

The Final Frontier:

Evolution of Space Law in a Global Society

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Introduction

“Space: the final frontier!” These are the famous introductory words spoken by William Shatner on every episode of *Star Trek*. This science-fiction TV show has gained a cult-following with its premise as a futuristic Space odyssey. Originally released in 1966, many saw the portrayed future filled with Space-travel, inter-planetary commerce and politics, and futuristic technology as merely a dream. However, today we are starting to explore this frontier.

“We are entering an exciting era in [S]pace where we expect more advances in the next few decades than throughout human history.”¹ *Bank of America/Merrill Lynch* has predicted that the Space industry will grow to over \$2.7 trillion over the next three decades. Its report said, “a new raft of drivers is pushing the ‘Space Age 2.0’”.² Indeed, this market has seen start-up investments in the range of \$16 billion,³ helping fund impressive new companies like *Virgin Galactic* and *SpaceX*. There is certainly a market as *Virgin Galactic* says more than 600 customers have registered for a \$250,000 suborbital trip, including Leonardo DiCaprio, Katy Perry, Ashton Kutcher, and physicist Stephen Hawking.⁴

Although Space-tourism is the exciting face of a future in Space, the Space industry has far more to offer. According to the *Satellite Industries*

¹ Michael Sheetz, *The Space Industry Will Be Worth Nearly \$3 Trillion in 30 Years*, Bank of America Predicts, CNBC, (last updated Oct. 31, 2017, 8:05 PM), <https://www.cnbc.com/2017/10/31/the-space-industry-will-be-worth-nearly-3-trillion-in-30-years-bank-of-america-predicts.html>, (last visited March 14, 2018).

² Id.

³ Id.

⁴ Adam Mann, *So You Want to Be a Space Tourist*, NBC News, 2017, <https://www.nbcnews.com/mach/science/so-you-want-be-space-tourist-here-are-your-options-ncna784166>, (last visited March 14, 2018).

Association, small satellites used for observing conditions on the Earth are the fastest growing segment of the \$260.5 billion global satellite industry.⁵ Its report states that satellites generated an 11 percent jump in annual revenue for Earth imagery in 2016 and a rapidly increasing volume of the 1,459-operating Spacecraft that circled the planet at the end of that year. These satellites are essential to society contributing to GPS, telecommunications, and Earth imagery.

Thanks to decreased costs, increased capabilities, and new innovations, we are seeing what some call the “democratization of space.”⁶ Improvements in various fields that include satellites and launch systems are essential to this growth. With the advent of artificial intelligence and machine learning, we will see exponential development in technologies that will lead to further investment in Space industries. M. François Lombard, head of the Intelligence Business Cluster, Airbus Defense and Space,⁷ said, concerning the ongoing revolution, “A recurrent theme is that the barriers to access are being reduced and that this is at the core of this revolution.”⁸

In order to understand this revolution in context, one should look at Thomas Friedman’s theory of globalization as presented in his best-selling book, *The World is Flat*. In it, he alludes to the fact that countries, companies, and individuals must remain competitive in a global market where historical and geographic divisions are becoming increasingly irrelevant.⁹ His theory designates three stages of globalization, or the interconnection of the world:

⁵ Irene Klotz, *Small satellites driving space industry growth: report*, Reuters, <https://www.reuters.com/article/us-space-satellites/small-satellites-driving-space-industry-growth-report-idUSKBN19W2LR>, (last visited March 14, 2018).

⁶ Anusuya Datta, *The NewSpace Revolution: The emerging commercial space industry and new technologies*, Geospatial World, Aug. 1, 2017, <https://www.geospatialworld.net/article/emerging-commercial-space-industry-new-technologies/>, (last visited March 14, 2018).

⁷ Id.

⁸ Id.

⁹ Thomas Friedman, *It’s a Flat World After All*, New York Times, (Apr. 3, 2005), <http://www.nytimes.com/2005/04/03/magazine/its-a-flat-world-after-all.html>, (last visited March 14, 2018).

(1) interaction between governments; (2) interaction between businesses; and (3) interaction between individuals.¹⁰ With the era of government monopoly in Space coming to an end, we are now entering the second stage, where multinational companies drive global integration.

On July 21, 2011, the *Atlantis* Space shuttle landed at *Kennedy Space Center*, thus marking the end of NASA's 30-year Space shuttle program¹¹ and the symbolic shift to Globalization 2.0. NASA administrator, Charles Bolden said after the landing, "This final shuttle flight marks the end of an era, but today, we recommit ourselves to continuing human spaceflight and taking the necessary — and difficult — steps to ensure America's leadership in human spaceflight for years to come."¹² Indeed, the private industry has taken the initiative.

For one, Elon Musk has very ambitious plans for *SpaceX*. At the *67th Annual International Astronautical Congress* in Guadalajara, Mexico, he announced that he wanted to set up a civilization on Mars.¹³ Using the *SpaceX Interplanetary Transport System*, he estimates that a person will soon be able to travel to Mars for around \$200,000.¹⁴ With 17 successful liftoffs, 14 successful landings, and 4 successful flights of a reusable rocket in 2017, *SpaceX* is a testament to the promise of the private Space industry. This past year, *SpaceX* was contracted by the US government to operate several covert missions for the *Air Force* and the *National Reconnaissance Office*. However, it was on February 6, 2018 that *SpaceX* made history. With the whole world

¹⁰ Id.

¹¹ Alan Boyle, *Space shuttle Atlantis lands, ending an era at NASA*, MSNBC, last updated July, 21, 2011, 12:19 PM, http://www.nbcnews.com/id/43835197/ns/technology_and_science-space/#.Wj2MMYozPjA, (last visited March 14, 2018).

¹² David Weaver, *NASA Administrator Commemorates Final Space Shuttle Landing*, NASA, last updated: Aug. 7, 2017, https://www.nasa.gov/home/hqnews/2011/jul/HQ_11-241_Bolden_Statement.html, (last visited March 14, 2018).

¹³ Nick Stockton, *Elon Musk Announces His Plan To Colonize Mars And Save Humanity*, Wired, Sept. 27, 2016, 9:13 PM, <https://www.wired.com/2016/09/elon-musk-colonize-mars/>, (last visited March 14, 2018).

¹⁴ Id.

watching, the company successfully launched the *Falcon Heavy* rocket, establishing itself as the most powerful rocket ever built.¹⁵ The rocket placed Elon Musk's personal Tesla (with a Spaceman sitting in the driver's seat listening to David Bowie's 'Life on Mars?' and accompanied by references to *The Hitchhiker's Guide to the Galaxy*) in a heliocentric orbit.¹⁶ The impact of this launch is considerable as the launch showcased an incredibly powerful, yet inexpensive rocket. All things considered, while the entrepreneurial spirit of industry leaders is admirable, they must rely on the government to create the optimal conditions for investment and growth.

Since taking office, U.S. President Donald Trump has identified Space as a matter of importance; he sees it as a source of patriotic unity and as a national security priority.¹⁷ Holding its first meeting on October 5th, 2017,¹⁸ President Trump's newly resurrected *National Space Council* has chosen the Moon as its first priority. "We will return American astronauts to the moon, not only to leave behind footprints and flags, but to build the foundation we need to send Americans to Mars and beyond," said U.S. Vice-President Pence.¹⁹

In order to accomplish this, the Trump administration will adopt its central theme of business deregulation.²⁰ Dr. Scott Pace, the executive secretary of

¹⁵ Jeff Foust, *SpaceX Successfully Launches Falcon Heavy*, Space News, 2018, <http://spacenews.com/spacex-successfully-launches-falcon-heavy/> (last visited Feb 8, 2018).

¹⁶ *Id.*

¹⁷ Sandra Erwin, *Space industry takes prominent role in Trump's national security strategy*, SpaceNews, Dec. 18, 2017, <http://spacenews.com/space-industry-takes-prominent-role-in-trumps-national-security-strategy/>, (last visited March 14, 2018).

¹⁸ Tariq Malik, *Resurrected National Space Council Will Hold 1st Meeting Oct. 5*, SPACE.COM, Sept. 28, 2017, 10:30 AM, <https://www.space.com/38300-national-space-council-first-meeting-date.html>, (last visited March 14, 2018).

¹⁹ Kenneth Chang, *Space Council Chooses the Moon as Trump Administration Priority*, New York Times, Oct. 5, 2017, <https://www.nytimes.com/2017/10/05/science/national-space-council-moon-pence.html>, (last visited March 14, 2018).

²⁰ Andrew Restuccia & Nancy Cook, *Inside Trump's war on regulations*, Politico, May 28, 2017, 5:00 AM, <https://www.politico.com/interactives/2017/trump-war-on-regulations/>, (last visited March 14, 2018).

the *National Space Council*, echoed this in a speech to a Space law group in Washington, D.C.: “The United States should strive to be the most attractive jurisdiction in the world for private sector investment and innovation in outer Space. This requires a transparent, efficient, and minimally burdensome domestic regulatory mechanism for companies conducting Space activities.”²¹ Dr. Pace and the administration believe that a stable, peaceful environment must be fostered for both government and commercial activities. He further states that the private sector “must have confidence that it will be able to profit from capital investments.”²²

The Space industry will welcome this environment. *SpaceX* President, Gwynne Shotwell told the *National Space Council* that “if we want to achieve rapid progress in [S]pace, the US government must remove bureaucratic practices that run counter to innovation and speed.”²³

While deregulation will help spur growth and investment, it is still important for jurisprudence to be firmly established. Like all growing industries, the law must be promptly and preemptively crafted to guide those who participate, otherwise, lawless chaos is inevitable.

“Law, if viewed realistically, is not a static body of rules.”²⁴ Law is fluid, in the sense that this assemblage of rules is always changing due to the constant influx of new discoveries and social behaviors around the world. Just as weeds eventually break through thick concrete sidewalks, even the firmest legal prescriptions, *written in stone*, must give way to modern configurations of social behavior if new facts and opinions so demand it.²⁵ This analogy has

²¹ Sandra Erwin, *Space industry takes prominent role in Trump’s national security strategy*, SpaceNews, Dec. 18, 2017, <http://spacenews.com/space-industry-takes-prominent-role-in-trumps-national-security-strategy/>, (last visited March 14, 2018).

²² *Id.*

²³ Robin Seemangal, *How Is SpaceX Doing On Its Deep Space Ambitions?* Wired, (Dec. 22, 2017, 7:00 AM), <https://www.wired.com/story/how-is-spacex-doing-on-its-deep-space-ambitions/>, (last visited March 14, 2018).

²⁴ Siegfried Wiessner, *Human Activities in Outer Space: A Framework for Decision-Making*, *Space Law: Views Of The Future*, Int’l Inst of Air and Space Law 7 (1988).

²⁵ *Id.*

once again revealed itself in today's Space community. Earth's Cold War-era Space laws are in need of a modern appraisal. Terrestrial laws may serve as an exemplar of how to fashion those laws which extend into the boundless darkness, or perhaps a new form of policy is necessary.

This article is divided into four sections. *Section One* will provide an overview of the industry with a focus on the actors involved, the conflicts they must deal with, and the promise of technological advancement. *Section Two* will detail the jurisprudence of the system. After discussing the system's role in international law, the authors will provide a case study on American and Luxembourg law. In *Section Three*, we will examine past conflicts between nations to determine how the world can move forward in the future. Finally, in *Section Four*, we address the current system's flaws while offering our solution in the form of a new system based on both Realist and Liberal ideologies.

Conflict in the Face of Technological Advancement

Expanding Man's Reach Into The Universe Through Technology

Private and commercial Space travel is no longer light-years away. Modern technology has rapidly outpaced our forefathers' imaginations. Advances in computing make the capabilities of two decades ago feel more like two centuries ago. Today, a "smartphone is millions of times more powerful than all of NASA's combined computing in 1969." Decades of advancements in computer designs, assembly processes, and 3-D printing have made manufacturing drastically less expensive.²⁶ One company, in particular, *Deep Space Industries* ("*DSI*"), has created an array of cost-effective products suitable for Asteroid-Mining operations.²⁷ *DSI* offers customers small Spacecraft technology, such as: (1) an electro-thermal thruster that uses water as a propellant; (2) a two-camera optical navigation system for close-proximity Asteroid-Mining operations; and (3) radiation-tolerant electronic

²⁶ Dave Baiocchi & William Welsler IV, *The Democratization of Space*, Foreign Affairs, 2015, <https://www.foreignaffairs.com/articles/space/2015-04-20/democratization-space>, (last visited March 14, 2018).

²⁷ *Deep Space Industries, Inc.*, Aug. 10, 2015, <https://deepspaceindustries.com/technology/> (last visited March 15, 2018).

equipment built for Spaceflight.²⁸

While generations of dreamers have had the ambition, modern technology and cultural interests are finally making the Space Industry a reality.²⁹ “Space development enriches human life on the Earth.”³⁰ With the support of various enthusiastic investors, Space pioneers are testing revolutionary Spacecraft technologies and anticipate launching Asteroid-Mining operations by the mid-2020s.³¹ Investors’ ambitions are not exclusively focused on Asteroid-Mining, they have other prospects in mind as well. Space tourism and eventually inhabitation on other planets are among the many visions of investors.³² For instance, in 2014, *NASA*, *Boeing*, and *SpaceX* announced their plans to create a local taxi service to Space.³³

Machine Learning/Artificial Intelligence

Operating in Space is intricately nuanced. Calculations must be made for every possible scenario. The film, *Hidden Figures*,³⁴ documents how

²⁸ *Id.*

²⁹ Kelsey Tollefson, *Asteroid Prospects: The Facts And Future Of Space Mining*, Space Angels Network, Jan. 11, 2017, 8:08 PM, <http://spaceangelsnetwork.com/2017/01/11/asteroid-prospects-the-facts-and-future-of-space-mining/>, (last visited March 14, 2018).

³⁰ Takeshi Hakamada, *A Japanese New Space Perspective: Lunar resource utilization and development of legal perspective in Japan*, iSPACE, 2017, <http://www.unoosa.org/documents/pdf/copuos/lsc/2017/symp-03.pdf>, (last visited March 14, 2018).

³¹ Kelsey Tollefson, *Asteroid Prospects: The Facts And Future Of Space Mining*, Note 31, Space Angels Network, Jan. 11, 2017, 8:08 PM, <http://spaceangelsnetwork.com/2017/01/11/asteroid-prospects-the-facts-and-future-of-space-mining/>, (last visited March 14, 2018).

