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UNDERSTANDING SPACE LAW: THE LACUNAE THAT PAVED THE WAY FOR COMMERCIALISATION AND MILITARISATION

-Tanushree Ajmera and Abhishree Manikantan[1]

ABSTRACT

In the aftermath of the technological breakthrough of the 21st century, States find themselves critically dependent on a "space-river" governed by the Outer Space Treaty, which has significantly prioritised the military and the private commercial interests of a few spacefaring state and non-state actors. Built on the legacy of the Cold War, the treaty while failing to delimit the scope of international law in outer space, has on one hand botched the principle of "common heritage of mankind," on the other served the individual ambitions of various space actors.

This paper takes up the necessary question: whether the prospects for stability in space, the final frontier of the 21st century, can be left unsecured in the hands of an ill-equipped piece of law that has failed the modern test of values of "loyalty, mutual trust, and benefit of all humankind." To this end, the paper analyses the historical development of the treaty while outlining the implications of the diplomatic binary phase prevalent at the time. It argues that the lacunae of the space legal regime have not only failed in preventing the contemporary military uses of outer space but also proved futile in controlling the increasing role of private commercial entities in space. The aim of the research is to discuss the inadequacies of the present space treaties with the intent to contribute possible suggestions in tune with changing dynamics in outer space.

INTRODUCTION

The Greek philosopher, Aristotle described "vacuum" as abhorrent and against the laws of nature. Accordingly, throughout the Middle Ages, it was believed to be a place where neither man nor his explorative ambitions belonged.[2] Multiple centuries later, the underlying intent of the statement remains as accurate as ever in the context of outer space, which is the closest known estimate to vacuum. Out of all the environments human beings have ventured into for military, economic, and scientific advancements, outer space to date remains the most inhospitable. The near absence of gravity, the presence of ionizing cosmic rays and the existence

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[2] EDWARD GRANT, MUCH ADO ABOUT NOTHING: THEORIES OF SPACE AND VACUUM FROM THE MIDDLE AGES TO THE SCIENTIFIC REVOLUTION, 9-11 (Cambridge University Press, 2011).

of high-energy, together form an unpredictable and ultimately dangerous territory.[3] Yet, despite these terrible difficulties posed, space and celestial bodies remain a constant source of wonder and speculation.

In fact, the study of celestial objects and phenomena under Astronomy has been traced to a period as early as 2000 B.C. in the Rigveda of Ancient India.[4] It has been one of man's earliest ambitions to conquer space and explore its depths, something which has been extensively featured in sci-fi thrillers over the years.

Space is effectively ruled by an amalgamation of three social elements – the scientific community, the military and private commercial actors. While initial forays into space were perhaps made in the name of science and advancement of knowledge, there have always been those who wished to make use of the final frontier for their own purposes – or those of their country. Recent leaps in space technology can be attributed quite clearly to the ambitions of wealthy corporations looking to open the doors to new forms of business. Correspondingly, the Space Age was initially dominated by the imminent need for enhanced military prowess.

This paper is an attempt to understand the development of space law from the very onset of the Space Age well into contemporary times. It will primarily focus on the latter two social elements, the military, and the commercial entities, as it endeavours to understand the shortcomings of the existing international space regime and analyse it in terms of modern developments in space technology.

I. A "SPACE RACE" LED MILITARIZATION

The desire to enter space and establish control over it stems from man's innate nature to overpower, exploit, and dominate everything in his path. Under the garb of awe and wonder, states increasingly find themselves wanting to stake their claim on the high ground. To this end, despite the difficulties – rather, the massive costs of overcoming them – countries are turning space into the next frontier for building a strategic military defence. In 2019, Government Space Programs of Euroconsult released a report totalling the global space budget to USD 70.9 billion in the year 2018.[5]

[3] Richard B. Setlow, *The hazards of space travel*, 4(11), EMBO REPORTS, 1013–1016 (2003), https://doi.org/10.1038/sj.embor.embor7400016.
[4] INDIAN ASTRONOMY - HISTORY OF ASTRONOMY, https://explorable.com/indian-astronomy (last visited May 15, 2020).
[5] Simon Seminari, *Op-ed: Global government space budgets continues multiyear rebound*, SPACE NEWS, (November 24, 2019), https://spacenews.com/op-ed-global-government-space-budgets-continues-multiyear-rebound/.

While this space-military-dependence seems unproblematic to technologically advanced nations, the lawlessness with which it is being pursued is in fact terrifyingly dangerous. Over the years multiple space treaties, especially the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 1967 (the "Outer Space Treaty" or "OST") have tried establishing a global space governance regime, however to no avail. This is mainly due to the fact that military inviolability in space is rooted in the limited accomplishments of the Cold War.[6] A piece of law is viable only to the extent that it can survive the modern test of values despite the demise of the social construct it was built on.[7] Hence, to understand the lacunae in the current space regime, it is important to first trace the history it was built on.

A. A Historical Background

On October 4, 1957, the Soviet Union launched the world's first artificial satellite, *Sputnik 1* into a low altitude elliptical Earth orbit from Baikonur, Kazakhstan.[8] The successful launch struck a direct blow to the United States' pursuit of space dominance and marked the commencement of a "Space Race," [9] which initially involved two conflicting superpowers striving to prove the other as technologically inferior.

In *Sputnik 1,* the United States recognised a scientific advancement that posed the tactical threat of a deliverable nuclear warhead, an Intercontinental Ballistic Missile. [10] The palpable tension between the two nations modelled the serious possibility of another warfare, one which might disrupt the delicate post World-War II peace with nothing less than a devastating nuclear attack.

To eliminate this risk, the United Nations ("UN") General Assembly set up the Committee on the Peaceful Uses of Outer Space ("COPUS") in 1959 to ensure that the use and exploration of space is done for security, peace, development and benefit of all humanity.[11] The driving force behind the negotiation of multilateral outer space agreements, COPUS as of 2019 has 95 committee member states,[12] including the major space faring countries China, Russia, India, and the United States.

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[6] MYRIAM DUNN CAVELTY, ET AL., STRATEGIC TRENDS 2015: KEY DEVELOPMENTS IN GLOBAL AFFAIRS, 69 (Oliver Thränert, Martin Zapfe, 2015).
[7] P. J. Blount, *Renovating Space: The Future of International Space Law*, 40, DENV. J. INT'L L. & POL'Y, 515, 515, (2011).
[8] *Sputnik*, NASA, https://www.history.nasa.gov/sputnik (last visited Jun 15, 2020).
[9] P. J. Blount, *Renovating Space: The Future of International Space Law*, 40, DENV. J. INT'L L. & POL'Y, 515, 516, (2011).
[10] Dwayne Day, *The Sputnik Non-surprise*, THE SPACE REVIEW (Sept. 8, 2009) http://www.thespacereview.com/article/1457/1.
[11] UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS COPUOS, https://www.unoosa.org/oosa/en/ourwork/copuos/index.html (last visited February 14, 2020).
[12] UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS COPUOS,

On October 10, 1967, COPUS laid out the Outer Space Treaty.[13] Marked as the biggest accomplishment of the Committee, the foundational treaty till date serves as the "Constitution" for governing outer space activities. Moreover, it has proven fundamental in providing a legal framework for the current space regime.

