultural and scientific fields. The principle hints at the Outer Space Treaty for guidance, along with the Charter of the United Nations and international law.
3. The Remote Sensing Principles.[24] Along with defining the terms related to remote sensing it promotes the free flow of information that is gathered with remote sensing and the use of it for the protection of human life and the environment.
4. The Nuclear Power Sources Principles.[25] The purpose is to protect from radiation and provide guidelines for nuclear safety. It provides what should be the basis for the operation of nuclear reactors, providing when and how it would be appropriate to operate them. For example, providing those nuclear reactors should only be operated on interplanetary missions or when there is a sufficiently high orbit and there is minimal risk of collision with Earth and other objects. There are also provisions that explain the measures to be taken when issues or a malfunction have occurred.
5. The Benefits Declaration.[26] As the name implies it guides all states to determine their participation in outer space on a mutually acceptable basis and promotes states with space capabilities to help other nations achieve the same capabilities. A separate section is also dedicated to developing countries, guiding that promoting, fostering and facilitating should be done to help those countries grow and develop the necessary skills for outer space research and ultimately even travel.

[22] General Assembly resolution 1962 (XVIII) of 13 December 1963
[23] General Assembly resolution 37/92 of 10 December 1982
[24] General Assembly resolution 41/65 of 3 December 1986
[25] General Assembly resolution 47/68 of 14 December 1992
[26] General Assembly resolution 51/122 of 13 December 1996

There is also a resolution of 1721 (XVI): International cooperation in the peaceful uses of outer space, which is regarded as containing principles commonly accepted in outer space law and has binding customary rules.[27] When it comes to more recent past there are still resolutions that are released, the resolution 59/115 of 2004: Application of the Concept of the "Launching State",[28] which more or less recommends that states also actively supervise the non-governmental entities involved with outer space activity under their jurisdiction and the resolution 62/101 of 2007: Recommendation on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects,[29] which promotes the acceptance of the Registration Convention and harmonization of space objects registration, just to name a few.

It can also be noted that new guidelines are also created to deal with whatever issues come up, for example, the "Space Debris Mitigation Guideline of the Committee on the Peaceful Uses of Outer Space" which was published in 2010 by the United Nations.[30]

3.2. Treaties

As stated before, treaties are more binding throughout the world, meaning a great number of countries have ratified, signed or accepted them.[31] Back when the space race was happening none of the states really wanted to involve outer space warfare or more political conflicts in their agenda and even gave leniency to other states with the hopes of gaining some for themselves. A good example is when the first man-made satellite was in orbit. Even though the Cold War was still going strong between the USSR and the US, US president Dwight D. Eisenhower did not forbid the satellite from orbiting over their territory. According to the Paris Convention of 1919, he would have had the right to not allow this.[32] But since the US had similar plans of sending one of their satellites to orbit so they offered leniency in hopes of being able to do the same and it worked. Because of this more peaceful approach to outer space, the treaties were more directed

[27] Official Records of the General Assembly. document A/4987. Sixteenth Session, Annexes, agenda item 21.
[28] Resolution adopted by the General Assembly (A/59/469). 10.12.2004. Report of the Special Political and Decolonization Committee (Fourth Committee).
[29] Resolution adopted by the General Assembly (A/62/403). 10.01.2008. Report of the Special Political and Decolonization Committee (Fourth Committee).
[30] United Nations Office for Outer Space Affairs. 2010. Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space. Austria
[31] Fawcett, J. (1969). International Law and the Uses of Outer Space. volume 44, issue 2, article 10. - also explained that because of the features of these declarations they effectively created rules of law.
[32] Paris Convention. 13.10.1919. Convention Relating to the Regulation of Aerial Navigation Signed at Paris

towards demilitarisation and peaceful exploration and answering political or scientific questions. No treaty really deals with non-governmental entities or agencies for this exact reason, along with people not really even imagining that someday private persons can grasp outer space as much as we can today.

Since these treaties only aim to make governments more responsible with outer space activities all the regulations that are within them are also mostly thought of as for government activities only. That is not to say that private activities are more or less not applicable to the treaties but summed up as carrying liability for the state. This means each state has to regulate private sector activities within its territory for itself.

3.2.1. The Outer Space Treaty

The treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies entered into force 10 October 1967, commonly referred to as "the Outer Space Treaty."[33] The treaty is one of the most essential ones because of the first actual agreement on how to handle outer space activities. This means that all other treaties effectively add or better define some parts of this one.

Articles I to V lay down the general conditions of how outer space and the celestial bodies should be used and activities conducted, article V being the one that specifically talks about the safety of astronauts.[34] This means that the utmost importance is to carry out activities for the benefit of all countries while maintaining peace and security of all, freedom of information should be exercised and occupation or claim of sovereignty is prohibited while cooperation is promoted.[35] As there is fear of wrongful use, nuclear weapons, military bases/installations/fortifications are prohibited along with military personnel unless the personnel

[33] RES 2222 (XXI). (1966). supra nota 9.

[34] Ibid., Art. I - IV.

[35] The idea of non-exclusive rights of outer space was analysed to great extent by Christol, Carl Q. Pergamon Press. 1982. The Modern International Law of Outer Space by. New York; More recently an article regarding Mars missions was also published Cristian van Eijk. Sorry, Elon: Mars is not a legal vacuum – and it's not yours, either. Völkerrechtsblog, 05.11.2020, doi: 10.17176/20210107-183703-0.

is used for scientific or peaceful purposes.[36] This is to ensure all States have free and equal access to outer space. Equality, peace, and freedom of science are key. However, there are works stating that the prohibition of weapons should be updated, specifically Article IV.[37] The part which is most important for states when it comes to international liabilities is articles VI and VII, the former of which states: "*States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty.[38] The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty. When activities are carried on in outer space, including the Moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization.*"[39] This clearly brings on any and all liability to the state on an international level even when a non-governmental entity is conducting it. This of course also brings on more responsibility for the state in the form of supervising and regulating all activities that are conducted in connection to outer space within its territory be it a government act or not. Article VII on the other hand expands the meaning of who the Launching state is and includes that the damage done is not limited to Earth for the purposes of the liability claim. "Launching state" is defined by who launches, procures the launching, and whose facility or territory it is launched. Although the definition is clear the interpretations may vary as nowadays the private sector deals with launching and grey areas can come apparent. The most widely accepted interpretation is that the state who has authorized the space activity is regarded as the launching State. Articles from VIII to XIII on the other hand mostly create the foundation of how the cooperation should work.[40] While article VIII talks about the registry and how it should provide a good view for the return of recovered items, the rest imply a so-called open door policy for spacecraft, cooperation, and consultations between states when experiments are conducted and provides a footing where the scientific community could thrive.