³² Corey S. Powell, *Private Companies Are the New Space Pioneers*, Dec. 2014 Issue, *Discover*, (Nov. 12, 2014), <http://discovermagazine.com/2014/dec/13-ticket-to-ride>, (last visited March 14, 2018).

³³ *Id.*

³⁴ *Hidden Figures*, *Screenplay by Allison Schroeder and Theodore Melfi, based upon the book by Margot Lee Shetterly*, 20th Century Fox, <https://www.foxmovies.com/movies/hidden-figures>, (last visited Feb. 22, 2018).

mathematician Katherine Johnson helped *NASA* calculate flight trajectories. As the film explained, these calculations are crucial as any slight error could spell disaster for the Space capsule and its passengers. Later in the film, *NASA* begins to utilize the state-of-the-art *IBM 7090* which was capable of making multiple calculations faster than the team of mathematicians.

Computing technology has improved considerably since the 1960s. Today, programmers are developing systems that utilize machine learning. “Machine Learning at its most basic is the practice of using algorithms to parse data, learn from it, and then make a determination or prediction about something in the world.”³⁵ This may sound familiar; at this point, you may be thinking that it sounds a lot like what *Apple’s* “Siri” or *Amazon’s* “Alexa” does. Yes, colloquially, we refer to machine learning as artificial intelligence (“AI”).

Anyone who has seen Stanley Kubrick and Arthur C. Clarke’s *2001: A Space Odyssey* would tremor at the possibility of re-creating *HAL 9000*. However, Space travel has not become any less complicated with the passing of time. There are still numerous calculations that must be run at every stage of a mission. Furthermore, astronauts need software to help them respond to unexpected events ranging from equipment failure to medical emergencies.³⁶ Simply put, there is no better tool than AI for operating in Space. Indeed, *IBM’s Watson* supercomputer is a sign of things to come with the software capable of reading one-million medical textbooks in three seconds.³⁷ As Terry Fong, *NASA Ames Research Center’s* senior scientist for autonomous systems and director of the *Intelligent Robotics Group* explains, AI will allow systems

³⁵ Michael V. Copeland, *Deep Learning Explained*, Nvidia, https://www.nvidia.com/content/dam/en-zz/Solutions/deep-learning/home/DeepLearning_eBook_FINAL.pdf, (last visited March 14, 2018).

³⁶ Debra Werner, *Beyond HAL: How artificial intelligence is changing space systems*, SpaceNews, (Aug. 15, 2017), <http://spacenews.com/beyond-hal-how-artificial-intelligence-is-changing-space-systems/>, (last visited March 14, 2018).

³⁷ Benja Ma, Sarbjit Nahal, & Felix Tran, *Robot Revolution*, Bank of America | Merrill Lynch. Thematic Investing. December 16, 2015.

to be more self-reliant.³⁸

This is crucial for any mission to Mars. Well-crafted artificial intelligence planning software will make distant missions more practical. Daily planning time and costs for missions will be reduced.³⁹ Alonso Vera, who leads a group developing artificial intelligence software at *NASA Ames Research Center* explains:

“The human and the computer are equal partners in a dialog that happens around the generation of a plan. Each brings different skills to the table. The human can focus on what humans are good at (high-level decisions, for example), while the computer can focus on what computers are good at -- making thousands of smaller decisions -- or automatically enforcing rules and constraints.”⁴⁰

Technological barriers for operating in Space will exponentially decrease as AI improves. With *Deep Learning* capabilities being expanded, we will eventually be able to effortlessly run large data sets through “neural networks” until the system can recognize patterns.⁴¹ IBM recently announced that its software improved “scaling efficiency” to 95%, and did the run in just under 50 minutes, compared with an hour for Facebook.⁴²

If *Moore’s Law*⁴³ is any indication, we can certainly anticipate exciting

³⁸ John Bluck, *NASA Artificial Intelligence Could Help Astronauts Work More Efficiently in Space*, NASA (Mar. 30, 2005), <https://www.nasa.gov/centers/ames/research/exploringtheuniverse/spiffy.html>, (last visited March 14, 2018).

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ Steve LeVine, *IBM claims big breakthrough in “deep learning”*, Axios, (Aug. 8, 2017), <https://www.axios.com/ibm-claims-a-big-breakthrough-in-the-speed-of-artificial-intelligence-2470342674.html>, (last visited March 14, 2018).

⁴² *Id.*

⁴³ Thomas Friedman, *Moore’s Law Turns 50*, New York Times, May 13, 2015, https://www.nytimes.com/2015/05/13/opinion/thomas-friedman-moores-law-turns-50.html?_r=0&mtrref=www.google.com&gwh=F5E4F0CA236E82E8CD9589E6DB8F6509&gwt=pay&assetType=opinion, (last visited March 14, 2018).

breakthroughs in the near future. Just over 50 years ago, Gordon Moore, one of the co-founders of Intel, predicted that every two years we'd double the number of transistors that could fit on a single chip of silicon, so you'd get twice as much computing power for only slightly more money. "Moore's Law" has essentially held up ever since and is an example of sustained exponential growth of a technology. However, at the same time, we must take heed of the legal issues that arise from using this technology.

Property Rights Conflict

Current international law is seen as an economic stumbling block for the development of the Space industry. In sum, the *Outer Space Treaty of 1967* (the "*Space Treaty*"), which is at the base of all laws in Space, forbids any country from laying sovereign claim to any celestial body.⁴⁴ However, the *Outer Space Treaty* and subsequent international laws have failed to address whether any country can own any natural resources on celestial bodies.⁴⁵

In 2015, in an effort to elude this ban, the United States enacted its own law, the *United States Commercial Space Launch Competitiveness Act* (the "*U.S. Space Act*"), which effectively gave United States companies the right to lay claim to Space resources.⁴⁶ Nevertheless, some experts still deem this step as a possible violation of the *Space Treaty*.⁴⁷ The problem, however, is in the minerals still unmined. The *U.S. Space Act* only gives ownership of resources already mined.⁴⁸ In the law's current status, Space-miners may be subjected to the invasion of adverse claimants who attempt to mine the same resources they are in the process of mining.

Flags Of Convenience In Outer Space

⁴⁴ David Drake, *Luxembourg takes a Bold Step towards Legislating Space Mining*, HedgeCo., (Jan. 12, 2017), <https://www.hedgeco.net/blogs/2017/01/12/luxembourg-takes-a-bold-step-towards-legislating-space-mining-by-david-drake/>, (last visited March 14, 2018).

⁴⁵ Id.

⁴⁶ Id.

⁴⁷ Id.

⁴⁸ Id.

A danger posed by non-state actors operating without clarified Space regulation is the likely possibility of flags of convenience. Like any industrial arena, there will be companies who want to trim their budgets, even when it creates risk for disasters. Flags of convenience are used to reduce operating costs in business.⁴⁹

Flags of convenience pose an obvious environmental threat as well. On our oceans, a ship operates under the laws of its flag state.⁵⁰ Analogously under the *Space Treaty*, “each country retains jurisdiction and control over its governmental and non-governmental” Spacecraft.⁵¹ In the sea, vessel owners often register in other nations with open registries, like Panama and Liberia, to take advantage of lax regulations and lower fees.⁵² A comparable allure exists among nations who seek to attract private Space companies, by maintaining lax regulations.⁵³ The laws which govern Space do not prohibit other actors from following a parallel track. The temptation has already blossomed in Luxembourg where two major mining players based in the United States, *Planetary Resources* and *Deep Space Industries*, have now established legal offices within Luxembourg.⁵⁴

⁴⁹ *What is a Flag of Convenience?* HG.Org Legal Resources, <https://www.hg.org/article.asp?id=31395>, (last visited Mar. 13, 2017).

⁵⁰ *Id.*

⁵¹ Matthew J. Kleiman, *Space Law 101: An Introduction to Space Law*, American Bar Association, 2017, http://www.americanbar.org/groups/young_lawyers/publications/the_101_201_practice_series/space_law_101_an_introduction_to_space_law.html, (last visited March 14, 2018).

⁵² *What is a Flag of Convenience?* HG.Org Legal Resources, <https://www.hg.org/article.asp?id=31395>, (last visited Mar. 13, 2017).

⁵³ Matthew J. Kleiman, *Space Law 101: An Introduction to Space Law*, American Bar Association, Note 53, 2017, http://www.americanbar.org/groups/young_lawyers/publications/the_101_201_practice_series/space_law_101_an_introduction_to_space_law.html, (last visited March 14, 2018).

⁵⁴ Sarah Scoles, *Luxembourg's Bid to Become the Silicon Valley of Space Mining*, Wired, (Jan. 10, 2017: 7:00 AM), <https://www.wired.com/2017/01/luxembourg-setting-silicon-valley-space-mining/>, (last visited March 14, 2018).

Unregulated Environment: Space-Debris

The low-earth orbit is the area immediately surrounding our globe, and it is crowded with litter.⁵⁵ As a result of countless attempts to launch into the deep black beyond, our society has littered it with Space junk.⁵⁶ An estimated 600,000 miscellaneous objects larger than a centimeter loop our planet.⁵⁷ These objects include old satellite fragments, spent rocket stages, flecks of paint, nuts and bolts, as well as discarded astronaut gloves, spatulas, cameras, and crystals of urine.⁵⁸

Why should Space-pioneers be concerned about a few yellow popsicles? Because this garbage can hurtle through Space with speeds “as much as 17,500 miles per hour.”⁵⁹ The Space-debris can damage expensive equipment, and also presents a deadly risk to astronauts.⁶⁰ This spectacle is depicted in the 2013 movie, *Gravity*, wherein two astronauts stranded in Space are repeatedly forced to take shelter to avoid incoming debris.⁶¹ Near-Earth-Object tracking systems, like *Sentry* or *Scout* (both of which were created by NASA), may help to alleviate some of the risk of larger Space-debris colliding

⁵⁵ Adam Mann, *Space: The Final Frontier of Environmental Disasters?* Wired, (July 15, 2013, 6:30 AM), <https://www.wired.com/2013/07/space-environmentalism/>, (last visited March 14, 2018).

⁵⁶ Id.

⁵⁷ Matthew J. Kleiman, *Space Law 101: An Introduction to Space Law*, Note 53, American Bar Association, (2017), http://www.americanbar.org/groups/young_lawyers/publications/the_101_201_practice_series/space_law_101_an_introduction_to_space_law.html, (last visited March 14, 2018).

⁵⁸ Adam Mann, *Space: The Final Frontier of Environmental Disasters?* Wired (July 15, 2013, 6:30 AM), <https://www.wired.com/2013/07/space-environmentalism/>, (last visited March 14, 2018).

⁵⁹ Lacy Cooke, *Japan successfully orbits giant space junk collector*, Inhabitat, (Dec. 12, 2016), <http://inhabitat.com/japan-successfully-orbits-giant-space-junk-net/>, (last visited March 14, 2018).

⁶⁰ Id.

⁶¹ *Gravity*, Warner Bros, (original theatrical date: Oct. 4, 2013), <https://www.warnerbros.com/gravity/>, (last visited March 14, 2018).

with Spacecraft and/or entering and exiting Earth's atmosphere. However, the further from Earth a craft travels, the less evasiveness is possible.

The current laws of Space do not adequately address several issues regarding the accumulation of Space-debris.⁶² The *Space Treaty* and other legislation fail to clearly delegate liability for damage caused by this flying garbage.⁶³ Under the *1972 Liability Convention*, countries are liable for damage caused to other Spacecraft only if they act negligently.⁶⁴ Despite this effort to assign liability, there is no international policy which defines a standard for operation of a Spacecraft that prevents or reduces creating Space-debris.⁶⁵ This lack of clarity in the law makes it quite a difficult challenge to actually assign liability for negligence.⁶⁶ Furthermore, in Space, it can be nearly impossible to identify where most Space-debris originates.⁶⁷

In our oceans, there is the *law of salvage* under Maritime law, which essentially rewards a person who recovers another's ship or cargo after it is lost at sea.⁶⁸ In Space there is no such law, which essentially means that it's

⁶² Matthew J. Kleiman, *Space Law 101: An Introduction to Space Law*, American Bar Association, Note 53, 2017, http://www.americanbar.org/groups/young_lawyers/publications/the_101_201_practice_series/space_law_101_an_introduction_to_space_law.html, (last visited March 14, 2018)..

⁶³ Id.

⁶⁴ Convention on International Liability for Damage Caused by Space Objects, adopted Sept. 1, 1972, 961 U.N.T.S., <http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introliability-convention.html>, (last visited March 14, 2018).

⁶⁵ Matthew J. Kleiman, *Space Law 101: An Introduction to Space Law*, Note 53, American Bar Association, (2017), http://www.americanbar.org/groups/young_lawyers/publications/the_101_201_practice_series/space_law_101_an_introduction_to_space_law.html, (last visited March 14, 2018).

⁶⁶ Id.

⁶⁷ Id.

⁶⁸ H. Robinson, *Admiralty Law of Salvage*, 23 Cornell L. Rev. 229 (1938), <http://scholarship.law.cornell.edu/cgi/viewcontent.cgi?article=1399&context=clr>, (last visited March 14, 2018).

illegal for one party to remove another's Space-debris without consent.⁶⁹ Considering the multitude of parties involved, the Asteroid-Mining industry and other Space endeavors will unquestionably bring more Space flight traffic, which will inevitably result in more Space-debris.⁷⁰ This imminent surge in Space activity caused by expeditions makes it abundantly clear that international Space law must be reevaluated. Experts agree this debris could not only pose risks to future Space-travel, but it could provoke armed conflict among nations on Earth.⁷¹

Conflicting Claims Invested Governments

In the introduction, we alluded to President Trump's interest in Outer Space. In addition to covert military and Space-travel initiatives, NASA announced its plan to launch the *Asteroid Redirect Mission*; its first robotic mission to collect samples from Near-Earth Asteroids.⁷² The mission is scheduled for 2023, and the targeted asteroid is named *Psyche*; one of the largest objects in the asteroid belt, which may be the exposed metal core of an early planet.⁷³ Both President Trump and the United States Congress have reaffirmed a commitment to a United States presence in Space. In March of 2017, President Trump signed the *2017 NASA Authorization Act*, which is the first

⁶⁹ Matthew J. Kleiman, *Space Law 101: An Introduction to Space Law*, Note 53, American Bar Association, 2017, http://www.americanbar.org/groups/young_lawyers/publications/the_101_201_practice_series/space_law_101_an_introduction_to_space_law.html, (last visited March 14, 2018).

⁷⁰ Id.