Building on the principles of international law, the treaty promoted understanding and international cooperation in order to maintain security and peace.[14] Article III of the treaty further established the principles of international law, including the Charter of the United Nations, as the governing law in outer space.[15]

B. Space Diplomacy in Cold War Era

It is imperative to note that although polyadic in nature, the treaty was constructed during a time when the world was experiencing a binary phase. With two superpowers competing for dominance, the political and societal pressures confronting the drafters were colossal. Guided by the necessity to tackle the immense strategic risk posed by the Cold War, the drafters aimed to reduce the increasing tensions between the Soviet Union and the United States. On one hand, the drafters had to provide enough self-serving incentives to these nations to garner their support for the law while on the other, strike a balance by restricting States from placing *"in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner."*[16] The dramatic result of such delicate space diplomacy led to differing interpretations of the treaty that have eventually rendered it powerless in ensuring the non-militarization of space.

In the first instance, Article IV(1) of the treaty only imposes restrictions on the placement of nuclear weapons or other weapons of mass destruction, thereby presumably excluding prohibition on the stationing of any other weapons, such as laser or conventional weapons, in outer space for military purposes. States have often interpreted this as a green flag entitling them to use space for military purposes, provided they do not deploy or involve the specifically mentioned nuclear weapons or weapons of mass destruction.[17]

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https://www.unoosa.org/oosa/en/ourwork/copuos/members/evolution.html (last visited February 10, 2020).
[13] Ricky J. Lee, *Jus Ad Bellum in Outer Space: The Interrelation between Article 103 of the Charter of the United Nations and Article IV of the Outer Space Treaty*, 45, PROC. ON L. OUTER SPACE, 139 (2002).
[14] Outer Space Treaty, art. III.
[15] UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS COPUOS,
https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html (last visited February 15, 2020).
[16] Outer Space Treaty, art. IV.
[17] Cheng, *The Legal Status of Outer Space and Relevant Issues: Delimitation of Outer Space and Definition of Peaceful Use*, 11, J. SPACE L., 89, 102, (1983).

In the second instance, Article IV(2) of the Treaty permits *"the use of military personnel for scientific research or for any other peaceful purposes"* and *"the use of any equipment or facility necessary for peaceful exploration of the moon and other celestial bodies."*[18] Both the Soviet Union and the United States initially accepted the "non-military" interpretation of "peaceful purposes."[19] This meaning was derived from the similarly worded Article 1 of the Antarctic Treaty, 1959 which stated that Antarctica shall be solely used for peaceful purposes. It further prohibited any other measures of military nature including testing of any type of weapons.[20]

However, the Soviet Union later retracted its opinion by continually sending military payloads into space. The action was not only disruptive but also of unlawful nature as it violated the "non-military" clause of the treaty. Further, the Soviets increased their dependence on space technology for military defence and planning.[21] Threatened by the actions of its contemporary rival, the United States took the legal approach. The intent was to either hold the Soviet Union accountable, which seemed far-fetched in the Cold War era or catch up to its military ambitions in space.

To this end, the United States sought to take advantage of the supposed uncertainty surrounding the meaning of "peaceful purposes" by changing its meaning from "non-military" to "non-aggressive."[22] It followed that States could conduct activities in space so long as they do not "use threat of force" as per Article 2 of the UN Charter.[23] The alteration resonated with the permitted use of non-aggressive military actions under Law of the sea, which is of particular importance to space law – supposedly more than the Antarctic Treaty. Interestingly, the idea behind space a "common heritage of mankind" is in fact based on the suggestions by Arvid Pardo, "the father of the Law of the Sea," who at the United Nations General Assembly in 1967, proposed that the seabed and the ocean floor beyond national jurisdiction be shared by all without domination of any country.[24] Therefore, while upholding the Law of the Sea supported justification, other member states including the Soviets accepted the modification.

The obvious advantage of rejecting "peaceful" as a complete bar on military activities, was the access to the right of self-defence under Article 51 of the UN Charter.[25] States maintained that they possessed the right to defend themselves against threats in outer space. Here, the application of international law in interpreting the provisions of the Outer Space Treaty becomes extremely relevant to the discussion. The drafters of the treaty extended the application of international law

[18] UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS COPUOS, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html (last visited February 16, 2020).
[19] Mitchell Ford, *War on the Final Frontier: Can Twentieth-Century Space Law Combat Twenty-First Century Warfare?*, 39:1, HOUS. J. INT'L L. 237, 242, (2017).
[20] Antarctic Treaty, art. I.
[21] *Supra* note 18 at 242.
[22] *Supra* note 18 at 242-243.
[23] UN Charter, art. 2, ¶ 4.
[24] M. Bourbonniere, *National security law in outer space: the interface of exploration and security*, 70, J. AIR L. & COM., 16 (2005).
[25] U.N. Charter, art. 51.

including the UN Charter under the principle of *legi generali*, which is applied to overcome the lacunae in the existing legal systems.[26] However, they failed to limit the extent to which the law could be applied. Article 103 of the UN Charter proclaims it as the "superior law," which means that in case of a conflict, the obligations under the Charter shall prevail over those under the OST.[27] In the context of the interpretation of Article IV of the OST, the prevalence of international law over the treaty resulted in legal validation of military activities in space under the garb of self-defence.

The aim of the authors is not to undermine the application of international law in the exploration of outer space. One of the central provisions of the United Nations Charter is the essential concept of sovereign equality, which purports to base the existence of a state not on its economic or military power but on its virtuous status as a state.[28] It is due to this principle that under the treaty all states are deemed equal, and in the spirit of international cooperation, each state is free to undertake exploratory missions in space in the interest of all humankind. However, the discrepancies between the two laws have enabled states to protect their individual interests and build a pattern of abuse of law. For example, both the United States and the Soviet Union have repeatedly pointed out that, by excluding "outer space" from requirements under peaceful purposes, the drafters have restricted the broad prohibition of military activities only to the moon and other celestial bodies and not outer space in general.[29] Put simply, states have construed the limitations under the treaty to mean that there is no express prohibition on the military use of outer space.

II. BREAKDOWN OF UNITED STATES - SOVIET UNION POLICY OF DÉTENTE

Throughout the second half of the 20th century, space law was used as a platform to depict the fluctuating turmoil surrounding political relations between the United States and the Soviet Union. When warmed, these relations increased cooperation and when worsened, caused ties to cut off. The relationship between the United States and the Soviet Union observed a period of détente from 1963-1975. This led to the formation of agreements such as the Limited Test-Ban Treaty in 1963, the Strategic Arms Limitation Treaty in 1972, among others. [30]

[26] LOH Ing Hoe et al., *Article III Of The 1967 Outer Space Treaty: A Critical Analysis*, 8(5), INT'L J. ACAD. RES. BUS. SOC. SCI., 330, 339. (2018).
[27] UN Charter, art. 103.
[28] *The Concept of Sovereign Equality of States in International Law*, 2(1), GIMPA L. REV., 14-34, (2016).
[29] *Supra* note 12 at 140.
[30] JAMES CLAY MOLTZ, CROWDED ORBITS, 151 (Columbia University Press, 2014).

