### 1NC

#### Interpretation – the aff must specify what type of Private Actor Appropriation they affect.

#### Appropriation is extremely vague – no legal precedent means no normal means

Pershing 19, Abigail D. "Interpreting the Outer Space Treaty's Non-Appropriation Principle: Customary International Law from 1967 to Today." Yale J. Int'l L. 44 (2019): 149. (Robina Fellow at European Court of Human Rights. European Court of Human Rights Yale Law School)//Elmer

Though the Outer Space Treaty flatly prohibits national appropriation of space,150 it leaves unanswered many questions as to what actually counts as appropriation. As far back as 1969, scholars wondered about the implications of this article.151 While it is clear that a nation may not claim ownership of the moon, other questions are not so clear. Does the prohibition extend to collecting scientific samples?152 Does creating space debris count as appropriation by occupation? While the answers to these questions are most likely no, simply because of the difficulties that would be caused otherwise, there are some questions that are more difficult to answer, and more pressing. As commercial space flight becomes more and more prevalent,153 the question of whether private entities can appropriate property in space becomes very important. Whereas once it took a nation to get into space, it will soon take only a corporation, and scholars have pondered whether these entities will be able to claim property in space.154 Though this seems allowable, since the treaty only prohibits “national appropriation,”155 allowing such appropriation would lead to an absurd result. This is because the only value that lies in recognition of a claim is the ability to have that claim enforced.156 If a nation recognized and enforced such a claim, this enforcement would constitute state action.157 It would serve to exclude members of other nations and would thus serve as a form of national appropriation, even though the nation never attempted to directly appropriate the property.158 Furthermore, the Outer Space Treaty also requires that non-governmental entities must be authorized and monitored by the entities’ home countries to operate in space.159 Since a nation cannot authorize its citizens to act in contradiction to international law, a nation would not be allowed to license a private entity to appropriate property in space.160 While this nonappropriation principle is great for allowing free access to space, thereby encouraging research and development in the field, it makes it difficult to create or police a solution to the space debris problem. A viable solution will have to work without becoming an appropriation. There is, however, very little substantive law on what actually counts as appropriation in the context of space.161 So, the best way to see what is and is not allowed is to look both at the general international law regarding appropriations and to look at the past actions of space actors to see what has been allowed (or at least tolerated) and what has been prohibited or rejected.

#### Violation: they don’t

#### The net benefit is shiftiness – vague plan wording wrecks Neg Ground since it’s impossible to know which arguments link given different types of appropriation like mining, space col, satellites, and tourism – the 1AR dodges links by saying they don’t affect particular types of appropriation, or they don’t reduce private appropriation enough to trigger the link

**1NC**

#### CP: The significant investment into the exclusive use of Low Earth Orbit via Large Satellite Constellations for the purposes of 6G development and research is just. All other forms of private appropriation is unjust.

#### Private LEO appropriation drive rapid SatCom 6G innovations – that’s key to pervasive communication services that solve medical data flow deficits and solve UN SGDs

Höyhtyä et al 22 Marko Höyhtyä, Senior Member, IEEE, Sandrine Boumard, Anastasia Yastrebova, Pertti Järvensivu, Markku Kiviranta, Senior Member, IEEE and Antti Anttonen, Senior Member, IEEE. "Sustainable Satellite Communications in the 6G Era: A European View for Multi-Layer Systems and Space Safety." arXiv preprint arXiv:2201.02408 (2022)

THE two main disruptions driving the development and rapid growth of satellite communications (SatCom) are increasing satellite constellations sizes and integration of satellite and terrestrial networks. The former also aims to provide broadband services to currently underserved areas with improved performance. The latter is related to the evolution of mobile networks where different wireless and wired technologies converge together. This creates vast amount of new opportunities in different application fields such as public safety, digital health, logistics and Internet services in developing countries. The annual space business related to 5th generation (5G) and 6th generation (6G) of communication systems is expected to grow to more than €500B during the next two decades [1]–[3]. This is more than the whole space business currently including scientific missions, earth observation (EO) and navigations. At the same time the whole space sector is in the transformation phase due to so called New Space Economy. Significant reduction of launch costs and easy and affordable access to space have attracted new innovative players to space business [4], [5]. Especially Low Earth Orbit (LEO) systems and small satellites are increasing rapidly. The most typical orbit heights are above 500 km but there are significant efforts to use also very low Earth orbits (vLEO) to provide sensing and communications services. The so called Karman line, defining where atmosphere ends and space begins, is above 80 km and orbiting objects can survive multiple perigees passages at altitudes around 80–90 km [6]. Small satellites in the range of 80-220 kg can be seen as a sweet spot [5] since they are large enough for payloads to support e.g. broadband communications [7]–[9] or synthetic aperture radar (SAR) imaging [10], [11]. A. Multi-Layer Networks 6G systems will be used to provide pervasive services worldwide in order to support both dense and less dense areas. To achieve this goal, 6G systems will need to integrate terrestrial, airborne (drones, high-altitude platforms (HAPs)) and satellite communications at different orbits [12], [13]. This means that in contrast to traditional research and development (R&D) work, network analysis, planning and optimization will be updated from two dimensions to three dimensions (3D), where also the heights of communications nodes are taken into consideration [12]–[15]. In this way, 6G networks will be able to provide drastically higher performance to support e.g., passengers in ships and airplanes. The initiatives spawned recently range from very high throughput geostationary orbit (GEO) systems to unmanned aerial vehicles (UAVs) [16]–[18] and small satellite systems dedicated to machine-to-machine (M2M) and Internet-of- things (IoT) services [19]–[21]. Especially interesting are mega-constellations consisting of hundreds to thousands of small and medium size satellites like those proprietary ones envisaged by OneWeb, Starlink, Orbcomm and Telesat to mention but a few. There is also ongoing active work in the 3rd Generation Partnership Project (3GPP) standardization to define non-terrestrial networks (NTN) with interoperable interfaces in order to have truly seamless connectivity in the future, described in detail in Section V.B. B. Space Safety and Sustainability There are not only technical drivers in the development of the multi-layer 6G networks. It is essential to develop services and technologies in a sustainable way in order to ensure high quality services also to coming generations. To mention a few examples: 1) According to International Telecommunication Union (ITU) only half of the world’s population has access to broadband services above 256 kbits/s currently [22]. 2) The COVID-19 pandemic has shown that video communications provide means for people and businesses, including medical professionals, and their patients to remain in virtual contact, avoiding the need for travel while remaining socially, professionally, and commercially active [23]. A comprehensive analysis to linkage between 6G and the United Nations Sustainable Development Goals (UN SDGs) from technological, business and regulation perspectives has been provided in [24], [25]. A very good overview on how European Space Agency (ESA) programs support SDGs is given in [26]. For instance, satellite communication technologies provide e-learning in Congo, tools for telemedicine and transmission of key medical data to and from remote locations, and means to gather and share data on arctic sea and climate conditions. Thus, it supports multitude of SDGs including good health and wellbeing, climate action, quality education, sustainable cities and communities, reduced inequalities, and life on land by helping to protect terrestrial ecosystems. Therefore, modern communication networks will be purposefully designed to be socially, economically and environmentally sustainable, and they will provide means to support equality globally. The main sustainability aspects are visualized in Figure 1. In the following, we list a couple of key points from the SatCom point of view.

#### solves emerging biodisasters – extinction

**Su ’21** [Zhaohui; 2021; Center on Smart and Connected Health Technologies, Mays Cancer Center, School of Nursing, UT Health San Antonio; The Hong Kong Polytechnic University, “Addressing Biodisaster X Threats with Artificial Intelligence and 6G Technologies: Literature Review and Critical Insights,” https://arxiv.org/pdf/2105.08870.pdf]