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[36] the preservation of outer space for peaceful purposes and avoiding military conflicts in outer space was analysed by Hurwitz, Bruce A. 1986. The Legality of Space Militarization. Amsterdam and New York.

[37] Rathnayake, RMTSK. (2016). Faculty of Law, General Sir John Kotelawala Defence University. Critical analysis of the article IV of the outer space treaty and its relevance for the present day. Ratmalana

[38] the definition "national activities" were analysed by UNOOSA. United Nations/Brazil Workshop on Space Law (ST/SPACE/28). 2005. "Disseminating and developing international and national space law: the Latin America and Caribbean perspective. New York

[39] RES 2222 (XXI). (1966). supra nota 9. Art. VI - VII

[40] RES 2222 (XXI). (1966). supra nota 9. Art. VIII - XIII

Something that is not covered in this treaty however is the definition of "outer space". In the Finnish "Government proposal to the parliament for the approval and implementation of the Convention on Registration of Objects Launched into Outer Space and for the Act on Space Activities and the Act on the Amendment of Section 2 of the Lost and Found Objects Act[41]" It was stated after researching other countries' legislation that: "*The absence of a definition has not, however, resulted in significant problems in practice. It is unanimously recognized internationally that outer space begins after the atmosphere.*"

The Treaty has been signed by 23 States and ratified by 112 States (situation on 1 January 2022).

3.2.2. The Rescue Agreement

The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space[42], known as the Rescue Agreement**,** entered into force internationally on 3 December 1968**.** It provides specifications for the Outer Space Treaty concerning astronauts, mostly in situations where astronauts need assistance. It is stated that each Contracting Party shall notify the launching authority or UN if a spacecraft has had an accident, is experiencing conditions of distress, or has made an emergency or unintended landing in territory under its jurisdiction or on the high seas. Contracting Parties should also attempt a rescue of any personnel that has landed in their territory and promptly return them to the launching authority. This also applies to any space objects and their components.

The Treaty has been signed by 23 States and ratified by 99 States (situation on 1 January 2022).

[41] HE 157/2017. Finland.
[42] RES 2345 (XXII). supra nota 10.

3.2.3. The Liability Convention

The Convention on International Liability for Damage Caused by Space Objects[43] (the Liability Convention) entered into force internationally on 1 September 1972. The objective of it is to create international rules for liability claims to ensure full payment of the damages caused by space objects. The treaty defines personal injury, impairment of health, and loss/damage of property as "damage". It also defines the phrase "launching state" but this is the same as the Outer Space Treaty`s definition. These definitions however are needed for the application of articles II and III[44] of the treaty. Article II states that the launching state is absolutely liable to pay compensation for damages caused by its space object, whether it happened on Earth or while in flight. Article III on the other hand limits the liability by defining that they are only liable when the damage caused was due to the fault of the object or person it is responsible for. Liability towards launching states nationals and foreign nationals taking part in the launch are excluded. The treaty also encompasses cases where there are several states involved in the launch, making both liable and providing states the opportunity of recourse if some other state is eligible to pay compensation as well. When it comes to issuing the liability claim and making agreements regarding this, it is stated that diplomatic channels should be used with a time limit of 1 year for the settlement of the claim. In case of no settlement within this time limit, a Claims Commission can be established who shall decide on the claim and the amount payable. This decision however is only final and binding if the parties so agree.[45] The same terms also apply to all intergovernmental organisations that conduct outer space activities if they accept the rights and obligations that come with the treaty, in this case, the liability of the organisation is invoked before the member states.

The Treaty has been signed by 19 States and ratified by 98 States (situation on 1 January 2022).

[43] RES 2777 (XXVI). 1971. Convention on International Liability for Damage Caused by Space Object.
[44] Ibid., Art II - III.
[45] The Claims Commission have been criticised because of its ad hoc nature, a suggestion of establishing a permanent outer space court was suggested by Forkosch, Morris D. (1982). Outer space and legal liability. Martinus Nijhoff Publishers. The Hague/Boston/London.

3.2.4. The Registration Convention

The Convention on Registration of Objects Launched into Outer Space[46] entered into force internationally on 15.09.1976. This convention applies that all vessels that are launched need to be registered by the launching state. This information is also given to the Secretary General of the UN who maintains a public Register of space objects. According to Article IV[47] the information that should be registered is:

1. name of the launching State or States if there are multiple,
2. name of the space object or its registration number,
3. the date of the launch,
4. territory or location where it is launched,
5. the basic orbital parameters (nodal period, inclination, apogee, perigee),
6. and what function the space object has.

This list of information is not exhaustive but rather minimal. The convention also deems that all nations should notify if there are changes in the status of the object (ownership changes, vessel has landed, etc). States should also assist one another when identifying has proven difficult. As with the Liability Convention, the same principles apply to intergovernmental agencies that deal with outer space activities.

The Treaty has been signed by 3 States and ratified by 72 States (situation on 1 January 2022).

[46] RES 3235 (XXIX). (1974). Convention of Registration of Objects Launched into Outer Space.
[47] Ibid., Art. IV.

3.2.5. The Moon Agreement

The last of the treaties is the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies[48] entered into force internationally on 11 July 1984. The purpose of it is to ensure that the common interests of mankind are what guide the use of the Moon and other celestial bodies. It is not prohibited to establish stations, use the natural resources present or otherwise use it for scientific purposes, however, appropriation of land and resources for own gain is prohibited. Because of this prohibition of using resources for their own gain the list of states ratifying or signing of this treaty is considerably smaller. This is due to the fact that many hoped and still hope to do exactly that when technology has given it an economic sense.[49] It has even been pointed out that when comparing the negotiations of the Outer Space treaty and the Moon Agreement, there was a noticeable contrast in the atmosphere as it was drafted.[50] Some scholars, however, find that the agreement can still be amended and even state that the agreement lacks in resource use restrictions which means appropriation can be possible.[51]

The Treaty has been signed by 4 States and ratified by 18 States (situation on 1 January 2022).

[48] RES 34/68. (1979).Agreement Governing the Activities of States on the Moon and Other Celestial Bodies.
[49] The problem can be traced to the "common heritage" principle, this is addressed in length by Tronchetti, F. (2010). Journal of space law. The Moon Agreement in the 21st Century: Addressing its potential role in the era of commercial exploitation of the natural resources of the moon and other celestial bodies'. p 489 - 524.; and Frakes, J. (2003). The Common Heritage of Mankind Principle and Deep Seabed, Outer Space, and Antarctica: Will Developed and Developing Nations Reach Compromise. Wisconsin International Law Journal, 21(2), 409-434 p. 410-415
[50] Reynolds & Merges. (1989). Outer Space: Problems of law and policy. p. 50.
[51] This topic was analysed by both Balan, S. (2018). Commercializing the moon: need for a new legal space regime. Journal on contemporary issues of law (JCIL). Volume 4 Issue 9. p. 101. Bengaluru.; and Cook, K. (1999). The Discovery of Lunar Water: An Opportunity to Develop a Workable Moon Treaty.

