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Space advancements and control will produce a qualitative military advantage – advanced technologies, and space weapon platforms. US space privatization maintains a shaky but tenable US lead.

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Advancements in space technology are quickly leading to an inevitable conflict over control in space, which includes control over the Moon through lunar bases and potentially control over the colonization of Mars. The PRC has added the capability to "physically attack satellites using **antisatellite** [ASAT] interceptors, miniature space mines, and ground-based lasers" into its military space program.1 These capabilities fall under the guise of the Outer Space Treaty's permission to destroy militarized satellites.2 These technologies could easily be used offensively to create a decision advantage in combat. Some analysts believe that the deliberate collision of PRC satellites with older satellites shows that the PRC has experimented with "parasitic satellites" designed to lie dormant in the vicinity of a target until activated, potentially for hacking purposes.3 The PRC even "reportedly launched a hypersonic 'prototype space fighter' " in 2010. It continues to be locked in an intense space race with the rest of the space-savvy international community—particularly Russia, the United States, and India—with a short-term goal of controlling the Moon with a lunar base and a longer-term goal of populating Mars under the rule of the PRC.4

The development of maneuverable space planes and lunar bases is not unique to the PRC. The National Aeronautical and Space Administration (NASA) developed the X-37 and X-37B space planes, and the Russian Federation is developing a maneuverable space plane using nuclear technology for power.5 All of these nations (as well as several others, including India and Japan) intend to establish lunar bases within the next 20 years.6 Despite the array of international treaties and agreements promoting peaceful global development of space resources in the name of science and humanity, it is unlikely that space will remain weapon free and likely that it will become the next frontier of global combat. **Space weapons in development may use robotics, nanotechnology, and directed energy such as microwaves and lasers**.7 With the establishment of a lunar base, a nation with advanced laser technology, advanced cyber weaponry, maneuverable space planes, satellite targeting capabilities, nano-science stealth technology, artificial intelligence, and self-guiding nanotechnology bullets would undoubtedly have the capacity to rule the Earth as it sees fit. All of these technologies already exist or are in development phases, and they are the future of intelligence and warfare.8

The US government and NASA, unlike the PRC and the RF, have been encouraging the commercialization of space cargo transportation to meet future American needs for access to the International Space Station (ISS) and to improve the research and development of spaceborne technologies and other developments.9 Private sector involvement has also opened the market for alternative rocket propulsion technologies that can achieve government and commercial goals for space at lower costs and faster than possible under the existing bureaucracy of NASA. Enhanced private sector involvement in space travel utilizes the free-market system to foster radical developments and investment for both government and private sector programs, incentivizing broader participation, which benefits both. Commercializing aspects of standard space operations, such as the recent partnership with SpaceX, will also pave

the way for space tourism. This will free up resources for NASA and the newly minted US Space Force to pursue broader goals, such as manned deep space travel, a lunar base, and manned missions to Mars.

Part 2: Lunar Power

Rare earth metals and other minerals are quickly becoming scarce in the United States to the point where the international space race to claim the Moon and Mars has become a top priority, not just for control over them but for the resources available for exploitation. Uranium has even entered the economic radar as a good idea for boosting the American economy instead of remaining too dangerous to mine due to the associated health risks and environmental hazards. This resource is in abundance on the Moon.10 Estimates suggest there may be up to five million tons of Helium-3 (3He) contained within the lunar regolith.11 This has the potential to meet all of [hu]mankind's power needs for thousands of years when used with fusion power.12 On top of the resources potentially available, the Moon provides a unique launching position for future missions to Mars with a faster, more direct, and more efficient path to the Red Planet.13 Control over the Moon is an inherent factor in the future of the human race.

Uranium has long been a part of the nuclear fission enterprise on Earth but comes with high costs, including radioactive waste and extreme health and environmental hazards due to the radiation produced in the fission process. Terrestrial reserves of other energy-producing resources, like oil and natural gas, have also been projected to be exhausted within 50–100 years under current and projected mining and usage rates.14 Alternatively, the element tritium (T), which has a half-life of 12.32 years, naturally decays into 3He,15 which can be used to create a new kind of power—fusion power. Fusion power can be generated by combining deuterium (D) with either more D, T, or 3He, using the following calculations shown in order of their ignition temperatures: D + T = 4He [Helium-4] + n [neutrons] + 17.6 MeV [Million electron Volts] D + D = T + H [Hydrogen] + 4.0 MeV (50%) = 3He + n + 3.3 MeV (50%) D + 3He = 4He + H + 18.4 MeV16 Fusion power can also be created by combining 3He with more 3He, creating Helium-4 (4He).17 The combination of 3He and 3He is the most energy efficient, producing the greatest net energy,18 but also requires the highest ignition temperature to achieve fusion.19 Unfortunately, 3He exists only in minute amounts on Earth.20 The nation that establishes a mining and transportation industry capable of bringing lunar 3He to Earth, and develops a fusion plant network that transforms 3He into power, could control a substantial portion of the planet's energy industry for decades. Some scientific estimates discount both the estimates of the potential amount of extractable 3He in the lunar regolith and the potential to achieve industrial fusion reactors on Earth capable of processing it. Exemplifying this scientific stance are the calculations of Ian Crawford, who believes both prospects are greatly exaggerated and that there are only approximately 220,507 tons of 3He available in logical extraction areas, such as the titanium-rich lunar basalt flats.21 Despite his dissent, Crawford admits even lunar resources that seem impractical and economically inefficient to transport resources to Earth may provide substantial economic benefits for space-based uses, such as solar power systems and spacecraft fusion engines, for example,22 which would not require transport back to Earth. Earth's finite resources make lunar and space resource exploitation an inevitability. The most pertinent factor governing future human resource exploitation in space is the question of **which nation will achieve a successful and effective industrial supply chain first**. The most probable three nations to achieve this are the US, the PRC, and the RF, and the three areas that need to be navigated to succeed are facility establishment, production/refinement, and transportation. Establishing lunar facilities is the easiest of these goals, especially when lunar resources that can be used for building are taken into account, which decreases the amount of materials needed to be brought to the Moon and the time needed for construction. In 2008, a NASA experiment found that lunar regolith has potential construction properties. When scientists heated the regolith and used sulfur as a binding agent, they made "waterless concrete," which can be molded and is nearly as strong as concrete when it hardens.23 This process requires minimal effort and relies primarily on direct heat application and the ability to shape the regolith. Consequently, the entire process can be automated by robots with the appropriate tools on the lunar surface, such as the ones NASA began developing specifically for this purpose in 2009.24 The simplicity of the operational requirements means that these three nations already have the technical capability to begin construction using lunar soil after arriving on the Moon. They will also all be capable of bringing any other materials that would be necessary to construct facilities or bases on the lunar surface. Unlike the US, and contrary to existing international law, the PRC's stance on the Moon is that it is territory,25 despite the prohibition on "national appropriation" of celestial bodies outlined in Article II of the Outer Space Treaty.26 The PRC has also proposed mining 3He for future fusion power opportunities.27 The RF, while not openly pursuing a territorial ambition for the Moon, is certainly exploring and advancing prospects of economic development, including 3He extraction and tourism.28 Facility development and **resource exploitation areas on the Moon are limited**. This will exacerbate the race for prime locations and desirable resources, particularly at the poles, where water ice is believed to exist in large quantities (which can be used to sustain lunar human habitation), and in the titanium- and 3He-rich basalt flats of Mare Tranquillitatis and Oceanus Procellarum.29 Once established, facility operations can begin to extract and refine resources either for use on the lunar surface or for transportation to Earth. Transportation of materials from the Moon to Earth is a substantial financial and logistical undertaking. It will not be easy to show a profit after the considerable expenses associated with it. Nevertheless, extraction and transportation of 3He and other resources to Earth, specifically for fusion power production, have been expressed as long-term goals of the PRC and the RF within decades. Interestingly, the US