A disaster can be defined as “a serious disruption of the functioning of a community or society involving widespread human, material, economic, or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources” [47]. Based on the contributing causes, disasters are usually categorized as **natural** (eg, **earthquakes**, infectious disease-inducing epidemics, or **pandemics** of natural origin) and **anthropogenic** (eg, armed **conflicts**, **nuclear accidents**, or the release of **pathogenic genetically modified organisms** from laboratory settings). In the context of this study, **biodisasters** are defined as disasters that occur as a result of **infectious** **pathogens** **with bioweapon potential**, which are unleashed by state or nonstate actors **accidentally** and **intentionally** (eg, the Japanese government’s controversial decision to dump Fukushima’s contaminated water into the boundless and borderless ocean shared by all life forms on earth, including humans and sharks [48]). In the context of biodisasters, a state actor often takes the form of a nation that deliberately and systematically designs and develops infectious pathogens with its national interest in mind. In contrast, a nonstate actor is an individual or group acting independently to obtain or manufacture a pathogen either owing to misguidance or malice. Of note, although existing multilateral agreements prohibit the production and use of bioweapons by state actors (termed biowarfare) [49], the presence of signed agreements **does not imply** that accidental or intentional development and release of pathogens by state actors **will not occur**. The concept of “bioterrorism,” defined as the deliberate release of pathogens that could cause illnesses and deaths in society, is not the focus of this study because “**bioterrorism**” entails both deliberation and malice (eg, to elicit terror to the public) [50]; antecedents **may not necessarily apply** to Biodisaster X threats. Insights from behavioral science [51-53] and evidence regarding individual-caused mass casualty events (eg, indiscriminate mass shootings) [54-56] suggest that individual actors’ behaviors, potentially leading to the onset of Biodisaster X, may or may not include conscious deliberation to harm. In other words, while it is possible that individual actors’ malicious actions might cause **some** biodisasters, it is also possible that some individual-caused biodisasters are **accidental**. Furthermore, the term bioterrorism is **limited**, in that “**terror**” is the main outcome. We believe that for Biodisaster X, which could **upend lives**, **livelihoods**, and **economies**, “**disaster**” is a more appropriate description that sheds light on the **scale** and **severity** of its consequences and is more diverse than “terror.” Drawing insight from real-world examples, similar to the prevalent ransomware hacks, it is possible that state or individual actors could develop and utilize infectious pathogens as “ransomgens” for financial gain rather than merely aiming to generate terror in society. Therefore, under the current research context, we adopted the term “biodisaster” instead of “bioterrorism.” Furthermore, considering that various studies have discussed approaches to address state actor–initiated biodisasters [57-61], this study focuses on biodisasters that are infectious in nature, caused by individual actors, and can result in catastrophic human and economic consequences. Biodisaster X vs Disease X The risk of biodisasters, such as Biodisaster X, is **increasing** **in likelihood**: advances in technology, particularly the **availability** and **maturity** of **biotech**nology, have grown **considerably** in recent years. Inadvertently, these advances may resemble those of **Oppenheimer** [62] in facilitating the release of destructive factors. One example of the misuse of biotechnology is a microbiologist, vaccinologist, and senior biodefense researcher who worked at the United States Army Medical Research Institute of Infectious Diseases, who allegedly engineered the 2001 anthrax attacks [63-65]. While the scale of the 2001 **anthrax** attacks was minor, it demonstrated how **easily** biodisasters can occur and how **unprepared** society was for these events. As seen in the lack of **adequate preparation** and **coherent responses** to infectious disease–induced **pandemics**, including **COVID**-19 [66-69], Biodisaster X’s effects may be **compounded** to the same, if not greater, degree by **incompetence** across international, national, and regional agencies and organizations. The concept of Biodisaster X can be best understood in contrast with Disease X. In terms of similarities, both Biodisaster X and Disease X are driven by pathogens unknown to humans and have the potential to cause crippling effects on society. Furthermore, based on previous inadequacies in response to emergency events including pandemics [66-74], the world at large may be ill-prepared for both Biodisaster X and Disease X. In terms of unique attributes, compared to Disease X, Biodisaster X is more likely to have the following characteristics: (1) having a pathogen directly affiliated to a laboratory; (2) having distinctive and engineered attributes tailored by the capabilities and intentions of the developer; and (3) the origin, development, and history can be definitively ascertained upon identification of the developer, which is not possible for naturally occurring pathogens (eg, the 1918 influenza pandemic), where there is always uncertainty regarding the origin and evolutionary history of the disaster [75-77]. The Imperative of Preparing for Biodisaster X Some of the **deadliest** **pandemics**—the most recent ones ranging from AIDS, severe acute respiratory syndrome, Middle East respiratory syndrome, Ebola, and COVID-19—all have zoonotic origins [78]. Studies have further shown that for viruses that can transmit from animals to humans, especially those that can infect a diverse range of host species, the transmission speeds are **substantially amplified** once human-to-human transmission is established, and the diseases can **quickly evolve** into **global pandemics** [79]. Consequently, once a pathogen is transmissible within a population, there is a **low access threshold**: an individual actor can “obtain” these deadly pathogens **without** the need for **advanced laboratory skills** or **extensive financial resources**. However, costs to physical and mental health may reveal a counternarrative. Based on available evidence, it is difficult to determine whether an individual can be a malicious “patient zero”; an individual who intentionally contracts a novel virus intending to cause infectious disease outbreaks in a society [80]. It is not impossible to purposely study and capture known or unknown deadly pathogens that can trigger infectious diseases; microbial surveys are commonly conducted to identify novel pathogens before they pose a threat to public health [81-84]. In theory, there could be individual actors, with adequate knowledge or experience (similar to the microbiologist allegedly behind the 2011 anthrax attacks [63-65]), who may take the same actions but with different motives, ranging from scientific curiosity to ill-guided intentions. Considering the **rich biodiversity** of wildlife, along with the large number of “**missing viruses**” and “missing **zoonoses**” that remain unidentified [85], close contacts with latent deadly pathogens are **nearly impossible** to control, which in turn, renders it challenging to locate or identify individual actors who might utilize them. Advances in **synthetic biology** may further compound the situation, especially considering the scholarly endeavors using pathogens in laboratory settings, which could amount to the level of real-world pandemics (eg, laboratory-cultured viruses such as smallpox [86-88]). The likelihood of Biodisaster X increases in proportion to these factors. Overall, considering the species diversity of wildlife, the unknown factors related to the scale and severity of viruses in animals, which have the latent potential to infect humans, and the varying degrees of competency of community health centers in detecting infectious disease outbreaks in a bottom-up manner, it could be tremendously difficult for health experts and government officials to monitor potentially emerging Biodisaster X threats. However, not all hope is lost. Technology-based solutions, especially those utilizing AI and 6G technologies, can help address these issues. The Need for Advanced Technology Solutions for Monitoring and Managing Biodisaster X The Need for Technology-Based Solutions Once Biodisaster X becomes a reality, human contact will drive transmission and become the primary fuel for exacerbating infections and deaths caused by the disaster. As seen during the COVID-19 pandemic, owing to virus spread and subsequent public health policies (eg, lockdowns), many **critical** **societal** **functions** could be **substantially** **disrupted**. The potential to **control** and **contain** human and economic **consequences** of Biodisaster X, such as the functionality of the health care systems (eg, infected health care professionals) [89-91], may also become **critically undermined**. In these circumstances, **tech**nology-based solutions could be the **key** to addressing these crises, as they are different from conventional solutions; they are **not** **highly** **dependent** on physical interactions and transportation. Overall, technology-based solutions require **limited** human resources (eg, with the ability to operate without human input), can be delivered **independent** of physical human contact (eg, web-based and remote deployment), and are **immune** to infectious diseases (eg, can function in contaminated environments). Furthermore, technology-based solutions are **less vulnerable** to issues ranging from physical fatigue to mental health burdens, which are health challenges that frontline workers often face amid emergency events. The Need for Advanced Technologies To effectively predict, control, and manage Biodisaster X, which is an event with a low probability (ie, difficult to detect preemptively) and a high impact (ie, difficult to control and contain), advanced technologies are needed. While many emerging technologies can address the dangers and damages associated with Biodisaster X [92,93], 2 families of advanced technology-based solutions show particular promise, namely AI techniques and 6G technologies. Unique Capabilities of AI AI is generally considered synonymous with “thinking machines” [94], or techniques that can facilitate “a computer to do things which, when done by people, are said to involve intelligence” [95]. With AI technologies, machines can identify patterns too intricate for humans to identify and process quickly. AI techniques are widely used in areas such as natural language processing, speech recognition, machine vision, targeted marketing, and health care, including efforts to combat COVID-19 [96-99]. While technologies such as virtual reality, smart sensors, drones, and robotics could play a positive role in supporting health care professionals to cope with the pandemic [100-102], AI technologies are arguably most instrumental in addressing some of the most prominent issues health experts and government officials are faced with, ranging from pandemic surveillance to COVID-19 drug and vaccine development [103-106]. AI and machine learning techniques are particularly valuable in their ability to identify trends and patterns across large amounts of data promptly and cost-effectively; for example, in identifying or searching for specific patterns. With natural language processing, for instance, data can be extracted retrospectively from clinical records or prospectively in real time and statistically processed for insights, which, in turn, can supplement existing structured data to enrich actionable information [86]. During the COVID-19 pandemic, natural language processing models have been used to analyze publicly available information such as tweets, tweet timestamps, and geolocation data, to identify and map potential COVID-19 cases cost-effectively, without utilizing testing devices or other medical resources that involve health care professional [107]. Overall, most, if not all, AI techniques are irreplaceable in regard to administering complex tasks such as extracting useful information from large data sets. Moreover, with the continuously increasing speed of its technological advancements and applications, AI technologies are often utilized as core components in other emerging technologies [108]. Smart sensors that perform advanced tasks, such as effectively identifying and recognizing captured motions and images, often need to integrate deep learning technologies (a subgroup of AI) [109-111]. These combined insights suggest that AI techniques have great potential in monitoring and managing Biodisaster X threats. Unique Capabilities of 6G Networks 6G technologies are the next generation of wireless communication systems following 5G networks [112]. While 6G is still under development, it is envisioned as the most capable communication network currently available [112-119]. The advantages of 6G networks derive from their high data transmission speed (up to 1 terabyte per second), wireless hyper-connectivity (100 million connections per km2), low end-to-end latency (< 1 ms), reliability (1-10-9) (reliability in terms of the frame error rate, which is defined as the ratio of the number of incorrectly decoded frames to that of total transmitted frames), and high-accuracy positioning capabilities (indoor: <10 cm in 3D; outdoor: <1 m in 3D) [112-119]. Adding the fact that 6G networks also excel in their energy efficiency and spectrum efficiency, these networks can provide fast and efficient wireless reporting and access to remote computational facilities, facilitating mobile biomonitoring and disaster management. For instance, the high reliability and data transmission speed of 6G technologies will be of critical importance amid global emergency events with the scale of Biodisaster X. At the onset of the COVID-19 pandemic, many internet companies and service providers experienced outrage and were forced to reduce the amount of data individuals and organizations could utilize to ensure continuous communication for all [120]. This limitation of existing communication networks could compromise the ability of health experts and government officials to monitor and manage COVID-19–related threats and other disasters promptly and properly. Of note, in the face of an extremely deadly, contagious, and fast-developing Biodisaster X, information will be predominantly updated and exchanged remotely and over the internet. The speed and success of updating and exchanging information are highly dependent on the reliability of communication networks, in which 6G technologies excel, especially when spatial big data have been introduced for disease control and prevention since the COVID-19 pandemic [27,108,121]. Figure 1 lists visual comparisons in communication capabilities between 6G and 5G networks.

