CHAPTER I
INTRODUCTION

1.1 Background

The dream of human being going out in space to see the beauty of earth from thousands of miles away have been realised. Something that seemed impossible back then has come to reality thanks to science and human's desire to go further beyond their capabilities through inventions and innovations. People are striving to explore space to find something new, somewhere to settle and perhaps that small chance of meeting a brand-new civilization. A hundred years ago, this would've been a vision but now it is something within our reach, to find a settlement in other planet and develop humanity. It came to reality when the cold war between the United States **["US"]** and Soviet Union broke out. From the first space satellite in orbit to the first men on the moon, it was all a journey to the next frontier. The competitiveness between these states sprouts innovation which brings us to where we are right now. Recently, the Gateway Foundation, a company based in California announced their plans for a cruise-ship styled hotel, which lets guests have the first-hand experience on outer space tourism. [1] Not to mention, multi-billionaire Elon Musk and Jeff Bezos also has their plans to establish their own space hotel in the coming future.[2] To them, this is a brand-new avenue of business

[1] CNN Travel, "World's first space hotel scheduled to open in 2027" https://edition.cnn.com/travel/article/voyager-station-space-hotel-scn/index.html, Retrieved 4 September 2021

[2] The Washington Post. "You are now free to move about the cosmos ... if you can afford it". https://www.washingtonpost.com/technology/2021/06/08/space-tourism-wealthy-bezos-musk-branson/. Retrieved 4 September 2021

and industry with high stakes and high return. It is even safe to say that within the near future, we would be travelling in space, experiencing zero gravity and the marvel of the universe through a spacecraft.

Aside from that, we are also looking at a more efficient way for intercontinental travel. This is made possible by flying above the regulated altitude, known as sub-orbital spaceflight. Such opens the possibility for various stakeholders that are interested in utilizing outer space, including innovations by scientists and researchers, technology investments by business actors, and many more. An evident example would be Virgin Galactic, an American spaceflight company founded on 2004 with a vision to make space travel accessible to the people. Despite their drawbacks, they finally launched their debut flight with the company's CEO and other 3 members onboard the Virgin Galactic Unity 22.[3] The flight was overseen by the Federal Aviation Administration (FAA) of the United States along with the National Aeronautics and Space Agency (NASA). Similar to aviation practices, spaceflights must be tracked and regulated by governmental bodies to ensure compliance to the law, considering the possibility of clashing between sky and space limitations.

Regulatory frameworks should then be established in order to accommodate future prospects of outer space utilization. That is to say that technology development must be accommodated by the prevailing laws, mainly in terms of fundamental principles which would be crucial in establishing a firm legal standing.

[3] Virgin Galactic, "Virgin Galactic announces first fully crewed spaceflight". https://www.virgingalactic.com/articles/virgin-galactic-announces-first-fully-crewed-spaceflight/. Retrieved 5 September 2021

Currently, the IL governs space related activities through the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, or commonly known as the Outer Space Treaty 1967 **["OST"],** which acts as the *lex generali* for international space conducts. The idea was first initiated in the late 1950s by the US and its Western allies, with the intention to pursue peaceful use of outer space, however the Soviet Union rejected the idea as they were preparing their first intercontinental ballistic missile. It was on 1963 when the United Nations then approved two resolutions on outer space, which would serve as the cornerstone of OST, especially the early prohibition of Weapons of Mass Destruction in outer space. The treaty was then enacted on January 27, 1967 signed in Washington, Moscow and London.[4] In its preamble, it explains the motivation behind the enactment of the treaty, which was a result of mankind's entry to outer space. Although the entry doesn't necessarily pertain to peaceful purposes during that time, the treaty was enacted as a form of consolidation and future cooperation between states. This is also to recognize the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes.