In tandem with the Cold War Politics, July 1975 saw the last welcoming establishment of a special bilateral working group for mutual space projects.[31] Unfortunately, the invasion of Afghanistan by the Soviets in December 1979 killed all possible hope for any additional cooperation in space. Further, the imposition of martial law in Poland, placement of cruise missiles and Pershing rockets in Europe by NATO, and hurried deployment of SS-20 medium-range nuclear missiles by the Soviet Union marked a period of terror in the Space Age.[32]

Historically, security treaties have a reputation for succeeding only in times of mutual cooperation. In this regard, the space governance remained somewhat "triumphant" during the period when the two superpowers collectively vouched for averting a further escalation of on-going weaponization. The formula was that both the Soviet Union and the United States seemed to value their own assets more than the ability to destroy the assets of the adversary.[33] In the narrowest sense, this meant avoiding permanent deployment of specific weapons in orbit if the mutual interest so demanded.[34]

Therefore, the massive impact of the failure of the current space regime was felt for the first time with the breakdown of Soviet-U.S. détente. From 1960-80, the Soviet Union had extensively developed anti-satellite weaponry by the name of co-orbitals, which first synced and then detonated the target satellite. In the aftermath of the breakdown, mutual suspicion grew to such an extent that in the 1980s, that the United States responded to the co-orbitals with a more advanced air-launched kinetic anti-satellite weapon, ASM-135 distinguished for its hit-to-kill method.[35] Moreover, U.S. President Ronald Reagan launched a Strategic Defence Initiative, also known as "Star Wars," which aimed to deploy thousands of space-based interceptors to defend against Soviet missiles.[36] In the "First Space War," better known as the Gulf War of 1991, the United States extensively used its satellite capabilities to win over the conflict.[37] This shifted the paradigm of operations in space in support of conventional weapons.

Today, military space operations have mainly three forms, (i) in-orbit proximity operations to spy on other satellites;[38] (ii) use of anti-satellite (ASAT) technology to debilitate satellites;[39] and (iii) launching long-range target missiles that pass through outer space for military strategic

[31] *Supra* note 29 at 151-152.
[32] Roald Sagdeev et al., *United States-Soviet Space Cooperation during the Cold War*, NASA, https://www.nasa.gov/50th/50th_magazine/coldWarCoOp.html.
[33] Roger G. Harrison, *Space and Verification*, 1, POLICY IMPLICATIONS, 9, (2011).
[34] *Supra* note 5 at 69-70.
[35] Talia M. Blatt, *Anti-Satellite Weapons and the Emerging Space Arms Race*, HIR, (May 26, 2020), https://hir.harvard.edu/anti-satellite-weapons-and-the-emerging-space-arms-race/.
[36] Chris Bowlby, *Could a War in Space Really Happen,* BBC NEWS, (December 19, 2015), https://www.bbc.com/news/magazine-35130478.
[37] Kubo Mačák, *Silent War: Applicability of the Jus in Bello to Military Space Operations*, 94, INT'L L. STUD., 1, 3, (2018).
[38] Subrata Ghoshroy, *The X-37B: Backdoor weaponization of space?*, 71, BUL. ATOMIC SCI., 19, 22 (2015).
[39] *Supra* note 34.

purposes.[4041] Currently, the most worrisome of the three is the development of kinetic anti-satellite ("ASAT") technology, which has the potential to physically collide with another satellite at high velocity to destroy the latter's functioning. Ballistic missiles, drones, etc. come under this category.[42] As discussed above, the Outer Space Treaty only prohibits nuclear weapons or weapons of mass destruction. Since anti-satellite or conventional military weaponry does not *per se* fall in either category, their use falls well within the established norms.

The end of Soviet-U.S. détente, hence, has clearly displayed the ill-effects of power-driven diplomacy being constructed on a house of cards. Space governance, if left with unsecured agreements and treaties that serve the individual interests of nations, has the potential to shatter the beneficial interest of all humanity.

A. ASAT: A Weapon of War

To add to the complexity of the space race, the revolutionary advancement in technology in the last quarter of the 20th century has increased the dependence of spacefaring nations on satellite applications for conducting military operations.[43] From the low-bandwidth uses of Global Positioning Systems ("GPS"), signals intercepts, voice communications, and low-resolution radar remote sensing imagery, to high-bandwidth uses of live video streaming, high-resolution optical remote sensing imagery, and television broadcasting, satellites are responsible for a whole host of modern military operations. For instance, in the *"War on Terror"* operations in Afghanistan and Iraq where ground communications infrastructure was often unavailable or unsecured, these satellite applications offered an instrument to overcome such limitations. Moreover, with the introduction of private and commercial satellites as significant service providers for the military in recent years, this movement towards digital communications has significantly upped the stakes in the race.[44]

Anti-satellite weaponry has thus garnered global appeal as a way to challenge traditional military supremacy. It is apparent, however, that the failure of the current space regime in protecting the strategic and tactical value of satellite applications under Article IV of the OST, has essentially rendered them genuine military targets in outer space.

Countries like China and India are using the space race to gain an advantage over their traditionally superior opponents.[45] In an ideal scenario, a conflict-like situation could be handled

[40] John E. Shaw, *The Influence of Space Power upon History 1944–1998*, 46, AIR POWER HIST., 20, 23 (1999).
[41] *Supra* note 36 at 7.
[42] *Supra* note 34
[43] Bob Silberg, *Bringing NASA Satellite Data Down to Earth*, NASA: ENERGY INNOVATIONS, (May 4, 2015), http://climate.nasa.gov/news/2271/bringing-nasasatellite-data-down-to-earth/.
[44] Ricky J. Lee et al., *Military Use of Satellite Communications, Remote Sensing, and Global Positioning Systems in the War on Terror*, 79, J. AIR L. & COM., 69, 72, (2014).
[45] *Supra* note 34.

if both sides believe that the other is capable of rendering its military blind and unarmed. For instance, if two ASAT equipped countries destroy each other's military satellites, they essentially leave themselves defenceless in the face of a third adversary who might take advantage of their incapacitation.

However, the basic drawback in this "ideal scenario" was highlighted by China in 2007, when it successfully conducted a debris generating test of KE-ASAT, destroying one of its own defunct weather satellites.[46] In its wake, the test left 3,000 potentially hazardous tiny fragments circulating in a heavily used belt of Earth orbit.[47] In another case of February 10, 2009, two communication satellites, commercial Iridium-33 and Russian Kosmos-2251 collided in a brutally risky accident 789 kilometres above a Siberian Peninsula, leaving behind over 200,000 pieces of space junk.[48]

The biggest concern of the international space community was that if the untraceable fragments collided with a sensitive spot on any satellite, it would be impossible to determine whether it was deliberate or not. The obvious response is to assume the worst and retaliate to the hostile act with force. Additionally, the treaty's silence on such situations has paved the way for regularization of such unfavourable activities – as is seen in the case of addressing the legality of China's ASAT of 2007, where countries opted for diplomatic protests over legal accountability.

On March 27, 2019, almost 12 years after China, India conducted its first successful KE-ASAT test. India's ballistic missile defence interceptor, the Prithvi Delivery Vehicle Mark-II (PDV MK-II), struck and destroyed an Indian Microsat-R satellite. In comparison to the Chinese ASAT test, the Indian demonstration produced around 130 untraceable and about 270 traceable fragments. The fact that the untraceable fragments could decay in perhaps a few weeks, brought a wave of calm over the international community. However, the relief was only short-lived, as the test thrust the motion towards debris-causing tests which can turn space into a highly unwelcoming environment, as correctly depicted in the academy award-winning sci-fi thriller, Gravity.[49]

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[46] Mike Gruss, *U.S. Official: China Turned to Debris-free ASAT Tests Following 2007 Outcry*, SPACE NEWS (January 11, 2016), https://spacenews.com/u-s-official-china-turned-to-debris-free-asat-tests-following-2007-outcry/.