#### That outweighs their impacts

Walker 18 (Robert Walker, first class honours degree in Math from York university, PhD at Wolfson College Oxford, 2018, "Debunked: Nuclear Winter and Radioactive Fallou...," https://debunkingdoomsday.quora.com/Debunked-Nuclear-Winter-and-Radioactive-Fallout-myths)

**There are many online pages and websites that seem very authoritative that say that even a limited nuclear war, say between India and Pakistan, would plunge the Earth into** a ‘Nuclear winter’ with no crops able to grow, no plants, no animals, and people soon starving to extinction. **This** is politically motivated and based on **out of date or** junk science. I am very much in favour of nuclear disarmament so I’m strongly in favour of the political views that motivate these people. I go so far as to argue that the UK should disarm unilaterally, and should never use its nuclear weapons under any circumstances. This is a similar view to the Scottish National Party and Jeremy Corbyn though he has not persuaded his party to adopt this stance, see my [Is Corbyn Right About The Bomb?- Op Ed](http://www.science20.com/robert_inventor/is_corbyn_right_about_the_bomb_op_ed-180465). But I think people need to know the truth and make decisions based on truth. I think it is important to speak up when a view is widely publicized that just about all scientists believe to be false, based on poorly supported research that they think will lead politicians to desired actions. Even if it has good political effects. In this case as well, **it is** also scaring **people** unnecessarily **who are afraid that even a small nuclear war could plunge us all into a deep freeze. No, it would not, and the** research suggesting this is **fundamentally** flawed and based on out of date ideas**. The** expert scientists **involved are sure** **that the** older nuclear winter models were incorrect, based on their failed predictions for the Kuwaiti oil fires **which they predicted would harm agriculture over much of** Asia but it only had local short term effects. There were many who were skeptical all along, but that was what persuaded nearly all of the ones who still thought it was possible that their models were wrong. There is one notable remaining nuclear winter proponent, Robok, who along with various co-authors publishes articles that are widely publicized because of their dramatic conclusions. However these predictions are not only not well received by other climate researchers, they are generally regarded as incorrect due to fundamental flaws in the assumptions his models are based on. The researchers who say this make assumptions that they can't prove and that everyone else in the field has said long ago don't work. **Carl Sagan gave up on the nuclear winter hypothesis after the Kuwaiti oil field fires and just about everyone else** except Robok **agreed with him.** SUMMARY The nuclear winter predictions date back to some predictions in the 1970s based on their limited crude models on slow computers (by modern standards) with hardly any memory, just kilobytes. They tried to model what would happen to the soot from fires in cities during a nuclear war. They concluded that it would be lofted so high into the atmosphere that it would get above all the normal weather and linger there for a decade, nearly blocking out the sun completely world wide. Their predictions were so dramatic that a 'nuclear winter' is an understatement. Average world temperature -25 C. You are talking about the ocean freezing even right to the tropics, for ten years. It's no wonder that they gave it that name. It had the support by highly respected scientist. One of the authors of the original paper was Carl Sagan. But the models were based on flawed assumptions**. Even at the time they were questioned. Nowadays just about all scientists involved, including ones that supported the hypothesis originally, are** **agreed that it would have little effect**. **It might** no effect on temperature **at all,** **except for a brief reduction of temperature** **locally during the fire itself as it turns day to night temporarily - since after all we have** large areas burnt in wildfires **every year with no effect.** The **scientists who did the nuclear winter work realized they had made a mistake in the modeling after the Kuwaiti oil fires**. **When the oil fields were left burning by the retreating troops, they predicted dire consequences for agriculture througout Asia. Instead it** **shaded out a** small part **of the gulf area** **with a** slight reduction of temperature **(similar to night time) for the duration of the fires** (several months). This showed that there was something wrong with their models. After looking into it in more detail **they decided that the** **soot** **doesn't rise nearly as high as they predicted in the atmosphere, and it** **tends to get** washed out within days **by rain.** The combined effect is that the darkening is temporary and local instead of long term and global. So, nearly all scientists agreed on this, but **Alan Robock published a paper in Physics Today in which he claimed that an all out exchange between Pakistan and India, of, say, 100 nuclear weapons would cool the Earth on average by a few degrees. The** **science in this paper** **was good except that he** started it already pre-loaded with soot **in the upper atmosphere**. Remember the very reason the early models got discredited is because soot doesn’t rise as high as expected in the Kuwaiti oil fires. Nor does it with wildfires or the fires from the Dreden bombing - and Hiroshima and Nagasaki didn’t have fire storms at all. This paper doesn’t even discuss this question. **It simply pre-loads the atmosphere with soot in the upper atmosphere, and from then on it follows the consequences.** **But that is the very point at contention** - **whether the soot would end up so high in the atmosphere.** **Everyone is agreed that there would be serious consequences if this happened but the evidence is that** it can’t get there **after the fires started in a nuclear war.**

#### It’s topical

* Answers Matignon

Takaya et al 18 “The Principle of Non-Appropriation and the Exclusive Uses of LEO by Large Satellite Constellations” Yuri Takaya-Umehara [Visiting researcher at the University of Tokyo since April 2017. She was affiliated to the Kobe University to provide a course on space law to post-graduate students (2011-2017). She chairs a working group on the formulation of global norms in space law organized by the Keio University since 2018. She obtained her Ph.D. degree at the IDEST of Paris XI University in France, LL.M. at the Leiden University in the Netherlands.] Quentin Verspieren [Ph.D. in public policy @ The University of Tokyo, Assistant Professor of Space Policy @UTokyo, General Manager, Global Strategy @ArkEdge Space Inc., Associate Research Fellow @ESPI] Goutham Karthikeyan [The University of Tokyo & Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency (ISAS-JAXA)] 2018 https://www.researchgate.net/publication/328094878\_The\_Principle\_of\_Non-Appropriation\_and\_the\_Exclusive\_Use\_of\_LEO\_by\_Large\_Satellite\_Constellations SM

* LSC = large satellite constellations

Firstly, it is important to specify that, as the scope of the non-appropriation principle includes outer space and celestial bodies, it applies to orbits around the Earth and other celestial bodies as well as interplanetary transferring orbits.29 The terms “use or occupation” need to be read in the context of Article I that ensures free exploration and use of outer space to “any state”. Any orbit, be it in LEO or anywhere else, is a precisely defined area of outer space that can be physically occupied by spacecraft, substantially resulting into national appropriation; therefore, the exclusive use of a specific orbit by any public or private would fall under the “means of occupation” as stated in the OST, being in direct violation of the non-appropriation principle.

Secondly, in light with ITU’s conception of orbits are “limited natural resources,”30 the debate over the violation of the non-appropriation principle by “means of [exclusive] use” of LEO can be equated to the debate over the legality of the exploitation of natural resources in space. As argued by Philip De Man, the specific use made of an orbit conditions its classification as a natural resource or not.

“In the case of point-to-point traversal of a medium, its use is incidental to the main goal of transportation, and is a means of overcoming the obstacle of distance, while the placement of a satellite in a particular orbital position is a necessary precondition for actualizing the economic value of the medium itself”31

Therefore, the exclusive use of an orbit by an LSC for obvious economic benefits would justify its classification as natural resource and, due to the exclusive nature of the use, trigger a violation of the non-appropriation principle, as argued in the following section.

Finally, an important aspect of the exclusive use of LEO by LSC is the growing contradiction between the “first come, first served” principle under ITU regulation32 and the non-appropriation principle. While the organized allocation of GEO slots has been motivated by the high interests and expected use of a relatively limited orbital region, LEO have been considered until now exempt from the risk of over-crowdedness. However, now that the advances of space engineering allow the deployment of constellations large enough to constitute an exclusive use of specific orbits in the LEO region or as some scholar said, to “exclude new competitive systems”, 33 the limit of the “first come, first served” principle is reached as it directly contradicts, not to say violates, the non-appropriation principle. It would therefore be beneficial for both the respect of international space law and the sustainability of the LEO environment to call ITU’s “first come, first served” principle’s fairness into question.34 A notable inspiration is the IADC’s classification of protected regions of outer space, with LEO being the “protected region A” while GSO is labelled “protected region B.”35

#### Reject the arg on 1AR Theory

#### 1. Proportionality- punishment is worse than the skew which is solved by investment in the original arg and defending theory.