4. OUTER SPACE LAW IN ESTONIA

Since 2018 the talks of whether or not outer space law should be drafted, among the questions of how Estonia can contribute and improve our conduct in space, have been more and more pressing. The main reason is that Estonia itself currently does not have any legislative piece regarding space law. All the guidance, legislation wize, is still coming from the European union agreements and treaties. Most notable of which is the Outer Space Treaty which Estonia signed in 2010. This was largely due to the development of the first Estonian satellite, ESTCube, which was a student initiative that went to space in 2013. Estonia is also part of the intergovernmental organization ESA as of 2015 after having cooperated with ESA for 5 years. With this in mind, Estonia seems like the new kid on the block when it comes to space explorations, just starting to explore the vastness of space in the last 10 or so years. This is however not the case as the research of space in Estonia actually started in 1810 before the moon landing had even changed categories in libraries. That was the time when the Tartu Observatory started its research. Today it's the workplace for ESTCube, that just being one of the many things it offers to the collective of outer space science.

When it comes to space Estonia has actually been fairly active in research and in the not-so-far past has just started dipping its toes in actual space exploration. This however brings up the question of why has it not drafted a proper space law. The truth is that according to the Ministry of Economic Affairs and Communication the work started in 2020 to create a national space law, that's when the proposal for national outer space law was drafted. According to 2021 information this work is still in progress while also drawing focus to Estonian e-governance systems for space and the creation of Estonian position on space resources.

To find out more on this subject an interview was conducted on 07.11.2022 with Paul Liias who is the head of space in the Estonian Ministry of Economic Affairs and Communication. The topic of the interview was Estionain national outer space legislation, more specifically, what is the situation of it currently, what might be the needs for said legislation and a general conversation

was had regarding what should be looked for when conducting this research. The author of this thesis has a recording of said interview. According to the interview plan to create national law is very much still the plan. The main reason why such a law has currently not been drafted is because space can still be a fairly futuristic idea and getting people and politicians on board can be difficult because of this. An example that was given is that if bigger EU states such as Germany do not have national laws for outer space activities then why should Estonia have such laws. However, as he pointed out that the positive sides of better regulating the outer space industry is as of now well understood. It was explained that Promoting the outer space industry helps also improve the industries dealing with advanced technologies which Estonia needs, helping the economy grow and protecting the interests of the government, as well as, the interests of the companies operating in these fields.[52]

One of the weak points that were mentioned in the interview is that Estonia doesn't have many people who have experience in this sector, especially when the first step is drafting laws, requiring legal background to competently explain the legal aspects of it all. The same issue can arise when Estonia will start to more actively engage in international forums such as COPUOS which need time and human resources. The silver lining for this is that with national laws in place Estonia can nurture the sector via monetary funding to create new interests and fields of study, ultimately creating a bigger workforce that can expand the industry even more and create a self-sustaining one through the private sector.

Furthermore, one crucial part that was brought out by Paul Liias was that a more technical document should also be created along with the national law. This document would encompass two primary sections: First the technical aspects, for example, what materials should be used to create a space object, what should be the lifetime of the object, what should be the altitude and etc. Secondly, the political undertone which would encompass the reasons for activities and promote the direction where outer space activities should move in Estonia. This document would not be fixed such as the national law but would accompany the advancements of technology.

[52] Paul Liias. Head of Space. Author`s interview. Voice recording. Estonian Ministry of Economic Affairs and Communication. 07.11.2022.

What can be gathered from the documents publicly available and from the interview is that Estonia is aiming to be an active member of outer space exploration. Work is being done to achieve this. Just as the Outer Space Treaty was signed the intent is to ratify it as well. The same plan is for the Liability Convention and the Registration Convention.[53]

[53] 2-2/20-0290/5115. (11.08.2020). Eesti kosmoseobjektide seaduseelnõu väljatöötamise kavatsus.

5. NATIONAL OUTER SPACE LAW IN OTHER COUNTRIES

Throughout the world there are a number of countries that have national legislation to regulate and promote outer space exploration and research, however, for the purposes of this thesis only a few have been chosen to look at possible hints to what gives a national law the element of providing the industry self-sufficiency and possibilities to develop. Finland, Sweden, and the UK have been chosen to bring the context needed for this thesis. Finland being a nation that had their national outer space law passed quite recently, in 2018, can give a view of what a country with no previous legislative pieces in this regard has chosen to include in their law. Sweden and UK being the complete opposites can give a different perspective upon which to look at national outer space law.

There are certain details that other countries can provide as well. For example, according to the legislative history of the Austrian Outer Space Act, Austria regards itself as the launching State procuring the launching of a space object if the activity has been authorized by Austria.[54] In contrast, the view of the Netherlands is that it is never the launching State in cases where space activities are carried on by private operators even if the State has authorized such activities.[55] According to the legislative history of the Danish Act, Denmark regards itself as the launching State in those cases where it launches a space object.[56] For context, the Outer Space Treaty and the Liability Convention states that: "launches or procures the launching of an object into outer space", and any State "from whose territory or facility an object is launched."[57]

[54] Bundesgesetzblatt I Nr. 132/2011 of 27 December 2011. Austria
[55] This was explained in more detail by Masson-Zwaan, Tanja. The Law Review. (09.12.2021). The Space Law Review: Netherlands. https://thelawreviews.co.uk/title/the-space-law-review/netherlands. Site accessed 11.12.2022.
[56] lov om aktiviteter i det ydre rum. Act no. 409 of 11 May 2016.. Denmark.
[57] RES 2222 (XXI). (1966). supra nota 9.

5.1. Finland

As mentioned in one of the examples in the introduction, in Finland the department responsible for regulating space is the Ministry of Economic Affairs and Employment of Finland. Under this department there is a Finnish Space Committee which is responsible for all aspects of outer space activities including drafting policies and law proposals and creating future strategies. The Committee is comprised of the Ministry of Economic Affairs and Employment, the Ministry of Transport and Communications who are the chair and deputy chair of this committee, as well as, the Ministry of Education and Culture, the Ministry of the Interior, the Ministry of Defence, the Ministry of Environment, the Finnish Meteorological Institute, the National Land Survey of Finland, the Academy of Finland, the Association of Finnish Defence and Aerospace Industries and the Finnish Funding Agency for Innovation and AFDA (Takes) who are members of this committee.[58]

On 16 January 2017, the Ministry of Economic Affairs and Employment appointed a working group for the purposes of assessing the needs of national space legislation on the basis of the UN treaties on outer space and international obligations. They would then draft a proposal for new national space legislation. In addition, were tasked with drafting a proposal for measures relating to the registration and authorization procedures for space objects and preparing other possible proposals concerning the matters of outer space for the Ministry of Economic Affairs and Employment.