The current status quo establishes OST as a general guideline to space conducts, especially in regards to the exploitability of outer space and its resources. Article 2 of the OST regarding the principle of non-appropriation states that celestial bodies are not subject to entitlement by states or private entities. This

[4] Arms Control Association. "The Outer Space Treaty at a Glance". https://www.armscontrol.org/factsheets/outerspace. Retrieved on 5 September 2021.

essentially means that parties are not entitled to own any of the celestial bodies and its properties. However, the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies **["Moon Treaty"]** article 11 further specified the OST by using the term "common heritage of mankind" which means that the natural resources may be extracted, harvested, and processed for the developmental purpose of mankind. Therefore, "non-appropriation" does not necessarily entail the prohibition of extraction of resources. This treaty was enacted as a follow up to UN-sponsored conferences that took place after the ratification of the OST, as more and more parties seemed to take interest in the utilization of outer space. It was initially formulated to accommodate the OST, especially in regards to its procedural framework.[5] The principle's main purpose is to ensure fairness and equal chances among countries in harvesting the resources. Given that it is in fact possible to extract resources from space, therefore there exist burden to proof that the coexistence of both principles will be beneficial for both state and private entities in the long run.

Although experts argue that the Moon Treaty accommodates commercial activities, there still needs to be a clear guideline in international regulations to universalize domestic laws enacted by specific states. [6] Said international regulations consists of the general consensus on the key aspects of the field of law

[5] James R. Wilson (2011). *Regulation of the Outer Space Environment Through International Accord*: The 1979 Moon Treaty. Fordham Environmental Law Review, Volume 2, Number 2, Article 1, 2011.

[6] Ridderhof, R. *Space Mining and (U.S.) Space Law.* https://peacepalacelibrary.nl/blog/2015/space-mining-and-us-space-law. Retrieved 7 October 2021; The Guardian. "Asteroid mining could be space's new frontier: the problem is doing it legally". https://www.theguardian.com/business/2016/feb/06/asteroid-mining-space-minerals-legal-issues. Retrieved 15 October 2021.

which have been widely practiced and accepted by states, which can also be understood as customary IL. Similar to the approach taken by the commercial legal regime, the commercialization of outer space is backed by the SOFIA guidelines, a model law designated to assist states in reforming and modernizing as well as setting out the grounds for procedural implementations in a domestic scope. It was a result of discussions of the Space Law Committee of the International Law Association and should act as the "building-blocks" for national space laws adopted by space faring nations. Although the interpretation to the principles may differ from one state to another (i.e., allowing private appropriation in the future), the international community also has to preserve the cornerstone of the treaty namely equitable access and peaceful use of outer space.[7] However, it is no easy task, as outer space law is a niche field and it is not widely practiced by states yet. Humanity is approaching the era of outer space commercialization and despite its nicheness, such is an urgent matter to address.

Commercialization of outer space is the future; and various stakeholders have prepared their business schemes thoroughly with domestic legislation as their warrantee.[8] Etymologically, domestic law refers to national regulation enacted by states to regulate specific certain matter. It is clear that national regulations only regulate the specifics of the guiding principles provided by IL. Hence, enacting national legislation in conformity with the OST is one of the alternatives. National

[7] Abigail D. Pershing (2019*). Interpreting the Outer Space Treaty's Non-Appropriation Principle: Customary IL from 1967 to Today.* Yale Journal of IL.
[8] International Civil Aviation Organization (2018). "*United States Suborbital Regime as it Relates to the Use of Civil Aviation Airspace*", AN-Conf/13-WP/272. Available at https://www.icao.int/Meetings/anconf13/Documents/WP/wp_272_en.pdf

space laws will touch on a wide range of areas, including registration, safety, insurance and indemnification, environmental protection, and enforcement by the relevant state. While such national space laws diverge widely with regard to their treatment of each area, they generally seek to balance the responsibilities and potential liabilities of the private entity and the state.

For that to happen, there needs to be a way for state to register companies such as incentivising them to register under the state. This is done in order to ensure that the state is not exposed to excessive international liability done by individuals/ private entities. It is to set the boundaries of conduct by states and private entities. Such boundary will be necessary to ensure the vision of "common heritage of mankind", which is the spirit of OST itself. Moreover, by enacting national legislation it acts as an additional regulatory measure for private companies to not go overboard the underlying rules.