has not stated this as a goal but has already shifted its space transportation industry sufficiently toward the private sector**. The private sector will have the most viable opportunity to build the first industrial space transportation system, specifically because of advantages in the American free-market system.**[30] **By encouraging private sector participation in the space industry and commercializing space transportation, the US has made production of space technologies competitive with proposals in the National Space Policy**.31 A competitive industry makes substantial investments in research, development, and production of space transports; engine components for space travel; and tools for use in zero gravity. America cannot afford to fall behind in the race for lunar facility establishment and resource exploitation. This is for reasons of economic and national security and the future security of human expansion into space as the Moon offers the most efficient launching position for missions to Earth's red neighbor, Mars. Part 3: Mars Domination Mars is widely accepted by the scientific community to be the most plausible planet for the first human habitation on a celestial body and, consequently, the most likely location for the first space colony and eventually a second planet for humankind. Thus, Mars is a desirable goal for nations involved in space exploration for many reasons. The territory on Mars, for example, will most likely become marketable for economic value to civilians in the long term. The Outer Space Treaty prevents ownership of territory on celestial bodies but makes no mention of ownership or sale for profit of structures built on, or items brought to, celestial bodies, just as there is no explicit language in the treaty preventing profit-based resource exploitation on celestial bodies by either governments, organizations, or private nationals.32 Additionally, the inevitability of Mars becoming a second planet inhabited by humanity must be considered, along with all of the implications of living spaces and ownership of property that will eventually follow. Denying this inevitability and claiming it as outlawed by international law due to the prohibition on appropriating territory on a celestial body would essentially equate owning property on Earth as also outlawed by international law. After all, Earth is also a celestial body. Language in the treaty encourages expansion into space and essentially says that if persons, governments, or organizations build something on a celestial body, they own that building33 and can do what they want with it, including selling it. They cannot, however, claim to own the planet's ground outside the building—yet. Resources on Mars, while still not mapped out as substantially as lunar resources have been, will likewise create new markets for economic prosperity and national wealth, including more 3He deposits from solar winds like those found in lunar regolith along with substantially high concentrations of iron.34 In addition to buildings constructed on celestial bodies, spacecraft and facilities constructed in space and on celestial bodies are also considered to be the territory of the owning nation, which means that the UN Charter applies to facilities and spacecraft in space and on celestial bodies. UN Charter Article 2(4), in particular, protects space explorers and potential future residents on Mars by prohibiting the "use of force against the territorial integrity" of another nation party to the treaty,35 which all space-faring nations are. Article 51 further dictates that if attacked, "the inherent right of . . . self-defense" shall not be impaired.36 Article V of the Outer Space Treaty prescribes that, in space, all humans are bound to "render all possible assistance to" each other as "envoys of Mankind."37 Essentially, a peaceful international course is possible—even mandated—for human expansion into space. Unfortunately, the PRC and the RF regard space and celestial bodies as territorial goals,38 leading to the assumption that attempts will be made to control and defend such territories as necessary to achieve space superiority, control over space resources, and managerial power over the future colonization of Mars. Control over Mars, in addition to affecting resource exploitation, transportation, and scientific advancements, also has implications for the direction of humanity in space. Establishment of a human colony, or human colonies, on Mars will eventually lead to territorial spaces, development of the land and air (potentially involving terraforming the planet for atmospheric enhancement), and security issues. While an established colony on the Red Planet is still likely decades away, **trends within the PRC and RF governments suggest that any established colony on Mars under their jurisdiction would be authoritarian, weaponized, and secret**. Given the nature of weather on Mars, fortified structures are easily justified, and the lack of a conventional weapons ban on celestial bodies makes weaponization of such a colony both legal and desirable, mainly because of the third inherently desired factor—secrecy. The inevitability of PRC and RF presence on Mars also suggests that any US developments will also include fortifications and weaponization. while the Outer Space Treaty mandates cooperation between nations on celestial bodies, the extreme distance between Earth and Mars means that a compliance verification system with effective monitoring and enforcement will be complicated, if not impossible, for the foreseeable future. For these reasons, a nation that effectively controls near-Earth space and establishes a security presence on the Moon will effectively be in a position to control Mars. Part 4: Space Control Celestial bodies are not the only potential fields of conflict in space, and in the short term, space itself has become a much more immediately relevant focus for spacefaring nations and the world. This is particularly the case in the vicinity of Earth, including orbital paths for communication technologies, weapon platforms, and sensors. Technological improvements and the proliferation of nation-state and private sector interest and capacity to enter space are causing the acceleration of an inevitability—usable orbital space around Earth is diminishing.39 Satellites and other spaceborne assets orbiting Earth are quickly filling up all of the most useful places to perform their assigned functions within Earth's various orbits, and space debris is complicating matters even further. Increasing numbers of space objects are causing difficulty in establishing safe orbital paths for newly launched spacecraft while increasing the risk to launches destined for deep space.40 Adding to these complications are international developments of ASAT weapons, many of which add to the more than 500,000 pieces of space debris traveling as fast as 17,500 mph41 already orbiting Earth.42 ASATs in use and under development include essentially two broad areas: kinetic energy (KE), such as missiles and rail guns, which impact targets in space; and directed energy (DE), which includes lasers, particle beams, and cyber weapons.43 The Outer Space Treaty, while prohibiting nuclear weapons from being used in any way in space including being stationed in space, "has no specific provision prohibiting the use of conventional weapons, [including lasers], in outer space,"44 which inherently authorizes them. The Outer Space Treaty also contains no prohibition of such weapons being stationed on space-based platforms, including on celestial bodies, or of them being used to target objects on Earth, in space, or on celestial bodies.45 In other words, these weapons are legal in every way, regardless of the potential damage they can cause to international stability and humanity. There are, however, multiple ongoing debates over the nature, definitions, and classifications of

several kinds of ASATs currently in operation or in developmental phases. Nearly every KE ASAT results in a large amount of space debris, which causes an abundance of future and immediate problems for space activities, including endangerment of the basic military and commercial functions of satellites for the Global Positioning System (GPS), communications, and recreation. Space debris is therefore a highly undesirable side effect for any nation to risk and potentially dangerous to the integrity of a nation's armed forces. David Koplow addresses this issue in a substantially relevant and logical way in his article "An Inference about Interference: A Surprising Application of Existing International Law to Inhibit Anti-Satellite Weapons." His stated thesis is as follows: "The [National Technical Means] NTM-protection provisions of arms control treaties already prohibit the testing and use of destructive, debris-creating ASATs, because it is foreseeable that the resulting cloud of space junk will, sooner or later, impermissibly interfere with the operation of another state's NTM satellite, such as by colliding with it or causing it to maneuver away from its preferred orbital parameters into a safer, but less useful, location."46 By "interfering" with these NTM verifications mandated by multiple treaties, Koplow suggests that intentional actions creating space debris are already outlawed by international law, and that the development of debris creating KE ASATs should cease and be banned immediately.47 Laser weapons, particle beams, and weapons containing depleted uranium are also under debate due to their radioactivity as well as nuclear processes used for some of their operations. Some posit that nuclear activities or materials within a weapon system should constitute classifying them as nuclear weapons, thereby outlawing them in space per the Outer Space Treaty's nuclear weapons ban.48 Advocates for these weapons declare that the weapons are not nuclear. Of the three primary types debated, laser weapons use a nuclear or chemical reaction process to fire a radioactive beam, particle beams rapidly fire atomic charged particles at a target, and hypervelocity rod bundle weapons and railguns use depleted uranium as ammunition.49 Finally, the potential exists for the use of a nuclear explosion in space designed to generate an electromagnetic pulse (EMP) attack on an Earth target, which the RF "has worked on developing" in the form of an "EMP ASAT."50 With the RF's recent developments in ASATs and its stated intent "to station weapons in space,"51 the complete weaponization of space by the RF and other nations—including the US and the PRC—is inevitable. The RF and PRC are aggressively pursuing ASAT weapon advancements and preparing for space combat operations, including the RF recently fielding a "ground-based laser weapon" even as it publicly advocated for space not to be weaponized.52 Part 5: The Future of Space Space exploration converges on two of Sun Tzu's concepts of the strategic battlespace: "open ground" and the "ground of intersecting highways." The former consists of areas where all sides have "liberty of movement" and the latter of areas where "contiguous states" converge.53 On open ground, Sun Tzu advises not "to block the enemy's way," and on intersecting grounds he suggests to "join hands with your allies.54 Space is essentially a combination of these types of ground, where all nations are contiguously connected, and yet it consists of a legally recognized area of free movement for all persons and nations. Interestingly, Sun Tzu's The Art of War, written over 2,000 years ago, advocates indirectly for pe**aceful human expansion into space, where allied nations proceed forth together while intentionally avoiding negative engagements with potential adversaries**. This ancient concept of human cooperation and peaceful coexistence is also consistent with the Department of Defense's (DOD) and intelligence community's (IC) National Security Space Policy55 and the National Space Policy of the United States of America.56 Executive Order (EO) 13914, signed on 6 April 2020, clarifies the position of the US government that while international cooperation in space exploration is essentially mandatory, America "does not view [space] as a global commons,"57 reiterating that the Outer Space Treaty does in fact protect the individual interests of nations in space, including the right to self-defense. The policy further clarifies the intent of the United States to harvest materials from celestial bodies and strengthens the implied relationships with both the international community and the private sector concerning space exploration and related developments.58 By combining these principles, this renewed position on space developments further complements Sun Tzu's ideas of the strategic battlespace in relation to the space domain moving into the future, regarding space as an area that can be used and exploited by everyone, but acknowledging that claims, defense, and security are also going to be essential factors in the way mankind moves forward in the space domain. In addressing the impact of space exploration, and the subsequent superiority gained by the PRC, the RF, or the US in the process, it is important to recognize the three principle issues of the strategic space environment outlined in these national policies: congestion, contestation, and competitiveness. The US IC is mandated by section 1.1 of EO 12333 to "provide . . . the necessary information on which to base decisions concerning the development and conduct of foreign, defense, and economic policies, and the protection of United States national interests from foreign security threats,"59 which now include threats from space and threats toward US space assets. Congestion, contestation, and competitiveness in space now directly impact the IC's ability to effectively pursue its mandate under EO 12333 and must be addressed collectively to ensure the future national security of the United States on Earth and in space. Enhancing the space industrial base's ability to innovate and participate in the expansion of humankind into space fosters a unique opportunity to share with, and benefit from, research and development initiatives related to activities in space. Combining private sector and government resources together has the potential to greatly accelerate advancements across a wide range of space assets—including spacecraft developments, zero gravity research, energy production, and weapon applications—all of which will help minimize the risks of congestion, contestation, and competitiveness. Congestion in space refers to objects, including active devices and dangerous debris, filling up the usable orbital paths used for government and commercial purposes, primarily satellites. It also applies to finite amounts of bandwidth and frequencies used for transmissions that are currently being exhausted by demand threatening to exceed supply.60 Congestion will also inherently refer to space traffic once an industry exists that requires transportation between the Earth and the Moon, as well as to physical locations for lunar and Martian resource exploitation facilities and extraction points and places to build and operate on celestial bodies, including the Moon and Mars. This will eventually include a significant focus on the colonization of Mars since large portions of the planet are unsuitable for human habitation due to terrain, radiation, meteoroids, and weather. Short-term intelligence and counterintelligence impacts from the congestion of near-Earth space consist of primarily radio interference, protecting satellites from becoming compromised, effective deployment and concealment of collection platforms, and ensuring the integrity of protected information in transit.