⁷¹ Lacy Cooke, *Japan successfully orbits giant space junk collector*, Inhabitat, (Dec. 12, 2016), <http://inhabitat.com/japan-successfully-orbits-giant-space-junk-net/>, (last visited March 14, 2018).

⁷² Erin Mahoney, *Asteroid Redirect Mission*, National Aeronautics and Space Administration, (last updated Sept. 7, 2016), https://www.nasa.gov/mission_pages/asteroids/initiative/index.html, (last visited March 14, 2018).

⁷³ Marina Koren, *Is NASA Paving the Way for Asteroid Mining?* The Atlantic, (Jan. 6, 2017), <https://www.theatlantic.com/science/archive/2017/01/nasas-asteroid-kick/512342/>, (last visited March 14, 2018).

complete authorization of the agency since 2010 while also providing a proposed budget of \$19.5 billion for the 2018 fiscal year.⁷⁴ Among other provisions, it calls on *NASA* to reexamine the feasibility of using the *Orion* spacecraft to transport crews to and from the *International Space Station*.

The United States is not the only nation looking to the stars above. Luxembourg, with its history in the iron and steel industries and a willingness to reinvent its economy, is now a great competitor in this cosmic gold rush.⁷⁵ This tiny country aspires to become “the global center” or *Silicon Valley* of Asteroid-Mining.⁷⁶ The program will utilize a legal and regulatory framework that will guarantee private companies the right to keep any minerals, water or other valuable commodities that they extract in space.⁷⁷ Luxembourg passed a law in mid-2017 that sets out the procedures for authorizing and supervising missions to explore, extract, process and utilize Space resources.⁷⁸ Luxembourg sent a convincing message when its government publicized its \$227 million fund aimed at investing in Asteroid-Mining companies that set

⁷⁴ Andrew Wagner, *Why you should take a closer look at this week's NASA bill*, WGNU (Mar. 24, 2017, 5:17 PM), <https://www.pbs.org/newshour/science/take-closer-look-weeks-nasa-bill>, (last visited March 14, 2018).

⁷⁵ Dylan Love, *The Next Frontier: Space Miners are the Universe's Future Tycoons*, NBC News, (Dec. 26, 2016: 3:50 PM), <http://www.cnbc.com/2016/12/26/the-next-frontier-space-miners-are-the-universes-future-tycoons.html>, (last visited March 14, 2018).

⁷⁶ David Schrieberg, *Asteroid Mining: The Next Grand Venture Of Tiny Luxembourg*, Forbes, (Jan. 24, 2017: 1:26 AM), <https://www.forbes.com/sites/davidschrieberg1/2017/01/24/asteroid-mining-the-next-grand-venture-of-tiny-luxembourg/#6569f7f8375a>, (last visited March 14, 2018).

⁷⁷ Elie Dolgin, *The New Capital of the Private Space Industry*, Scientific American, (May 15, 2017), <https://www.scientificamerican.com/products/luxembourg-innovation/the-new-capital-of-the-private-space-industry/>, (last visited March 14, 2018).

⁷⁸ *Luxembourg adopts space resources law*, SpaceNews.com (2017), <http://spaceneews.com/luxembourg-adopts-space-resources-law/> (last visited Jan 3, 2018).

up operations within the country's borders.⁷⁹ Although countries like the United States, Russia, China, and Luxembourg have expressed their firm desire to conduct activity in Space, the Space Race has evolved into more than just a race between governments.⁸⁰

Invested Private Parties

The big players in the transport Space industry are *SpaceX*, *Blue Origin*, *Virgin Galactic*, *Lockheed Martin*, *Boeing*, and *Airbus*. There are also the businesses which utilize satellites including *Google Maps*, *AT&T*, *Comcast*, *Garmin*, and other telecommunication companies.

Additionally, there are three private companies specifically focused on mining in Space: (1) *Moon Express*, a company planning to mine on the moon, is aiming to launch its maiden voyage in 2018, and could have human colonies there within five years; (2) *Deep Space Industries*, which expects to send an autonomous craft to an asteroid by the end of the decade; and (3) *Planetary Resources*, which expects to begin exploring asteroids starting around the year 2020.⁸¹

Money is not a dirty word in Space. As Gordon Gekko elucidates in the film,

⁷⁹ Dylan Love, *The Next Frontier: Space Miners are the Universe's Future Tycoons*, NBC News, (Dec. 26, 2016: 3:50 PM), <http://www.cnbc.com/2016/12/26/the-next-frontier-space-miners-are-the-universes-future-tycoons.html>, (last visited March 14, 2018).

⁸⁰ Namrata Goswami, *China's Unique Space Ambitions*, The Diplomat, (Aug. 3, 2016), <http://thediplomat.com/2016/08/chinas-unique-space-ambitions/>; see also Cecilia Jamasmie, *Russia pushes forward plans to mine the moon*, INFOMINE (Oct. 28, 2014: 6:44 PM), <http://www.mining.com/russia-pushes-forward-plans-to-mine-the-moon-13769/>, (last visited March 14, 2018).

⁸¹ Dan Tynan, *Galactic gold rush: the tech companies aiming to make space mining a reality*, The Guardian, (Dec. 6, 2016: 7:00 AM), <https://www.theguardian.com/science/2016/dec/06/space-mining-moon-asteroids-tech-companies>; Arjun Kharpal, *Moon Express Says First Launch Is 'Definitely' Happening In 2018*, CNBC (Nov. 30, 2017: 3:02 AM), <https://www.cnbc.com/2017/11/30/moon-express-says-first-launch-happening-in-2018.html>, (last visited March 14, 2018).

Wall Street, “Greed is – for lack of a better word – good... Greed clarifies, cuts through, and captures the essence of the evolutionary spirit.”⁸² Undeniably, money literally has private companies racing to the stars for just that; they seek the promise of abounding profits stemming from their investments. So, if money talks on Earth, money roars in Space. Like all responsible businesses, these Space pioneers seek calculated efficiency. Private companies such as *Orbital ATK*, *SpaceX*, and *Blue Origin* have invested in reusable vehicles, more efficient workflows, and streamlined manufacturing processes.⁸³ Every detail must be accounted for. If successful, all these advancements will result in significantly lower costing Space launches, thus making Space travel more affordable.⁸⁴

Google recently entered the picture hoping to speed up these advancements. The 30-million-dollar *Google Lunar XPRIZE* was promised to be the first private firm to land on the Moon, travel at least 500 meters, and transmit high-definition images back from the surface by March 2018.⁸⁵ This contest aimed to promote development of low-cost methods of robotic Space exploration.⁸⁶ Five companies raced against the clock in this race to the Moon in hopes of financing their future Space endeavors – *SpaceIL* (Israel), *Moon Express* (US), *Synergy Moon* (International), *TeamIndus* (India), and *HAKUTO* (Japan).⁸⁷ According to *SpaceNews.com*, Israeli team *SpaceIL* said in a November 29th statement that “it needed to raise \$20 million by the end of the year, from both the public as well as the Israeli government, or else it would be forced to

⁸² *Wall Street: Gordon Gekko: Address to Teldar Paper Stockholders* (1987), <http://www.americanrhetoric.com/MovieSpeeches/moviespeechwallstreet.html>, (last visited March 14, 2018).

⁸³ Dan Tynan, *Galactic gold rush: the tech companies aiming to make space mining a reality*, *The Guardian*, (Dec. 6, 2016: 7:00 AM), <https://www.theguardian.com/science/2016/dec/06/space-mining-moon-asteroids-tech-companies>, (last visited March 14, 2018).

⁸⁴ *Id.*

⁸⁵ XPRIZE Foundation, *What Is The Google Lunar Xprize?* Google, (2017), <http://lunar.xprize.org>, (last visited March 14, 2018).

⁸⁶ *Id.*

⁸⁷ *Id.*

cancel the entire mission.”⁸⁸ Unfortunately, none of the teams were able to reach their goal. On January 23, 2018, Google announced that the prize would expire in March without a winner.⁸⁹ Even with several granted extensions in the past, Google stated that no team would be able to launch a mission before the deadline.⁹⁰ Despite the disappointment, many of these competitors have indicated that they plan to continue their initiatives independently.⁹¹

Environmental Opposition

These government agencies and private companies are all operating under the premise that it is okay to act first and ask questions later. Yet, like all great endeavors, there are parties who oppose this gold-rush mentality. Environmentalists and other common interest advocates want to leave our solar system pristine and prohibit exploiting its resources. At first, environmentalism in Space might seem unusual. After all, environmentalism typically involves preservation of living organisms.⁹² But since we have not yet discovered life in Space, what do we have to protect?⁹³

As established earlier, Earth’s orbit is crowded with tiny pieces of junk traveling at dangerous velocities; reaching “17,500 miles per hour.”⁹⁴ Environmentalists analogize Space-debris as “a classic example of *Tragedy of*

⁸⁸ Jeff Foust, *Google Lunar X Prize teams make last-ditch fundraising appeals*, SpaceNews, (Dec. 5, 2017), <http://spacenews.com/google-lunar-x-prize-teams-make-last-ditch-fundraising-appeals/>, (last visited March 14, 2018).

⁸⁹ Jeff Foust, *Google Lunar X Prize to End Without Winner*, Space News, 2018, <http://spacenews.com/google-lunar-x-prize-to-end-without-winner/> (last visited Jan 26, 2018).

⁹⁰ *Id.*

⁹¹ *Id.*

⁹² Adam Mann, *Space: The Final Frontier of Environmental Disasters?* Wired (July 15, 2013, 6:30 AM), <https://www.wired.com/2013/07/space-environmentalism/>, (last visited Jan 26, 2018).

⁹³ *Id.*

⁹⁴ Lacy Cooke, *Japan successfully orbits giant space junk collector*, Inhabitat, (Dec. 12, 2016), <http://inhabitat.com/japan-successfully-orbits-giant-space-junk-net/>; see also Kleiman, *supra* note 51, (last visited March 14, 2018).

the Commons”.⁹⁵ This economic term references when individuals share a common good, but through the selfish overuse of many individuals acting in their own interests, this good is eventually destroyed.⁹⁶ Since we have already affected our own planet, it wouldn’t be difficult to visualize a similar pattern repeating itself on other celestial bodies. For example, irresponsible mining on other bodies in Space could cultivate mass amounts of Space-debris.⁹⁷

This environmental concern is highlighted by a recent experimental effort to clean up Space-junk by the *Japan Aerospace Exploration Agency* (“JAXA”).⁹⁸ The plan was to use a 700-meter (2,296-foot) metal tether attached to a Spacecraft that was designed to slow down Space-junk and bring it back to Earth.⁹⁹ The craft launched last December, but unfortunately, its mission was a failure.¹⁰⁰ As the Space Industry continues to grow, environmentalists will inevitably point out threats to the environment and demand balancing regulations to prevent risk and damage.

II. Past Trends in Decisions and Conditioning Factors International Laws

There are two ways in which a State¹⁰¹ becomes bound to international law —

⁹⁵ Adam Mann, *Space: The Final Frontier of Environmental Disasters?* Wired, (July 15, 2013, 6:30 AM), <https://www.wired.com/2013/07/space-environmentalism/>, (last visited Jan 26, 2018).

⁹⁶ Id.

⁹⁷ Id.

⁹⁸ Colin Payne, *Japan’s experimental mission to clean up space junk ends in failure*, Inhabitat, (Feb. 7, 2017), <http://inhabitat.com/japans-experimental-mission-to-clean-up-space-junk-ends-in-failure/>, (last visited March 14, 2018).

⁹⁹ Sam Byford, *Japanese mission to clear up space junk ends in failure*, The Verge, (Feb. 6, 2017, 11:39 PM), <http://www.theverge.com/2017/2/6/14530348/jaxa-kounotori-space-junk-mission-failure>, (last visited March 14, 2018).

¹⁰⁰ Id.

¹⁰¹ Defined as “one of the constituent units of a nation having a federal government” per Merriam Webster. <https://www.merriam-webster.com/dictionary/state>, (last visited March 14, 2018).

either by signing a treaty or by customary international law.¹⁰² A treaty is an agreement entered into by countries under international law.¹⁰³ There is more than one path for a country to take when seeking to be a party to a treaty. A country has the option to sign a treaty when it is open for signature and then ratify the treaty, or a country may also become a party by acceding to or by accepting the treaty.¹⁰⁴ If a country becomes a signatory to a treaty, it is declaring an intention to make the terms of the treaty legally binding on itself.¹⁰⁵ However, the terms of a treaty are not actually legally binding until a country ratifies the treaty and once the treaty's requirements for entry into force are met.¹⁰⁶

Customary international law, on the other hand, does not require the formality of a signed agreement between nations. The *International Court of Justice* (the “*ICJ*”) is considered a global authority in determining customary international law. Through the authority of the *United Nations*, the *ICJ* gives advisory opinions on legal questions and settles legal disputes between States in accordance with international law.¹⁰⁷ In the *North Sea Continental Shelf* cases,¹⁰⁸ the *ICJ* held that for a customary rule to emerge that it needed: (1) the

¹⁰² W. Michael Reisman, Mahnoush H. Arsanjani, Siegfried Wiessner & Gayl S. Westerman, *The View from the New Haven School of International Law*, *International Law in Contemporary Perspective* 15, Foundation Press ed., 2004.

¹⁰³ Black's Law Dictionary, 10th Edition officially defines a treaty as, an agreement formally signed, ratified, or adhered to between two countries or sovereigns; an international agreement concluded between two or more states in written form and governed by international law.

¹⁰⁴ Clarify the differences between being a party to a convention/treaty and being a signatory and what are the legal implications, Socioeconomic Data and Applications Center (SEDAC), The Trustees of Columbia University in the City of New York, <https://sedac.uservoice.com/knowledgebase/articles/41617-clarify-the-differences-between-being-a-party-to-a>, (last visited Mar. 14, 2018).