2. Creates perverse incentives to collapse to theory instead of returning to substance- turns deterrence since theory over-proliferates which crowds out substance. Condo is good - -Alternatives worse -- a reactionary 2AR can make up for neg abuse especially when they set the terms of the debate. procedurals and DAs fill in and are worse because perms and 1AC solvency defenses can’t check them and try or die framing requires the aff read impact d on each issue which incentivizes worse da writing and contrived t violations

**1NC**

#### CP:

#### The internal implementation of the following cybersecurity measures by private entities engaged in the private appropriation of outer space is just: Multi check for IoT devices, Identity and Access Management, Intrusion Detection System, Immediate Kill-Switch of Satellites that’s required to activate when malicious, anomalous, or abnormal activity is detected, Supply Chain Risk Program, Independent Command Logging, Physical Separation of Network Components, Crisis Communication Plans, Machine Learning that detects abnormal activity, and Collision Avoidance Procedures.

#### The creation and implemention of an intergovernmental anti-trust doctrine and governing board in space as part of the Outer Space Treaty is just.

#### The internal implementation of the following debris measures by private entities engaged in the private appropriation of outer space is just: mandating all satellites be launched with active debris removal shepherd satellites, launch Active Debris Removal satellites and require all satellites be equipped with systems to enable spacecraft to deorbit themselves.

#### Collision avoidance solves

Arif 17 — (Aayesha Arif, Journalist, “This Is How Satellites Avoid Colliding Into Each Other“, Wonderful Engineering, Available Online at https://wonderfulengineering.com/satellite-collision/, accessed 3-22-2022, HKR-AR)

A standard collision avoidance procedure has been established by space agencies to avoid any such accident. Every time a satellite is launched, a Collision On Launch Assessment (COLA) is performed. To make sure that the space vehicle trajectory does not take it too close to any other object in space, the launch window is set such that it has COLA blackout period, the intervals during which the spacecraft does not lift.

The purpose of COLA is to avoid the collision after launch. To avoid any debris or spacecraft collision while in orbit, the satellite performs collision avoidance maneuver also called Debris Avoidance Maneuver (DAM). The collision avoidance maneuver is usually performed to raise or lower the orbit of the craft by a few kilometers. Read more about how the Hubble Space Telescope conducts it to avoid space debris hits.

#### Solve the entirety of the armed conflict and tech innovation adv

Maria Rhimbassen (Research Fellow with Open Lunar & PhD Candidate in Space Law at the University of Toulouse and CNES), 6-6-2021, "An Introduction to Space Antitrust," Open Lunar Founation, https://www.openlunar.org/library/an-introduction-to-space-antitrust#analysis-of-the-what-antitrust-and-the-ost-principles

Analysis of the What: Antitrust and the OST Principles ¶ One such strategy could stem from the realm of national law, even though it can trigger international implications and consequences. In this case, it is not about national space legislation, but about competition law, or what is also called antitrust. The only reason why antitrust is considered at his stage, is that antitrust stems from the national level and that there is no such thing, to this day, as a harmonized international antitrust regime per se besides a fragile international governance consisting of non-binding guidelines (33) and failed dialogue at the level of the World Trade Organization (WTO) (34). Antitrust is indeed very much politicized (35) and arbitrary, judged on a case-by-case basis, and at the service of “national champions” (36). However, despite these hurdles, several arguments can be made in favor of antitrust mechanisms applied to the commercial space sector for the benefit of protecting the aforementioned principles to prevent a zero-sum dynamic (37).¶ Benefit Sharing¶ Firstly, fair competition entails preventing further consolidation of a market and breaking up monopolies which absorb most benefits in one place (38). In the space sector, the 1966 Declaration on Space Benefits (39) and the OST emphasize the need for space activities to be “carried out for the benefit” of humankind. Indeed, article I of the OST, provides that: ¶ “The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind (...)” (emphasis added)¶ However, it is not clear how space activities are exactly to be carried out for the benefit of all. The notion of “sharing” benefits derived from space activities appears in the Moon Agreement of 1979 but the agreement itself has not succeeded in being adopted by a significant number of nations and its fate remains uncertain (40). However, the notion of benefit “sharing” has resurfaced through international working groups such as the Hague International Space Resources Governance Working Group (HIRSGWG) and debated by scholars at Outer Space Institute (OSI) in terms of what benefit sharing should entail (41). What is clear, though, is that more work must be done to determine what the notion of benefits entails, and an antitrust perspective might be helpful in terms of promoting fair competition while restricting unchecked consolidation. More work must also determine whether equality or equity (or both, and if so, to what extent) should prevail.¶ Equality and Free Access¶ Secondly, it could be argued that the principle of “equality” and “free access” as enshrined within article I of the OST would seem to preclude monopolies insofar as equal access to celestial bodies must be maintained while, in theory, monopolization would potentially bar such equal access:¶ (...) Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies (...) (42). (emphasis added)¶ The main concern raised by the above-cited paragraph is to determine to what extent the article I applies to space resources on the celestial bodies in question. Since celestial bodies are not defined, as previously stated, and since there is no mention of space “resources” within the OST, national law or doctrine can be used to answer the question. The only national legislations mentioning space resources are the ones in favor of the commercialization, as listed supra (43). Secondary sources, or doctrine, reflect divergent views expressed by scholars at the international level (44). This situation illustrates how national law is filling the legal void previously referred to. Nevertheless, which void does it precisely try to fill? The term “appropriation” appears in article II of the OST, alongside with the term “celestial body” which, in article I appears next to “free access”, “equality” and “benefit”. By association, it can be inferred that the States in favor of space commerce do not object to the idea of the extension of these principles to space resources. In this case, as space resources regulation seems to emanate from the national level, national antitrust measures constitute, (at the first stage) an adequate legal response, in parallel, to contain and monitor the risk of monopolization or other anti-competitive behavior in space (an international level field). Such measures could indeed be included within current and future national space legislation and enforce fair competition based on the OST principles. This could in turn generate enough momentum and critical mass to trigger an international framework and intensify harmonization efforts (at the second stage), especially with regards to the commercialization of the space sector.¶ ‍¶ Cooperation and Due Regard¶ Thirdly, article IX of the OST provides that principles such as “cooperation” and “due regard” must be complied with: ¶ In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty (45) (emphasis added)¶ These obligations, under international law, bind States directly and non-governmental entities, indirectly, because of article VI which extends the State’s responsibility to the activities of their respective nationals. However, as “due regard” may be interpreted as mandatory because of the wording “shall conduct” which precedes it, the same rationale might not necessarily cover cooperation because the wording “shall be guided” might rather lead towards the realm of guidelines. Monopolization tends to preclude cooperation, but it is harder to draw the line between what might consist of cooperation (46) vs collusion (47). “Cooperation” in this case represents an interesting “beacon” because if not carefully delimited, it might lead to a legal void and be used to justify some form of collusion in the future. Therefore, this is a useful example to bring forth ethics and values in the light of the OST principles towards “guiding” interpretation of “cooperation” in compliance with fair competition requirements. Mandatory “due regard” is a key argument backing fair competition due to its definition: “to give a fair consideration to and give sufficient attention to all of the facts” (48). In article IX, “due regard” extends to the interests of “all” other States Parties to the OST, which means that all these interests should be taken into “fair consideration” before conducting activities in outer space. It is difficult to imagine how a monopolistic environment, or any other anti-competitive behavior would come to terms with this norm. ¶ ‍¶ Non-Harmful Interference and Equitable Access/Distribution¶ Fourthly, international space law, thanks to article IX of the OST and international telecommunications law, owing to the International Telecommunications Union (ITU), both share an important principle which is non-interference that is a major pillar of space activities. On the one hand, article XI continues as follows:¶ (...) If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, may request consultation concerning the activity or experiment. (emphasis added)¶ When applied to the fair competition lens, this implies that prior to commercial activities which might result in limiting other nations or nationals’ activities, to the point of potentially “interfering” with their current or prospective activities, States shall conduct consultations or basically notify one another. The enforcement of these consultations remains however uncertain. Nevertheless, the legal obligation remains, and represents, at least in theory, an opportunity for antitrust to set forth recommendations and precedents.¶ On the other hand, the ITU’s Constitution forbids “harmful interference” in its article 45 (49), but in this case, it defines “harmful interference” in more technical terms, confined to telecommunications:¶ “Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with the Radio Regulations” (50).¶ However, it is inferred that non-harmful interference is relevant to fair competition, with regards to radio spectrum frequencies management and orbital slot allocation, due to the frequent reference to “equitable geographical distribution”, “equitable use” (article 12), and “equitable access” (article 44) which states the following:¶ “In using frequency bands for radio services, Member States shall bear in mind that radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to those orbits and frequencies, taking into account the special needs of the developing countries and the geographical situation of particular countries”. (emphasis added)¶ Equitable access to limited natural resources has also been interpreted by legal scholars as amounting to a fair competition principle (51) and this would add to the argument against potential monopolization of space resources. Furthermore, despite the increasing privatization of the telecommunications sector (52), there remains the obligation to ensure that “fair competition” is adhered to, as in the case of Intelsat (53). ¶ Still, what is to be considered as more problematic is the national interpretation of the principle of non-harmful interference in the sense that it is not clear to what extent national legislation is ready to apply “reciprocity” as implied within article IX of the OST whereby States shall not “interfere” with each other’s activities, and if there is a risk of harmful interference, they must enter into consultation. For instance, one such national law is the US Space Act of 2015 (54) which, in section 402 relative to space resources utilization, provides that the President is directed by the bill to:¶ (...) promote the right of U.S. citizens to engage in commercial exploration for and commercial recovery of space resources free from harmful interference, in accordance with such obligations and subject to authorization and continuing supervision by the federal government. (emphasis added)¶ The only instance where “reciprocity” is mentioned within the OST is in article XII whereby installations and equipment are to be open to other States on a basis of reciprocity, due notice, and no interference with the facilities’ operations. It might then be inferred that non-interference is of a reciprocal nature and that this interpretation would take precedence over the US Space Act of 2015 which must comply with international applicable law (55). Otherwise, if the US Space Act of 2015 does not recognize the reciprocal nature of non-interference access to and/or recovery of space resources, it would advocate for an extremely competitive environment which would result in challenging the higher principles which the OST fundamentally relies on. This legal contention points to another example for space antitrust “beacons”, channeling prospective space commerce through reciprocal dynamics and non-interfering forces. In this case, what might clarify the perspective of the US is the wording found in bilateral agreements such as the 2020 Artemis Accords (56). Indeed, section 11 on “Deconfliction of Space Activities” (57) elaborates on “due regard” and “non-harmful interference” under the form of “safety zones” (58), while committing to the OST (59). Section 11.3 of the Accords further reiterate the bilateral agreement’s commitment to article IX of the OST and its implied reciprocity:¶ Consistent with Article IX of the Outer Space Treaty, a Signatory authorizing an activity under these Accords commits to respect the principle of due regard. A Signatory to these Accords with reason to believe that it may suffer, or has suffered, harmful interference, may request consultations with a Signatory or any other Party to the Outer Space Treaty authorizing the activity (60). (emphasis added)¶ Furthermore, the implied reciprocity is emphasized in section 4: ¶ The Signatories commit to seek to refrain from any intentional actions that may create harmful interference with each other’s use of outer space in their activities under these Accords.¶ In short, it can be posited that reciprocal non-harmful interference (or no interference), as referenced supra, complies with fair competition principles in that it might be interpreted as a barrier to monopolization attempts with regards to, inter alia, space resources. This leads the analysis to contemplate antitrust as a potentially satisfactory solution to reach regulatory targets into a growingly transnationalist arena surrounding commercial imperatives. A “space antitrust” framework would require a mandate to make sure that these commercial imperatives thrive for the benefit of the higher principles within space law, whi