Finland's national outer space law was Enforced on 23 January 2018.[59] According to the Government Proposal one of the reasons that necessitated this was: *"Increased activity in the sector has created the need to enact national legislation regarding the conditions for these activities and operators' obligations"*.[60] Furthermore, in 2001, the decisions made by the Claims Commission were declared as binding in relation to any other States accepting the same obligation.[61] The Rescue Agreement was also implemented by the Act on the Rescue and Return of Astronauts and the Return of Space Objects.[62] Like many other states, Finland has not acceded to the Moon Agreement.

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[58] Finland Ministry of Economic Affairs and Employment. https://tem.fi/en/the-finnish-space-committee. Site accessed 02.12.2022.
[59] Lag om rymdverksamhet. (63/2018). Finland.
[60] HE 157/2017. Supra 39.
[61] författningssamlings nr 1003/2001. Finland.
[62] 5.8.1970/616. Finland.

The application of the Act on Space Activities itself is limited to within the territory of Finland or to the object that is registered to Finland, or to the Finnish citizen or legal person incorporated in Finland.[63]

According to the Act similar to other countries, prior authorizations need to be granted before launch. The conditions for authorisations are as follows but are not limited to:[64]

- the operator is reliable and has the necessary technical expertise and financial capacity for carrying on space activities;
- the operator has provided a risk assessment concerning its space activities to the Ministry and, according to the assessment, the activities will not cause any particular risk to persons, property or public safety;
- the operator seeks to prevent the generation of space debris and adverse environmental impacts on the earth, in the atmosphere and in outer space in accordance with section 10;
- the operator has made a plan for discontinuing the space activities and for the related measures;
- the space activities are compatible with the national security interests, Finland's international obligations and Finland's foreign policy interests;
- the operator complies with the insurance requirements under section 8;
- the operator complies with the rules of the International Telecommunications Union in force;
- the operator provides evidence of compliance with the export control provisions in force

The authorisation can also be revoked in accordance with section 13 if situation grants it, such as false information given to the state, conditions or obligations are not complied with or Finnish international obligations command it to.

When it comes to the registration of objects the required information under section 6 of the act are:

1) name of the launching State or States;

2) name of the operator;

3) designator or registration number of the space object;

4) general function of the space object;

5) date and place of launch and launch vehicle;

[63] (63/2018). supra 53.

[64] (63/2018). supra 53. Section 5.

6) orbital parameters of the space object, including (nodal period, inclination, apogee, perigee).
It does mention that extra pieces of information can also be required when the decree states but currently there are no extra parameters that need to be submitted.

Section 7 of the Act deals with liability claims. More specifically, it lays down that initial compensation will be paid from state funds with the exception of damages caused to the space object operator. However, this keeps the right to get compensation if there is a right in accordance with the Tort Liability Act.[65] Even if the Tort Liability Act does not convey liability to the operator it can still be billed if the damage was caused on earth, to an aircraft in flight or to its passenger or crew member and the damage was not deliberate or by negligence. The maximum amount for recourse is 60 million euros with the condition that the operator has not failed to comply with the Act or conditions connected to the authorization. The same cap of 60 million euros is also the minimum amount laid down in section 8 as the insurance amount.
The other provisions also give way to more power to the state, guide operators to preserve the environment, give way to information sharing policies and general space exploration conduct such as the right to inspection in section 15, section 10 regarding space debris and environmental protection and transfer of space objects and space activities to others in section 11. The law is also supplemented with the Decree of the Ministry of Economic Affairs and Employment on Space Activities.[66] The Decree provides extra details, for example, section 3 provides that 25 years from the operation end date the space object should move or be moved to the atmosphere or orbit where it would not cause harm. There are also further details on how insurance requirements are calculated in section 5, providing that insurance is not mandatory when the risk of collision is lower than 1/1 000 and the probability of burning in the atmosphere is lower than 1/10 000. Although these extra details are not fully fledged checklists and do not provide every possible example it's a good starting point to give some sort of references to what operators should look at when planning space travel.

[65] Vahingonkorvauslaki 31.5.1974/412. Finland.
[66] Työ- ja elinkeinoministeriön asetus avaruustoiminnasta. 23.1.2018/74. Finland.

5.2. United Kingdom

In 1986, the Outer Space Act of the United Kingdom was passed.[67] The act applies to UK nationals and legal persons residing in the UK or UK entities carrying out activities overseas and covers the launch and operation of space objects. In 2018 however, the Space Industry Act was created to renew and update the original regulations.[68] Along with the Space Industry Act came more detailed regulations to implement this act. There is the Space Industry Regulations 2021, according to the explanation notes this piece of legislation: "*implements the Space Industry Act by putting in place a regulatory regime for spaceflight operations carried out in the United Kingdom.*"[69] Next, there is the Spaceflight Activities (Investigation of Spaceflight Accidents) Regulations 2021 No. 793, which deals with spaceflight accidents.[70] Lastly, there is the Space Industry (Appeals) Regulations 2021 No. 816 which deals with spaceflight accident investigations.[71] There are also regulatory guidance documents and licensing rules that are handed out by the UK Civil Aviation Authority (CAA). The original Outer Space Act is still in effect for UK entities conducting outer space activities overseas.

The supervision is covered by all space activities requiring a license which is granted by the Secretary of State and procedures carried out by the UK space agency. Decision-making for this license is done by keeping in mind safety risks, UK's international obligations and national security. There is also an assessment of the technical and financial feasibility, inquiries into space debris mitigation, and finally the termination plan for the activity. Regarding the financial feasibility, there is a liability cap for the operator and a need for insurance against third-party-caused liabilities arising from the activity up to that liability cap.

In regards to the liability under section 34 of the Space Industry Act: "damages in respect of the injury or damage are recoverable without proof of negligence or intention or other cause of

[67] The Outer Space Act (OSA). 1986. United Kingdom.
[68] Space Industry Act. 15.03.2018. United Kingdom.
[69] Space Industry Regulation 2021 no. 972. explanatory note. United Kingdom.
[70] The Spaceflight Activities (Investigation of Spaceflight Accidents) Regulations 2021 No. 793. United Kingdom.
[71] The Space Industry (Appeals) Regulations 2021 No. 816. United Kingdom.

action, as if the injury or damage had been caused by the wilful act, neglect, or default of the operator."[72] In essence, the UK does not differentiate the acts of negligence and just accidents but treats them all the same while just limiting the total liability amount.