¹⁰⁵ *Id.*

¹⁰⁶ *Id.*

¹⁰⁷ International Court of Justice Staff, *The Court*, United Nations, , <http://www.icj-cij.org/court/index.php?p1=1>, (last visited Mar. 31, 2017)

¹⁰⁸ *North Sea Continental Shelf Cases, Federal Republic of Germany v. Denmark; Federal Republic of Germany v. Netherlands*, I.C.J. Reports 1969, (Feb. 20, 1969), <http://www.refworld.org/cases,ICJ,50645e9d2.html>, (last visited Mar. 14, 2018).

objective element of a widespread State practice; and (2) the subjective element of a virtually uniform practice undertaken in a manner that demonstrates a general recognition of the rule of law or legal obligation.¹⁰⁹ The passage of time was unnecessary (i.e. duration) to form a customary law.¹¹⁰ States that persistently object to an emerging customary law may successfully avoid being bound by it, even after the law matures.¹¹¹

In Space, customary law would require two key components: (1) a general state practice accepted as law; and (2) the major Space capable nations to be amongst these practicing states. Today, the major Space capable nations are the United States of America, China, the Russian Federation, Japan, the United Kingdom, India, Canada, Germany, France, and Luxembourg.¹¹²

Fortunately, there are existing laws which govern the great beyond, mostly due to the satellite industry. Currently, there are 1,071 operational satellites in orbit around the Earth, half of which were launched by the United States.¹¹³ In what is called the geosynchronous equatorial orbit (“GEO”), there are approximately 402 satellites in assigned “orbital slots” which follow the direction of the Earth’s rotation.¹¹⁴ Satellites must remain in a very confined area and not drift too far from their assigned orbital slot above Earth;

¹⁰⁹ Ruwanthika Gunaratne, *2.1. Customary International Law As A Source of Law*, World Press (Apr. 21, 2011), <https://ruwanthikagunaratne.wordpress.com/2011/04/21/lesson-2-2-customary-international-law-as-a-source-of-law/>, (last visited Mar. 14, 2018).

¹¹⁰ *Id.*

¹¹¹ W. Michael Reisman, Mahnoush H. Arsanjani, Siegfried Wiessner & Gayl S. Westerman, *The View from the New Haven School of International Law*, International Law in Contemporary Perspective 15, Foundation Press ed., 2004.

¹¹² *The 10 countries most active in space*, Kable Intelligence Limited, (Dec. 22, 2015), <http://www.aerospace-technology.com/features/featurethe-10-countries-most-active-in-space-4744018/>, (last visited March 15, 2018).

¹¹³ Fraser Cane, *How Many Satellites Are In Space?* Universe Today, (last updated Mar. 16, 2017), <http://www.universetoday.com/42198/how-many-satellites-in-space/>, (last visited March 15, 2018).

¹¹⁴ Elizabeth Howell, *What Is a Geosynchronous Orbit?* Space.com (Apr. 24, 2015: 7:31 PM), <http://www.space.com/29222-geosynchronous-orbit.html>, (last visited March 15, 2018).

otherwise, they may interfere with other satellites.¹¹⁵ The *International Telecommunication Union* assigns these orbital slots and settles disputes between countries about the slots.¹¹⁶

The *Space Age* and the satellite industry began on October 4, 1957, the year the Soviet Union launched *Sputnik I*, the first satellite to be placed into Earth's orbit.¹¹⁷ Then in 1958, the United States launched its own satellite, *Explorer I*, and created the *National Aeronautics and Space Administration* ("NASA"), a federal agency dedicated to Space exploration.¹¹⁸ The notorious 20th-century arms race brought by the Cold War morphed into a Space race. As a result of this dramatic global competition, the *United Nations* formed the *Committee on the Peaceful Uses of Outer Space* ("COPUOUS") in 1958.¹¹⁹

COPUOUS has 77 members, including the United States (NASA), Russia (*Roscosmos*), Japan, China, Canada, Brazil, Australia and the member states of the *European Space Agency*.¹²⁰ COPUOUS is used for promoting international cooperation and peaceful negotiations in Space by exchanging information of government and nongovernmental activities.¹²¹ COPUOUS has influenced the creation of five principles and five treaties that govern much of Space law today.¹²²

The most important treaty influenced by COPUOUS is the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies* (the "Space

¹¹⁵ Id.

¹¹⁶ Id.

¹¹⁷ *The Space Race*, History, A & E Television Networks, (Mar. 11, 2017), <http://www.history.com/topics/space-race>, (last visited March 15, 2018).

¹¹⁸ Id.

¹¹⁹ Elizabeth Howell, *Who Owns the Moon?* Space Law & Outer Space Treaties, Space.com, (Jul. 15, 2016: 7:59 PM), <http://www.space.com/33440-space-law.html>, (last visited March 15, 2018).

¹²⁰ Id.

¹²¹ Id.

¹²² Id.

Treaty”), ratified in 1967.¹²³ The *Space Treaty* satisfies the requirements of customary international law; a general state practice accepted as law, and the major Space capable nations to be amongst these practicing states. Thus, all nations are bound, even those who are not signatories.

When discussing the *Space Treaty*, one must recognize its place not only in law, but also in the context of international affairs. The international community was starting to embrace the theory of liberalism following two world wars,¹²⁴ essentially caused by geopolitical expansion (i.e.; Germany basically wanted to conquer all of Europe).¹²⁵ The key tenants of liberalism, the rejection of power politics and the focus on the mutual benefits of international cooperation, are easily apparent in the *Space Treaty*.¹²⁶ The writers of the treaty saw Space as an opportunity to fully embrace the theory and prove that the system was a superior alternative to the realist approach that was well established in the international community.¹²⁷ The *Space Treaty* set up the framework, which remains in effect today, for managing activities in Space and established national governments as responsible for governing Space.¹²⁸ There are four basic concepts of the *Space Treaty*: Parties must (1) keep Space open for exploration and use by all states; (2) take responsibility for all activities conducted from within their borders (whether carried out by

¹²³ 2222 (XXI) *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space*, United Nations Office for Outer Space Affairs, Oct. 10, 1967, <http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html>, (last visited March 15, 2018).

¹²⁴ Anne-Marie Slaughter Burley, *International Law and International Relations Theory: A Dual Agenda*, 87 *The Am. J. of Int'l L.* 205, 207-09, 1993.

¹²⁵ Michael J. Listner, *It's time to rethink international space law*, *The Space Rev.* (May 31, 2015), <http://www.thespacereview.com/article/381/1>, (last visited March 15, 2018).

¹²⁶ Eric B. Shiraev & Vladislav M. Zubok, *International Relations*, New York: Oxford University Press, 78-87 (2d ed. 2014), (last visited March 15, 2018).

¹²⁷ James P. Muldoon Jr., Earl Sullivan, JoAnn Fagot Aviel, Richard Reitano, *Multilateral Diplomacy and the United Nations Today*, Westview Press 311 (2005).

¹²⁸ Dave Baiocchi & William Welser IV, *The Democratization of Space*, *Foreign Affairs*, note 28, 2015, <https://www.foreignaffairs.com/articles/space/2015-04-20/democratization-space>, (last visited March 14, 2018).

governmental or nongovernmental entities); (3) assume liability for damage caused by their Space objects; and (4) cooperate with one another and provide mutual assistance.¹²⁹ The *Space Treaty* also imposes a benefits clause which imposes that use of Space should be “in the interests of all countries”.¹³⁰ It also further restricts appropriation by barring sovereign claims in Space.¹³¹

In support of the *Space Treaty* and peaceful Space exploration, *COPUOUS* implemented four more treaties.¹³² The first of these treaties is the *1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space* (the “*Rescue Agreement*”), formed to give astronauts emergency assistance.¹³³ It decreed that States “shall immediately take all possible steps to rescue them and render them all necessary assistance.”¹³⁴ The second treaty is the *1972 Convention on International Liability for Damage Caused by Space Objects* (the “*Liability Convention*”), which addresses concerns if a Space object causes damage or loss to human life.¹³⁵ It stated that “a launching state shall be absolutely liable to pay compensation for damage caused by its [S]pace object on the surface of

¹²⁹ *Id.*

¹³⁰ 2222 (XXI) *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space*, United Nations Office for Outer Space Affairs, Oct. 10, 1967, <http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html>, (last visited March 15, 2018).

¹³¹ *Id.*

¹³² Elizabeth Howell, *Who Owns the Moon?* Space Law & Outer Space Treaties, note 121, Space.com, (Jul. 15, 2016: 7:59 PM), <http://www.space.com/33440-space-law.html>, (last visited March 15, 2018). 119

¹³³ *Id.*

¹³⁴ 2777 (XXVI) *Convention on International Liability for Damage Caused by Space Objects*, Dec. 3, 1968, 672 U.N.T.S., <http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/rescueagreement.html#fn1>, (last visited March 15, 2018).

¹³⁵ Elizabeth Howell, *Who Owns the Moon?* Space Law & Outer Space Treaties, Note 121, Space.com, (Jul. 15, 2016: 7:59 PM), <http://www.space.com/33440-space-law.html>, (last visited March 15, 2018).

the earth or to aircraft flight.”¹³⁶ In 1975, the *Convention on Registration of Objects Launched into Outer Space* (the “Registration Convention”) was enacted to help nations keep track of all objects launched into outer Space.¹³⁷ The fourth convention born of the *Space Treaty* is the *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies* (the “Moon Agreement”); it was developed by COPUOUS in 1979.¹³⁸ The *Moon Agreement* is essentially a more detailed and specific extension of the *Outer Space Treaty*, focused primarily on property rights and usage of the moon and other celestial bodies in the solar system.¹³⁹ Presently, the *Moon Treaty* only has 17 State parties, and 11 signatory states, all of which are minor players in Space exploration.¹⁴⁰ “The United States, the Russian Federation (former Soviet Union), and the People’s Republic of China have neither signed, acceded, nor ratified the *Moon Treaty*, which has led to the conclusion that it is a failure from the standpoint of international law.”¹⁴¹ Simply put, the *Moon*

¹³⁶ 2777 (XXVI) *Convention on International Liability for Damage Caused by Space Objects*, Dec. 3, 1968, 672 U.N.T.S., <http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/rescueagreement.html#fn1>, (last visited March 15, 2018).

¹³⁷ Elizabeth Howell, *Who Owns the Moon?* Space Law & Outer Space Treaties, Space.com, (Jul. 15, 2016: 7:59 PM), <http://www.space.com/33440-space-law.html>, (last visited March 15, 2018).

¹³⁸ Michael Listner, *The Moon Treaty: failed international law or waiting in the shadows?* The Space Review, Oct. 24, 2011, <http://www.thespacereview.com/article/1954/1>, (last visited March 15, 2018).

¹³⁹ Elizabeth Howell, *Who Owns the Moon?* Space Law & Outer Space Treaties, note 121, Space.com, (Jul. 15, 2016: 7:59 PM), <http://www.space.com/33440-space-law.html>, (last visited March 15, 2018); see also 2222 (XXI) *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space*, United Nations Office for Outer Space Affairs, Oct. 10, 1967, <http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html>, (last visited March 15, 2018).

¹⁴⁰ *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, United Nations Office for Disarmament Affairs (UNODA), <http://disarmament.un.org/treaties/t/moon>, (last visited Apr. 21, 2017).

¹⁴¹ Michael Listner, *The Moon Treaty: failed international law or waiting in the shadows?* Note 140, The Space Review, Oct. 24, 2011, <http://www.thespacereview.com/article/1954/1>, (last visited March 15, 2018).

Agreement does not qualify as binding customary international law.

The *Moon Agreement* is disfavored by major Spacefaring nations. Their disfavor is primarily due to one controversial section which deals with natural resources on the Moon.¹⁴² The term “resources” is not defined, but it is reasonable to presume that it refers to the “mineral deposits including titanium, the substantial water ice discovered at the Moon’s south pole, and the helium-3 within the lunar regolith.”¹⁴³ Through a benefits clause, the Moon Agreement effectively forbids states from conducting commercial mining on planets and asteroids until there is an international regime to approve such exploitation.¹⁴⁴ For some major governments, the impossibility to make profit outweighs the positive aspects of the agreement.¹⁴⁵ The *Moon Agreement* failed to elaborate on the proposed structure of an international regime. However, it would likely develop into an arrangement mirroring that of the international regime hypothesized by *Part XI* of the *United Nations Convention on the Law of the Sea* (the “*Sea Treaty*”), implemented in 1994.¹⁴⁶

Part XI of the *Sea Treaty* sets forth an international organizational structure to regulate the future industry of deep-seabed mining of mineral resources in the world’s oceans, which involves areas beyond national jurisdiction.¹⁴⁷ Also, the *Sea Treaty* proposed an *International Seabed Authority* (“*ISA*”) to enforce the

¹⁴² *Id.*

¹⁴³ *Id.*

¹⁴⁴ Gbenga Oduntan, *Who Owns Space? US Asteroid-Mining Act Is Dangerous And Potentially Illegal*, *The Conversation*, Nov. 25, 2015, 6:34 AM, <https://theconversation.com/who-owns-space-us-asteroid-mining-act-is-dangerous-and-potentially-illegal-51073>, (last visited March 15, 2018).

¹⁴⁵ Phillippa Blabler & Angélique Verrecchia, *The Moon Agreement*, *Born for Space*, Dec. 17, 2013, <https://born4space.wordpress.com/2013/12/17/the-moon-agreement/>, (last visited March 15, 2018).

¹⁴⁶ Michael Listner, *The Moon Treaty: failed international law or waiting in the shadows?* Note 140, *The Space Review*, Oct. 24, 2011, <http://www.thespacereview.com/article/1954/1>, (last visited March 15, 2018).

¹⁴⁷ Marjorie Ann Browne, *CRS Issue Brief for Congress: The Law of the Sea Convention and U.S. Policy*, *The Library of Congress*, (last updated June 16, 2006), http://www.gc.noaa.gov/documents/gcil_crs_2006_report.pdf, (last visited March 15, 2018).

regime; composed of all States parties to the Convention.¹⁴⁸ The *Sea Treaty* recognized an underlying concept present in the *Moon Agreement* called the “common heritage of mankind,” a phrase which refers to the seabed and its resources as vested in mankind as a whole.¹⁴⁹ Under this concept, claims to sovereign rights over any part of the seabed or its resources are forbidden.¹⁵⁰ In an effort to manage developed nations involvement, the *ISA* would require a portion of the mineral wealth mined from the ocean floor to be taxed from the developed nations for redistribution among the undeveloped countries.¹⁵¹ Additionally, the *ISA* would enforce a mandatory transfer of technology so that undeveloped countries could participate in the extraction of resources from the seabed.¹⁵² If the international regime proposed by the *Moon Agreement* were to take a form akin to that of the *Sea Treaty*, it would require nations to relinquish not only a portion of their resources extracted from celestial bodies, but they would also be required to surrender technology developed by private industries under their jurisdiction.¹⁵³ Basically, “the *Moon Treaty’s* common heritage view applies not only to extraterrestrial real property and resources but to intellectual property rights as well.”¹⁵⁴

Although most scholars have concluded that exploitation of Space resources (i.e. mining of celestial objects) is permissible, there is still no customary norm of international law in existence.¹⁵⁵ This deficiency in international law is partially due to an absence of consistent state practice.¹⁵⁶ Both the United States and Russia have occasionally transported moon rocks and other materials back to Earth for scientific research, without protest from other

¹⁴⁸ Id.