Sharing space in accordance with Sun Tzu's ancient wisdom does not mean ceding it, and while space debris is the primary factor in congestion, contestation is becoming an issue due to potential adversarial ASATs. Contestation is an anticipated inevitability and one that will grow exponentially as more nations enter space and with further developments and potential use of ASATs, either in war, by accident, or for other reasons. Murphy's Law applies, even in space. Currently, competitiveness is driving both the potential for contestation as well as the congestion in near-Earth space. Commercial and multi-governmental competition is increasing for space-related research and development, deployment of assets, and physical space for occupation by those assets. Intelligence agencies in many nations, including allies and adversaries of the US, are now advancing the deployment, use, and decision advantages of spaceborne intelligence assets, including space-based surveillance and weapons platforms. Reasserting US superiority over the space environment is vital to the continuation of American leadership on Earth

and the effectiveness of IC assurance of national security through space superiority. **American leadership in space exploration is the only way to ensure that humanity's expansion into the stars is undertaken with the ideologies of liberty and free-market economics leading the way.**

America's leadership in ingenuity and technological developments, combined with free-market capitalism, has transformed the face of the world for more than two centuries. Its leadership has created the environment necessary to explore game-changing space technologies. These technologies will revolutionize the entire space industry. For example, the Variable Specific Impulse Magnetoplasma Rocket (VASIMR) is an experimental electromagnetic thruster for spacecraft propulsion that will dramatically reduce travel time to Mars and other destinations.61 Commercial spacecraft like the Dream Chaser Cargo System will result in a private sector space travel industry, incentivizing space tourism and, potentially, a space cargo transportation industry. 62 In February 2020, the US Department of Energy announced a $50 million investment in fusion research and development projects across the country.63 One of these is the Plasma Science and Fusion Center at the Massachusetts Institute of Technology with the goal of keeping the United States at the forefront of fusion energy development.64 Another is the Fusion Technology Institute at the University of Wisconsin, which is focusing on advancing research in the field of helium-based fusion power production technologies on Earth.65 This technology will address finite terrestrial energy resources and production of 3He-based electricity from lunar regolith.

These are just a few examples of the future of space technology research and development, and such technologies were all made possible because of the structure of the American free-market system. The biggest challenge for the IC will be to balance President Dwight Eisenhower's vision with Sun Tzu's battlefield strategies. Eisenhower understood in 1958 that "through [space] exploration, man hopes to broaden his horizons, add to his knowledge, [and] improve his way of living on earth."66 Sun Tzu knew that "all warfare is based on deception," "the highest form of generalship is to balk the enemy's plans," and the greatest fighters "put themselves beyond the possibility of defeat" to achieve victory.67 American leaders participating in seizing and maintaining US space superiority shoulder this responsibility and must forge a new path forward that enhances human life on Earth, denies the possibility of victory to US adversaries, and ensures the integrity and security of American assets in the space domain as the world moves forward together into the future.

Private property rights are key to economic investment in space

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Current space law is unclear as to whether private entities may claim possession of resources extracted from their endeavors in outer space. The lack of certainty prevents private entities from entirely investing in infrastructure and capabilities to access new deposits of resources due to the depletion of minerals and resources on Earth. The establishment of a new space regime devoid of non-appropriation principles found in international law **is necessary to motivate private entities to invest the capital in extracting and transporting space resources** back to Earth. This Comment seeks to understand how the current framework of space law impacts the property rights of private entities and their claim to resources in space. The 1967 Outer Space Treaty prohibited the claiming of property by sovereign nations. However, the concept of private entities now having the capability to extract resources from outer space has reignited the issue of property rights in outer space. With resources becoming scarcer or priced out of the market, the solution of mining these resources from celestial bodies has caused a new space race. Past multilateral agreements have dealt with similar discoveries such as the polymetallic nodules on the ocean floor; however, these agreements led to disputes as to ownership and the rights to extract said resources. With little to no support from the industrialized nations, the structure of any new regime must ensure access for the benefit of humankind. The benefit of allowing these private entities the right to claim mined resources must be weighed against potential drawbacks in order to create a framework that balances the interest of the free market with that of the common heritage principle. In determining that a suitable framework fails to guide a new space regime, this Comment proposes that a new governing body comprising a rotation of space-faring and nonspacefaring nations act as a regulatory body for the interest of all of humankind.

I. INTRODUCTION On October 4, 1957, the Space Age officially began when the Soviet Union launched Sputnik into orbit, the first successful, human made satellite.1 A little more than a decade later, on July 20, 1969, American astronauts Neil Armstrong and Edwin "Buzz" Aldrin became the first humans to land and step foot on the moon.2 Neil Armstrong marked the completion of John F. Kenney's national goal of landing an

astronaut on the moon when he radioed back to Earth "[t]hat's one small step for man, one giant leap for mankind."3 The launch of Sputnik, the moon landing, and other endeavors achieved by the scientific community, kick-started a chain of events leading to the current ambition of exploring outer space and mining resources throughout the solar system. The push for unlocking low-cost space travel and space industrialization by entrepreneurs, like Elon Musk and Jeff Bezos, propels the search for extraterrestrial materials such as water and minerals.4 According to NASA, minerals found in the asteroid belt between Mars and Jupiter contain an estimated value of approximately $100 billion for every person on Earth.5 However, uncertainty lingers because private entities are unsure that they will possess property rights to their payload or the mined celestial body.6 Celestial bodies refer to naturally occurring objects in space. The United States Commercial Space Transportation Advisory Committee ("COMSTAC"), an advisory body to the Federal Aviation Administration's ("FAA") Office of Commercial Space Transportation ("FAA-AST"), has undertaken review regarding the granting of private property licenses.7 COMSTAC expressed a desire to confirm that private entity resource extractions may be owned and utilized as it deems appropriate.8

The current framework of space law is a combination of agreements with the foundation of space law consisting of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies ("Outer Space Treaty").9 At the time of signing, the Outer Space Treaty hoped to foster cooperative and peaceful exploration of outer space without discrimination of any kind.10 However, Article II of the Outer Space Treaty contains the bane of private property rights in outer space, which forbids the national appropriation of the moon and other celestial bodies.11 While the Outer Space Treaty explicitly mentions the prohibition of public entities claiming celestial bodies, private enterprises risk failing to have their interest in property rights recognized by the global community. Private entities and investors grapple with the issues pertaining to their rights to mine and extract resources from outer space legally. Without further international recognition of their property rights, private entities may shy away from exploring the concept of celestial mining. The issue of not knowing what laws are applicable, or to whom private companies are accountable, impedes the progress private entities make in achieving their goal of harvesting extraterrestrial resources. **Private entities fear that the non-appropriation clause of Article II of the Outer Space Treaty, the epicenter of the issue, will strip them of the right to transport their mined resources back to Earth. A new legal regime will likely need to be formed that facilitates the continuation of innovation and promotes** the exploration of outer space. Whether or not past private and public international doctrines, i.e., the law of the sea, may provide guidance in creating a new doctrine of space law is yet to be determined.