[47] Carin Zissis, *China's Anti-Satellite Test*, COUNCIL ON FOREIGN RELATIONS, (February 22, 2007), https://www.cfr.org/backgrounder/chinas-anti-satellite-test.

[48] Nicholas L. Johnson, *Preserving the Near-Earth Space Environment with Green Engineering and Operations*, NASA, https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20090032041.pdf.

[49] Ashley J. Tellis, *India's ASAT Test: An Incomplete Success,* CARNEGIE ENDOWMENT FOR INTERNATIONAL PEACE, (April 15, 2019), https://carnegieendowment.org/2019/04/15/india-s-asat-test-incomplete-success-pub-78884.

III. SPACE: A MULTIPLAYER GAME IN THE 21ST CENTURY

Despite a lack of rapprochement, both the Soviets and the United States maintained a no-war scenario in the 20th century. However, space is a multiplayer game in the 21st century. There is an idea that certain key players in the current scenario might value the destruction of their opposition's assets in space more than the preservation of their own assets, which is a recipe for creating an environment of suspicion. For instance, North Korea has repeatedly conducted space launches that resemble an Inter-Continental Ballistic Missile test under the shielded concept of "peaceful non-aggressive purposes" of the treaty. Dr Robert Soofer, the Deputy Assistant Secretary of Defence for nuclear and missile defence policy of United States asserted that the endeavours to develop nuclear ballistic missiles by North Korea were catered towards its long-drawn ambition to threaten the United States homeland, allies, and partners. When confronted with this unanimous criticism from European countries and the United States regarding the missile tests, a spokesperson of the Foreign Ministry of North Korea stated that the missiles are "self-defensive" in nature against what the country believes is aggression by the United States and South Korea.[50]

The entry of relatively small nations such as North Korea into the Space Race is essentially ironic. That a treaty built around the bipolar era of the Cold War would one day serve the individual interests of a small nation like North Korea, is something neither the United States nor the Soviets could have predicted. If this is an indication of the risk of territorial conflict looming over the world, then it can easily be presumed that such a war might involve modern space military weaponry such as kinetic ASAT. With increasing rivalries among nations such as China and the United States in East Asia; Russia and the United States in Eurasia; and India and China in South Asia, this threat is as apparent as ever. Interestingly, all of these spacefaring countries have successfully demonstrated their anti-satellite launch capabilities. With the establishment of the United States Space Force as a branch of the U.S. Armed Forces, the United States in particular, has integrated a possible scenario of space warfare into its military planning.[51]

In the 1950s it was widely believed space would not stay peaceful. Every action undertaken, every successful negotiation and every signed treaty since then has subconsciously attributed to fuel this belief. When the Soviets designed the space station in 1965, based on their serious analysis of a possible military conflict in space, they armed it with cannons and small rockets. Equally, the United States had planned on depicting its nuclear strength by causing an explosion on the Moon, the impact of which could have been seen by the naked eye on Earth.[52]

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[50] Jacob Fromer, *North Korea may be ready with "even more capable" ICBM: Pentagon official,* NK NEWS, (March 12, 2020), https://www.nknews.org/2020/03/north-korea-may-be-ready-with-even-more-capable-icbm-pentagon-official/.
[51] *Supra* note 5 at 65.
[52] S*upra* note 35.

The 72 countries[53] active in space today are carrying forward this legacy, it is almost as if they are waiting for the inevitable space war to happen, and in the meanwhile are equipping themselves with enough weaponry to emerge victoriously. Adding to the riot, the onset of the 21st century has opened floodgates to renewed interests of private commercial entities in the space regime. However, with the ever-intensifying space race today, the major concern remains the same – an increasing militarisation of space fuelled by a treaty that is proving incapable of preserving the beneficial interest of all civilisations.

IV. THE COMMERCIAL WINDOW TO SPACE IS NOW OPEN

Although the 20th century was fixated on the military benefits of outer space, Yuri Gagarin's historic spaceflight around the earth in 1961[54] and Neil Armstrong's landing on the moon in 1969[55] are the events that laid the foundation for the lofty space-ambitions seen today. This was the first giant leap humankind took into outer space, proving that humans can survive in the "vacuum" with the correct technology.

Space exploration inherently involves remarkably high costs – to the tune of billions of dollars[56] – which are difficult to meet without government aid, and hence, for about the first 50 years, space exploration was primarily the prerogative of the State. However, the 21st century has seen a paradigm shift from government-led space exploration to increasing participation by private entities. Billionaires such as Elon Musk, CEO of *SpaceX*, Jeff Bezos, founder of *Blue Origin* and Richard Branson, co-founder of *Virgin Galactic* are considered pioneers in this field. These companies are working towards ventures such as space tourism and mining, as will be discussed in depth subsequently. This section will focus on the rapid commercialisation and privatisation of outer space and attempt to analyse its probable legal ramifications.

V. THE CURRENT TRENDS IN SPACE

The discussion on the commercialization of the space industry is often presumptively linked to privatisation. Therefore, it is imperative to understand that the former is a process by which a

[53] THE SPACE REPORT ONLINE, https://www.thespacereport.org/ (Last visited May 29, 2020).
[54] *Yuri Gagarin*, NASA, https://starchild.gsfc.nasa.gov/docs/StarChild/whos_who_level2/gagarin.html.
[55] *July 20, 1969: One Giant Leap For Mankind*, NASA, https://www.nasa.gov/mission_pages/apollo/apollo11.html.
[56] *Space Shuttle and International Space Station*, NASA, https://www.nasa.gov/centers/kennedy/about/information/shuttle_faq.html

hitherto freely existing product is converted into a profit-making entity.[57] For instance, coal as a mineral was used free of cost for generations until it was commercialised for fuel purposes. Conversely, privatisation refers to situations wherein public sector enterprises are sold or transferred completely to the private sector, as exemplified by the privatisation of the erstwhile Indian public company, Bharat Aluminium Company Limited (BALCO) via disinvestment in 2001.[58]

The commercialization of the space sector began in earnest with the introduction of satellite technology and its increasing use in all fields of life. *Telstar 1,* launched in 1962, was the first satellite capable of trans-Atlantic TV transmission and also the world's first privately-sponsored satellite to enter orbit.[59] In the last two decades, the demand for cutting edge, high-resolution satellite imagery has increased manifold, prompting commercial entities such as Google to send up more such earth-observing satellites.[60] Today, apart from satellite technology, newer start-ups are exploring other means of exploiting space as well.

As more and more private individuals enter the space sector, it is apparent that in the 21st-century space is no longer being utilised for "the common interest of humankind."[61] The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 1984 ("Moon Treaty") had envisioned an international regimen to govern the exploitation of natural resources on the Moon and celestial bodies,[62] in the absence of which, the United Nations was expected to suspend commercial growth of the space sector and also limit its exploitation as a consequence of scientific investigations. However, as the flag-bearer of capitalism, the United States impeded the move.[63] It is also notable that during the drafting of the Outer Space Treaty, the Soviet Union had proposed to outlaw all non-governmental activity in space, which was yet again blocked by the United States.[64] Clearly, the decisions not only disregarded the common heritage principle but also sowed the seeds of cut-throat competition driven by need.