¹⁴⁹ Id.

¹⁵⁰ Id.

¹⁵¹ Michael Listner, *The Moon Treaty: failed international law or waiting in the shadows?* Note 140, *The Space Review*, Oct. 24, 2011,

<http://www.thespacereview.com/article/1954/1>, (last visited March 15, 2018).

¹⁵² Id.

¹⁵³ Id.

¹⁵⁴ Id.

¹⁵⁵ John G. Sprankling, *The International Law of Property*, Oxford University Press, 184 (2014).

¹⁵⁶ Id. at 185.

States.¹⁵⁷ “Yet the quantities were quite small, the occasions were infrequent, and only two states were involved. It cannot be seriously argued that such limited activities have matured into a customary norm that would permit large-scale exploitation.”¹⁵⁸

American Law

In September of 2014, a bill presented to Congress called the *American Space Technology for Exploring Resource Opportunities in Deep Space Act* (the “*Asteroids Act*”) failed to get off the ground.¹⁵⁹ The bill failed to address basic issues, such as who would license and regulate Asteroid-Mining operations, as well as larger issues, such as the legality of mining operations under international law.¹⁶⁰

A year later, Congress passed the *U.S. Space Act*.¹⁶¹ This 2015 law was designed to foster growth in the emerging commercial Space industry, specifically in areas such as mining and tourism.¹⁶² Advocates believe the *U.S. Space Act* to be a step forward, but there is much criticism surrounding this law.¹⁶³ In a nutshell, the *U.S. Space Act* makes it legal for United States

¹⁵⁷ Id.

¹⁵⁸ Id.

¹⁵⁹ Takeshi Hakamada, *A Japanese New Space Perspective: Lunar resource utilization and development of legal perspective in Japan*, iSPACE (2017), <http://www.unoosa.org/documents/pdf/copuos/lsc/2017/symp-03.pdf>, (last visited March 14, 2018).

¹⁶⁰ Jon Kelvey, *Is It Legal to Mine Asteroids?* Slate, Oct. 13, 2014: 5:45 PM, http://www.slate.com/articles/health_and_science/space_20/2014/10/asteroid_mining_and_space_law_who_gets_to_profit_from_outer_space_platinum.html, (last visited March 15, 2018).

¹⁶¹ H.R.2262 - *U.S. Commercial Space Launch Competitiveness Act*, U.S. Government Publishing Office, Nov. 25, 2015, <https://www.congress.gov/bill/114th-congress/house-bill/2262/text>, (last visited March 15, 2018).

¹⁶² James Rathz, *Law Provides New Regulatory Framework for Space Commerce*, The Regulatory Review, Dec. 31, 2015, <https://www.theregreview.org/2015/12/31/rathz-space-commerce-regulation/>, (last visited March 15, 2018).

¹⁶³ Id.

citizens to “possess, own, transport, use, and sell” an asteroid resource once they obtain it.¹⁶⁴ On the other hand, *Article One* of the *Outer Space Treaty*, to which the United States is a signatory, says that Space exploration and use thereof shall be carried out for the benefit and in the interests of all countries.¹⁶⁵ Essentially, the *Outer Space Treaty* prevents the sale of Space-based resources for profit, which is exactly what the U.S. *Space Act* permits.¹⁶⁶ The *U.S. Space Act* also has a paragraph stating that these claims are not declarations of sovereignty.¹⁶⁷ However, there is concern that not every country is going to see things the same way.¹⁶⁸ Indeed, the law is spurring contentious international debate.¹⁶⁹

In Spring of 2017, the United States Congress passed the *National Aeronautics and Space Administration Transition Authorization Act of 2017* (the *2017 NASA Authorization Act*).¹⁷⁰ The law authorizes \$19.5 billion in spending for NASA in fiscal year 2017 and includes a number of policy provisions directing NASA’s activities; these include the development of a detailed plan for NASA’s human exploration programs (such as sending humans to Mars) and NASA

¹⁶⁴ Clive Thompson, *Space Mining Could Set Off a Star War*, Wired, Jan. 14, 2016, 7:00 AM, <https://www.wired.com/2016/01/clive-thompson-11/>, (last visited March 15, 2018).

¹⁶⁵ Gbenga Oduntan, *Who Owns Space? US Asteroid-Mining Act Is Dangerous And Potentially Illegal*, Note 146, The Conversation, Nov. 25, 2015, 6:34 AM, <https://theconversation.com/who-owns-space-us-asteroid-mining-act-is-dangerous-and-potentially-illegal-51073>, (last visited March 15, 2018).

¹⁶⁶ Id.

¹⁶⁷ Nick Stockton, *Congress Says Yes to Space Mining, No to Rocket Regulations*, Wired, Nov. 18, 2015: 10:00 AM, <https://www.wired.com/2015/11/congress-says-yes-to-space-mining-no-to-rocket-regulations/>, (last visited March 15, 2018).

¹⁶⁸ Id.

¹⁶⁹ Id.

¹⁷⁰ Public Law 115-10, *National Aeronautics And Space Administration Transition Authorization Act Of 2017*, U.S. Government Publishing Office, Mar. 21, 2017, <https://www.congress.gov/115/plaws/pub110/PLAW-115pub110.pdf>, (last visited March 15, 2018).

establishing long-term medical monitoring of former astronauts.¹⁷¹ It is, however, an iterated commitment to commercial space-operations that stands out in this law.¹⁷²

The law creates an indemnity clause that shifts the power from Congress to the Executive Branch (the *NASA* administrator); this will help the parties involved efficiently handle a catastrophic event.¹⁷³ Furthermore, private companies are mandated to purchase insurance coverage of \$500 million for any launch or reentry mission. More importantly, the new law effectively bans the use of foreign human space flight transportation services from a foreign entity unless: (1) no United States Government-operated human space flight capability is available; (2) no United States commercial provider is available; and (3) it is a qualified foreign entity.¹⁷⁴

This shows a commitment to home-grown commercial enterprises such as *SpaceX* and *Boeing*. With the *Office of Space Commerce* being established in 2015 within the *Department of Commerce*,¹⁷⁵ the *2017 NASA Authorization Act* reinforces the commitment to commercial Space enterprise in that it “calls on *NASA* to facilitate the ‘commercialization and economic development’ of low-earth orbit activities, such as lowering the costs of commercial satellite operations and exploring the possibility of transferring the International Space

¹⁷¹ Jeff Foust, *Google Lunar X Prize to End Without Winner*, *Space News*, 2018, <http://spacenews.com/google-lunar-x-prize-to-end-without-winner/> (last visited Jan 26, 2018).

¹⁷² *Id.*

¹⁷³ Andrew Wagner and Nsikan Akpan, *Why you should take a closer look at this week's NASA bill*, *PBS News Hour*, Mar. 24, 2017, 5:17 PM, <https://www.pbs.org/newshour/science/take-closer-look-weeks-nasa-bill>, (last visited March 15, 2018).

¹⁷⁴ 42 U.S.C.A. § 18311, *United States human space flight policy*, West, [https://1nextwestlaw.com.ezproxy.fau.edu/Document/N4CF69E70188411E7B6D8BE689CB59C06/View/FullText.html?transitionType=UniqueDocItem&contextData=\(sc.Default\)&userEnteredCitation=42+U.S.C.A.+s+18311](https://1nextwestlaw.com.ezproxy.fau.edu/Document/N4CF69E70188411E7B6D8BE689CB59C06/View/FullText.html?transitionType=UniqueDocItem&contextData=(sc.Default)&userEnteredCitation=42+U.S.C.A.+s+18311), (last visited March 19, 2018).

¹⁷⁵ *National and Commercial Space Programs*, 51 U.S.C.A. § 50702, <https://www.law.cornell.edu/uscode/text/51>, (last visited March 15, 2018).

Station into the private sector.”¹⁷⁶ In 2015, Congress extended *NASA’s* operations of the International Space Station through 2024.¹⁷⁷ The *2017 NASA Authorization Act* reemphasizes a commitment to the 2024 date and notes that “once developed and certified to meet the Administration’s safety and reliability requirements, United States commercially provided crew transportation systems can serve as the primary means of transporting United States government astronauts and international partner astronauts to and from the ISS.”¹⁷⁸

After 2024, the White House plans to have *NASA* shift its attention from the *ISS*. As of January 26, 2018, it is reported that the Trump administration is preparing to end *NASA* support of the International Space Station program by 2025.¹⁷⁹ Although the program is useful in conducting scientific research, it costs *NASA* “between \$3 to \$4 billion each year, and represents a more than \$87 billion investment from the US government.”¹⁸⁰ US leaders are confident that this money would be best utilized to help “fund the development of vehicles needed to explore deep space.”¹⁸¹

There are those that oppose this plan. Some fear that “canceling the *ISS* too

¹⁷⁶ Andrew Wagner and Nsikan Akpan, *Why you should take a closer look at this week’s NASA bill*, PBS News Hour, Mar. 24, 2017, 5:17 PM, <https://www.pbs.org/newshour/science/take-closer-look-weeks-nasa-bill>, (last visited March 15, 2018).

¹⁷⁷ Loren Grush, *Congress is trying to figure out what to do with the International Space Station after 2024*, The Verge, Mar. 22, 2017, 3:26 PM, <https://www.theverge.com/2017/3/22/15021540/nasa-iss-private-sector-turnover-plan-2024>, (last visited March 15, 2018).

¹⁷⁸ *National Aeronautics and Space Administration Transition Authorization Act of 2017*, Title III. Section 302(b)(1) <https://www.congress.gov/115/plaws/publ110/PLAW-115publ10.pdf>, (last visited March 15, 2018).

¹⁷⁹ Loren Grush, *Trump administration wants to end NASA funding for the International Space Station by 2025*, The Verge, 2018, <https://www.theverge.com/2018/1/24/16930154/nasa-international-space-station-president-trump-budget-request-2025>, (last visited March 15, 2018).

¹⁸⁰ *Id.*

¹⁸¹ *Id.*

early without a viable replacement could lead to a gap of human activities in lower Earth orbit.”¹⁸² “A similar scenario played out in 2011, when the Space Shuttle program ended. The Obama administration had canceled NASA’s initiative to return to the Moon, known as the Constellation program, leaving the space agency without a way to get its astronauts into space.”¹⁸³ In addition, many commercial space companies rely on the *ISS* to test their technologies.¹⁸⁴ Voicing opposition, Senator Bill Nelson (D-FL) recently said, “If the administration plans to abruptly pull us out of the *International Space Station* in 2025, they’re going to have a fight on their hands” as the move would decimate Florida’s blossoming commercial space industry.¹⁸⁵

Private Space companies are eager to learn what the future holds in store for them. “Several companies, including *Axiom Space*, *Bigelow Aerospace* and *NanoRacks* have proposed developing commercial stations, in some cases starting with commercial modules on the *ISS*.”¹⁸⁶ Although US Space law is in the process of being rewritten, it remains clear that the United States sees commercial enterprise as the future.

Luxembourg Law

Roughly the size of Rhode Island, Luxembourg has no Space agency, no launch sites, and minimal research capabilities.¹⁸⁷ This begs the question of why this tiny country has an interest in Space. Atossa Araxia Abrahamian, a writer for *The Guardian*, opines that “Luxembourg’s very essence – as a speck in the heart of Europe – allows, even requires, it to partake in such ambitious

¹⁸² *Id.*

¹⁸³ *Id.*

¹⁸⁴ *Id.*

¹⁸⁵ Jeff Foust, *Potential End of the ISS Raises Concerns, Presents Opportunities*, Space News, 2018, <http://spacenews.com/potential-end-of-the-iss-raises-concerns-presents-opportunities/>, (last visited Jan 26, 2018).

¹⁸⁶ *Id.*

¹⁸⁷ Atossa Araxia Abrahamian, *How a tax haven is leading the race to privatise space*, *The Guardian*, Sept. 15, 2017, <https://www.theguardian.com/news/2017/sep/15/luxembourg-tax-haven-privatise-space>, (last visited March 15, 2018).

ventures.”¹⁸⁸ A quick glance at this country’s economic history certainly shows that it has devoted “itself to anticipating and accommodating the needs of global capital.”¹⁸⁹ Prior to becoming a financial powerhouse (a tax haven), this tiny country’s main industry was steel mining.¹⁹⁰ When the satellite communications industry was just emerging in the 1980s (also coinciding with the demise of its steel industry), Luxembourg provided financial support and created a business-friendly environment (through tax breaks) that allowed it to become host to the world’s second-largest commercial satellite operator.¹⁹¹ Thirty years later, Luxembourg aims to become the nucleus of the Asteroid-Mining industry.¹⁹² Indeed, Luxembourg Deputy Prime Minister, Etienne Schneider, believes that the Space industry’s GDP growth in the country could reach 5% within 10 or 15 years.¹⁹³

Luxembourg is now the first European country to join the United States in adopting rules dictating ownership rights over Space resources.¹⁹⁴ Its parliament passed a law in 2017 giving companies the rights to Space resources they extract from asteroids or other celestial bodies while setting up a system for the government to authorize and supervise resource extraction

¹⁸⁸ Id.

¹⁸⁹ Id.

¹⁹⁰ Id.

¹⁹¹ Sarah Scoles, *Luxembourg’s Bid to Become the Silicon Valley of Space Mining*, Note 56, *Wired*, (Jan. 10, 2017: 7:00 AM), <https://www.wired.com/2017/01/luxembourg-setting-silicon-valley-space-mining/>, (last visited March 14, 2018).

¹⁹² David Drake, *Luxembourg takes a Bold Step towards Legislating Space Mining*, Note 46, *HedgeCo.*, (Jan. 12, 2017), <https://www.hedgeco.net/blogs/2017/01/12/luxembourg-takes-a-bold-step-towards-legislating-space-mining-by-david-drake/>, (last visited March 14, 2018).

¹⁹³ Michael Sheetz, *How Luxembourg is moving to put itself 'at the heart' of Europe's space exploration industry*, *CNBC*, 2017, <https://www.cnbc.com/2017/11/11/etienne-schneider-the-space-industry-is-now-2-percent-of-luxembourgs-gdp.html> (last visited Jan 3, 2018).