The advancement in modern technology, along with the depletion of natural resources, creates a unique opportunity for private entities to resolve this issue through the exploitation of outer space. Space law is once again relevant due to its inadequacies in protecting the property rights of said entities in space. Part II will explore the different treaties and principles that gave rise to space law, and Part III will analyze whether the application of such principles should continue, or if the establishment of a new regime offers a more beneficial long-term solution. Part IV will then explore the structure of a new outer space regime and the enforcement of property rights. II. LEGAL PRINCIPLES INFLUENCING THE DEVELOPMENT OF SPACE LAW As the world continues to transform and evolve, lawmakers across the globe must adapt past laws or develop and ratify new laws to address current events and situations. The venture into outer space is similar to that of famous past explorations in which customary laws guided journeys, providing a framework of starting points for the crafting of the present-age space law. Space law must adapt and evolve as engineers and the science community make discoveries that past generations could only dream about. The United Nations General Assembly ("General Assembly") maintains the view that "International Law" is not spatially restricted, and that its charter is relevant even in the outer reaches of outer space and to celestial bodies.12 When analogizing to present international treaties, the most applicable set of principles is that of the high seas.13 Based on the principle of res communis, issues arise because there is a lack of precise rules.14 Since the beginning of the space race in 1957, the United Nations facilitated general agreements on how space exploration should be conducted. However, an understanding of past and current laws is necessary to determine how to proceed in recognizing property rights in space for private entities.

A. History of the Current Space Law Framework Space law is the body of law applicable to and involved in governing space-related activities.15 Space law is "associated with the rules, principles, and standards of international law appearing in the five international treaties and five sets of principles governing outer space," originating under the supervision of the United Nations Organization.16 The foundation of space law, similar to general international law, is composed of matters such as international agreements, treaties, conventions, rules and regulations of international organizations, General Assembly resolutions, national laws, executive and administrative orders, and judicial decisions.17 Following the launch of Sputnik in 1957, the General Assembly created an ad hoc committee concerned with identifying legal issues involving outer space activities.18 The Committee on the Peaceful Uses of Outer Space ("COPUOS") was established in 1958 and was made permanent on December 12, 1959.19 COPUOS is intended to endorse peaceful international collaboration and establish the common interest of humankind in outer space.20 It is the preeminent body regarding the formation of international space law, drafting five international treaties and five sets of principles regarding space-related activities.21 Topics covered by the treaties include nonappropriation of outer space by any one country, arms control within space, and the freedom of exploration.22 The primary focus of the treaties being

any and all activities performed in outer space be done so to enhance the well-being of humankind and the promotion of international cooperation.23 In 1966, COPUOS proposed the Outer Space Treaty, which was ratified soon after in 1967.24 The Outer Space Treaty forms the bedrock for international cooperation in the peaceful exploration of space and the development of new law.25 The Outer Space Treaty's principles focus on exploration carried out for the benefit and in the interest of all countries (Art. I), preclusion of sovereign states from appropriating celestial bodies in outer space (Art. II), the performance of activities in outer space in accordance with international law (Art. III), and the prohibition of launching any kinds of objects or armaments into orbit that possess nuclear weapons or any other kinds of weapons of mass destruction (Art. IV).26 Of importance to this Comment is the language of Article II. Article II does not explicitly mention the property rights of private entities; the failure to do so led to a split regarding whether such rights breach the Outer Space Treaty.27 COPUOS concluded four more treaties following the ratification of the Outer Space Treaty.28 The second treaty was the Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space ("Rescue Agreement"), which entered into force in 1968.29 The Rescue Agreement elaborates on Articles V and VII of the Outer Space Treaty.30 It provides that nations rescue and assist distressed astronauts, which also includes returning them to their launching state.31 Also, states, upon request, are to provide assistance in recovering space objects that re-enter Earth outside of the territory of its proper owner.32 The Convention on International Liability for Damage Caused by Space Objects ("Liability Convention"), the third of the five COPUOS treaties, was under the scrutiny of the Legal Subcommittee of COPUOS for approximately nine years.33 The General Assembly ultimately reached an agreement in 1971, and the Liability Convention entered into force in 1972.34 The Liability Convention expounds on Article VII of the Outer Space Treaty providing "that a launching [s]tate shall be absolutely liable to pay compensation for damage caused by its space objects on the surface of the Earth or to aircraft, and liable for damage due to its faults in space."35 The Liability Convention possesses the procedures regarding claim settlement for damages.36 The COPUOS Legal Subcommittee drafted the Convention on Registration of Objects Launched into Outer Space ("Registration Convention"), the fourth treaty, from 1962 until the General Assembly adopted the treaty in 1974.37 The convention entered into force in September 1976.38 This treaty builds upon desires in prior treaties to provide a mechanism to assist identifying space objects.39 The Registration Convention made a request for the Secretary-General to maintain the registration and provide open admittance to the information.40 The fifth and final treaty by COPUOS was the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies ("Moon Agreement").41 The General Assembly adopted the agreement in 1979; however, the Moon Agreement lacked widespread ratification, with only five countries signing by July 1984.42 The overall purpose of the Moon Agreement was to reinforce the principles highlighted in the provisions of the Outer Space Treaty and their application to the Moon and other celestial bodies.43 The Moon Agreement seeks to encourage peaceful exploration, avoid disruption of celestial environments, and alert the United Nations of the location and purpose of any construction of a station on a celestial body.44 In addition, the Moon and its natural resources are identified as belonging to the common heritage of humankind and, should exploitation of these resources become feasible, an international regime should be created to oversee such progress.45 Since its inception, the Moon Agreement, containing the resource limitation found within the common heritage principle, garnered little support internationally, particularly within the United States.46 With only fourteen signatories, none being spacefaring nations, the Moon Agreement lacks international recognition as law.47 However, the provisions of the Moon Agreement may block the full economic potential and development of space.48 A comprehension of international law aids in understanding the principle of the common heritage of humankind emphasized in the Moon Agreement

Primacy solves arms races and great power war – unipolarity is sustainable, and prevents power vacuums and global escalation

Brands 18 [(Hal, Henry Kissinger Distinguished Professor at Johns Hopkins University's School of Advanced International Studies and a senior fellow at the Center for Strategic and Budgetary Assessments) "American Grand Strategy in the Age of Trump," Page 129-133]

Since World War II, the United States has had a military **second to none**. Since the Cold War, America has **committed** to having **overwhelming military primacy**. The idea, as George W. Bush declared in 2002, that America must possess "strengths beyond challenge" has featured in every major U.S. strategy document for a quarter century; it has also been reflected in concrete terms.6

From the early 1990s, for example, the United **S**tates consistently accounted for around 35 to 45 percent of world defense spending and maintained **peerless global power-projection capabilities**.7 Perhaps more important, U.S. primacy was also unrivaled in key overseas **strategic regions**—**Europe, East Asia, the Middle East**. From **thrashing Saddam** Hussein's million-man Iraqi military during Operation Desert Storm, to deploying—with impunity—two carrier strike groups off Taiwan during the China-Taiwan crisis of 1995– 96, Washington has been able to project military power **superior** to anything a **regional rival** could employ even **on its own geopolitical doorstep.**

This **military dominance** has constituted the **hard-power backbone** of an ambitious global strategy. After the Cold War, U.S. policymakers committed to averting a return to the **unstable multipolarity** of earlier eras, and to perpetuating the more favorable

unipolar order. They committed to building on the successes of the postwar era by further advancing **liberal political values** and an open international **economy**, and to **suppressing** international scourges such as **rogue states**, **nuclear proliferation**, and catastrophic **terrorism**. And because they recognized that military force remained the ultima ratio regum, they understood the **centrality** of military preponderance.