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[57] *Commercialisation,* CAMBRIDGE DICTIONARY, https://dictionary.cambridge.org/dictionary/english/commercialization.
[58] Rohit Saran, *Privatisation row: Disinvestment Ministry comes to grips with fallout of Balco controversy,* INDIA TODAY, https://www.indiatoday.in/magazine/economy/story/20010521-privatisation-row-disinvestment-ministry-comes-to-grips-with-fallout-of-balco-controversy-776142-2001-05-21.
[59] *July 12, 1962: The Day Information Went Global,* https://www.nasa.gov/topics/technology/features/telstar.html.
[60] *Commercial Satellites,* http://gsp.humboldt.edu/OLM/Courses/GSP_216_Online/lesson3-2/commercial.html.
[61] Outer Space Treaty, art I.
[62] Moon Treaty, art. XI, ¶ 5; *See also:* Moon Treaty, art. XI, ¶ 7.
[63] Daniel A. Porras, *The "Common Heritage" of Outer Space: Equal Benefits for Most of Mankind*, 37, CAL. WEST. INT'L. L. J., 143, 161 (2006); https://scholarlycommons.law.cwsl.edu/cgi/viewcontent.cgi?article=1130&context=cwilj.
[64] Christopher Johnson, *The Outer Space Treaty at 50,* THE SPACE REVIEW, https://www.thespacereview.com/article/3155/1.

A. Unleashing the Competitive Streak

The age of industrialisation brought with it a huge increase in the world's requirement for minerals and other finite resources. Since its advent over two centuries ago, the needs and requirements of the world market, economy and the average human have grown exponentially. Together they paved the way for a flourishing mining industry, which has left the mineral deposits of earth critically depleted.[65] In these dire circumstances, profit hungry entrepreneurs and industrialists have turned their gaze skywards, into space. They see a USD 5 trillion potential in the space-resource mining industry as asteroids and other celestial bodies are rich reservoirs for heavy metals that are necessary components of computers and smart phones.[66]

Unfortunately, the last six decades have not shown the speed of progress anticipated at the inception of the Space Age. A necessary catalyst for progress and innovation is competition, something that has only recently been introduced to the space sector. This may be largely due to the near-monopoly governments around the world had on space exploration, aided by the erstwhile prohibitively high operational costs. However, the commercial market has proved to be a willing financier of any endeavour so long as the benefits are clearly laid out, and this has altered the scenario drastically. For instance, *Virgin Galactic* is selling seats to passengers on future spacecraft to tour outer space at relatively meagre prices.[67] Some governments have also adopted this strategy, such as the Russian government, which began selling seats on their spacecrafts to passengers interested in visiting the International Space Station ("ISS").[68] The USA's National Aeronautics and Space Administration ("NASA") is also planning to open the ISS for space tourism[69] in partnership with *SpaceX*, who became the first private company to safely launch astronauts into space with their successful mission to the ISS on May 30, 2020.[70]

At this juncture, it is imperative to realise that commercialisation is a process that cannot be completely stopped. While this paper will highlight the ill effects uncontrolled growth in this sector can have on the environment of earth and space, it will focus more on pointing out the loopholes in the existing legal framework and devising a strategy to regulate future commercial endeavours into outer space.

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[65] Pradeep Mehta, *The Indian Mining Sector: Effects on the Environment & FDI Inflows*, CCNM Global Forum on International Investment, OECD, (2002) https://www.oecd.org/env/1830307.pdf.

[66] Dr Cassandra Steer, *Why Outer Space Matters for National and International Security,* CENTRE FOR ETHICS AND THE RULE OF LAW, UNIVERSITY OF PENNSYLVANIA, (Jan 2020), pp.12, https://www.law.upenn.edu/live/files/10053-why-outer-space-matters-for-national-and.

[67] Mike Wall, *Virgin Galactic gearing up to start selling suborbital spaceflight tickets again*, SPACE.COM, (FEBRUARY 26, 2020) https://www.space.com/virgin-galactic-spaceshiptwo-reservations-one-small-step.html.

[68] John Lewis, Christopher Lewis, *A Proposed International Legal Regime for the Era of Private Commercial Utilization of Space*, 37(3) GEO. WASH. INT'L L. REV., 745, 745 (2005).

[69] *NASA Considers Selling Seats on the Spacecraft Used For Space Station*, NDTV, (November 20, 2018) https://www.ndtv.com/science/nasa-considers-selling-seats-on-the-spacecraft-used-for-international-space-station-1950402.

[70] *NASA Astronauts Launch from America in Historic Test Flight of SpaceX Crew Dragon,* NASA, (May 31, 2020) https://www.nasa.gov/press-release/nasa-astronauts-launch-from-america-in-historic-test-flight-of-spacex-crew-dragon.

B. Privatising Outer Space

The world today has nine countries capable of orbital launch. More and more often, these nations have been aligning with commercial players to achieve their space goals. For instance, in 2017 the Indian Space Research Organisation ("ISRO") for the first time contracted a private company to make a complete, heavy-duty satellite.[71] India also seems to be considering utilising private--sector innovations to augment its space capabilities as part of the *Aatma Nirbhar Bharat Abhiyan*, a move backed by nascent plans to share ISRO's facilities with private players.[72] The Chinese government, too, allowed private companies to build and launch satellites in 2014, after which many of them began securing multi-million dollar satellite investment deals.[73] Conversely, the private sector has always been deeply involved in the developmental aspects of the space industry in the United States. More recently since 2015, NASA has begun giving out contracts to SpaceX and Boeing to launch its astronauts, rather than relying upon Russian launches as they have been since the NASA space shuttles were retired in 2011.[74]

Recent years have also seen a substantial tilt in favour of space-oriented start-ups in various parts of the world, aside from the well-known companies belonging to billionaires such as Elon Musk and Jeff Bezos. For instance, Moon Express Inc. is another American privately held start-up that aims to provide transportation to the Moon for the government as well as commercial actors. It is known for being the first company to receive government approval to send a robotic spacecraft beyond traditional Earth orbit in 2016.[75] Goonhilly Earth Station Ltd., a United Kingdom based company, aims to develop deep space communications systems and has been in the market since the launch of *Telstar 1* in 1962.[76] In Japan, iSpace was founded in 2010 with the intention to mine resources from the Moon to help sustain modern life on earth.[77] SpaceIL is an Israeli non-profit organisation founded in 2011 to land the first Israel-based spacecraft on the moon.[78] Planetary Resources, acquired by ConsenSys Space, aims to be the first company to mine minerals from an asteroid.[79]

These examples illustrate the increasing participation of private companies in the field. Most of these corporations are based in the developed parts of the world, but organisations like SpaceIL

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[71] *ISRO embraces private sector, outsources satellite manufacture*, ECONOMIC TIMES, (Apr 02, 2017) https://economictimes.indiatimes.com/news/science/isro-embraces-private-sector-outsources-satellite-manufacture/articleshow/57971440.cms?from=mdr.

[72] Rajeswari Rajagopalan, *India's Space Program: A Role for the Private Sector, Finally?,* SCIENCE THE WIRE,(MAY 22, 2020) https://science.thewire.in/space/nirmala-sitharaman-indian-space-programme-isro-private-sector/.