Under the context of commercialization, article 1 of the OST states that "the exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind." It also states that "the outer space shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with IL, and there shall be free access to all areas of celestial bodies." Space tourism is such a high-cost recreational activity and on some instances, it defeats the main purpose of utilization of space must be for the benefit of all mankind. However, such may also have long term social and economic advantages

such as further development in technology which entails a more affordable access to space. Whatever the future may hold for space commercialization, the two aforementioned articles had encapsulated the nature of the outer space legal regime that needs to be complied by states during their exploration.

First, the notion of benefit and interests of all countries. In the current status quo, the main stakeholders to the space exploration programme includes not only state-owned enterprises but also private entities. Take SpaceX for instance, a company built by multi-billionaire Elon Musk, who also worked with the government of the US in transporting individuals to the International Space Station through their dragon project. SpaceX has also proven that space vehicles can be built at a more reasonable cost compared to the ones produced by the National Aeronautics and Space Administration **["NASA"]**.[9] This shows the capability of private entities in this field, and the benefits that it provides towards the stakeholders. United Nations Office for Outer Space Affairs **["UNOOSA"]**, as the governing and regulatory body of outer space has also foreseen this development and in November 2019 launched the "Space Law for New Space Actors: fostering responsible national space activities" project. As the name suggests, this project facilitates UN member states to draft their own national space legislation in line with international space law, while promoting the long-term sustainability of outer space activities, including future space explorations and colonialization.[10]

[9] New York Times, "*With U.S. Help, Private Space Companies Press Their Case: Why Not Us*?" https://www.nytimes.com/2008/12/30/science/30spacside.html. Retrieved 15 October 2021
[10] UNOOSA, *UNOOSA Annual Report 2019*, pp. 6

Secondly, the benefits procured from these explorations must be accessible to all stakeholders, upholding the principle of non-discrimination and equality. Experts tend to correlate this provision with article 3 of the OST as it explains the justification on the basis of equality. In order to do so, states must also recognize that celestial bodies are not of appropriative nature, meaning that no individuals may claim a portion of outer space.[11] The notion of jurisdiction does not exist in outer space therefore. Even if there are such thing, the delimitation of it is another issue. Although it may be a future roadblock, UNOOSA is currently trying to ensure that states have equal access to space programmes and technologies. A memorandum of understanding was also signed by NASA and the UNOOSA to expand access to the benefits of space, including spacecraft data, tools and expertise, which would help countries without space capabilities to develop early stages of the assets.[12] This was proven through the cooperation between Indonesia's telecommunication company (Telkom Indonesia) and SpaceX. The plan was to provide internet access to all of Indonesia, because fibre optics and cables are not enough to reach rural and secluded areas. With such a vast territory to accommodate, Telkom Indonesia collaborated with SpaceX to launch its telecommunication satellite (Telkom-4), named Merah Putih Mission.[13]

Observation suggests that the price of space transports becomes cheaper and cheaper each year. During the launch of Telkom-1 in 1999, the company paid US$

[11] John G. Wrench (2019), "Non-Appropriation, No Problem: The Outer Space Treaty Is Ready for Asteroid Mining", 51 Case W. Res. J. Int'l L. 437
[12] UNOOSA, *UNOOSA Annual Report 2020,* pp. 13
[13] Tempo.co, "Besok, Satelit Merah Putih Telkom Diluncurkan dari Florida AS". https://bisnis.tempo.co/read/1114190/besok-satelit-merah-putih-telkom-diluncurkan-dari-florida-as, Retrieved 15 October 2021

191.4 million and it has been on a constant fall since. For their subsequent productions, Telkom-3S which was launched on 2017 costed US$ 199.7 million and recent Telkom-4 costed US$ 165 million and was launched in 2018.[14][15] This goes to show that space transports are getting more and more affordable to states, further enunciating its urgency especially due to its private takeovers. This becomes the notion of privatization, and how private stakeholders will commercialize space in the near future. The benefits would be immense as humanity is looking at a more cost-efficient way to go to space, and conduct exploration and scientific researches. Space travel in particular, falls under the utilization of space exploration in which it introduces the world to the beauty of earth from space. New business entities will soon test their technology on the open market, regularizing suborbital human space travel through less expensive, but reliable and safe launch vehicles. This is the momentum to determine the certainty of the legal regime in space travel once again.