There are also other provisions such as national registry requirements which consist of objects launched within the UK and objects that are connected to the UK in some other manner, which is standard and is an obligation from the Registration Treaty. Only the date of launch, spaceport where it is launched, purpose and nature are mentioned under Space Industry Act section 61 subsection 3 but room is left for the Secretary of State to inquire about extra information where appropriate.[73]

5.3. Sweden

"The Swedish National Space Agency (SNSA) contributes to Swedish space operations through calls that give companies the opportunity to develop new innovative products and services from satellites, rockets and data deployment - to name just a few areas."[74] The law regulating Swedish outer space activities is the Swedish Act on Space Activities (1982:963).[75] It is supplemented with the Decree on Space Activities.[76] These regulations date back to 1982.

The Act applies to activities in outer space, including the launching of objects into outer space and all measures to manoeuvre or in any way affect space objects. However, it does not apply to merely receiving signals or information or to the launching of sounding rockets. The Act does not provide any separate definitions of terms.

Under the Act, space activities carried on from Swedish territory or carried on by a Swedish natural or juridical person anywhere else require a license granted by the Government, however

[72] Space Industry Act. (2018). supra. 62. Section 34 subsection 2.
[73] Space Industry Act. (2018). supra. 62. Section 61 subsection 3.
[74] Swedish National Space Agency. https://www.rymdstyrelsen.se/en/swedish-space-industry/, Site accessed 06.12.2022.
[75] Lag om rymdverksamhet (1982:963). (1982). Sweden.
[76] Förordning om rymdverksamhet (1982:1069). (1982). Sweden.

no exact details how this licence is granted is provided. Under the Decree, applications for a licence shall be submitted to the Swedish National Space Board (SNSB) and activities may not be transferred without the Minister's prior authorisation.

Details of space objects for which Sweden is the launching State are entered in the registry kept by the SNSB which under the decree must include the designation or registry number of the space object, date and place of the launch, parameters (such as orbital period, inclination of the orbital plane, apogee, and perigee) and general use of the space object.

The State has the right of recourse for compensation for damage paid by the State. The Act does not lay down any separate requirement for insurance. Activities are supervised by the SNSB. The sanction for violations of the Act or for carrying out space activities without authorization may be a fine or imprisonment for a maximum of one year.

Sweden is currently working on new regulations for outer space activities.[77] As of writing this it has not yet been enacted but according to a presentation by the SNSB should be enforced sometime in 2023.[78]

[77] The investigation for the new law was completed in 2021: En ny rymdlag, SOU 2021:91. Sweden.
[78] SNSB. (13.07.2022). Swedish Space Programmes – Balloons, rockets, satellites. https://indico.ict.inaf.it/event/993/contributions/11195/attachments/6060/12161/Swedish%20programmes%20Rome%20Dannenberg%202022.pdf, Site accessed 06.12.2022

6. DEVELOPMENT OF NATIONAL LAW

"In fulfilling three essential obligations that must be fulfilled by a country when launching a celestial body, there are at least three things, namely registration, supervision, and responsibility when a loss occurs."[79] As seen with treaties regarding outer space and with national laws of other countries these three elements are the minimum requirements that the national law should regulate. Research project "Project 2001+" had similar results coming up with 5 major blocks that should be implemented.[80] To sum up the project's findings there should be a licensing system that allows the control and monitoring of licensed activities, including provisions on liability reimbursement and attendant insurance obligations.[81] These details are more explained and actually used in the Sofia Guidelines which is a Model Law on space legislation.[82] This model law is basically a blank sheet that can be used to create the full national law. It's a good starting point to once again confirm what the basic building blocks should be. Moreover, when the Sofia Guidelines were drafted the findings of Project 2001+ were used to create it.[83] This means that only the Sofia Guidelines should be analyzed as this gives more direct implementation tactics and good explanations on how such building blocks should be implemented into national law.

6.1. The Sofia Guidelines

The Sofia Guidelines for a Model Law on National Space Legislation was done in 2012. It is under the Resolution 6/2012 of the 75th ILA Conference on 30 August 2012. The Model Law came to fruition from the cooperation of the Cologne Institute of Air and Space Law and the German Aerospace Centre (DLR). The discussion was based on how to apply authorization, supervision, registration, and the recourse of the government and insurance for national outer space law. It is basically a mockup of a fictional country XY to which the national outer space law was created. As mentioned before it provides definitions for terms like space activity,

[79] Amalia, R. Universitas Lampung. (2020). Lajil. State obligations related to the launch of objects into outer space under international law. Volume 2 Issue 2. p. 99-108. Indonesia.
[80] Institute of Air and Space Law & University of Cologne and Deutsches Zentrum für Luft- und Raumfahrt e.V. & DLR (German Aerospace Center). (8-10 June, 2005). Project 2001 Plus - global and European challenges for air and space law at the edge of the 21st century : proceedings of an international symposium. Cologne.
[81] This was also analysed by Frans von der Dunk. (2006). Fundamental Provisions for National Space Laws. University of Nebraska - Lincoln.
[82] RES 6/2012 The Sofia Guidelines. (30.082012). 75th ILA Conference.
[83] Ibid., section 1.

operator, and space object. For the purposes of this model law, the authorization of space activities was granted by the minister. Requirements for the operator's financial position, reliability, and technical knowledge, along with points of interest such as compatibility with public safety standards, national security, international obligations, foreign policy, and International Telecommunication Union (ITU) regulations were looked at when providing such authorizations. Insurance requirements, space debris mitigation plans, and the environment were also taken into account.

To analyze this model law it is best to use the 5 building blocks that were concluded by Project 2001+ and see how the model law implements these findings:

- Authorisation of space activities in accordance with article VI of the Outer Space Treaty. According to the findings, it should deal with calculating risks of private ventures, mitigating these risks, and actively filtering who meets the safety requirements, has the know-how, and is actually capable of conducting safe outer space travel.
    - According to Sofia Guidelines, as mentioned before, the competent minister should give out these authorizations as stated in Article 3 of the Sofia Guidelines. Article 4 lays down the conditions under which the authorization is given. These are related to operators' financial position, reliability, compliance with insurance and other regulations, as well as, national interests, international obligations, environmental safety, public safety, and risk mitigation. This is mostly the bare bones of what should be looked at when authorizing such activities and as stated in section 3 of article 4 may contain conditions and requirements. These conditions also need to come with implementing decree or regulation as stated in section 2 as appropriate evidence and documentation need to be provided to discourage false information submission. For this reason, article 6 of withdrawal, suspension, or amendment of authorization is in place as the conditions of authorization need to be followed even after it has been given. Article 9, the transfer of space activity, is also relevant and should be in national law as instructions on how to procure such authorization. There are also references to articles 7 and 12 which deal with the protection of the environment and insurance

respectively. As liability is mentioned in another building block the guidelines for insurance will be analyzed in that block as well.