[73] PETER WARD, THE CONSEQUENTIAL FRONTIER: CHALLENGING THE PRIVATIZATION OF SPACE, 118 (2019).

[74] Rachel Mitchell, *Into the Final Frontier: The Expanse of Space Commercialization,* 83 MO. L. REV. 429, 432 (2018), https://scholarship.law.missouri.edu/mlr/vol83/iss2/9.

[75] MOON EXPRESS, http://moonexpress.com/ (last visited on May 29, 2020).

[76] *About Us*, GOONHILLY EARTH STATION, https://www.goonhilly.org/about-us/about-ges-ltd (last visited on May 29, 2020).

[77] *About Us*, ISPACE, https://ispace-inc.com/aboutus/ (last visited on May 29, 2020).

[78] *The Mission*, SPACE IL, http://www.spaceil.com/mission/ (last visited on May 29, 2020).

[79] PLANETARY RESOURCES, https://www.planetaryresources.com/ (last visited on May 29, 2020).

demonstrate how even less-developed nations benefit from corporate competition. Also of note is the example of the government of Chile, which established its spacefaring agency in 2001. Ordinarily, it would have to request the national space organisation of a country capable of orbital launch to send its satellites to space. With commercial parties able to step in and fulfil this demand, however, the Chilean government is able to invite bids to implement its space endeavours without directly benefiting another nation. This is an actual account of what the government of Chile has been actively pursuing since 2007.[80]

With this context, clearly, it is now crucial to designate rules and regulations and lay down parameters within which these nascent companies and even governments must function. Not having comprehensive, watertight legislation to govern space exploration and exploitation has the potential to engulf the world in turmoil as each nation competes over resources and territory in space to establish its dominance.

VI. THE LAW OF SPACE – A COMMERCIAL PERSPECTIVE

At present, there exist five treaties to govern space law. These are (1) Outer Space Treaty, 1967; (2) the Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space, 1968 ("Rescue Agreement"); (3) the Convention on International Liability for Damage Caused by Space Objects, 1972 ("Liability Convention"); (4) the Convention on Registration of Objects Launched into Outer Space, 1976 ("Registration Convention"); and (5) the Moon Treaty, 1984.[81]

Of these, the Outer Space Treaty and the Moon Treaty are of specific importance to this paper. Both treaties expressly agree on the fact that *"Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."*[82] However, there exists a dichotomy in the interpretation of this clause. Non-space powers contend that this provision acts as a bar to any state desiring to mine space resources as such an act would require the permission of all humankind. Conversely, nations with spacefaring capabilities argue that this clause prohibits the permanent appropriation of celestial bodies by States and not the consumption of resources by private entities.[83] Seeing as the same treaties have also catered for future prospects of exploiting space, however, it is reasonable to infer that the latter interpretation is correct. For instance, Article VI of the OST

[80] Zach Meyer, *Private Commercialization of Space in an International Regime: A Proposal for a Space District*, 30, NW. J. INT'L L. & BUS., 241, 248 (2010), https://scholarlycommons.law.northwestern.edu/cgi/njilb.
[81] *Space Law Treaties and Principles*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html.
[82] Outer Space Treaty, art. II; *See also* Moon Treaty, art. XI, ¶ 2.
[83] Adam G. Quinn, *The New Age of Space Law: The Outer Space Treaty and the Weaponization of Space*, 17 MINN. J. INT'L L. 475, 481 (2008), https://scholarship.law.umn.edu/mjil/63.

firmly establishes that in case any activities are carried out in space by non-governmental organisations, they would require prior authorisation and continuous supervision by the appropriate State Party.[84]

Read in conjugation, it is clear that the Outer Space Treaty and the Moon Treaty both foresaw the possibility of future exploitation of space resources. The Outer Space Treaty laid the foundation for prohibiting unilateral appropriation of celestial bodies and outer space by States or sovereigns, while the Moon Treaty elaborated upon the concept and defined the procedure for allowing commercial exploitation. It is unfortunate, however, that the Moon Treaty has been ratified by only 18 countries.[85] This rejection has largely been because the term "common heritage of mankind"[86] is seen as an allusion to socialism and the phrase "equitable sharing" [87] is described as vague and unspecific in terms of how it would affect private profits.[88] Spacefaring nations also seem to have avoided this treaty since it purports to place immense burdens upon them in terms of preservation of the environment of earth and celestial bodies, free access for all nations to space resources, etc. This is despite the provision for a review process present in the treaty itself, which further allows for considering *"the question of implementation of the provisions of article 11, paragraph 5 on the basis of the principle mentioned in paragraph 1 of that article and taking into account in particular any relevant technological developments.*[89] The only saving grace is that India, a fast-upcoming space power, is a signatory to the Moon Treaty. The above discussion illustrates the importance of this treaty in the long term for facilitating large-scale commercial exploitation of these treasure troves of resources. That India is a signatory implies that there is a possibility for the treaty to gain international relevance in the near future. However, at the moment, the Moon Treaty does not bind any of the major spacefaring nations, including the USA, Russia and China, which is a cause for concern. These countries are at the forefront of space exploitation and in the absence of an applicable international obligation, have resorted to formulating their own laws and acting solely for their personal benefit. It bears reiteration that this sort of behaviour is exactly what will lead to turmoil and anarchy in space, further reinforcing the requirement for a revamped space treaty.

[84] Outer Space Treaty, art. VI.
[85] *Status of International Agreements Relating to Activities in Outer Space*, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, https://www.unoosa.org/documents/pdf/spacelaw/treatystatus/TreatiesStatus-2020E.pdf.
[86] Moon Treaty, art. XI, ¶ 1.
[87] Moon Treaty, art. XI, ¶ 7, cl. 4.
[88] Rachel Mitchell, *Into the Final Frontier: The Expanse of Space Commercialization,* 83 MO. L. REV. 429, 436 (2018), https://scholarship.law.missouri.edu/mlr/vol83/iss2/9.
[89] Moon Treaty, art. XVIII.

A. Legal Space Regime in the Domestic Sphere

The USA has had a domestic law for space for the last 36 years. In consonance with the demands of the OST,[90] the US Congress passed the Commercial Space Launch Act of 1984 by virtue of which, the launch of space vehicles or payloads was prohibited within the boundaries of the nation unless the private parties had been duly certified by the Federal Aviation Administration ("FAA").[91] Most other space laws enacted pertained to near-earth satellites,[92] until 2015, when President Barack Obama signed the US Commercial Space Launch Competitiveness Act ("SPACE Act") into law. This statute exists to *spur private aerospace competitiveness and entrepreneurship.*

The SPACE Act specifically allows and encourages US citizens and registered companies to engage in commercial activities in space and entitles them to *"possess, own, transport, use, and sell asteroid resource or space resource obtained in accordance with applicable law",*[93] thereby granting property rights to private citizens over outer space resources. It may be argued that the legislation only grants ownership of the space resource and not the celestial body itself. However, the fact remains that enshrined in the maxim *nemo dat quod non habet*[94] is an established common law principle that only a government that has sovereign rights over territory may grant property rights to its citizens.[95] Further, the OST imposes liability upon its State parties to compensate for any damage caused by private ventures into space.[96] In pith and substance, this implies that the Outer Space Treaty considers private space endeavours part and parcel of State activity. Thus, it is concluded that the US Congress has effectively attempted to circumvent the non-appropriation provision of the Outer Space Treaty[97] by indirectly claiming sovereignty over asteroids via their private citizens and companies under the garb of the principle of *legi generali* under international law, as discussed previously. This is a view that has been espoused by international law scholars as well.[98]