Another thing to highlight is the delimitation of airspace, which differs outer space from regular airspace which commercial airlines use for aircrafts. States believed that the delimitation of outer space must be determined in reference to the activities and technology instead of scientific approaches. However, experts argued that there needs to be a clear line, measured objectively and not simply the dichotomy between aircraft and spacecraft. This vague definition creates

[14] The Jakarta Post, "Telkom-1 satellite gets go-ahead for launch", https://www.thejakartapost.com/news/2018/08/07/indonesiastelkom-launches-newest-satellite.html, Retrieved 15 October 2021

[15] Taking into account the inflation since the year 1997, the year the rocket was purchased, it would cost US$ 311.9 million in 2018, the year the rocket was purchased with a cumulative rate of inflation at 56.5% [calculated with the US inflation calculator < https://www.usinflationcalculator.com/>]

uncertainty to the jurisdiction should there be a violation conducted by state, whether it falls under aviation law or space law. There are multiple interpretations on this, both from the scientific and technological criteria and arbitrary approach with airspace law. Professor C. de Jager from the Committee on Space Research suggested that the delimitation should be fixed at 160km, which is the lowest flying altitude of a satellite. The arbitrary approach on this is to conform with the laws of airspace by the International Civil Aviation Organization **["ICAO"]**.[16] Although the ICAO stated that they have not discussed regarding this matter, but such may be discussed in the future if requested by member state. USSR in the other hand proposed to the ICAO to set the delimitation at 100-120 km above sea level and has been agreed by most of the delegations in UNCOPUOS.[17] What differs the airspace law and space law is on the notion of sovereignty.[18] Outer space does not let states claim sovereignty, and through space travel this has to be cleared up.[19] Sovereignty and jurisdictions are required to determine liability, mainly to regulate and pre-empt should there be unprecedented harms. Similar to aircrafts and vessels, spacecrafts have sovereignty of itself, the question lies on the commercial liability, and whether airspace law principles may be adopted to accommodate the early development of space travel legal regime.

[16] Legal Subcommittee UNCOPUOS, session 10 March-3 April 1980, UN Doc.A/AC-105/271, par. 42
[17] UN DOC.A/AC-105/C-2/SR 314, par. 2 (5 April 1979) referring to a working paper by the USSR (UN DOC.A/AC-105/C-2/L-121)
[18] David Collins (2008), *Efficient Allocation of Real Property Rights on the Planet Mars*, 14 B.U.J. Sci. & TECH. L. 201, 204
[19] Zhao Yun (2009), *A Legal Regime for Space Tourism: Creating Legal Certainty in Outer Space*, 74 J. Air L. & Com. 959

Coming to the notion of liability, the OST also regulates it under article VII in which launching states and sites must hold international liability for damage to another state party in airspace or airspace. Notice that liability here refers to state responsibility. Before the commercialization and privatization era, states hold full control over space expeditions and exploration. However, as we approach the modern era of transport in which private stakeholders also partake in this industry, it gives rise to the question of whether these companies would then hold individual responsibility, or do they still hold the states liable for violations of space law. This may be interpreted in both ways, but assuming that it is an ideal interpretation, states would then hold companies accountable for their actions through the national legislation. There are no problems regarding state liability, as it will be shared with the private entities and in the end of the day. In cases like this, it is up to national legislation to regulate as IL only acts as the guiding principles. It lays down the legal regime of space law and creates national legislation that complies with those principles.