- Continued supervision in accordance with article VI of the Outer Space Treaty. This points out that active information sharing should be exercised between the government and non-government organizations to keep updated records of all activities and creates an atmosphere of information sharing between states as well.
    - Sofia Guidelines article 5 deals with the supervision of related activities. There isn't much about how to implement the supervision but this can be implemented the same way as Finland does, by giving the state rights for regular inspections when needed.
- Registration of space objects in accordance with article IV of the Registration Convention and possibly even adding further information requirements to gather a full view of what the space object is achieving, what is the mass and size of it, and even define what payload or power sources it has.
    - Sofia Guidelines article 10 deals with the registration of space objects. As stated the competent minister will maintain the space register and the Registration Convention is referenced to define the launching state. Just as in the convention, the cases of more than one launching state are mentioned and the pieces of information mentioned in the convention are also added as the details required for the national register. Since the convention covers a lot of this and the obligation for the state to register is already there the information in national law should mostly be for private entities as a list of what to submit.
- Rights to recourse should be implemented into national law, as well as, liability should be defined more clearly and a maximum cap for liability codified.
    - Article 11 deals with liability and recourse. Under this article, if the state is liable it is allowed to have recourse against the operator as well. Although it is mentioned that this should be limited and the problems with liability in tort are also stated as needing legislation otherwise there would be no legal basis. For this, the acts of other countries can be taken as an example with Finland giving a liability cap that is equal to the insurance amount in most cases. The groundwork of what Sofia Guideline has is similar to what Finland has put in place regarding the recourse leaving the tort liability mostly open to use if need be. Regarding insurance article 12 states that there should be insurance to cover damages caused to third parties. The amount is not actually stated and it is mentioned that criteria

should be compiled and harmonized with other states to avoid license shopping. The Dutch and French regulations are referred to in this regard as an example.

- Final building block was defined as all other necessary documents or regulations that would supplement the main national law such as legislative pieces dealing with Intellectual property, liability-related issues such as appeals, and possible transportation laws. This would include for example technical requirements regulation that was mentioned by Paul Liias during the interview as being an important piece regulating the technical aspects and providing clear guidelines on what the space object should consist of and what the size and weight should be.[84]
    - Sofia Guidelines does not have any real list of documents but does mention in almost every article that extra instructions or requirements documents need to be present to make the law fully comprehensible. This however can be the subject of a technical requirements document that combines the technical elements with extra procedures, rights, or obligations. This would essentially create a more flexible legislation that adapts to what the space object and its purpose is and keeps in mind the nuances of every endeavor and its operator.

6.2. Proposals for the Estonian National Law

Now that the international perspective has been looked at, by analyzing treaties and principles, and the implementation of those have been observed through the current laws of the selected countries, the research question can be tackled to provide clear answers on what are the important parts that national law needs.

As stated before when looking at Sofia Guidelines and as seen with implemented laws in other countries, there are a number of decrees and extra documents that should support the main body of national law. Like Paul Liias mentioned during the interview done for this thesis, the technical document would be an important part to more successfully manage outer space activities. This can be seen in other countries' laws as well, with key elements of law being supported by additional regulations which help future operators navigate what they need to submit, document

[84] Paul Liias. (07.11.2022). supra 46.

and how they should conduct their travels. This would be something that future research can look into, however, for the purposes of this thesis, these elements will only be partially mentioned.

To answer the research question, *"What are the key pieces of law that the Estonian national law needs to efficiently regulate outer space activities and fulfil its obligations on an international level?",* the simple answer would be registration, supervision and responsibility, as brought out in a previous chapter of this thesis. These three elements however can be dissected to give a more detailed answer:

- Registration
    - For the purposes of fulfilling the Registration Treaty the most crucial details that should be present are:
        - An assigned ministry that handles the registry, updates it, and consequently would deal with the issuing of licenses for space activities. In Estonia, this is currently being done by the Ministry of Economic Affairs and Communication and therefore it would be fitting to actually implement it into law along with the responsibilities that come with it.
        - Information that the state is obligated to share internationally such as:
            - name of the launching State or States if there are multiple,
            - name of the space object or its registration number,
            - the date of the launch,
            - territory or location where it is launched,
            - the basic orbital parameters (nodal period, inclination, apogee, perigee),
            - and what function the space object has.
            - Information that is not expressly stated but should also be present for the functioning of this registry (and is present in other states' national law) is the name and registration code of the operator or operators.
        - As always there should be a provision that gives the right to ask for further details when necessary. However, a link should be created to a so-called

technical document once it has been drafted since then extra information such as the material, size and weight can also be acquired for future research and a better understanding of what is actually transported to outer space.

- Supervision
    - Supervision should first consist of who has the right to conduct space activities. For this licenses should be by the relevant ministry, in this case, the Ministry of Economic Affairs and Communication because of the reasons mentioned under registration. To hand out licenses there also needs to be requirements on who should be allowed to conduct these activities. By bringing inspiration from other countries' laws the following should be the minimum list of details that need to be looked at:
        - The operator is in a financial position to undertake space activities, is confirmed to be reliable and has the technical expertise to successfully carry out space activities;
        - Has made a plan for the discontinuing of space activities and for the related measures, including the neutralization of the space object and the mitigation of space debris;
        - Has made risk assessments for environmental damages, property damages and harm to human life, including mitigating factors and possible activities to further lower the risks;
        - The assessments and activities are compatible with public safety standards,
        - The activities are compatible with national interests and safety, foreign policies and international obligations;
        - Other related regulations are complied with;
        - Operator has sufficient insurance to cover unexpected damages.
    - Secondly, there should be provisions in place to actively monitor the activities of operators. This can include a provision for regular and surprise audits, regular documentation of all activities and active information sharing, and a regular assessment of the status of the mission and its goals.
    - Of course provisions such as revoking of license should also be present for when it is needed.
- Responsibility

- As is established in the Outer Space Treaty the launching state is ultimately responsible for all launches on an international level. However, the right to recourse and the conditions of recourse should be present. Also, the provisions requiring insurance should be present, although not required by any treaty other countries do have insurance requirements. Following suit would further deter license shopping and insure that the state would not need to absorb all the liability, at least partly.
    - Regarding liability claims Estonia can use the example that the UK has, giving the right to recourse for every damage caused by the operator even if it's not from negligence or a willful act. On the other hand, there can be differentiation just as Finland has enacted their law, using tort. Providing a maximum limit for liability however would be a necessary provision, keeping. Otherwise with unlimited potential for liability private outer space activities might not be feasible or attractive unless a state-sized budget is available. The limit can always be added with the exception of a willful act which would further limit states liability in the long run.
    - Lastly, with liability being a place to choose between two approaches, both would need at least some form of insurance to provide that operators can actually cover the liability, even if there is a limit. The maximum limit of liability can even be used as a minimum requirement for insurance, just like the UK has.