Following in the footsteps of the USA is Luxembourg, which has long established itself as an ally to all entrepreneurial endeavours in the space sector and has reaped significant economic benefits. Though lacking in space capability, this European nation is a party to the Outer Space Treaty, 1967 and the Liability Convention, 1972 via ratification and is also a signatory to the

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[90] Outer Space Treaty, art. VI.
[91] Commercial Space Launch Act, 1984 - H.R.3942.
[92] *Commercial Law Resources,* NASA, https://www.nasa.gov/offices/ogc/commercial/Comm_subst_areas_text.html.
[93] US Commercial Space Launch Competitiveness Act, 2015, Section 51303.
[94] *Nemo dat quod non habet,* OXFORD REFERENCE, https://www.oxfordreference.com/view/10.1093/oi/authority.20110803100228794.
[95] Austin C. Murnane, *The Prospector's Guide to the Galaxy*, 37 FORDHAM INT'L L.J. 235, 259 (2013), https://ir.lawnet.fordham.edu/ilj/vol37/iss1/12.
[96] Outer Space Treaty, art. VII.
[97] Outer Space Treaty, art. II.
[98] Justin Rostoff, *"Asteroids for Sale": Private Property Rights in Outer Space, and the SPACE Act of 2015,* 51 NEW ENG. L. REV. 373 (2017), https://newenglrev.com/asteroids-for-sale-private-property-rights-in-outer-space-and-the-space-act-of-2015/.

Rescue Agreement of 1968 and the Registration Convention of 1975.[99] So far, it is the only other country to have adopted a comprehensive legislation specific to space resource mining in an attempt to establish itself as the centre for space business. The Exploration and Use of Space Resources Act which came into force on August 1 2017, is remarkably similar to the SPACE Act of the United States. It provides, in no uncertain terms that *"space resources are capable of being owned"*[100] and therefore, it is subject to the same line of argument as above. What makes this piece of legislation more interesting, and commercially viable for a small, non-spacefaring nation such as Luxembourg, is the fact that it extends the ambit of the legislation to any company with a registered office in Luxembourg.[101] This provision will enable foreign investments and encourage the setting up of space companies and start-ups in Luxembourg over any other country in the world.

Interestingly, other nations participating in this new space race are doing so without even a domestic law in place. In fact, the space laws of other nations are quite broad in their ambit. For instance, Japan's space legislation pertains mainly to the development and launch of artificial satellites and rockets – but in 2017, the Japanese government entered into a five-year space mining contract with Luxembourg.[102] China, fast developing into a space force to be reckoned with, has grandiose plans to use moon resources for expanding its economy.[103] Russia is also planning to join the new space race, despite its official stance on the subject being a strict upholding of the "province of humankind" principle.[104] Most of these countries have at least some form of domestic space regulation.[105]

On the other hand, India is the only spacefaring nation that does not yet have any concrete, specific space legislation. While its vision is primarily for the peaceful exploration of space for the benefit of science, in recent times it has encouraged the participation of private firms in the sector to increase its space competency.[106] An established principle of international law is that once a treaty is ratified, the State Party is under obligation to ensure that its domestic laws are consistent with the treaty.[107] The examples cited above are of nations that have signed and

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[99] *Legal Framework,* LUXEMBOURG SPACE AGENCY, https://space-agency.public.lu/en/agency/legal-framework.html; *See also:* https://www.unoosa.org/documents/pdf/spacelaw/treatystatus/TreatiesStatus-2020E.pdf.
[100] LUXEMBOURG, Law of July 20th, 2017 on the Exploration and Use of Space Resources, art. 1.
[101] LUXEMBOURG, Law of July 20th, 2017 on the Exploration and Use of Space Resources, art. 4.
[102] *Luxembourg, a rising star in the space industry,* DELOITTE, https://www2.deloitte.com/lu/en/pages/technology/articles/luxembourg-space-industry-companies.html.
[103] Jack Burke, *China's New Wealth-Creation Scheme: Mining the Moon,* NATIONAL REVIEW, (June 13, 2019) https://www.nationalreview.com/2019/06/china-moon-mining-ambitious-space-plans/.
[104] *Russia Joins Asteroid Mining Space Race,* MINING JOURNAL, (7 MARCH 2019) https://www.mining-journal.com/exploration/news/1358127/russia-joins-asteroid-mining-space-race.
[105] SPACE RESOURCE UTILIZATION: A VIEW FROM AN EMERGING SPACE FARING NATION, 36-37 (Annette Froehlich, 2018).
[106] Rajeswari Pillai Rajagopalan, Pulkit Mohan and Rahul Krishna, *India in the final frontier: Strategy, policy and industry,* ORF Special Report No. 100, January 2020, Observer Research Foundation, https://www.orfonline.org/research/india-in-the-final-frontier-strategy-policy-and-industry/.
[107] *Chapter Five: National legislation and the Convention – Incorporating the Convention into domestic law,* UNITED NATIONS DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS,

ratified the Outer Space Treaty.[108] Ergo, they are bound by its terms and under obligation to frame domestic laws consistent with such terms. Formulating a domestic law consistent with international obligations is necessary to ensure that these obligations to the international community are being fulfilled. Unfortunately, at present, the international space treaties are toothless. Without a means to enforce the obligations, nations may simply ignore them without fear of repercussions, of which the USA's move to enact the SPACE Act is a clear example. In light of the possible outcomes of unregulated commercialisation of space discussed subsequently, it is necessary to devise a robust, internationally accepted regulatory framework to avoid disasters, which are backed up by each nation's domestic laws.

B. The Cons of Commercially Exploiting Space

Given the predominantly capitalist character of the global market today, there is little doubt that commercialising outer space and its resources cannot be stopped but if done correctly, it will greatly boost the world economy.

Today, lower earth orbit is populated by a huge number of artificial satellites.[109] As discussed earlier, the destruction of artificial satellites – either by ASAT technology or due to collisions – releases a large number of high-speed particles that pose a significant risk to other satellites and the ISS. Further, this debris can fall to the Earth and damage territory and infrastructure. Countries have so far avoided major property damage on earth due to falling debris, but the recent uncontrolled descent of the 20-ton Chinese rocket, *Long March 5B,* highlights the dangers of such an event.[110]

Admittedly, it is not only collisions between satellites that need to be discussed and prepared for. As previously mentioned, the possibility of mining resources from asteroids in the near future is real. A common result of mining is the release of dust into the atmosphere. As asteroids have weak surface gravity, it is plausible that mining activities would lead to the breakage of some of its pieces, leading to the formation of a "debris stream".[111] Most of such commercial mining plans aim to make use of near-earth celestial bodies and therefore, it is conceivable that this debris stream would enter the Earth's orbit and collide with the existing satellites, creating more hazardous space junk. Once again, attributing liability for such an event is difficult. Parameters

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https://www.un.org/development/desa/disabilities/resources/handbook-for-parliamentarians-on-the-convention-on-the-rights-of-persons-with-disabilities/chapter-five-national-legislation-and-the-convention.html.