The liability convention expands on the idea of article VII of the OST in which this framework provides a legal framework for the full compensation of damage caused on Earth by the space farers as a result of their activities in space.[20] This holds states liable if there are in the occasion of malfunction during a rocket launch and the fallen debris hits civilians' settlement which may cause casualties. In such a scenario, launching state and the manufacturer may be held liable under the liability convention. It distinguishes two situations when the launching state(s)

[20] Julian Hermida, Legal Basis For A National Space Legislation 12 (2004)

are liable: (1) "damage caused by its space object on the surface of the earth or to aircraft in flight" and (2) "damage being caused elsewhere than on the surface of the earth to a space object of one launching State or to persons or property on board such a space object by a space object of another launching State."[21]

In this paper, the author will provide an in-depth discussion on the future of space commercialization, and how the space law legal regime is coping up with the current development of spacecraft technologies. It would be laid down based on the general process and procedure of space travel, which includes, launching, sub-orbital/orbital space tourism and landing.

1.2 Formulation of Issues

In regards to the topic of this thesis, this paper attempts to elaborate and analyse on the following formulation of issues:

1. How does the Space Law legal instruments and international practice define and regulate the commercialization of outer space?

1.3 Research Purposes

Responding to the aforementioned questions proposed, this thesis namely attempts:

1. To assess the current space law legal regime towards the development of outer space, particularly in relations to jurisdictional and liability contentions that posed legal gaps in regulating the commercialization of space.

[21] Liability Convention Art. II-III

1.4 Research Benefits

The benefits of this research are divided into (1) theoretical and (2) practical benefits.

1.4.1 Theoretical Benefits

This thesis aims to provide an understanding regarding the legal regime of space tourism under the outer space legal instruments, and whether those are open for interpretation valid for the commercialization and privatization of outer space. The author also sees the need to analyse on whether in the future, these legal instruments would be adequate enough to accommodate the businesses in this particular field.

1.4.2 Practical Benefits

Practically, the Author hopes that this research can provide better understanding to space law actors for their future expansion on the commercialization and privatization of outer space. The author also hopes that this would be beneficial to investors and innovators who plans to develop in the field of space travel, laying down the legal certainty and possible plans and projection towards the outer space legal regime.

1.5 Framework of Writing

This thesis is arranged into five main chapters that will ease the readers to understand the discussion of this thesis.

CHAPTER I: INTRODUCTION

The first chapter introduces the grand narrative of space commercialization as the starting point of this thesis. It then informs the readers on the background of the topic, briefly explaining how space travel would work in the near future, the legal problems that might arise from its future developments and the urgency of coming with legal certainty within this regime. Following the background, this chapter will also lay down fundamental issues along with the purpose and benefits of this research.

CHAPTER II: LITERATURE REVIEW

The second chapter discusses theoretical background of the thesis, addressing relevant concepts, terminologies and legal provisions which will be addressed in subsequent chapters. This thesis will elaborate on the notion of IL, international space law and relevant treaties, and commercialization of outer space. It will also look into existing theories and literature by experts regarding the characterization of space travel and its liability and jurisdiction under the space legal regime.

CHAPTER III: RESEARCH METHODS

This chapter will discuss in general about the type of research, the type of data, data analysis technique and the type of research approach. Followed by the types of research, data, data analysis technique and research approach that the Author use to discuss the issues in this thesis.

CHAPTER IV: DISCUSSION AND ANALYSIS

The fourth chapter will discuss the research problems along with its possible solutions. This chapter will be divided into two sub-chapters and will address the questions stipulated in chapter two of this thesis. The first sub-chapter will consist of analysis on whether the OST would be relevant in the future of space travel, including the different businesses that may run in the near future and how the legal regime would legitimize these businesses. The second sub-chapter would then discuss on whether there needs to be an amendment to the OST in the near future, especially concerning the relevance with the status quo and the future development.

CHAPTER V: CLOSING

In this last chapter, the Author will explain the conclusion as a response to the issues proposed in chapter four of this thesis. Aside from providing a conclusion, the Author will also give suggestions and recommendations towards these issues and possible approaches that can be taken by UNOOSA and preparations by investors in acknowledging the legal regime of space travel under OST, thus providing legal certainty on the future of space exploration, pushing it beyond the boundaries.