7. CONCLUSION

The main reason for conducting the analysis and ultimately writing this thesis was the issue that Estonia does not currently have a law that regulates national outer space activities. As is written in the introduction, outer space is a fastly evolving topic with already a long history and a big potential for humankind, just like ocean exploration before it. It is understandable that it isn't always possible to regulate fields and technology as fast as it grows and advances. As can be seen with Estonia the process of drafting a suitable law that would empower the study of space and its exploration of it can be lengthy but it needs to be done to ensure safe exploration that is done for the right reasons. The good thing is that the process of drafting the national law has already started with the potential to be enacted soon.

However, the aim of this thesis was to analyze what are the key pieces of law that the Estonian national law needs to efficiently regulate outer space activities and fulfill its obligations on an international level. These key pieces were found by analyzing all the obligations that come from international forums, previous studies and looking at legislation from other countries with already enacted outer space laws.

The answer to it is that a national outer space law needs to, firstly, have provisions for managing outer space activities, such as launching new missions, conducting research, exploration, or even hunting for natural resources in outer space. These outer space activities should be managed by the competent authority issuing licenses which would only be provided if an entity or individual requesting for one has satisfied the needs for one (has sufficient capabilities, a plan in place, and redundancy plans if something goes wrong, etc.) and come with requirements which need to be fulfilled for the duration of exercising the rights given with the license. The conformity to these requirements needs to be frequently checked by the competent authority to preserve the quality of life for all and additionally creates a way of supervising the license holders to confirm good intentions and provide access to new knowledge for everybody. Secondly, the registration and managing of the registry needs to be done to have an accurate view of what is orbiting, being launched and being decommissioned. Thirdly, since international forums have only decided on state-level liability, it is up to Estonia to regulate responsibilities within its borders, including the regulation of insurance to provide mitigating factors to entities conducting outer space activities.

In conclusion, these key elements are crucial to have a functioning national outer space law which would give way to advancements in outer space research and industry in Estonia. Even though some are obligations from treaties, the national regulation to effectively handle these obligations is essential as the state is not the only one conducting space activities.

The topic of Estonian national outer space law is however not exhaustive. There is still much work to do until all elements of space activity are in some way accounted for. The so-called technical document that would provide entities conducting space travel actual metrics on how and for what purpose they should build their soon-to-be satellites, manned space vehicles or whatever else chosen fit for use. These metrics can include a list of materials that can be used to build, systems that need to be used, and data that need to be gathered for the good of all. This document would in essence be changing in time and give the state the reach to say what is necessary now. In Estonia, it would for example give a chance to guide the industry on what missions would actually be relevant or even necessary for the world and the people in it. This creates more of a team effort, a united front on how we conduct space travel, by bringing international agreements between other states to a national level and giving private parties a chance to fulfill and maybe even create those international agreements.

There are also a number of other supplementary documents that would need to be added to support the main body of outer space law. These can be more efficiently renewed to keep up with different advancements and policies, it can even be said that these supplementary documents can even be dependent on those advancements and policies. Providing details and suitable uses and clear guidelines on how to go about fulfilling obligations laid down by the main body of outer space law. This gives regulations more fluidity to match real-world situations.

To sum up, the field of outer space travel is still much in its infancy, even after so much has been done, and there is plenty to be learned from it.

8. LIST OF REFERENCES

8.1. Academic books

1. Aitken, F., &; Foulc, J. N. (2019). From Deep Sea to laboratory 1: The First Explorations of the Deep Sea by H.M.S. Challenger (1872–1876).
2. Brzezinski, Matthew B. (2007). Red Moon Rising: Sputnik and the Hidden Rivalries That Ignited the Space Age, New York, Henry Holt and Co.
3. Christol, Carl Q. Pergamon Press. 1982. The Modern International Law of Outer Space by. New York
4. Cook, K. (1999). The Discovery of Lunar Water: An Opportunity to Develop a Workable Moon Treaty.
5. Forkosch, Morris D. (1982). Outer space and legal liability. Martinus Nijhoff Publishers. The Hague/Boston/London.
6. Frans von der Dunk. (2006). Fundamental Provisions for National Space Laws. University of Nebraska - Lincoln.
7. Hurwitz, Bruce A. 1986. The Legality of Space Militarization. Amsterdam and New York.
8. Institute of Air and Space Law & University of Cologne and Deutsches Zentrum für Luft- und Raumfahrt e.V. & DLR (German Aerospace Center). (8-10 June, 2005). Project 2001 Plus - global and European challenges for air and space law at the edge of the 21st century: proceedings of an international symposium. Cologne.
9. Launius, Roger D. (2018) The Smithsonian History of Space Exploration: From the Ancient World to the Extraterrestrial Future.
10. McNair. (1953). The Law of the Air. 2nd Ed. Stevens & Sons Limited. Atlanti.

11. Nyman-Metcalf, Katrin M. (1999). Activities in Space - Appropriation or Use? Iustus Förlag. Upsala.
12. Rathnayake, RMTSK. (2016). Faculty of Law, General Sir John Kotelawala Defence University. Critical analysis of the article IV of the outer space treaty and its relevance for the present day. Ratmalana
13. Reynolds & Merges. (1989). Outer Space: Problems of law and policy.
14. White, Irvin L. (1970). Decision-making for Space: Law and Politics in Air, Sea, and Outer Space. Purdue University Press. Indiana.