ch distinguish outer space from most other domains.‍¶ ‍¶ Anti-monopoly Law¶ Antitrust, as a field of law per se, differs across national jurisdictions. On the one hand, in Europe, it merged into a transnational “continental” framework following the Treaty on the Functioning of the European Union (TFEU) (61). Success, however, remains limited due to divergent national interpretations and interests, and due to some of the articles’ wording perceived as controversial (62). European competition law considers anti-competitive behavior through abuse of dominance, collusion, concerted practice and cartelization and focuses on the consumer’s welfare while seeking to protect competition per se as opposed to protecting competitors. Competition law at the European level starts with article 101(1) of the TFEU which prohibits:¶ "All agreements between undertakings, decisions by associations of undertakings and concerted practices which may affect trade between member states and which have as their object or effect the prevention, restriction or distortion of competition within the common market." (63) (emphasis added)¶ On the other hand, on the other side of the Atlantic, in the US, the Sherman Antitrust Act of 1890 (64), the Clayton Act of 1914 (65) and the Federal Trade Commission (FTC), also created in 1914, mostly oppose artificial monopolies (66), anti-competitive or deceptive behavior under the condition that there is an anti-competitive action leading to such an outcome. For instance, section 1 of the Sherman Antitrust Act provides that any contract or conspiracy to restrict trade is illegal. Furthermore, on monopolization, section 2 provides that:¶ Every person who shall monopolize, or attempt to monopolize, or combine or conspire with any other person or persons, to monopolize any part of the trade or commerce among the several States, or with foreign nations, shall be deemed guilty of a felony (...) (67) (emphasis added)¶ This explains why certain scholars (68) refer to US antitrust as, among others, “anti-monopoly” law. At the very beginning, it was used to break monopolizing trusts, in a serial fashion, but in time, it lost its momentum. According to Posner (69), monopolies can be either natural (which the Sherman Act refers to as “innocent monopolies”, to be allowed as legal” or artificial (illegal). Natural monopolies enable, in theory, massive economies of scale and are therefore permitted. Artificial monopolies, on the contrary, are detrimental to the economy as they seek to distort and restrict trade, and they are to be therefore prohibited. Such was the argument of SpaceX in its antitrust battle vs United States Alliance (ULA) when it stated that ULA did not in fact enable such economies of scale and that SpaceX could provide launching services at a cheaper price. Nonetheless, in reality, it is hard to draw the line since antitrust authorities pretend to favor consumer welfare (low prices), but it is hard to distinguish whether low prices are indeed aimed at the final consumer or, in fact, to disqualify competitors thanks to predatory pricing.¶ Space Antitrust¶ The extrapolation of anti-monopoly law to outer space (e.g., on orbit, on celestial bodies, etc.), raises the question as to which jurisdiction applies. In theory, the launching State’s jurisdiction extends to the launched space object, in perpetuity, such as in the case of the International Space Station’s modules. However, in many cases, there can be confusion in determining the “launching State”, which is defined at article I of the Liability Convention of 1972 (70), especially when several States are involved in the launching, as opposed to the “State of Registry”, according to article VIII of the OST and the Registration Convention of 1976. Sometimes, the two notions collide head-on (71). The situation gains in further legal complexity in connection with on-orbit transfer of ownership vs title. It is not clear whether ownership can be fully transferred in orbit, as opposed to title, which does not. This may prove over-complicated indeed. Therefore, it would be next to impossible to assign or attribute antitrust to a specific jurisdiction in space and that explains the need for a harmonized outer space regime in terms of antitrust, even more when the principles addressed supra stem from international public law. Otherwise, different antitrust regimes would then apply to different sites of activity by different actors, which could end up in aberrant scenarios. ¶ It would be more convenient to establish a predictable and harmonious legal certainty, appropriate for each resource system or specific application in outer space and to consider antitrust as a creative tool, not an end in itself. The rationale is to rely on competition law to ensure market sustainability, while reducing the risk of fierce and unfair competition. For instance, in the case of scarce resources (e.g., polar ice water on the Moon), essential services (e.g., oxygen supply on a station, etc.), there is a need for measures against reckless monopolization based on a “first come, first served” logic. As mentioned supra, due regard and non-harmful interference may be used in that sense, but implementation remains to be established. Should that be brought to public international bodies, in the form of binding measures or non-binding guidelines? Should recommendations be made at the national level (e.g., model law clauses (72) to be inserted as amendments to national space legislation? Without harmonization efforts at that level, there is a risk of increasing forum shopping whereby a private actor seeks to register its activities in jurisdictions with less stringent legislation and dubious enforcement resources. This trend starts in the space sector and this is alarming since space is a high risk sector and launching States’ international liability is a complex notion in terms of attribution, especially if the damage takes place in orbit which explains why some private entities either choose a complex forum architecture, mostly through contractual law (73), or try to escape any national jurisdiction altogether by launching from international waters (74), which is considered as yet another example of legal void and deserves more consideration.‍¶ ‍¶ The How¶ The previous sections addressed the “what” or more precisely, the space market through the lens of fair competition and antitrust. However, determining the “how” is more challenging. Indeed, as mentioned, sources of a space antitrust could either originate in future initiatives at the level of hard law or could be left to the realm of soft law and self-regulation. The former surpasses the latter in terms of legitimacy, but might be very time-consuming (75), if reaching consensus at all. The latter might not sit well with the space community at large, but might prove more efficient and timelier, which is needed especially when space commerce beckons. ¶ To come to grips with the implementation conundrum, this section draws from the legal field of intellectual property, which is considered, according to the Organisation on Economic Cooperation and Development (OECD) (76), as a part of competition law because of its monopolistic potential. Intellectual property has its share of controversy in terms of knowledge enclosure and excludability of knowledge commons (77), thus arguably reducing the advancement of innovation to the status of stagnation and limiting the diversity of knowledge itself (78). Intellectual property (IP) rights, as any aspects of property law, rely on a State’s jurisdiction. However, when transformed into financial assets, these intangible assets can eventually escape that given jurisdiction (79). Furthermore, as IP increasingly interacts with antitrust (80), it is interesting to note here the junction between property rights, IP, finance, antitrust and space. Through IP, antitrust could find yet another way to escape national legislation and incentivize the growth, at the same time, of a space financial market. In this situation, the content of IP could be space resources per se, however modified somehow in order to qualify for either a patent or trade secrets and translated into financial assets. They could then benefit from innovative and decentralized archiving through technology such as blockchain -- although “consortium blockchains” (81) might raise collusion or concerted practices issues, which qualify as "unfair competition” and enter the realm of smart contracts, which are self-executory by default (82), and increase transparency, while escaping a whole lot of jurisdiction. They could even become a source of space commodities in the case of an eventual space commodities exchange (83). Such opportunity for decentralized governance can perhaps be managed at best through polycentricity, which is based on Ostrom’s matrix of goods (84) trying to solve issues around the “commons” and their respective rights (85). This might prove essential as IP carries an inherent risk of monopolization. In this scenario, entire resource systems, altered to qualify as IP, can be monopolized by a few private entities, which could end up restricting significantly the capacity and diversity of space commerce in the future. Since this kind of assets would fall under the fifth basket of commodities (86), namely financial rights, and in this case, derivatives, it would be trickier to determine the applicable law because of increasing deregulation. Furthermore, this problem is exacerbated by decentralized cyber technology such as blockchain. Hence the bigger problem of identifying the appropriate source of law to intervene in this transnational occurrence. ¶ Having touched on the pros and cons of hard and soft law, supra, the observation which could be made in this section is that soft law, building on the trend of privatization of the law, could seize this opportunity to play an active role through different instruments such as compliance requirements, contractual clauses, or ethical principles, which often precede law chronologically (87). These private sources of law, and perhaps soon enough public sources too, stem from a potential business model involving platforms that manage decentralized blockchain systems housing the code of financial assets derived from space resources IP -- and arguably creating thus new property rights “from scratch” (88). These platforms could make sure that no set of coded resource systems take over and monopolize the market and enforce their own rules and smart contracts over others (89). Such purpose focused on fair competition could be orchestrated inside a given community of interest (90) and rely on an external entity (oracle form to be determined) for guidance with respect to perpetuating the protection of the given purpose (91). That could take the form of a trust (92) and contribute to laying the foundations for future sustainable customary practice, norms, or behavior. Such trust might indeed address antitrust on the level of the “what” (fair competition and resource systems) and the “how” (fair competition in terms of platforms, i.e., preventing monopolization of one or several blockchains through initial allocations) by enforcing principles such as open access and transparency.¶ ‍¶ Discussion¶ Outer space remains a heavily regulated and strongly politicized sector. However, the growing commercialization of the sector opens the gate to another form of regulation besides the sectoral one. International commercial law, hand in hand with national legislation, fills the gap left by the corpus juris spatialis, however, with opaque transnational and private legal mutations as the ones negotiated behind closed doors, in arbitration, it is difficult to fully anticipate the “soft” lex ferenda, especially when customary norms are being set in motion as of this writing. This note asserts the need to at least anticipate the evolution of competition in the space ecosystem, through the legal lens, and to act on it to ensure fair competition and mitigate the risk of monopolization for the benefit of a sustainable and diversified space economy ahead.¶ Borrowing from legal design, the knowledge mapping below (Figure 1) summarizes the key principles as enshrined in the corpus juris spatialis and their potentially beneficial impact as compliance catalysts for fair competition in the commercial space sector. The mind mapping also includes various strategies leading to antitrust solutions such as the thesis of IP.¶ Figure 1: Space commerce through the lens of antitrust as a purpose¶ In a nutshell, the above figure aims to illustrate the fact that competition law in the space sector is not just about busting monopolies in the launchers sector (93). It can indeed be a lot more than that, and creativity is the limit. In short, the sky is not the limit but only the beginning.¶ ‍¶ Conclusion¶ The purpose of this paper is to demonstrate the hidden power of antitrust into shaping a sustainable space ecosystem in the future and to ensure that space commerce, and hence the emerging “lex mercatoria spatialis” adheres to the higher principles of international space law. Despite antitrust initially stemming from national law and its challenging international (or lack of) governance and harmonized enforcement, there are many shortcuts, as elaborated throughout this paper, to apply antitrust in the space sector. One such strategy is through anticipating the future nature of the space financial market thanks to decentralized technology seeking to further escape jurisdiction requirements. This implies the need for an adaptive governance based on polycentricity and openness, for the benefit of intergenerational equity and sustainability. Pragmatic ways must indeed be found to preclude further enclosure of knowledge at the interplanetary level, which generate an adverse effect, opposite of economic and innovation growth (94). The next step is to compare governance models and select the most efficient path towards ensuring the perennial protection of space law principles such as benefit sharing, cooperation, equality, freedom of exploration, non-harmful interference, and due regard, applied through the lens of fair competition for a diversified space economy.