Washington would **need** the **military power** necessary to **underwrite** worldwide **alliance commitments.** It would have to preserve **substantial overmatch** versus any potential **great-power rival.** It must be able to answer the sharpest challenges to the international system, such as Saddam's invasion of Kuwait in 1990 or jihadist extremism after 9/11. Finally, because prevailing global **norms** generally reflect **hard-power realities**, America would need the superiority to assure that its own **values remained ascendant**. It was impolitic to say that U.S. strategy and the international order required "**strengths beyond challenge**," but it was not at all inaccurate.

American primacy, moreover, was eminently affordable. At the height of the Cold War, the United States spent over 12 percent of GDP on defense. Since the mid-1990s, the number has usually been between 3 and 4 percent.8 In a historically favorable international environment, Washington could enjoy primacy—and its geopolitical fruits—on the cheap.

Yet U.S. strategy also heeded, at least until recently, the fact that there was a limit to how cheaply that primacy could be had. The American military did shrink significantly during the 1990s, but U.S. officials understood that if Washington cut back too far, its primacy would erode to a point where it ceased to deliver its geopolitical benefits. **Alliances** would **lose credibility**; the stability of key **regions** would be **eroded**; **rivals would be emboldened**; **international crises would go unaddressed**. American primacy was thus like a **reasonably priced insurance policy**. It required nontrivial expenditures, but protected against far costlier outcomes.9 Washington paid its insurance premiums for two decades after the Cold War. But more recently American primacy and strategic solvency have been imperiled.

THE DARKENING HORIZON For most of the post–Cold War era, the international system was— by historical standards—remarkably benign. Dangers existed, and as the terrorist attacks of September 11, 2001, demonstrated, they could manifest with horrific effect. But for two decades after the Soviet collapse, the world was characterized by **remarkably low levels of great-power competition,** high levels of **security** in key theaters such as **Europe** and **East Asia**, and the **comparative weakness** of those "**rogue" actors**—Iran, Iraq, North Korea, al-Qaeda—who most aggressively challenged American power. During the 1990s, some observers even spoke of a "strategic pause," the idea being that the end of the Cold War had afforded the United States a respite from normal levels of geopolitical danger and competition. Now, however, **the strategic horizon is darkening**, due to four factors.

First, **great-power military competition is back**. The world's two leading authoritarian powers—**China** and **Russia**—are seeking **regional hegemony**, contesting global norms such as nonaggression and freedom of navigation, and developing the **military punch** to underwrite these ambitions. Notwithstanding severe economic and demographic problems, Russia has conducted a major military **modernization** emphasizing **nuclear**

weapons, high-end conventional capabilities, and rapid-deployment and special operations forces—and utilized many of these capabilities in conflicts in Ukraine and Syria.10 China, meanwhile, has carried out a **buildup of historic proportions,** with constant-dollar defense outlays rising from US$26 billion in 1995 to US$226 billion in 2016.11 Ominously, these expenditures have funded development of **power-projection** and antiaccess/area denial (A2/**AD) tools** necessary to threaten China's neighbors and complicate U.S. intervention on their behalf. Washington has grown accustomed to having a generational military lead; Russian and Chinese modernization efforts are now creating a **far more competitive environment.0 - US HEg**

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Mining DA -1:22

Private companies are set to mine in space – new tech and profit motives make space lucrative

Gilbert 21, (Alex Gilbert is a complex systems researcher and PhD student in Space Resources at the Colorado School of Mines, "Mining in Space is Coming"), 4-26-21, Milken Institute Review, https://www.milkenreview.org/articles/mining-in-space-is-coming // MNHS NL

Space exploration is back. after decades of disappointment, a combination of better technology, falling costs and a rush of competitive energy from the private sector has put space travel front and center. indeed, many analysts (even some with their feet on the ground) **believe that commercial developments in the space industry may be on the cusp of starting the largest resource rush in history: mining on the Moon, Mars and asteroids.** While this may sound fantastical, some baby steps toward the goal have already been taken. **Last year, NASA awarded contracts to four companies to extract small amounts of lunar regolith by 2024, effectively beginning the era of commercial space mining. Whether this proves to be the dawn of a gigantic adjunct to mining on earth — and more immediately, a key to unlocking cost-effective space travel — will turn on the answers to a host of questions ranging from what resources can be efficiently.** As every fan of science fiction knows, the resources of the solar system appear virtually unlimited compared to those on Earth. There are whole other planets, dozens of moons, thousands of massive asteroids and millions of small ones that doubtless contain humungous quantities of materials that are scarce and very valuable (back on Earth). **Visionaries including Jeff Bezos imagine heavy industry moving to space and Earth becoming a residential area. However, as entrepreneurs look to harness the riches beyond the atmosphere, access to space resources remains tangled in the realities of economics and governance. Start with the fact that space belongs to no country, complicating traditional methods of resource allocation, property rights and trade. With limited demand for materials in space itself and the need for huge amounts of energy to return materials to Earth, creating a viable industry will turn on major advances in technology, finance and business models.** That said, there's no grass growing under potential pioneers' feet. **Potential economic, scientific and even security benefits underlie an emerging geopolitical competition to pursue space mining.** The United States is rapidly emerging as a front-runner, in part due to its ambitious Artemis Program to lead a multinational consortium back to the Moon. But it is also a leader in creating a legal infrastructure for mineral exploitation. **The United States has adopted the world's first space resources law, recognizing the property rights of private companies and individuals to materials gathered in space**. However, the United States is hardly alone. Luxembourg and the United Arab Emirates (you read those right) are racing to codify space-resources laws of their own, hoping to attract investment to their entrepot nations with business-friendly legal frameworks. China reportedly views space-resource development as a national priority, part of a strategy to challenge U.S. economic and security primacy in space. Meanwhile, Russia, Japan, India and the European Space Agency all harbor space-mining ambitions of their own. Governing these emerging interests is an outdated treaty framework from the Cold War. Sooner rather than later, we'll need new agreements to facilitate private investment and ensure international cooperation.

Back up for a moment. For the record**, space is already being heavily exploited**, because space resources include non-material assets such as orbital locations and abundant sunlight that enable satellites to provide services to Earth. Indeed, satellite-based telecommunications and global positioning systems have become indispensable infrastructure underpinning the modern economy. Mining space for materials, of course, is another matter. In the past several decades, planetary science has confirmed what has long been suspected: **celestial bodies are potential sources for dozens of natural materials that, in the right time and place, are incredibly valuable.** Of these, water may be the most attractive in the near-term, because — with assistance from solar energy or nuclear fission — H_2O can be split into hydrogen and oxygen to make rocket propellant, facilitating in-space refueling. **So-called "rare earth" metals are also potential targets of asteroid miners intending to service Earth markets**. Consisting of 17 elements, including lanthanum, neodymium, and yttrium, these critical materials (most of which are today mined in China at great environmental cost) are required for electronics. And they loom as bottlenecks in making the transition from fossil fuels to renewables backed up by battery storage. **The Moon is a prime space mining target.**

Boosted by NASA's mining solicitation, it is likely the first location for commercial mining. The Moon has several advantages. It is relatively close, requiring a journey of only several days by rocket and creating communication lags of only a couple seconds — a delay small enough to allow remote operation of robots from Earth. Its low gravity implies that relatively little energy expenditure will be needed to deliver mined resources to Earth orbit. The Moon may look parched — and by comparison to Earth, it is. But **recent probes have confirmed substantial amounts of water ice lurking in permanently shadowed craters at the lunar poles**. Further, it seems that solar winds have implanted significant deposits of helium-3 (a light stable isotope of helium) across the equatorial regions of the Moon. Helium-3 is a potential fuel source for second and third-generation fusion reactors that one hopes will be in service later in the century. The isotope is packed with energy (admittedly hard to unleash in a controlled manner) that might augment sunlight as a source of clean, safe energy on Earth or to power fast spaceships in this century. **Between its water and helium-3 deposits, the Moon could be the resource stepping-stone for further solar system exploration. Asteroids are another near-term mining target.** There are all sorts of space rocks hurtling through the solar system, with varying amounts of water, rare earth metals and other materials on board. The asteroid belt between the orbits of Mars and Jupiter contains most of them, many of which are greater than a kilometer in diameter. Although the potential water and mineral wealth of the asteroid belt is vast, the long distance from Earth and requisite travel times and energy consumption rule them out as targets in the near term. T**he prospects for space mining are being driven by technological advances across the space industry. The rise of reusable rocket components and the now-widespread use of off-the-shelf parts are lowering both launch and operations costs. Once limited to government contract missions and the delivery of telecom satellites to orbit, private firms are now emerging as leaders in developing "NewSpace" activities** — a catch-all term for endeavors including orbital tourism, orbital manufacturing and mini-satellites providing **specialized services. The space sector, with a market capitalization of $400 billion, could grow to as much as $1 trillion by 2040 as private investment soars.**