[108] Status of International Agreements Relating to Activities in Outer Space, UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, https://www.unoosa.org/documents/pdf/spacelaw/treatystatus/TreatiesStatus-2020E.pdf.

[109] Adam Mann, *Space: The Final Frontier of Environmental Disasters?*, WIRED, (JULY 15, 2013) https://www.wired.com/2013/07/space-environmentalism/.

[110] Nora McGreevy, *A Huge Hunk of Space Debris Fell to Earth,* SMITHSONIAN MAGAZINE (May 14, 2020) https://www.smithsonianmag.com/smart-news/huge-hunk-space-debris-fell-earth-monday-180974855/.

[111] Logan Fladeland, Aaron C. Boley, Michael Byers, *Meteoroid Stream Formation Due to the Extraction of Space Resources from Asteroids,* SPACEREF, (DECEMBER 3, 2019) http://spaceref.com/news/viewsr.html?pid=53088.

need to be laid down based upon which a neutral party may decide whether the incident was accidental or intentional – in which case, it could also be construed as an act of war. Having a robust legal system in place to avoid such circumstances, and contingency plans in case they do will go a long way in protecting the integrity of artificial satellites in low-earth orbit.

Space technology has come a long way in the last decade. With asteroid mining on the cards, it is probable that soon humans would be mining rare-earth minerals from the far reaches of the solar system. However, seeing how the Earth's resources have been indiscriminately extracted to meet industrial demands, it is apparent that unless strong regulations are established and implemented, the rest of the solar system will also meet the same fate in as little as 500 years.[112] Degradation of the environment of celestial bodies, a concept first envisioned in the Moon Treaty,[113] is another problem that will manifest itself once asteroid mining becomes a norm. From a commercial perspective, space resources need to be extracted in a sustainable manner because after a point, even they are finite and non-renewable. If at some moment in the distant future, humankind is able to exhaust the resources of every planet and celestial body in the solar system, it would need to switch energy sources fast, much like the energy crisis faced today. Sustainable use of space resources is the only way forward in this respect.

Similarly, the aspect of potential colonisation of other planets is also to be considered since, as mentioned, private firms like *Moon Express* and *SpaceX* aim to soon colonise the Moon and Mars, respectively.[114] While mankind has an established history of colonising newly discovered territories and thoroughly exploiting them, the moral and ethical ramifications of such an act in outer space require careful consideration. This was also notably explored in the movie *Avatar*.

The present space regime is woefully unprepared to handle these challenges. While they discuss these issues in vague and abstract terms, it is important to remember that in 1967 these were a distant possibility and the focus of the time was on preventing a nuclear war. As such, the time to re-open international deliberation on these points is upon us.

[112] Brandon Specktor, *Space Mining Could Ruin Our Solar System If We Don't Establish Protected Places Now, Researchers Warn*, LIVE SCIENCE, (MAY 14, 2019) https://www.livescience.com/65472-scientists-propose-solar-system-national-park.html.
[113] Moon Treaty, art. VII.
[114] Kashmira Gander, *Moon Express: How close are humans to living in space?* (9 August 2016) https://www.independent.co.uk/news/science/moon-express-how-close-are-humans-to-colonising-space-a7174361.html.

CONCLUSION

From its preamble, the Outer Space Treaty seems to reaffirm *"the prospects opening up before mankind as a result of man's entry into outer space."*[115] From its embellished principles of equality, the treaty seems to enshrine the core values of international space law. However, it is the main concept of the treaty that has failed to adapt to challenges posed by conventional space actors.

To understand these challenges better, take, for instance, an analogy drawn between space and the Yellow River in ancient China. Also known as the "cradle of Chinese civilization," the river was the source of fertile soil and irrigation water. The many tribes that lived alongside the river considered it their lifeblood. However, every few years the river would rage a torrent to wipe away villages. After years of suffering, the tribes finally realised that they cannot combat the challenge of devastating floods individually. Hence, they coalesced to form the Xia Kingdom. To battle the crushing floods, the leaders of the kingdom built dams and dug hundreds of kilometres of canals that first carried excess water outside of the city into the countryside, and eventually down to the sea. The unity not only provided control in the form of the distribution of water but also brought unparalleled prosperity to the people.[116]

Similar to the tribes of Yellow River, nations in the 21st century are living alongside a space-river, depending on it for their prosperity and exposed to its dangers. A common heritage to all humankind, space is indeed a river of infinite possibilities which will be essential to the welfare of humanity in the future. However, as much as countries are dependent on space for their prosperity, its exploration comes with great dangers such as micrometeorites, solar flares, radiation, debris etc.

No country can single-handedly control or regulate such an unpredictable space environment. China's debris-generating KE-ASAT test put all spacefaring nations in danger, including China itself! Further, no country can police disruptive space technology on its own. Even though the United States and the Soviet Union jealously protected their space technology, they did not prevent new entrants of the Space Race from obtaining it otherwise in subsequent decades. In an intolerant xenophobic world, countries tend to follow their contemporaries in a high-risk-high-gain technological path. Such a Space Race, however, has no other end but the bottom. Hence, there is an ardent need to unite space actors through a Xia-kingdom-space regime, which can make the climate of space more controlled and less volatile. The Outer Space Treaty needs to be revamped to establish global loyalty, which is imperative in ensuring that all state and non-state actors are held true to their international obligations.

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[115] Outer Space Treaty, Preamble.
[116] Kallie Szczepanski, *The Yellow River's Role in China's History*, THOUGHT CO., (July 28, 2019), https://www.thoughtco.com/yellow-river-in-chinas-history-195222.

Renegotiating the Outer Space Treaty is imperative in order to address its various shortcomings. Some might argue that no treaty can cover all possible scenarios, and to this end, the open language of the treaty has a great advantage in facilitating better communication between States. However, with the entry of private actors, it is important to recognise that the commercialisation of the space sector is not only dependent on good communication. If left unregulated, the commercial actors can severely disrupt the balance of ethical conduct and respect for the environment, be it that of earth, any other celestial body or space itself. Moreover, in the context of nations, two States disagreeing on fundamental values are bound to confront each other sooner or later. Unlike the Cold War Era, the goal today is to not only avoid conflict in space but also reap its benefits for economic prosperity.

Therefore, the existing treaties need to be revamped, amended, and modernised. Their aim, as a whole, must be on the lines of: i) establishing loyalty and unity at a global level to avoid conflict; ii) prohibiting the use of conventional weapons in space; iii) defining "peaceful purposes" as "non-military purposes"; iv) tackling exchange of disruptive space technology for the benefit of all humanity; iv) creating strict legal repercussions for destabilising space environment; v) delimiting the application of international law in space governance system; vi) devising a robust legal regime to govern commercial space actors; vii) defining regulations to guide potentially dangerous concepts like space mining and colonisation of other celestial bodies; viii) preventing over-exploitation of space by non-State actors; ix) holding states as well as commercial actors jointly and severally accountable for violation of space laws; x) ensuring peaceful use by holding State and non-State actors true to their international obligations; xi) finally, proposing the establishment of an organisation that can enforce international obligations in space, with repercussions for every country that violates the existing law.

If nations continue to pursue their selfish interests, they are not only exposing themselves to major destruction but also preventing themselves from exploring infinite possibilities in space. Hence, states need to discard the legacy of the Cold War in order to develop trust and mutual loyalty towards the common heritage that is space.