#### Solves the case

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2. Identity and access management (“IAM”) – those accessing flight control information and surfaces need to be identified and verified by an IAM solution that will pass muster on the user using machine learning identifiers to attempt to prevent authorized access to critical vehicle functions.

3. Multi check for IoT related devices – IoT devices must be able to be updated; no hard-coded passwords should be allowed.

4. The backbone of a cyber-resilient spacecraft should be a robust intrusion detection system (IDS). The IDS should consist of continuous monitoring of telemetry, command sequences, command receiver status, shared bus traffic, and flight software configuration and operating states, anticipate and adapt to mitigate evolving malicious behavior. The spacecraft IPS and the ground should **retain the ability to return critical systems** on the spacecraft to known cyber-safe mode. Logging should also be available to cross-check for anomalous behavior.

5. It is critical that spacecraft developers implement a supply chain risk management program. They must ensure that each of their vendors handles hardware and software appropriately and with an agreed-upon chain of custody. Critical units and subsystems should be identified and handled with different rigor and requirements than noncritical units and subsystems and should also be constructed with security in mind. All software on the spacecraft should be thoroughly vetted and properly handled through the configuration management and secure software development processes (DevSecOps).

6. Both the spacecraft and ground should independently perform command logging and anomaly detection of command sequences for cross validation. Commands received may be stored and sent to the ground through telemetry and automatically checked to verify consistency between commands sent and commands received.

7. Protections should be made against communications jamming and spoofing, such as signal strength monitoring and secured transmitters and receivers; links should be encrypted to provide additional security.

Security elements for defending ground-based systems and network assets include but are not limited to (also from the Homeland Security Today article):

1. Adoption of cybersecurity best practices, including those aligned with the NIST cybersecurity framework (“CSF”). As academic professors and pragmatists, we both are ardent supporters of the CSF and see no reason why the hundreds of space and satellite suppliers should not adopt the NIST framework.

2. Key network components should be logically and physically separate to prevent virus-like (ransomware) attacks from spreading throughout the network.

3. All ground-based system and network assets should be required to have the following policies in place: incident response, business continuity and crisis communications plans, patching policies, BYOD policies and backup policies.

4. All ground-based space systems and facilities should be required to hold quarterly employee training for all individuals on things like spear-phishing and socially engineered email attacks.

5. All ground-based space systems and facilities should be required to adopt a fulsome vendor supply chain risk management program that touches all primary and tertiary vendors.

6. All ground-based space systems and facilities must adopt machine learning intrusion detection systems to help guard against anomalous and potential malicious activity.

7. All ground-based space systems, facilities, and space manufacturers and vendors should be required to join the Space ISAC to be able to collaborate by sharing threats, warnings, and incident information.

#### solves adv 1

ESA 18 – [European Space Agency, “Curbing space debris in the era of mega-constellations,” 7/18/2018, https://www.esa.int/Enabling\_Support/Preparing\_for\_the\_Future/Discovery\_and\_Preparation/Curbing\_space\_debris\_in\_the\_era\_of\_mega-constellations]

Two ESA-led teams of researchers carried out investigations as part of this endeavour. The MEGACO study, consisting of representatives from Airbus, Braunschweig Technical University and École polytechnique fédérale de Lausanne, set out to understand the complexity of mega-constellations in general, including a focus on collision avoidance and dealing with satellites that have reach b ed the end of their lives. Meanwhile, a team from Thales Alenia Space explored two specific methods of removing debris, including failed satellites, from orbit.

The MEGACO team investigated three theoretical mega-constellations. For each one, they analysed the space and ground infrastructure required to operate the constellation, assessed different end-of-life strategies, looked at collision avoidance requirements, and investigated associated costs and risks.

"One aim of MEGACO was to design a set of spacecraft that can deorbit themselves, and to figure out what to do with failing spacecraft,” explains Kate Symonds, systems engineer responsible for the MEGACO study on ESA’s side.

The team selected one mega-constellation concept for further study and looked at more specific operational requirements.

“Our final investigations included exploring having spare satellites, carefully controlling launches and orbits to avoid collision, and using ‘shepherd satellites’ – in the same plane but in a lower orbit – that capture dead spacecraft and deorbit them,” Symonds continues. “This research will feed into future ESA studies on mega-constellations.”

The team from Thales Alenia Space looked more closely into actively deorbiting dead satellites. They identified two theoretical constellations (named Mega1000 and TAS3200) and produced a different Active Debris Removal (ADR) design for each.