The private sector is essential for asteroid mining – competition is key and government development is not effective, efficient, or cheap enough. Thiessen 21:

Marc Thiessen, 6-1, 21, Washington Post, Opinion: SpaceX's success is one small step for man, one giant leap for capitalism, https://www.washingtonpost.com/opinions/2020/06/01/spacexs-success-is-one-small-step-man-one-giant-leap-capitalism/

It was one small step for man, one giant leap for capitalism. Only three countries have ever launched human beings into orbit. This past weekend, SpaceX became the first private company ever to do so, when it sent its Crew Dragon capsule into space aboard its Falcon 9 rocket and docked with the International Space Station. This was accomplished by a company Elon Musk started in 2002 in a California strip mall warehouse with just a dozen employees and a mariachi band. At a time when our nation is debating the merits of socialism, SpaceX has given us an **incredible testament to the power of American free enterprise.** While the left is advocating unprecedented government intervention in almost every sector of the U.S. economy, from health care to energy, **today Americans are celebrating the successful privatization of space travel.** If you want to see the difference between what government and private enterprise can do, consider: It took a private company to give us the first space vehicle with touch-screen controls instead of antiquated knobs and buttons. It took a private company to give us a capsule that can fly entirely autonomously from launch to landing — including docking — without any participation by its human crew. It also took a private company to invent a reusable rocket that can not only take off but land as well. When the Apollo 11 crew reached the moon on July 20, 1969, Neil Armstrong declared "the Eagle has landed." On Saturday, SpaceX was able to declare that the Falcon had landed when its rocket settled down on a barge in the Atlantic Ocean — ready to be used again. That last development will save the taxpayers incredible amounts of money. **The cost to NASA** for launching a man into space on the space shuttle orbiter was **$170 million per seat, compared with just $60 million** to $67 million on the Dragon capsule. The cost for the space shuttle **to send a kilogram of cargo into to space was $54,500; with the Falcon rocket, the cost is just $2,720 — a decrease of 95 percent.** And while the space shuttle cost $27.4 billion to develop, **the Crew Dragon was** designed and built for just $1.7 **billion — making it the lowest-cost spacecraft developed in six decades.** SpaceX did it in six years — far faster than the time it took to develop the space shuttle. **The private sector does it better, cheaper, faster and more efficiently than government. Why? Competition.** Today, SpaceX has to compete with a constellation of private companies — including legacy aerospace firms such as Orbital ATK and United Launch Alliance and innovative start-ups such as Blue Origin (which is designing a Mars lander and whose owner, Jeff Bezos, also owns The Post) and Virgin Orbit (which is developing rockets than can launch satellites into space from the underside of a 747, avoiding the kinds of weather that delayed the Dragon launch). In the race to put the first privately launched man into orbit, upstart SpaceX had to beat aerospace behemoth Boeing and its Starliner capsule to the punch. It did so — for more than $1 billion less than its competitor. **That spirit of competition and innovation will revolutionize space travel in the years ahead.** Indeed, Musk has his sights set far beyond Earth orbit. Already, SpaceX is working on a much larger version of the Falcon 9 reusable rocket called Super Heavy that will carry a deep-space capsule named Starship capable of carrying up to 100 people to the moon and eventually to Mars. Musk's goal — the reason he founded SpaceX — is to colonize Mars and make humanity a multiplanetary species. He has set a goal of founding a million-person city on Mars by 2050 complete with iron foundries and pizza joints. Can it be done? Who knows. But this much is certain: **Private-sector innovation is opening the door to a new era of space exploration**. Wouldn't it be ironic if, just as capitalism is allowing us to explore the farthest reaches of our solar system, Americans decided to embrace socialism back here on Earth?

Non-appropriation scares investors away and spills over to other space activities.

Freeland 05

Steven Freeland (BCom, LLB, LLM, University of New South Wales; Senior Lecturer in International Law, University of Western Sydney, Australia; and a member of the Paris-based International Institute of Space Law). "Up, Up and … Back: The Emergence of Space Tourism and Its Impact on the International Law of Outer Space." Chicago Journal of International Law: Vol. 6: No. 1, Article 4. 2005. JDN. https://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?article=1269&context=cjil

V. THE NEED FOR CELESTIAL PROPERTY RIGHTS? ¶ The fundamental principle of "non-appropriation" upon which the international law of outer space is based stems from the desire of the international community to ensure that outer space remains an area beyond the jurisdiction of any state(s). Similar ideals emerge from UNCLOS (in relation to the High Seas) as well as the Antarctic Treaty, 42 although in the case of the latter treaty, it was finalised after a number of claims of sovereignty had already been made by various States and therefore was structured to "postpone" rather than prejudice or renounce those previously asserted claims.43 In the case of outer space, its exploitation and use is expressed in Article I of the Outer Space Treaty to be "the province of all mankind," a term whose meaning is not entirely clear but has been interpreted by most commentators as evincing the desire to ensure that any State is free to engage in space activities without reference to any sovereign claims of other States. This freedom is reinforced by other parts of the same Article and is repeated in the Moon Agreement (which also applies to "other celestial bodies within the solar system, other than the earth")." Even though both the scope for space activities and the number of private participants have expanded significantly since these treaties were finalised, it has still been suggested that the **nonappropriation** principle **constitutes** "**an absolute barrier in the realization of every kind of space activity., 4 ' The amount of capital expenditure required to research, scope, trial, and implement a new space activity is significant.** To bring this activity to the point where it can represent **a** viable "stand alone" **commercial venture takes many years and almost limitless funding. From the perspective of a private enterprise contemplating such an activity, it would** quite obviously **be an important element in its decision to devote resources** to this activity **that it is able to secure the highest degree of** legal **rights** in order **to protect its investment. Security** of patent **and** other intellectual **property** rights, for example, are vital prerequisites for private enterprise research activity on the ISS, and these rights are specifically addressed by the ISS Agreement between the partners to the project and were applicable to the experiments undertaken by Mark Shuttleworth when he was onboard the ISS.46

Space mining is the only way to solve climate change

Duran 21, (Paloma Duran is a journalist and industry analyst at Mexico Business News. "Is Space Mining the Best Option to Face Climate Change?"), 11-03-21, Mexico Business News, **https://mexicobusiness.news/mining/news/space-mining-best-option-face-climate-change // MNHS NL**

Going to net zero means that more mining is needed. Experts have said that the current supply cannot support the necessary metals demand for the green transition. As a result, new mining alternatives have gained greater relevance, among them is space mining. Several countries, including Mexico, have shown their interest in this alternative, creating a new space race. "**The solar system can support a billion times greater industry than we have on Earth. When you go to vastly larger scales of civilization, beyond the scale that a planet can support, then the types of things that civilization can do are incomprehensible to us … We would be able to promote healthy societies all over the world at the same time that we would be reducing the environmental burden on the Earth,**" said Dr. Phil Metzger, Planetary Scientist at the University of Central Florida. **Currently, there are several attempts to address global warming and transition to a net zero carbon economy. There has been an increasing interest in renewable energy and infrastructure, which has increased demand**

for various minerals, especially lithium, cobalt, nickel, copper and rare earth elements. However, according to experts, **the world is close to entering a metals supercycle, where demand will exceed available supply, causing prices to skyrocket. Consequently, the mining industry has sought alternatives to achieve the required supply**. Options include recycling and improved mine waste management, sea mining and **space mining**. The latter **is considered** one of **the alternative**s **with the greatest potential.** However, a regulatory framework is still lacking and there is almost no experience in this regard. Despite the lack of knowledge regarding **space mining, it has become a very attractive option since the planet is running out of resources. While some people believe that land-based mining is cheaper than space mining, experts believe this may change in the long term. Furthermore, within the solar system there are countless bodies rich in minerals, ores and elements that will accelerate the fight against climate change. "There will come a point when there is nothing left to mine on the surface, prompting mines to reach even further below. But even those resources are destined to run out and so we will aim toward ocean mining, which already has specific technologies that are being developed.** Nevertheless, even those mines are limited as well. The mine of the future, which today may seem unlikely, will no longer be on our planet. **There will be a time when space mining will be as common as an open leach mine,**" Eder Lugo, Minerals Head at Siemens, told MBN. More than 150 million asteroids measuring approximately 100m are believed to be in the inner solar system alone. **In addition, astronomers have also identified abundant minerals near the Earth's space and the Main Asteroid Belt.** There are three main groups into which asteroids are divided: C- type, S- type, and M- type. **The last two groups are the most abundant in minerals such as gold, platinum, cobalt, zinc, tin, lead, indium, silver, copper and rare earth metals. "Energy is limited here.** Within just a few hundred years, you will have to cover all of the landmass of Earth in solar cells. So, what are you going to do? Well, what I think you are going to do is you are going to move out in space … all of our heavy industry will be moved off-planet and Earth will be zoned residential and light-industrial," said Jeff Bezos, Founder of Amazon and the Space Launch Provider Blue Origin.