¹⁹⁴ Kelsey Tollefson, *Asteroid Prospects: The Facts And Future Of Space Mining*, Note 31, *Space Angels Network*, Jan. 11, 2017, 8:08 PM, <http://spaceangelsnetwork.com/2017/01/11/asteroid-prospects-the-facts-and-future-of-space-mining/>, (last visited March 14, 2018).

and other Space activities.¹⁹⁵ *Article One* provides that Space resources are capable of being appropriated in accordance with international law.¹⁹⁶ This legislation will ensure that private mining operators, based out of Luxembourg, can claim rights to the resources they extract from celestial objects.¹⁹⁷

Appraisal of the Future Conflict Between Nations

Claimed ownership of the Geosynchronous orbit has been a point of contention since the *Space Treaty*. The orbit is extremely desirable due to its location around the Earth's equator, as it is the ideal location for telecommunications satellites to maintain a constant link with their contact point on Earth.¹⁹⁸ As an essential component of intelligence-gathering, communications, entertainment, and enterprise, a spot on this orbit is in high demand. Recognizing its importance, some nations have fought for the territorial claim over the geosynchronous orbit by classifying it as airspace.

Most notable is the *Bogotá 8*. Created and led by Colombia in 1976, eight equatorial countries sought to secure the rights to the geostationary orbits directly above their territories.¹⁹⁹ They argued that they could do this by extending their sovereignty to Outer Space.²⁰⁰ These nations attempted to do this with the *1976 Bogotá Declaration*.²⁰¹ With this declaration, the *Bogotá 8* argued that the GSO arises directly from the Earth's gravity, thus implying that everything that lies in Earth's gravitational field is airspace.²⁰² This would

¹⁹⁵ Jeff Foust, *Luxembourg adopts space resources law*, SpaceNews.Com, 2017, <http://spacenews.com/luxembourg-adopts-space-resources-law/>, (last visited Jan 5, 2018).

¹⁹⁶ Id.

¹⁹⁷ Id.

¹⁹⁸ Elizabeth Howell, *Who Owns the Moon?* Space Law & Outer Space Treaties, Note 116, Space.com, (Jul. 15, 2016: 7:59 PM), <http://www.space.com/33440-space-law.html>, (last visited March 15, 2018).

¹⁹⁹ Nima Nayebi, *The Geosynchronous Orbit and the Outer Limits of Westphalian Sovereignty*, Hastings Science & Technology Law Journal, Vol. 3:2. (May 10, 2011).

²⁰⁰ Id.

²⁰¹ Id.

²⁰² Id.

allow the GSO to fall under air law instead of space law.²⁰³ They requested a special exemption for the GSO so that they could claim sovereignty without conflicting with the *Outer Space Treaty* and breaking international law under the established legal regime.²⁰⁴ They further claimed that the current system and solutions used and created by the *International Telecommunications Union* was “at present impracticable and unfair and would considerably increase the exploitation costs of this resource especially for developing countries that do not have equal technological and financial resources as compared to industrialized countries, who enjoy an apparent monopoly in the exploitation and use of its geostationary synchronous orbit.”²⁰⁵ In the end, the representative of the Soviet Union overwhelmingly rebutted the *Bogotá 8*'s argument.²⁰⁶ The subcommittee agreed that claims of sovereignty over the GSO or any other part of outer space are incompatible with the spirit of the *Outer Space Treaty* and should be dismissed.²⁰⁷ On top of this, none of the *Bogotá 8* were space-capable.²⁰⁸ This is significant because their actions could have potentially led to another space-capable nation to do the same and claim the GSO over their territory.²⁰⁹

Even though the *Bogotá 8* was defeated, the battle over the GSO still continued. Colombia, who signed the *Outer Space Treaty* but did not ratify it, went so far as to claim sovereignty over the GSO directly over their land in the *1991 Colombian Constitution. Article 101, Paragraph 4* states:

Also part of Colombia is the subsoil, the territorial sea, the contiguous

²⁰³ Lieutenant Colonel Patrick W. Franzese, *Sovereignty in Cyberspace: Can It Exist*, 64 A.F. L. Rev. 1, 26 (2009).

²⁰⁴ Nima Nayebi, *The Geosynchronous Orbit and the Outer Limits of Westphalian Sovereignty*, Note 201, *Hastings Science & Technology Law Journal*, Vol. 3:2. (May 10, 2011).

²⁰⁵ *Bogota Declaration* (1976), available at http://www.jaxa.jp/library/space_law/chapter_2/2-2-1-2_e.html.

²⁰⁶ Nima Nayebi, *The Geosynchronous Orbit and the Outer Limits of Westphalian Sovereignty*, Note 201, *Hastings Science & Technology Law Journal*, Vol. 3:2. (May 10, 2011).199

²⁰⁷ Id.

²⁰⁸ Id.

²⁰⁹ Id.

zone, the continental shelf, the exclusive economic zone, the airspace, the segment of the geostationary orbit, the electromagnetic spectrum and the space in which it operates, in accordance with international law or the laws of Colombia in the absence of international regulations.²¹⁰

Article 102, Paragraph 1 then follows up by saying, “The territory with the public resources that are part of it, belong to the nation.”²¹¹ Colombia’s actions, even though it can be argued that they are in direct violation of international law, shows that it still believes it can lay claim over the GSO directly above it and that it believes that the current legal regime is unfair to developing nations.²¹² Colombia is not alone in this conflict. China has also played around with the idea of claiming sovereignty in outer space. They are doing this by exploring the differences between *res nullius*, (areas which may be appropriated as national territory), and *res extra commercium* (areas which may *not* be appropriated as national territory).²¹³ As the common heritage and global commons adds another dimension to these legal principles,²¹⁴ countries like China are realizing that the status-quo has been altered in a way that could lead to a change in the international legal structure in regard to space.

The enactment of domestic Space law (e.g.; the *U.S. Space Act*) combined with the emergence of non-state Spacefaring actors will likely create Westphalian boundary disputes and property right conflicts with nations whose laws clash. Affording United States citizens with the right to claim Space resources will be seen as a direct blow to customary international law making. This has already encouraged Luxembourg to enact its own domestic Space law and is likely to influence other Spacefaring nations to create similar

²¹⁰ *Colombian Constitution* (1991),

http://confinder.richmond.edu/admin/docs/colombia_const2.pdf, (last visited March 15, 2018).

²¹¹ *Id.*

²¹² Nima Nayebi, *The Geosynchronous Orbit and the Outer Limits of Westphalian Sovereignty*, Note 201, *Hastings Science & Technology Law Journal*, Vol. 3:2. (May 10, 2011).

²¹³ *Id.*

²¹⁴ *Id.*

legislation that benefits their own citizens. It is expected that not all nations would have the same values and beliefs. Without international discussion, this inevitable free-for-all of domestic law making will most likely produce laws that oppose each other. If this domino effect creates opposing laws then there will be conflict in Space, which consequently creates conflict on Earth. China and Russia will likely be the next candidates to implement domestic policy for space, which could lead to major legal and political issues.²¹⁵

IV. Recommendations

There is a deficiency in Space jurisprudence; the legal system pales in comparison to the exponential growth of the Space industry. While there are several treaties signed by many nations, depending on interpretation, private entities may not be covered under existing treaties.²¹⁶ Also, the priorities which drove the creation of some of these treaties has changed now that many years have passed.²¹⁷ This, coupled with the rise of non-state actor involvement in Outer Space ventures means that policy needs to be updated to reflect our present realities.²¹⁸

Correcting the Flaws in Recent Laws

The matter of Asteroid-Mining illustrates the conflict in the jurisprudence of Space. The *U.S. Space Act* says a United States citizens' claim of ownership

²¹⁵ Rob Davies, *Asteroid mining could be space's new frontier: the problem is doing it legally*, The Guardian, Feb. 6, 2016: 11:00 AM, <https://www.theguardian.com/business/2016/feb/06/asteroid-mining-space-minerals-legal-issues>, (last visited March 15, 2018).

²¹⁶ Elizabeth Howell, *Who Owns the Moon?* Space Law & Outer Space Treaties, Note 121, Space.com, (Jul. 15, 2016: 7:59 PM), <http://www.space.com/33440-space-law.html>, (last visited March 15, 2018).

²¹⁷ Id.

²¹⁸ Id.

begins as soon as the existence of metals on an asteroid are detected.²¹⁹ But what if other Spacefaring nations decide to have laws for their citizens which are contrary to the standard proscribed by *U.S. Space Act*?²²⁰ Hypothetically, if the Chinese follow suit and formulate their own domestic Asteroid-Mining laws, which happen to conflict with American law, who's laws will govern when they both decide to mine the same asteroid?

The *U.S. Space Act* has made private investors ecstatic at their newly attained freedom, but one predicament everyone seems to be missing is that this law is insufficient to ensure a loosely regulated industry.²²¹ For instance, the *U.S. Space Act* only gives ownership of resources already mined.²²² However, there is no legal claim of right given for the unmined resources. Picture a United States based private company discovering valuable metals on a particular asteroid, then imagine the next day another company arrives and begins to mine the same ground at the same time.²²³ For this reason, there has to be international regulation to ensure that only the party that made the initial discovery can own the mining rights to that particular asteroid, even if this ownership is temporary.²²⁴ Furthermore, the *U.S. Space Act* fails to establish an agency or process for issuing Asteroid-Mining licenses.²²⁵ “The *Federal Aviation Administration* issues launch licenses and re-entry licenses, but there

²¹⁹ Clive Thompson, *Space Mining Could Set Off a Star War*, Note 166, *Wired*, Jan. 14, 2016, 7:00 AM, <https://www.wired.com/2016/01/clive-thompson-11/>, (last visited March 15, 2018)164.

²²⁰ *Id.*

²²¹ David Drake, *Luxembourg takes a Bold Step towards Legislating Space Mining*, Note 46, *HedgeCo.*, (Jan. 12, 2017), <https://www.hedgeco.net/blogs/2017/01/12/luxembourg-takes-a-bold-step-towards-legislating-space-mining-by-david-drake/>, (last visited March 14, 2018).

²²² *Id.*

²²³ *Id.*

²²⁴ *Id.*

²²⁵ Clive Thompson, *Space Mining Could Set Off a Star War*, Note 166, *Wired*, Jan. 14, 2016, 7:00 AM, <https://www.wired.com/2016/01/clive-thompson-11/>, (last visited March 15, 2018)164.

is no agency responsible for anything that happens in orbit or beyond.”²²⁶ Asteroid-Mining should be internationally regulated to some degree. Where there is no order, chaos is inevitable.

The United States and Luxembourg have set dangerous precedent by enacting their own laws determining property rights in Space. Nations cannot be permitted to independently decide when and how its citizens obtain rights over Space resources, particularly when existing customary international law conflicts (i.e.; the *Space Treaty*). Laws in Space directly or indirectly affect all nations on Earth, thus Space law should be a topic determined through global discussion. “What concerns all must be decided upon by all.”²²⁷ The Roman Empire truly had it right when they made this statement their legal maxim.²²⁸

Alternative Parallel Development Schemes The Moon Agreement and the Sea Treaty

Principles from existing terrestrial law and Space agreements may be utilized and serve as an exemplar for the future of the Space industry. The world’s nations could look to the *Moon Agreement* and the *Sea Treaty* as parallel development schemes for the creation of laws governing Space.

The *Moon Agreement’s* failed effort to create a universal authority in Space could be the best place to start for new laws regarding Outer Space. Although the United States is not a signatory to this treaty due to disagreement with certain provisions, most of the principles proposed may be favorable to all

²²⁶ Jon Kelvey, *Is It Legal to Mine Asteroids?* Slate, Note 162, Oct. 13, 2014: 5:45 PM, http://www.slate.com/articles/health_and_science/space_20/2014/10/asteroid_mining_and_space_law_who_gets_to_profit_from_outer_space_platinum.html, (last visited March 15, 2018).

²²⁷ Gbenga Oduntan, *Who Owns Space? US Asteroid-Mining Act Is Dangerous And Potentially Illegal*, Note 146, The Conversation, Nov. 25, 2015, 6:34 AM, <https://theconversation.com/who-owns-space-us-asteroid-mining-act-is-dangerous-and-potentially-illegal-51073>, (last visited March 15, 2018).

²²⁸ Id.

nations if properly restructured.²²⁹ For instance, the following provisions imposed by the *Moon Agreement* could be agreeable incentives: (1) peaceful exploration and use of celestial bodies; (2) prevention of contamination of celestial bodies; (3) equal access to celestial bodies for all states; (3) the *United Nations* must be informed of any activities on celestial bodies; and (4) the creation of an international regime.²³⁰

The biggest issue major Spacefaring nations have with both the *Space Treaty* and the *Moon Agreement* is the imposed benefits clauses. Because they are based off of the international relations theory of Liberalism, these benefits clauses emphasize the sharing of Space resources and intellectual property (i.e.; Space technology) with the global community. Consider for a moment, policy-oriented jurisprudence; the approach *Toward a World Public Order of Human Dignity*.²³¹ Through policy-oriented jurisprudence, “law” is the process by which members of a public community seek to illuminate and secure their common interests.²³² This approach demands satisfaction of eight values which all humans desire: (1) respect; (2) power; (3) enlightenment; (4) well-being; (5) wealth; (6) skill; (7) affection; and (8) rectitude.²³³ It can be interpreted that “sharing” among the public is an inherent element. The goal of this approach is to maximize access to all eight values by expanding beyond just attaining the greatest happiness for the greatest number of people, which may leave some minorities out in the cold.²³⁴ If Outer Space is infinite,

²²⁹ Phillippa Blabler & Angélique Verrecchia, *The Moon Agreement, Born for Space*, Dec. 17, 2013, <https://born4space.wordpress.com/2013/12/17/the-moon-agreement/>, (last visited March 16, 2018).

²³⁰ *Id.*

²³¹ Siegfried Wiessner & Andrew R. Willard, *Policy-Oriented Jurisprudence and Human Rights Abuses in Internal Conflict: Toward a World Public Order of Human Dignity*, 93 Am. J. Int'l L. 316, 317, 1999.

²³² *Id.* at 319.

²³³ Siegfried Wiessner, *The New Haven School of Jurisprudence: A Universal Toolkit for Understanding and Shaping the Law*, 18 Asia Pacific L. Rev. 45-61 (2010); see also Siegfried Wiessner & Andrew R. Willard, *Policy-Oriented Jurisprudence*, 44 GERMAN Y.B. INT'L L. 96-112 (2001).