“Without ADR, a failed spacecraft can remain in orbit for hundreds of years,” explains Robin Biesbroek, the ESA systems engineer overseeing the project. “This could affect other spacecraft in that orbit and result in lots of debris and many collisions.”

Similar to MEGACO’s shepherd satellite idea, the first ADR design includes a chaser satellite containing capture equipment that is launched with the rest of the constellation. When a spacecraft fails, the chaser captures it using a net and both spacecraft re-enter Earth’s atmosphere and burn up.

The other design puts three ADR spacecraft into space at once in a dedicated launch. Each spacecraft uses a robotic arm to capture and de-orbit at least 35 pieces of debris, one after another, before completely burning up on re-entry.

“Both techniques are viable options for Active Debris Removal, with the second being especially effective at removing a lot of debris,” Biesbroek concludes.

These two studies present exciting ideas for dealing with end-of-life mega-constellation spacecraft, and they will feed into new research by Clean Space, which continues to develop technologies required for ADR and collision avoidance.

### 1NC

#### Hacking of SATs by the government nonuniques this advantage

#### Squo tracking, shielding, and removal plans solve

Dr. Brian Koberlein 16, Professor of Physics at the Rochester Institute of Technology and PhD in Astrophysics from the University of Connecticut, “Cascade Effect”, 5-4, https://archive.briankoberlein.com/2016/05/04/cascade-effect/index.html

In the movie Gravity the driving force of the plot is a catastrophic cascade of space debris. An exploding satellite sends high speed debris into the path of other satellites, and the resulting collisions create more space debris until everything from a space shuttle to the International Space Station faces an eminent threat of destruction. Not unexpectedly, the movie portrayal of such a situation is not particularly accurate, but the risk of a debris cascade is very real.

It’s known as the Kessler syndrome, after Donald Kessler, who first imagined the scenario in the 1970s. The problem comes down to the fact that small objects in Earth orbit can stay in orbit for a very long time. If an astronaut drops a bolt, it can stay in orbit for decades or centuries. Because the relative speed of two objects in orbit can be quite large, it doesn’t take a big object to pose a real threat to your spacecraft. On the highway a small pebble can chip your car windshield. In space it can be done by a chip of paint traveling at thousands of kilometers per hour. In the history of the space shuttle missions, there were more than 1,600 debris strikes. Because of such strikes, more than 90 space shuttle windows had to be replaced over the lifetime of shuttle missions.

While that might sound alarming, it’s actually quite manageable. Upgrades and maintenance were quite common on the shuttle missions, and we tend to err on the side of caution when it comes to replacing parts. Modern spacecraft also have ways to mitigate the risk of small impacts, such as Whipple shields made of thin layers of material spaced apart so that objects disintegrate when hitting the shield rather than the spacecraft itself. We also have a tracking system that currently tracks more than 300,000 objects bigger than 1 cm, so we can make sure that most spacecraft avoid these objects.

But the risk of big collisions isn’t negligible. In 2009 the Iridium 33 and Kosmos-2251 satellites collided at high speed, destroying both spacecraft and creating more dangerous debris. It wouldn’t take many collisions like this for the debris numbers to rise dramatically, and more debris means a greater risk of collisions. In Gravity the cascade happens very quickly, triggered by a single event. The reality is not quite so grave. Instead of happening overnight, Kessler syndrome would occur gradually, raising collision risks to the point where certain orbits become logistically impractical. It could occur so gradually that we might not notice it early on, and there are some that argue it’s already underway.

The good news is that we’re aware of the threat. And, as the old saying goes, knowing is half the battle. Already we take steps to limit the amount of debris created. New spacecraft include end of life plans to remove them from orbit, either by sending them into Earths atmosphere to burn up, or sending them to a “graveyard orbit” that poses little risk to other spacecraft. There are also plans on the drawing board to clear orbits of debris, particularly in low-Earth orbit where the risk is greatest. The cascade effect is a real risk, but it’s also one we can likely manage with a bit of ingenuity.

#### No one’s going to war over a downed satellite

Bowen 18 [Bleddyn Bowen, Lecturer in International Relations at the University of Leicester. The Art of Space Deterrence. February 20, 2018. https://www.europeanleadershipnetwork.org/commentary/the-art-of-space-deterrence/]

Space is often an afterthought or a miscellaneous ancillary in the grand strategic views of top-level decision-makers. A president may not care that one satellite may be lost or go dark; it may cause panic and Twitter-based hysteria for the space community, of course. But the terrestrial context and consequences, as well as the political stakes and symbolism of any exchange of hostilities in space matters more. The political and media dimension can magnify or minimise the perceived consequences of losing specific satellites out of all proportion to their actual strategic effect.

#### Won’t go nuclear – seen as a normal conventional attack because of integration with ground forces

Firth 7/1/19 [News Editor at MIT Technology Review, was Chief News Editor at New Scientist. How to fight a war in space (and get away with it). July 1, 2019. MIT Technology Review]

Space is so intrinsic to how advanced militaries fight on the ground that an attack on a satellite need no longer signal the opening shot in a nuclear apocalypse. As a result, “deterrence in space is less certain than it was during the Cold War,” says Todd Harrison, who heads the Aerospace Security Project at CSIS, a think tank in Washington, DC. Non-state actors, as well as more minor powers like North Korea and Iran, are also gaining access to weapons that can bloody the noses of much larger nations in space.

#### New controls are coming online and successfully mitigate

Mike Miller 19, Materials Engineer, Master’s Degree in Materials Science and Engineering, “Should Governments Control The Amount Of Satellites To Keep Earth’s Orbit From Being Cluttered With So Much Space Junk And Restrict The Ability For Humans To Safely Leave The Planet?”, Quora, 5/6/2019, https://www.quora.com/Should-governments-control-the-amount-of-satellites-to-keep-earth-s-orbit-from-being-cluttered-with-so-much-space-junk-and-restrict-the-ability-for-humans-to-safely-leave-the-planet/answer/Mike-Miller-117

Should governments control the amount of satellites to keep earth’s orbit from being cluttered with so much space junk and restrict the ability for humans to safely leave the planet?

How much space junk do you think there is?

Right now, a volume of space thousands of times larger than the combined air, land, and sea of Earth have 5,500 tons of working satellites, a space station, dead satellites, and space debris.

Compare 7,500 tons of plastic to this: A much tinier area on Earth has 80,000 tons of plastic waste. The Great Pacific Garbage Patch. (Generally, you need to scoop and filter water in the area to find any plastic, contrary to misleading media photos.)

7,500 tons over 60 years of rocket-launch effort - the world produces 2.1 billion tons of garbage on its surface annually.

A lot of satellites will go their entire service lives without being hit.

Space junk is coming under control. Most space junk is close to Earth, so it has an orbital life of a few years to a few decades before it burns up in Earth’s atmosphere.

Most satellite builders and launch operators are modifying their products. Satellites at their end of life tend to be kicked to “graveyard” orbit where they can’t make trouble.

Upper stages - once a huge source of space debris - now feature low-cost “safing” mechanisms. Their batteries, which used to explode after several years in space, now have vents. Their fuel tanks are opened to vacuum instead of allowing fuels to stew for years. SpaceX has its upper stages de-orbit most of the time.

#### No debris cascades, but even a worst case is confined to low LEO with no impact

Daniel Von Fange 17, Web Application Engineer, Founder and Owner of LeanCoder, Full Stack, Polyglot Web Developer, “Kessler Syndrome is Over Hyped”, 5/21/2017, http://braino.org/essays/kessler\_syndrome\_is\_over\_hyped/

Kessler Syndrome is overhyped. A chorus of online commenters great any news of upcoming low earth orbit satellites with worry that humanity will to lose access to space. I now think they are wrong.

What is Kessler Syndrome?

Here’s the popular view on Kessler Syndrome. Every once in a while, a piece of junk in space hits a satellite. This single impact destroys the satellite, and breaks off several thousand additional pieces. These new pieces now fly around space looking for other satellites to hit, and so exponentially multiply themselves over time, like a nuclear reaction, until a sphere of man-made debris surrounds the earth, and humanity no longer has access to space nor the benefits of satellites.

It is a dark picture.

Is Kessler Syndrome likely to happen?

I had to stop everything and spend an afternoon doing back-of-the-napkin math to know how big the threat is. To estimate, we need to know where the stuff in space is, how much mass is there, and how long it would take to deorbit.

The orbital area around earth can be broken down into four regions.

Low LEO - Up to about 400km. Things that orbit here burn up in the earth’s atmosphere quickly - between a few months to two years. The space station operates at the high end of this range. It loses about a kilometer of altitude a month and if not pushed higher every few months, would soon burn up. For all practical purposes, Low LEO doesn’t matter for Kessler Syndrome. If Low LEO was ever full of space junk, we’d just wait a year and a half, and the problem would be over.

High LEO - 400km to 2000km. This where most heavy satellites and most space junk orbits. The air is thin enough here that satellites only go down slowly, and they have a much farther distance to fall. It can take 50 years for stuff here to get down. This is where Kessler Syndrome could be an issue.

Mid Orbit - GPS satellites and other navigation satellites travel here in lonely, long lives. The volume of space is so huge, and the number of satellites so few, that we don’t need to worry about Kessler here.