Climate change causes extinction.

Specktor 19

[Brandon writes about the science of everyday life for Live Science, and previously for Reader's Digest magazine, where he served as an editor for five years] 6-4-2019, **"Human Civilization Will Crumble by 2050 If We Don't Stop Climate Change** Now, New Paper Claims," livescience, https://www.livescience.com/65633-climate-change-dooms-humans-by-2050.html Justin

The current climate crisis, they say, is larger and more complex than any humans have ever dealt with before. General climate **models** — like the one that the United Nations' Panel on Climate Change (IPCC) used in 2018 to predict that a global temperature increase of 3.6 degrees Fahrenheit (2 degrees Celsius) could put hundreds of millions of people at risk — **fail to account for** the **sheer complexity of Earth's many interlinked geological processes**; as such, they fail to adequately predict the scale of the potential consequences. The truth, the authors wrote, is probably far worse than any models can fathom. How the world ends What might an accurate worst-case picture of the planet's climate-addled future actually look like, then? The authors provide one particularly grim scenario that begins with world **governments** "politely **ignoring**" the advice of **scientists** and the will of the public to decarbonize the economy (finding alternative energy sources), resulting in a global temperature increase 5.4 F (3 C) by the year 2050. At this point, the world's **ice sheets vanish; brutal**

droughts kill many of the trees in the Amazon rainforest (removing one of the world's largest carbon offsets); and the planet plunges into a feedback loop of ever-hotter, ever-deadlier conditions. "**Thirty-five percent of** the global **land** area, **and 55 percent of the global population, are subject to more than 20 days a year of lethal heat conditions**, beyond the threshold of human survivability," the authors hypothesized. Meanwhile, **droughts, floods and wildfires** regularly **ravage the land.** Nearly **one-third of the world's land surface turns to desert.** Entire **ecosystems collapse**, beginning with the **planet's coral reefs**, the **rainforest and the Arctic ice sheets.** The world's tropics are hit hardest by these new climate extremes, **destroying** the region's **agriculture** and **turning** more than **1 billion** people **into refugees.** This mass movement of refugees — coupled with **shrinking coastlines and** severe **drops in food and water** availability — begin to **stress the fabric of the world's largest nations**, including the United States. Armed conflicts over resources, perhaps **culminating in nuclear war, are likely**. The result, according to the new paper, is "outright chaos" and perhaps **"the end of** human global **civilization** as we know it."

1NC 3 Off: CP

States ought to call a global constitutional convention and establish a constitution reflecting intergenerational concern with exclusive authority to ban appropriation of outer space by private entities and bind participating bodies to its result

That solves the aff – No war - it addresses shared anxieties and creates unified government

Gardiner 14 1 [Stephen M. Gardiner, Professor of Philosophy and Ben Rabinowitz Endowed Professor of Human Dimensions of the Environment at the University of Washington, Seattle, "A Call for a Global Constitutional Convention Focused on Future Generations," 2014, *Ethics & International Affairs*, Vol. 28, Issue 3, pp. 299-315, https://doi.org/10.1017/S0892679414000379, EA]

A Constitutional Convention

In my view, the above line of reasoning leads naturally to a more specific proposal: that we—concerned individuals, interested community groups, **national governments**, and transnational organizations—should initiate a call for a **global constitutional convention** focused on **future generations.** This proposal has two components. The first component is procedural. The proposal takes the form of a **"call to action."** It is explicitly an attempt to engage a range of actors, based on a claim that **they** have or **should take on** a set of **responsibilities**, and a view about **how to go about discharging those responsibilities.** The second component is substantive. The main focus for action is a push for the creation of a constitutional convention at the global level, whose role is to pave the way for an overall constitutional system that appropriately embodies intergenerational concern.

The substantive idea rests on several key ideas. Still, for the purposes of a basic proposal, I suggest that these be understood in a relatively open way that, as far as is practicable, does not prejudge the outcome of the convention, and especially its main recommendations. First, the convention itself should be understood as "a representative body called together for some **occasional or**

temporary purpose" and "constituted by statute to represent the people in their primary relations."14 Second, a constitutional system should be thought of in a minimalist sense as "a set of **norms** (rules, principles or values) creating, structuring, and possibly defining the **limits** of government power or authority."15 Third, the "instigating" role of the convention should be to discuss, develop, make recommendations toward, and set in motion a process for the **establish**ment of **a constitution.** Fourth, its primary subject matter should be the need to **adequately reflect and embody intergenerational concern**, where this would include at least the protection of future generations, the promotion of their interests (where "interests" is to be broadly conceived so as to include rights, claims, welfare, and so on), and the discharging of duties with respect to them. It may also (and in my view should) include some way of reflecting concern for past generations, including responsiveness to at least certain of their interests and views. However, I will leave that issue aside in what follows.

The proposal to initiate a call for a global constitutional convention has at least two attractive features. First, it is based in a **deep political reality**, and does not underplay the challenge. It acknowledges the problem as it is, both specific and general, and calls attention to the heart of that problem, including to the failures of the current system, the need for an alternative, and the background issue of responsibility. Moreover, though the proposal is dramatic and rhetorically eye-catching, it is so in a way that is appropriately responsive to the seriousness of the issue at hand, the persistent political inertia surrounding more modest initiatives, and the fact that (grave though concerns about it are) climate change is only one instance of the tyranny of the contemporary (and the wider perfect moral storm), and we should expect others to arise over the coming decades and centuries.

The second attractive feature of the proposal is that, though ambitious, it is **not alienating.** While it does not succumb to despair in the face of the challenge, neither does it **needlessly polarize and divide** from the outset (for example, by leaping to specific recommendations about how to fill the institutional gap). Instead, it acknowledges that there are **fundamental difficulties and anxieties**, but uses them to **start the right kind of debate**, rather than to foreclose it. As a result, the proposal is a promising candidate to serve as the subject of a **wide** and overlapping **political consensus**, at least among those who share intergenerational concern.

Selective Mirroring

To quell some initial anxieties, it is perhaps worth clarifying the open-ended and non-alienating character of the proposal. One temptation would be to view the call for a global constitutional convention as a fairly naked plea for **world government**, a prospect that would be deeply alienating—indeed anathema—to many. However, that is not my intention. Though it is possible that a global constitutional convention would lead in this direction, it is **by no means certain.**

At a minimum, no such body could plausibly recommend any form of "world government" **without simultaneously advancing detailed suggestions** about how to **avoid** the **standard threats** such an institution might pose. Moreover, it seems perfectly conceivable, even likely under current ways of thinking, that a global constitutional convention would pursue what we might call a **selective mirroring** strategy. Specifically, a convention would seek to develop a **broader** system of **institutions** and **practices** that reflected the **desirable features** of a powerful and highly centralized global authority but **neutralized** the **standing threats** posed by it (for example, it might employ familiar strategies such as the separation of powers). In all likelihood, one feature of a selective mirroring approach would be the significant preservation of existing institutions to serve as a bulwark against the excesses of any newly created ones. Whether and how such a strategy might be made effective against the perfect moral storm, and whether something closer to a "world government" would do better, would be a central issue for discussion by the convention.

Case

AT: Col

1] Link Turn their contention 1 MArtin and Olson, Private entities can't undergo space col, that delinks the entire contention. Requires capital that private entities don't have. Private companies haven't landed on the moon yet. Even then their inherency has no link because it doesn't establish that private entities want to or will colonize space.

2] On Subpoint B Torres 18 -> No impact to genetic drift under util, independently diversity may be good for addressing disease sinc we get resistance.