²³⁴ Siegfried Wiessner & Andrew R. Willard, *Policy-Oriented Jurisprudence and Human Rights Abuses in Internal Conflict: Toward a World Public Order of Human Dignity*, Note 233, 93 Am. J. Int'l L. 316, 317, 1999.

shouldn't everyone have an equitable shot at it?²³⁵

Unfortunately, no. Let's face it, people don't like to share. If this "sharing" requirement is included in any future Space agreements, it is not likely to be signed by nations that value the international relations theory of realism, which advocates for actions that promote a state's own interests for self-preservation.²³⁶ Proof of this realist perspective is demonstrated by the United States' enactment of the *U.S. Space Act* and Luxembourg's recently adopted Space law.

Liberals believe that international institutions are key to shaping policy choices and encouraging cooperation between states.²³⁷ The international community or *United Nations* could create a regime that mirrors the legal structure established by the *Moon Agreement*, except for the portions requiring redistribution of resources and sharing of intellectual property. Once an international regime is formed which consists of all Spacefaring nations, this administration could develop individual Space authorities, such as an *International Asteroid-Mining Authority* ("IAMA") to oversee safe and orderly development of the Asteroid-Mining industry. Also, IAMA could provide day-to-day management of the parties participating in resource extraction from celestial bodies. IAMA would be comparable to the *International Seabed Authority* suggested by the *Sea Treaty*.²³⁸

²³⁵ Nick Stockton, *Congress Says Yes to Space Mining, No to Rocket Regulations*, Note 169, *Wired*, Nov. 18, 2015: 10:00 AM, <https://www.wired.com/2015/11/congress-says-yes-to-space-mining-no-to-rocket-regulations/>, (last visited March 15, 2018).

²³⁶ Anne-Marie Slaughter Burley, *International Law and International Relations Theory: A Dual Agenda*, Note 126, 87 *The Am. J. of Int'l L.* 205, 207-09 (1993).

²³⁷ *Id.* (explaining the application of liberal international relations theory to law); see also Eric B. Shiraev & Vladislav M. Zubok, *International Relations*, Note 128, New York: Oxford University Press, 78-87 (2d ed. 2014), (last visited March 15, 2018), (explaining the approach of liberalism).

²³⁸ Marjorie Ann Browne, *CRS Issue Brief for Congress: The Law of the Sea Convention and U.S. Policy*, The Library of Congress, (last updated June 16, 2006), http://www.gc.noaa.gov/documents/gcil_crs_2006_report.pdf, (last visited March 16, 2018).

Orbital Slots Model

The world could look to other functioning systems in Space for structural guidance. For instance, the system that allocates orbital slots for satellites.²³⁹ But even orbit slots are dispersed by a first come, first serve basis.²⁴⁰ Additionally, due to solar heating, asteroids orbit in an individual and unpredictable manner, which would make determining any territorial limits on a specific set of asteroids quite difficult.²⁴¹

Recommendation Free Market Approach

In light of the *Space Treaty*, there is a notion that claims to sovereignty have no place in Space. On the contrary, claims to sovereignty in Space may be in the best interest of the world community, given the tendency to neglect shared resources on Earth.²⁴² Common resources are easy to disregard when they seem abundant.²⁴³ For example, it doesn't seem wrong to pollute the air or water if, technically, no one owns these resources and the individual damage isn't exceedingly noticeable.²⁴⁴ Space-debris is evidence that this same view exists in the mind of a Space pioneer. Sovereignty would help preserve the

²³⁹ Michael J. Finch, *Limited Space: Allocating the Geostationary Orbit*, 7 NORTHWESTERN J. OF INT'L L. & BUSINESS (1986), <http://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?article=1216&context=njilb>, (last visited March 16, 2018).

²⁴⁰ ²⁴⁰ Nick Stockton, *Congress Says Yes to Space Mining, No to Rocket Regulations*, Note 169, *Wired*, Nov. 18, 2015: 10:00 AM, <https://www.wired.com/2015/11/congress-says-yes-to-space-mining-no-to-rocket-regulations/>, (last visited March 15, 2018).

²⁴¹ Bill Steigerwald, *New Animation Follows Long, Strange Trip of Bennu – Target of NASA's Asteroid Sample Return Mission*, Nat'l Aeronautics and Space Administration, (last updated July 30, 2015), <https://www.nasa.gov/content/goddard/bennus-journey>, (last visited March 24, 2018).

²⁴² Garrett Hardin, *The Tragedy of the Commons*, 162 *Science* 1243 (1968).

²⁴³ James Fieser, *The Environment, From Moral Issues that Divide Us and Applied Ethics: A Sourcebook* (Jan. 1, 2015), <https://www.utm.edu/staff/jfieser/class/160/10-environment.htm>, (last visited March 16, 2018).

²⁴⁴ *Id.*

Space environment and prevent accumulating Space-debris. Generally, people are more inclined to respect something owned to avoid conflict with the owner who is likely to defend his ownership.

Some argue that without the ability to own property in space, firms will not invest and develop Space business.²⁴⁵ On top of that, the treaties which are the framework of international space law contain language and definitions of key words that are inconsistent either among the five treaties or in the translations in the official languages of the *United Nations*.²⁴⁶ To add to this, the enforcement of the provisions of these treaties is extremely weak as documented by Colombia's constitution and China's 2007 anti-missile tests.²⁴⁷ It is left to the negotiations between aggrieved parties and the guidance of a *UN* Commission to make recommendations to the affected nations.²⁴⁸ Dr. Henry Hertzfeld, a leading expert on Space law, remains optimistic that commercial enterprise in Space has a future but cautions that change must be made to provide incentive to private businesses.²⁴⁹

Free market systems encourage protection of the environment because the resources are privately owned and privately managed.²⁵⁰ Nevertheless, the government may step in and establish some regulation to prevent misuse.²⁵¹ In a radical free market system, the environment and its resources are only subject to minimal public requirements and governmental regulation.²⁵² While remaining within the limits of sensible and balanced regulation, Space pioneers should be afforded the right to partake in almost any activity they

²⁴⁵ Dr. Henry Hertzfeld, *The Moon is a Land Without Sovereignty: Will It be a Business-Friendly Environment?* 3 *High Frontier* 2, 42-44, 2007, <http://www.afspc.af.mil/Portals/3/documents/HF/AFD-070322-103.pdf>, (last visited March 19, 2018).

²⁴⁶ *Id.*

²⁴⁷ *Id.*

²⁴⁸ *Id.*

²⁴⁹ *Id.*

²⁵⁰ James Fieser, *The Environment, From Moral Issues that Divide Us and Applied Ethics: A Sourcebook*, Jan. 1, 2015, <https://www.utm.edu/staff/jfieser/class/160/10-environment.htm>, (last visited March 16, 2018).

²⁵¹ *Id.*

²⁵² *Id.*

desire with their own property.

One possible form of regulated ownership could come in the form of temporary leaseholds over portions of celestial bodies. These leaseholds would expire after a reasonable time period that affords Space companies to procure enough resources to make their mission worthwhile. After the expiration of a leasehold, another company may claim this same leasehold. The private owner is less inclined to cause damage because it would be depleting the company's ownership value, and the surrounding owners who are affected are likely to sue. Meanwhile, the government intervention contributes its broader assessment of the universal impact. Both forces balance each other out. The institutional structure for this government intervention could be provided by a novel, specialized body, an *International Outer Space Agency*.²⁵³

Considering the substantial cost and tremendously technical undertaking associated with reaching the Moon and other celestial bodies, it seems apparent that sovereign claim to local resources is an essential element influencing growth in any Space industry. The economic freedom of a free market system will more than likely encourage the continued advancement of the Space endeavors. Investors need assurance that their investment will return profit.

Liability

The world is not what it once was. The world has evolved, and with it, law must adapt to these changes. The *Space Treaty* was created during a time when there was a fear plaguing the world that nations would simply take land by force from other countries – like Germany did during World War II.²⁵⁴ The *Space Treaty* was formed to combat this fear and foster cooperation between nations, by implementing a general rule that Outer Space was for the public per the dictum of *res communis*, and no one could lay claim to anything in

²⁵³ Siegfried Wiessner, *The Public Order of the Geostationary Orbit: Blueprints for the Future*, 9 *The Yale Journal of World Public Order* 217, 272, 1983.

²⁵⁴ Anne-Marie Slaughter Burley, *International Law and International Relations Theory: A Dual Agenda*, Note 126, 87 *The Am. J. of Intl'l L.* 205, 207-09, 1993.

it.²⁵⁵ Since then, the *United Nations* has helped to subside this fear.²⁵⁶

The future of Space law is tied with Thomas Friedman's theory of Globalization.²⁵⁷ When the foundation of Space law was written, the world was in the first stage – interactions between states.²⁵⁸ Now, we are moving towards the second stage, interactions between businesses.²⁵⁹ With this in mind, we must adapt from traditional international law and gravitate towards a more business and contract-oriented law. Under the *Space Treaty*, "States shall be responsible for their national activities" in Space, "whether carried on by governmental or non-governmental entities."²⁶⁰

Simply put, a country is liable for any Spacecraft that operate under their roof. This may have been adequate law during the Cold War era when private party involvement in Outer Space operations was inconceivable, but now that there is major private actor involvement, policy must mold to shifting tides. Private actors must be held accountable for their decisions via an appropriate legal mechanism. If a nation and a private company decide to operate together, then they will both be held jointly and severally liable for their operational errors. But nations cannot afford to allow private entities to operate under the impression that their country will always fix their individual mistakes. As a system, by moving from a macro to a micro scale, the Space community will be able to better innovate, allow those involved to protect their trade secrets, and promote the industry as a whole all while ensuring that they are held

²⁵⁵ Cyril E. S. Horsford, *Current Aspects of Space Law*, 27 *The Modern L. Rev.* 50-54 (1964), www.jstor.org/stable/1092256, (last visited March 16, 2018).

²⁵⁶ James P. Muldoon Jr., Earl Sullivan, JoAnn Fagot Aviel, Richard Reitano, *Multilateral Diplomacy and the United Nations Today*, Westview Press 311, 2005.

²⁵⁷ Thomas Friedman, *It's a Flat World After All*, Note 11, *New York Times*, Apr. 3, 2005, <http://www.nytimes.com/2005/04/03/magazine/its-a-flat-world-after-all.html>, (last visited March 14, 2018).

²⁵⁸ *Id.*

²⁵⁹ *Id.*

²⁶⁰ 2222 (XXI) *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space*, United Nations Office for Outer Space Affairs, Oct. 10, 1967, <http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html>, (last visited March 15, 2018).

directly accountable for any impropriety or errors.

International Outer Space Agency

A multilateral *International Outer Space Agency* (“IOSA”) has yet to be established.²⁶¹ As foreshadowed in the *Moon Agreement*, such a decision-making body should already be in place.²⁶² The 1998 *ISS Agreement*²⁶³ (which established the International Space Station) shows that such multilateral cooperation is possible. This agreement is important in that it was done without the *United Nations* and allows individual countries to maintain its own jurisdiction over certain modules as well as provide protection for intellectual property and procedures for criminal prosecution.

The *IOSA* could serve as a one-stop-shop for all problems in Outer Space by collecting all available information and supplying guidance on Space science and technology.²⁶⁴ It would also serve as a framework for building specific industries such as Asteroid-Mining and Space tourism.²⁶⁵ Although faced with the problem of individual sovereignty and multilateral unity, a global authority is needed to forego the dilemmas established in this article before the fast-approaching Space industry forces nations to create their own domestic laws, like the United States and Luxembourg have already done with their domestic Space laws.

This global authority can be formed through international agreement by a

²⁶¹ Jon Kelvey, *Is It Legal to Mine Asteroids?*, Slate, Oct. 13, 2014: 5:45 PM, http://www.slate.com/articles/health_and_science/space_20/2014/10/asteroid_mining_and_space_law_who_gets_to_profit_from_outer_space_platinum.html, (last visited March 15, 2018).

²⁶² Siegfried Wiessner, *The Public Order of the Geostationary Orbit: Blueprints for the Future*, 9 *The Yale Journal of World Public Order*, 217, 272 (1983).

²⁶³ National Aeronautics and Space Administration, *Space Station Assembly*, https://www.nasa.gov/mission_pages/station/structure/elements/partners_agreement.html, (last visited March 16, 2018).

²⁶⁴ Siegfried Wiessner, *The Public Order of the Geostationary Orbit: Blueprints for the Future*, 9 *The Yale Journal of World Public Order*, 217, 272 (1983).

²⁶⁵ *Id.*

congregation of the major Space-capable nations. While staying within some bounds of the *Space Treaty*, this congregation should form updated international agreements that address the concerns of nations and non-state actors.²⁶⁶ Even though it is important to allow the free market to set its direction, balanced government intervention is necessary to create a uniform and systemized set of laws. Following a free market approach, the international agreements should be sensible but not so overly restrictive that industrial growth is hindered. The agreements could establish the following:

- a) An impartial global authority governing all issues in Outer Space.
- b) The specific threshold required to be a “Major Spacefaring” member with veto power. Technological and financial qualifications will be considered.
- c) Reasonable and uniform protection standards on how resources are to be cultivated and activities to be conducted in order to avoid dangerous practices that may threaten the industry and environment.
- d) Process for issuing Space activity-licenses.
- e) Options for lease holder rights to particular celestial bodies, to avoid conflicting claims of rights.
- f) Consequences to ensure that Space industries and polices are not abused. This includes civil and criminal penalties, and the system of enforcement.

Framework for International Cooperation

Our proposed system would operate as such at the domestic level – private Spacefaring companies will congregate together within their own country. Each private company will cooperate with the others to determine their own propositions for rules and discuss mutual aspirations. Within this cartel-like

²⁶⁶ Jon Kelvey, *Is It Legal to Mine Asteroids?*, Slate, Oct. 13, 2014: 5:45 PM, http://www.slate.com/articles/health_and_science/space_20/2014/10/asteroid_mining_and_space_law_who_gets_to_profit_from_outer_space_platinum.html, (last visited March 15, 2018).

structure,²⁶⁷ a “Panel” will be formed consisting of three elected ambassadors. One ambassador will be appointed by the coalition of private companies while the nation’s government will appoint the other two ambassadors (with one possibly from the *Office of Space Commerce*).