8.2. Academic articles

1. Amalia, R. Universitas Lampung. (2020). Lajil. State obligations related to the launch of objects into outer space under international law. Volume 2 Issue 2. p. 99-108. Indonesia.
2. Balan, S. (2018). Commercializing the moon: need for a new legal space regime. Journal on contemporary issues of law (JCIL). Volume 4 Issue 9. p. 101. Bengaluru.
3. Cristian van Eijk. Sorry, Elon: Mars is not a legal vacuum – and it's not yours, either. Völkerrechtsblog, 05.11.2020, doi: 10.17176/20210107-183703-0.
4. Fawcett, J. (1969). International Law and the Uses of Outer Space. volume 44, issue 2, article 10.
5. Frakes, J. (2003). The Common Heritage of Mankind Principle and Deep Seabed, Outer Space, and Antarctica: Will Developed and Developing Nations Reach Compromise. Wisconsin International Law Journal, 21(2), 409-434 p. 410-415.
6. Masson-Zwaan, Tanja. The Law Review. (09.12.2021). The Space Law Review: Netherlands. https://thelawreviews.co.uk/title/the-space-law-review/netherlands. Site accessed 11.12.2022.
7. Tronchetti, F. (2010). Journal of space law. The Moon Agreement in the 21st Century: Addressing its potential role in the era of commercial

exploitation of the natural resources of the moon and other celestial bodies'. p 489 - 524.
8. UNOOSA. United Nations/Brazil Workshop on Space Law (ST/SPACE/28). 2005. "Disseminating and developing international and national space law: the Latin America and Caribbean perspective. New York
9. The Wilson Center. 1.10.2021. The Global Legal Landscape of Space: Who Writes the Rules on the Final Frontier? https://www.wilsoncenter.org/article/global-legal-landscape-space-who-writes-rules-final-frontier. Site accessed 11.12.2022.

8.3. International legislation

1. Paris Convention. 13.10.1919. Convention Relating to the Regulation of Aerial Navigation Signed at Paris
2. Official Records of the General Assembly. document A/4987. Sixteenth Session, Annexes, agenda item 21. 1961.
3. General Assembly resolution 1962 (XVIII) of 13 December 1963
4. RES 2222 (XXI). 1966. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. Art. I - IV, VI-VII, VIII - XIII.
5. RES 2345 (XXII). 1967. Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.
6. RES 2777 (XXVI). 1971. Convention on International Liability for Damage Caused by Space Object. Art. II - III.
7. RES 3235 (XXIX). (1974). Convention of Registration of Objects Launched into Outer Space. Art. IV.
8. RES 34/68. (1979).Agreement Governing the Activities of States on the Moon and Other Celestial Bodies.
9. General Assembly resolution 37/92 of 10 December 1982
10. General Assembly resolution 41/65 of 3 December 1986
11. General Assembly resolution 47/68 of 14 December 1992

12. 1980 Convention (Geneva Convention). 13 October 1995. Protocol IV: Protocol on Blinding Laser Weapons.
13. General Assembly resolution 51/122 of 13 December 1996
14. Resolution adopted by the General Assembly (A/59/469). 10.12.2004. Report of the Special Political and Decolonization Committee (Fourth Committee).
15. Resolution adopted by the General Assembly (A/62/403). 10.01.2008. Report of the Special Political and Decolonization Committee (Fourth Committee).
16. United Nations Office for Outer Space Affairs. 2010. Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space. Austria
17. RES 6/2012 The Sofia Guidelines. (30.08.2012). 75th ILA Conference. Section 1.
18. United Nations Office of Outer Space Affairs (UNOOSA). 2017. International Space Law: United Nations Instruments. New York.

8.4. National legislation

1. Bundesgesetzblatt I Nr 132/2011. 27 December 2011. Austria
2. En ny rymdlag, SOU 2021:91. Sweden.
3. författningssamlings nr 1003/2001. Finland.
4. Förordning om rymdverksamhet (1982:1069). (1982). Sweden.
5. HE 157/2017. Finland.
6. Lag om rymdverksamhet (1982:963). (1982). Sweden.
7. Lag om rymdverksamhet. (63/2018). Finland.
8. Laki avaruustoiminnasta (63/2018). Finland.
9. lov om aktiviteter i det ydre rum. Act no. 409 of 11 May 2016. Denmark.
10. Space Industry Act. 15.03.2018. United Kingdom.
11. Space Industry Regulation 2021 no. 972. United Kingdom.
12. The Outer Space Act (OSA). 1986. United Kingdom.
13. The Spaceflight Activities (Investigation of Spaceflight Accidents) Regulations 2021 No. 793. United Kingdom.

14. The Space Industry (Appeals) Regulations 2021 No. 816. United Kingdom.
15. Työ- ja elinkeinoministeriön asetus avaruustoiminnasta. 23.1.2018/74. Finland.
16. Vahingonkorvauslaki 31.5.1974/412. Finland.
17. 2-2/20-0290/5115. (11.08.2020). Eesti kosmoseobjektide seaduseelnõu väljatöötamise kavatsus.
18. 5.8.1970/616. Finland.

8.5. Other resources

1. Canada official government webpage. ttps://www.asc-csa.gc.ca/eng/about/csa-organization.asp. 08.11.2021. Canada.
2. ECSL. 20.12.2018. ECSL NPoC in Estonia - The Institute of Law at Tallinn University of Technology. https://www.esa.int/About_Us/ECSL_-_European_Centre_for_Space_Law/ECSL_NPoC_in_Estonia_-_The_Institute_of_Law_at_Tallinn_University_of_Technology. Tallinn.
3. Eesti Rahvusringhääling (ERR). 07.11.2017. EISC chair: Estonia should consider necessity of space law. https://news.err.ee/641223/eisc-chair-estonia-should-consider-necessity-of-space-law. Tallinn.
4. ESA. Member States & Cooperating States. https://www.esa.int/About_Us/Corporate_news/Member_States_Cooperating_States, Site accessed 07.11.2022.
5. FAA. https://www.faa.gov/space/compliance_enforcement_mishap. Site accessed 07.11.2022. USA.
6. Finland Ministry of Economic Affairs and Employment. https://tem.fi/en/space. Finland. Site accessed 07.11.2022.
7. Finland Ministry of Economic Affairs and Employment. https://tem.fi/en/the-finnish-space-committee. Site accessed 02.12.2022.

8. Liias, Paul. Head of Space. Author`s interview. Voice recording. Estonian Ministry of Economic Affairs and Communication. 07.11.2022.
9. NASA. https://www.nasa.gov/about/index.html. Site accessed 07.11.2022.
10. NASA. Explorer 1 Overview. https://www.nasa.gov/mission_pages/explorer/explorer-overview.html. Last accessed 4.08.2017
11. NOAA. How much of the ocean have we explored? https://oceanservice.noaa.gov/facts/exploration.html. Last accessed 26.02.2021
12. SNSB. (13.07.2022). Swedish Space Programmes – Balloons, rockets, satellites. https://indico.ict.inaf.it/event/993/contributions/11195/attachments/6060/12161/Swedish%20programmes%20Rome%20Dannenberg%202022.pdf, Site accessed 06.12.2022
13. Swedish National Space Agency. https://www.rymdstyrelsen.se/en/swedish-space-industry/, Site accessed 06.12.2022.

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