3] On subpoint C - TF we don't know if space col is even happening over hundreds of years + no impact to those conflicts given no new ev

This unified govt argument makes no sense in round- Leviathan was written in the 1600s and it is a philosophy considering a non-existent hypothetical state of nature and what might happen if we establish a social contract. Space is not in a state of nature since its being explored by agents that have allegiances and states that exist alr

No solvency - private appropriation doesn't get rid of govt

constitutional convention solves unified govt which solves the war impact

4] No space war - Unified govt solves + TF -> Brands multipolarity + ext o/w

Space weapon deployment doesn't cause an arms race or increase chance of war

Lopez 12 [LAURA DELGADO LO´ PEZ, Institute for Global Environmental Strategies, Arlington, Virginia. Astropolitics. "Predicting an Arms Race in Space: Problematic Assumptions for Space Arms Control." https://www.tandfonline.com/doi/full/10.1080/14777622.2012.647391]

The previous discussion demonstrates that although a globalized space arms race could follow U.S. deployment of space weapons, it is also plausible and **more likely** that it may **not happen at all**. As Mueller states: ''In the end, most of the inevitability arguments are **weak**.''62 The assumptions discussed here break the argument into a series of debatable maxims that other scholars have also considered. Hays, for instance, counters the inevitability argument by pointing out that **previous ASAT tests** did **not** have this purported **destabilizing effect**, to which we can add that even after the

Chinese ASAT test, neither Russia nor the United States, who would be both capable and more politically likely to launch space weapons, moved forward in that direction.63 Although some may draw attention to the recent wake-up calls in order to underline a sense of urgency, one should also recall that when it seemed truly inevitable before, it did not happen either. In his detailed account of military space developments from 1945 to 1984, Paul Stares described how superpowers' assessment of the value of space weapons shifted, with a ''hiatus in testing'' reflecting the attractiveness of satellites as military targets.64 In this changed landscape, Stares also assumed the inevitability argument, claiming that ''the chances of space remaining a 'sanctuary' [absence of weapons] into the 21st century appear today to be remote.''65 Perhaps the conditions are more conducive now, but the important point to be reiterated is that the outcome is not inevitable, and that any such prediction must be undertaken with caution. One of the most prominent theorists to propose an alternate picture and pair it with an aggressive pro-space weapons stance is Everett Dolman. In his Astropolitik theory, Dolman summarizes the steps that the United States must take to assume control of space, particularly through withdrawal from the current space regime.66 This move, he argues, would benefit not only the United States, but also the rest of the world, since having a democracy controlling space is a catalyst for peace.67 Elsewhere, he writes: ''Only a liberal world hegemon would be able to practice the restraint necessary to maintain its preponderant balance of hegemonic power without resorting to an attempt at empire.''68 Accordingly, he believes that this strategy would be ''perceived correctly as an attempt at continuing U.S. hegemony,''69 **but** that other countries, correctly assessing U.S. leadership in space, would **not** seek to **deploy** their **own systems**. Having the ability to prevent the stationing of foreign weapons systems in space, he writes, ''makes the possibility of large-scale space war and a military space race **less likely**, not more.''70 In fact, he says, ''to suggest that the inevitable result is a space arms competition is the worst kind of mirror-imaging.''71 Dolman argues that the **weaponization** of space by the United States would ''**decrease** the **likelihood** of an **arms race** by **shifting spending** away from **conventional** weapons **systems**,'' which would reduce U.S. capabilities in territorial occupation and would thus be perceived as **less threatening** to other countries.72

5] Impact turn the entire case - space col is good! It solves extinctionWorking towards outward expansion solves future extinction, giving the world a "relief-valve". Exploration initiatives are the first step.

Kennedy '19 [Fred, "To Colonize Space Or Not To Colonize: That Is The Question (For All Of Us)", 12-18-2019, Forbes, https://www.forbes.com/sites/fredkennedy/2019/12/18/to-colonize-or-not-to-colonize--that-is-the-question-for-all-of-us/?sh=65a8d2702367]//pranav

It's important to distinguish between colonize and explore. **Exploration** already enjoys broad approval here in America. In June, 77% of U.S. respondents told Gallup pollsters that NASA's budget should either be maintained or increased – undeniable evidence of support for the American space program (as it's currently constituted). **By any measure, we've done an admirable job of surveying the solar system over the past 60 years – an essential first step in any comprehensive program of exploration.** Unmanned probes developed and launched by the United States and the Soviet Union conducted flybys of the Moon and the terrestrial planets not long after we reached Earth orbit, and since then, we've flown by the outer planets. Multiple nations have placed increasingly sophisticated robotic emissaries on the surfaces of the Moon, Mars, Venus and Saturn's largest moon, Titan. Most stunningly, in a tour de force of technology and Cold War chutzpah, the U.S. dispatched humans to set foot on another world, just 50 years and a few months ago. But after only six such visits, we never returned. Moon habitats in lava tubes, crops under glass domes, ice mining at the south pole? No. NASA's Artemis program may place a man and a woman on the Moon again in 2024. But that's hardly colonization. For perspective, let's look closer to home. Sailors from an American vessel may have landed on Antarctica as early as 1821 – the claim is unverified – but no scientific expeditions "wintered" there for another 75 years. The first two of these, one Belgian and one British, endured extreme cold and privation – one inadvertently, the other by design. And yet, 200 years after the first explorer set foot on the continent, there are no permanent settlements (partially as a result of a political consensus reached in the late 1950s, but in no small part due to the difficulty of extracting resources such as ore or fossil fuels through kilometers of ice). Less than 5,000 international researchers and support staff comprise the "summer population" at the bottom of the world. That number dwindles to just 1,100 during the harsh Antarctic winter, requiring millions of tons of supplies and fuel to be delivered every year – none of which can be produced locally. To suggest that Antarctica is colonized would be far overstating the

sustainability of human presence there. If Antarctica is hard, the Moon, Mars, asteroids, and interplanetary space will be punishingly difficult. Writing in Gizmodo this past July, George Dvorsky describes the challenges to a human colony posed by low gravity, radiation, lack of air and water, and the psychological effects of long-term confinement and isolation inside artificial structures, in space or on planetary surfaces. Add to this the economic uncertainties of such a venture – where the modern analog of a Dutch or British East India Company would face enormous skepticism from investors regarding the profitability of shipping any good or finished product between colonial ports of call – and it becomes clear why nation states and mega-corporations alike have so far resisted the temptation to set up camp beyond geosynchronous orbit. Perhaps, many argue, we should focus our limited resources on unresolved problems here at home? **Yet a wave of interest in pursuing solar system colonization is building, whether its initial focus is the Moon, Mars, or O'Neill-style space habitats**. Jeff Bezos has argued eloquently for **moving heavy industry off the home planet, preserving Earth as a nature reserve, and building the space-based infrastructure that will lower barriers and create opportunities for vast economic and cultural growth (similar to how the Internet and a revolution in microelectronics has allowed Amazon and numerous other companies to achieve spectacular wealth).** Elon Musk and Stephen Hawking both **suggested the need for a "hedge" population of humans on Mars to allow human civilization to reboot itself in the event of a catastrophe on Earth** – an eggs-in-several-baskets approach which actually complements the arguments made by Bezos. **And while both are valid reasons for pursuing colonization, there's a stronger, overarching rationale that clinches it**. **I'll assert that a fundamental truth – repeatedly borne out by history – is that expanding, outwardly-focused civilizations are far less likely to turn on themselves, and far more likely to expend their fecundity on growing habitations, conducting important research and creating wealth for their citizens**. **A civilization that turns away from discovery and growth stagnates** – a point made by NASA's Chief Historian Steven Dick as well as Mars exploration advocate Robert Zubrin. As a species, **we have yet to resolve problems of extreme political polarization (both internal to nation states as well as among them), inequalities in wealth distribution, deficiencies in civil liberties, environmental depredations and war**. **Forgoing opportunities to expand our presence into the cosmos to achieve better outcomes here at home hasn't eliminated these scourges**. What's more, **the "cabin fever" often decried by opponents of colonization (when applied to small, isolated outposts far from Earth) turns out to be a potential problem for our own planet. Without a relief valve for ideological pilgrims or staunch individualists who might just prefer to be on their own despite the inevitable hardships, we may well run the risk of exacerbating the polarization and internecine strife we strive so hard to quell**. **Focusing humanity's attention and imagination on a grand project may well give us the running room we need to address these problems**. But the decision cannot be made by one country, or one company, or one segment of the human population. If we do this, it will of necessity be a truly international endeavor, a cross-sector endeavor (with all commercial, civil, and defense interests engaged and cooperating). **The good news: Critical technologies such as propulsion and power generation systems will improve over time. Transit durations between celestial destinations will shorten (in the same way sailing vessels gave way to steam ships and then to airliners and perhaps, one day, to point-to-point ballistic reusable rockets). Methods for obtaining critical resources on other planets will be refined and enhanced. Genetic engineering may be used to better adapt humans, their crops and other biota to life in space or on other planetary surfaces – to withstand the effects of low or micro-gravity, radiation, and the psychological effects of long-duration spaceflight.**