This Panel will represent both private and national interests at the *IOSA*. In preparation for the *IOSA*, this Panel will congregate independently to determine their cumulative interests. In case of disagreement between a private and a national party within a country, a tie vote can be broken by the second government ambassador. Theoretically, the safeguard of a two-thirds majority representation in each country ensures that private companies will be less likely to corrupt the system and society is represented as a whole. That said, the government must take measures to ensure that their ambassadors are not institutionally corrupted by industry interest groups in some form of “regulatory capture.”²⁶⁸

All ambassadors from each Spacefaring nation would congregate at the *IOSA* headquarters to discuss policy, industry, and all other issues related to Outer Space. All Panels would have the ability to bring proposals for policy change to the *IOSA*, and each Panel will have voting privileges. An elected *IOSA* council would operate the congregations and establish rulings based on the votes of all Panels. Panels from major Spacefaring nations would have veto power to resolve conflict and abolish outlandish proposals brought before the *IOSA* by other Panels. Such a system will ensure that policy decisions are based on consensus as the self-regulatory nature will cause the involved actors to efficiently work together for the benefit of the Space community.

Once Space industries expand, the ultimate goal will be to gravitate towards a

²⁶⁷ ‘Narconomics’: *How The Drug Cartels Operate Like Wal-Mart And McDonald’s*, NPR, Feb. 15, 2016: 1:05 PM, <http://www.npr.org/2016/02/15/466491812/narconomics-how-the-drug-cartels-operate-like-wal-mart-and-mcdonalds>, (last visited March 16, 2018).

²⁶⁸ Scott Hempling, *Regulatory Capture: Sources and Solutions*, Emory Corporate Governance and Accountability Review, Volume 1, Issue 1, 2014, <http://law.emory.edu/ecgar/content/volume-1/issue-1/essays/regulatory-capture.html>, (last visited March 16, 2018).

system like *FIFA* (minus the rampant corruption).²⁶⁹ Under a system like *FIFA*,²⁷⁰ continental regions, consisting of multiple Spacefaring nations, would operate independently but always in accordance with the rules of the global authority—*ISOA*.²⁷¹ Each region would have standing committee members that attend the global congress to advise and assist the *ISOA*, while also representing the majority interests of their region by voting; this promotes more uniformity and alleviates congestion at the global conference. In a system like *FIFA* there would be fewer ambassadors at the global congress, yet all nations' interests would be represented because their voices can still be heard at the regional level.

A Realist Approach – Diverging Ideologies

In the sphere of international relations, the debate is divisive between supporters of liberalism and realism. While liberalism emphasizes cooperation between nations, realism “is a view of international politics that stresses its competitive and conflictual side... Realists consider the principal actors in the international arena to be states, which are concerned with their own security, act in pursuit of their own national interests, and struggle for power.”²⁷² The theory has been promulgated by philosophers including Thucydides, Machiavelli, Hobbes, and Kenneth Waltz.²⁷³

United States *Secretary of State* Henry Kissinger used the theory to navigate the complexity of international politics and has essentially become a poster-

²⁶⁹ The Fédération Internationale de Football Association (FIFA) is the governing body of organized soccer around the world. It is comprised of regional confederations made up of member nations. Representatives from each confederation make up the Congress, FIFA's Supreme governing body.

²⁷⁰ *Who We Are*, FIFA.COM, <http://www.fifa.com/about-fifa/who-we-are/index.html>, (last visited Apr. 19, 2017).

²⁷¹ Committees, FIFA.COM, <http://www.fifa.com/about-fifa/committees/index.html#standingscommittee>, (last visited Apr. 19, 2017).

²⁷² W. Julian Korab-Karpowicz, *Political Realism in International Relations*, Stanford Encyclopedia of Philosophy (2010), <https://plato.stanford.edu/entries/realism-intl-relations/>, (last visited March 16, 2018).

²⁷³ *Id.*

child for the philosophy. As an article by famed biographer, Walter Isaacson, notes, “he forged a détente with the Soviet Union and an opening to China, then played off both to create a triangular balance of power that preserved the U.S.’s influence after its retreat from Vietnam.”²⁷⁴ In his 2014 book, *World Order*, Kissinger maintains that “Westphalian principles are... the sole generally recognized basis of what exists of a world order.”²⁷⁵

Kissinger showcases the theory of realism as he describes the context leading to Hitler’s invasion of Czechoslovakia. He writes in *A World Restored*,

Those ages which in retrospect seem most peaceful were least in search of peace.... Whenever peace -- conceived as the avoidance of war -- has been the primary objective of a power or a group of powers, the international system has been at the mercy of the most ruthless member of the international community.²⁷⁶

Kissinger promotes the realist argument when he expounds on British Prime Minister Chamberlain’s mistake. “It is a mistake to assume that diplomacy can always settle international disputes if there is ‘good faith’ and ‘willingness to come to an agreement’.”²⁷⁷ He follows by professing, “most fundamental problem of politics ... is not the control of wickedness but the limitation of righteousness.”²⁷⁸

A Realpolitik Approach in Space

U.S. President Donald Trump has embraced realism with his “America First” doctrine. Speaking at the *12th Eilene M. Galloway Symposium on Critical Issues in Space Law* in Washington, D.C., Dr. Scott Pace listed seven “core

²⁷⁴ Walter Isaacson, *Henry Kissinger Reminds Us Why Realism Matters*, Time, 2014, <http://time.com/3275385/henry-kissinger/>, (last visited March 16, 2018).

²⁷⁵ Id.

²⁷⁶ Robert Kaplan, *Kissinger, Metternich, and Realism*, The Atlantic, 1999, <https://www.theatlantic.com/magazine/archive/1999/06/kissinger-metternich-and-realism/377625/>, (last visited March 16, 2018).

²⁷⁷ Id.

²⁷⁸ Id.

elements” of the Trump Administration’s policy approach in Space:²⁷⁹

1. Support activities that advance U.S. national interests internationally. Quoting National Security Adviser H.R. McMaster: “America first does not mean America alone.”
2. Strive to be the most attractive jurisdiction in the world for private sector investment and innovation in space with a light touch of regulation.
3. Use legal and diplomatic means to create a stable, peaceful environment for governmental and commercial space activities.
4. Provide confidence to the private sector that it can profit from capital investments made to develop and utilize in-situ resources, commercial infrastructure and facilities in space.
5. Respond to questions about how the United States registers space objects and the responsibilities of space object ownership and operation.
6. Develop non-binding international norms complementary to the existing legal regime through best practices and confidence building measures — but no new treaties or international arms control agreements.
7. Reject the notion that space is a “global commons” or “common heritage of mankind” or “res communis” or a public good.

With these seven principles, the Trump administration fully espouses the basic principles of realism. By promoting “America First,” the administration places emphasis on states as central actors in the international community rather than individuals or organizations. Under the realist theory, opposing jurisdictions are not only possible, but desirable. The competition between states will result in environments that maximize growth in the Space industry. Thus, instead of having a slow-acting supranational governing entity, order will be imposed by the opposing actors. Business will gravitate towards the most inviting environments. As alluded to earlier, the United States and

²⁷⁹ Marcia Smith, *Pace Outlines Trump Administration’s Approach to Space Development and Law Space Policy Online* (2017), <https://spacepolicyonline.com/news/pace-outlines-trump-administrations-approach-to-space-development-and-law/> (last visited Jan 4, 2018).

Luxembourg are priming themselves to take prime position in this race. Finally, because all states desire power to ensure their own self-preservation, the system holds that each state actor will act rationally to maximize their self-interest.

Addressing the Potential Pitfalls of Liberalism

While our proposed system borrows heavily from *liberalism*, it is important to recognize the pitfalls that stem from this approach. After all, “[l]aw is nothing other than a certain ordinance of reason for the common good, promulgated by the person who has the care of the community.”²⁸⁰

The issue with law and politics is that we as a society often fail to recognize opposing stances. Polarized sides are quick to dismiss the other’s critiques as blasphemy forgetting that both parties seek what is best for the community – all that differs is their proposed solutions. If we are to accept Friedrich Nietzsche’s declaration that “there are no facts, only interpretations”²⁸¹ then we should address the views of divergent philosophies when seeking a solution.

One such issue that arises from a liberal system is that of maintaining pace. Dr. Pace explains that “technology and entrepreneurship threaten to outpace the legal and domestic regulatory mechanisms intended to enable and manage [S]pace activities. When technological generations occur every 18 months or so, it would appear to outside observers that the pace of international [S]pace discussions at the United Nations is, by comparison, glacial.”²⁸²

²⁸⁰ Thomas Aquinas, <https://www.brainyquote.com/topics/law>, (last visited March 16, 2018).

²⁸¹ Friedrich Nietzsche, <https://www.psychologytoday.com/blog/here-there-and-everywhere/201210/50-quotes-perspective>, (last visited March 16, 2018).

²⁸² Scott Pace, *Space Development, Law, and Values*, IISL Galloway Space Law Symposium. 12th Eilene M. Galloway Symposium on Critical Issues in Space Law (Jan. 3, 2017), spacepolicyonline.com/wp-content/uploads/2017/12/Scott-Pace-to-Galloway-FINAL.pdf?utm_content=buffer66778&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer, (last visited March 16, 2018).

In addition, one must come to terms with the conflicting notions between liberalism and individual sovereignty. It is for that reason that Dr. Pace disagrees with the *Moon Agreement*.²⁸³ In the same symposium speech mentioned earlier, Dr. Pace took issue with an agreement that was “more restrictive than the laws we have here in the United States” and was “contrary to American interests.”²⁸⁴ Following the realist ideology, the self-interest of a state actor will cultivate a more viable atmosphere for investment and growth. By trusting in the self-interest of the individual state actors, the Trump administration proposes a system that develops “non-binding international norms that are complementary to the existing legal regime through both ‘bottom-up’ best practices developed cooperatively with other space actors, and ‘top-down’ non-legally binding confidence-building measures.”²⁸⁵

We live “[i]n a world in which space capabilities are increasingly global.”²⁸⁶ Because of this, “no one state will be in a position to impose rules unilaterally for the exploration and development of [S]pace.”²⁸⁷ Since numerous competing interests deter a functional supranational order, “the task for the United States, if it wishes to influence how [S]pace is developed and utilized, is to create attractive projects and frameworks in which other nations choose to align themselves and their space activities with us, as opposed to others.”²⁸⁸ By leading the Space race, the United States can ensure that the values of “democracy, liberty, free enterprise, and respect for domestic and international

²⁸³ Marcia Smith, *Pace Outlines Trump Administration’s Approach To Space Development And Law*, SpacePolicyOnline, (last updated Dec. 13, 2017, 9:29 PM), <https://spacepolicyonline.com/news/pace-outlines-trump-administrations-approach-to-space-development-and-law/>, (last visited March 16, 2018).

²⁸⁴ Scott Pace, *Space Development, Law, and Values*, Note 284, IISL Galloway Space Law Symposium. 12th Eilene M. Galloway Symposium on Critical Issues in Space Law (Jan. 3, 2017), spacepolicyonline.com/wp-content/uploads/2017/12/Scott-Pace-to-Galloway-FINAL.pdf?utm_content=buffer66778&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer, (last visited March 16, 2018).

²⁸⁵ Id.

²⁸⁶ Id.

²⁸⁷ Id.

²⁸⁸ Id.

law in a peaceful international order” are well-represented in Space.²⁸⁹

It is for these reasons that we need a global self-regulating entity like the *IOSA* where the actors involved will be motivated to think as a collective unit so as to achieve their own self-interests. It will be in everyone’s interest to be efficient and decisive, as the success of the group as a whole will lead to substantial benefits for the individual actors; likewise, dragging their feet will only stifle their investment opportunities when the group leaves them behind. The free market will determine who survives within this structure and the systematized industry will work collectively to further itself. Thus, if the United States and Luxembourg want to be front-runners in Space, they must effectively become global leaders by cultivating a premier investment opportunity for businesses while inspiring others to believe that their success is shared by all.

If we turn to *FIFA* and organized soccer as an example, we can see how the sport grows as a whole with the collective body’s centralized leadership, but the structure still allows the regional confederations and leagues to make decisions which would allow them to maintain their sovereign authority. This would explain how some regional confederations such as *UEFA* (*Union of European Football Associations*) and *CONMEBOL* (*South American Football Confederation*) maintain a higher prestige and influence than others. Moving within each confederation, we have policies initiated at the league level that determines how competitive the teams are or what conditions will be established to entice players to join the league and teams. For example, will there be limits on spending or will teams be incentivized to spend big in order to lure star players? Will TV revenues be equally shared or distributed proportionately to ratings? Working in a mutual capacity with the leagues, the teams must sometimes balance their own interests with those of the league as a whole or they will find themselves restrained from the lack of true competition. Indeed, there is a reason that teams like *Real Madrid* (Spain), *Manchester United* (England), or *Bayern Munich* (Germany) are held in higher esteem than teams like *LA Galaxy* (United States), *Guangzhou Evergrande* (China), or *Celtic F.C.* (Scotland) – being the dominant champion

²⁸⁹ Id.

in a subpar league will still affect your standing when compared to the others. Inversely, since there is no sport without teams, each level of the system must work conjunctively to create an environment that helps the teams thrive. That said, the teams also have to perform on the pitch and function effectively to keep their prime positions.

Conclusion

The Space Industry is booming and its growth will only continue to exponentially develop. It is not difficult to imagine the plausible catastrophic consequences of increased Space activity paired with a lack of updated international law. Due to resistance in judicial systems to keep the status-quo, change in the law can be delayed.²⁹⁰ Often, adjustments in the law do not come about without a fight.²⁹¹ This process may take years to develop, which is more reason to start now, before the Space industry grows to an unmanageable scale.²⁹²

The Space industry can be analogized to the global tech boom at the turn of the century, and the cyber security issues which have ensued as a result of this new era. Law is constantly catching up to privacy issues brought by new technology. We have the chance now to learn from our mistakes and get a leg up on operating efficiently and peacefully in Outer Space. It would be quite incorrect to say that our recommendations are optimistic or easy to implement. Nevertheless, as a planet we need to come together to earnestly negotiate the rules of operating in Outer Space before the day arrives when technology and investment has surpassed our fancies and the new frontier that is Space becomes the new *Wild-Wild West*.

²⁹⁰ Siegfried Wiessner, *Human Activities in Outer Space: A Framework For Decision-Making*, *Space Law: Views Of The Future*, Int'l Inst of Air and Space Law 7 (1988).

²⁹¹ *Id.*

²⁹² Jon Kelvey, *Is It Legal to Mine Asteroids?* *Slate*, Oct. 13, 2014: 5:45 PM, http://www.slate.com/articles/health_and_science/space_20/2014/10/asteroid_mining_and_space_law_who_gets_to_profit_from_outer_space_platinum.html, (last visited March 15, 2018).