GEO - If you put a satellite far enough out from earth, the speed that the satellite travels around the earth will match the speed of the surface of the earth rotating under it. From the ground, the satellite will appear to hang motionless. Usually the geostationary orbit is used by big weather satellites and big TV broadcasting satellites. (This apparent motionlessness is why satellite TV dishes can be mounted pointing in a fixed direction. You can find approximate south just by looking around at the dishes in your northern hemisphere neighborhood.) For Kessler purposes, GEO orbit is roughly a ring 384,400 km around. However, all the satellites here are moving the same direction at the same speed - debris doesn’t get free velocity from the speed of the satellites. Also, it’s quite expensive to get a satellite here, and so there aren’t many, only about one satellite per 1000km of the ring. Kessler is not a problem here.

How bad could Kessler Syndrome in High LEO be?

Let’s imagine a worst case scenario.

An evil alien intelligence chops up everything in High LEO, turning it into 1cm cubes of death orbiting at 1000km, spread as evenly across the surface of this sphere as orbital mechanics would allow. Is humanity cut off from space?

I’m guessing the world has launched about 10,000 tons of satellites total. For guessing purposes, I’ll assume 2,500 tons of satellites and junk currently in High LEO. If satellites are made of aluminum, with a density of 2.70 g/cm3, then that’s 839,985,870 1cm cubes. A sphere for an orbit of 1,000km has a surface area of 682,752,000 square KM. So there would be one cube of junk per .81 square KM. If a rocket traveled through that, its odds of hitting that cube are tiny - less than 1 in 10,000.

So even in the worst case, we don’t lose access to space.

Now though you can travel through the debris, you couldn’t keep a satellite alive for long in this orbit of death. Kessler Syndrome at its worst just prevents us from putting satellites in certain orbits.

In real life, there’s a lot of factors that make Kessler syndrome even less of a problem than our worst case though experiment.

* Debris would be spread over a volume of space, not a single orbital surface, making collisions orders of magnitudes less likely.
* Most impact debris will have a slower orbital velocity than either of its original pieces - this makes it deorbit much sooner.
* Any collision will create large and small objects. Small objects are much more affected by atmospheric drag and deorbit faster, even in a few months from high LEO. Larger objects can be tracked by earth based radar and avoided.
* The planned big new constellations are not in High LEO, but in Low LEO for faster communications with the earth. They aren’t an issue for Kessler.
* Most importantly, all new satellite launches since the 1990’s are required to include a plan to get rid of the satellite at the end of its useful life (usually by deorbiting)

So the realistic worst case is that insurance premiums on satellites go up a bit. Given the current trend toward much smaller, cheaper micro satellites, this wouldn’t even have a huge effect.

I’m removing Kessler Syndrome from my list of things to worry about.

#### 1NC Sterns says “international tensions that could potentially lead to armed conflicts” – it’s not definitive and this relies on them winning space militarization

#### No space militarization --- too costly and technologically infeasible --- states prefer ground attacks

Rich Wordsworth 16, UK journalist, and write for Gizmodo, Kotaku and Vice, “Why We'll Never Fight a Real-Life Star Wars Space Conflict”, 18/12/2016, <http://www.gizmodo.co.uk/2015/12/why-well-never-fight-a-real-life-star-wars-space-conflict>

So Why Won’t It Happen? Well, never say never. You might not make to the end of this paragraph before the sky lights up and the world goes dark. **But there are some good reasons to be optimistic that won’t happen. One reassuring factor is that the more other countries develop their militaries, the more dependent on networks they become as well**. China is developing its own drone programme, and so is Russia, which will both presumably be dependent on satellites to operate. **And the more their (and our) economies and business interests develop, the more everyone will rely on satellites to further their economic ambitions. In the event that countries were to start knocking out each other’s satellites on a large scale, the consequences across the board – for everyone – would be disastrous.** It would also be expensive in the short term. **Getting things into orbit – peaceful or otherwise – still isn’t cheap, which is why only a handful of countries regularly do so.** And if you want to blow up a network of many satellites today (as you would have to in a first strike, to ensure other satellites couldn’t pick up the slack), launching small satellites or missiles into orbit is the only practical way to do that – **arming satellites with their own weaponry just isn’t financially or technologically feasible on a grand scale**. We are, happily, a long way from a Death Star. “I don’t think [a large first strike] would be financially too costly [if you’re] thinking about kinetic energy weapons and the air-based or ground-based lasers,” says Jasani. “It’s viable. But if you say, ‘I’m going to put an [ASAT] weapon [permanently] in orbit’, we are then getting into very expensive and very complicated technology. So my guess is that in the foreseeable future, what we are going to focus on are the kinetic energy weapons and possibly lasers that could blind satellites or affect, for example, the solar panels. That kind of technology will be delivered in the foreseeable future, rather than having lasers in orbit [like] the Star Wars kind of thing.” **But there’s another, possibly even more persuasive reason that a kinetic war in space may not happen: it’s just so much easier – and less damaging – to mess with satellites without getting close to them. “Jamming from the ground is not difficult,” says Quintana**. “If you look at the Middle East, pick a country where there’s a crisis and the chances are that the military in that country has tried to jam a commercial satellite to try and avoid satellite TV channels broadcasting anti-government messages.” “**My guess is that by the time we are ready for space warfare, I think you may not be banking on your hit-to-kill ASATs, but more on [non-destructive] high-energy laser-based systems,”** Jasani agrees. **“[Space debris] affects all sides, not just the attacked side.** The attacking side will have its own satellites in orbit, which might be affected by the debris [of its own attack].” And if you really need to remove an enemy’s satellite coverage, you can always try to flatten or hack the control stations on the ground, leaving the satellites talking with no-one to listen. **“I don’t think physically blowing things up from the ground is something that people are looking at again,**” says Quintana. “Countries and governments try to find means other than physical conflict to achieve their strategic ends. **So as space becomes more commercial and more civilian and as more scientific satellites go up, then you’ll find that** states will not seek to directly attack each other**, but will seek other means.** “It may just be that they will try to cyber-attack the satellites and take them over, which has been done in the past. It’s much easier to physically or cyber-attack the ground control station than it is to attack the satellite itself - so why would you not look to do that as a first port of call and achieve the same ends?” Ultimately, then, what might keep us safe from a war in space isn't the horror of explosives in orbit, but a question of cost and convenience.

#### The aff equally hurts innovation 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

#### the plan circumvents normal procedures for industry dialogue---that wrecks certainty and confidence, even if the substance of the plan is pro-business

Jeff Foust 18. Editor and publisher of The Space Review, and a senior staff writer with SpaceNews. 11-5-2018. "The Space Review: Turning space policy into space regulation." The Space Review. http://www.thespacereview.com/article/3598/1

More than five months ago, President Trump signed Space Policy Directive (SPD) 2, a policy document directing a series of regulatory reforms related to commercial space activities. That document, largely incorporating recommendations made at a February meeting of the National Space Council, was hailed by the space industry as a key step towards streamlining regulations and cutting red tape. “While many details have yet to be worked out, we are a committed and constructive partner in revising and reducing cumbersome space regulations,” said Frank Slazer, vice president for space and workforce at the Aerospace Industries Association, in a statement after the signing of SPD-2 (see “A step towards a ‘one-stop shop’ for commercial space regulations”, The Space Review, May 29, 2018). Now, though, is the time to work out those details. SPD-2 set schedules for some of those regulatory reform efforts, most notably reforms to launch licensing. The directive requires the Department of Transportation (through the FAA) to develop a formal, public draft of revised regulations for commercial launch and reentry regulations. Those changes, the directive states, would include unifying launch licenses and the use of “performance-based criteria” for licensing versus prescriptive requirements. Industry had long sought streamlining of such regulations, such as the requirement that a vehicle have a separate launch license for each site it operates from. “I think it requires heroics when you make any changes to those launch licenses. When you have to change a launch pad from [Space Launch Complex] 40 to [Launch Complex] 39A or back to 40, you have to basically apply for a new license,” said Gwynne Shotwell, president of SpaceX, at the first National Space Council meeting in October 2017. That’s a reference to the two launch sites the company has several kilometers apart in Florida, but in separate jurisdictions: LC-39A at the Kennedy Space Center and SLC-40 at Cape Canaveral Air Force station. Vice President Mike Pence picked up on that issue at the council’s second meeting in February. “You know, the government’s figured out how to honor driver’s licenses across state lines,” he said. “There’s no reason we can’t do the same for rockets.” While the government and industry might be on the same page when it comes to the broad goals of the regulatory changes, how that gets converted into actual regulations is an ongoing process. It’s one that’s taking place at rapid speed—from a bureaucratic point of view—in order to meet the deadline in SPD-2. “We’re moving at a rocket pace. We’re going as fast as we possibly can,” said Kelvin Coleman, the acting associate administrator for commercial space transportation at the FAA, during an October 31 meeting of the FAA’s Commercial Space Transportation Advisory Committee (COMSTAC) in Washington. A typical “rulemaking” process at the FAA can take four to five years to complete, he said. “It usually takes us a year or two, maybe three, even to get to a draft.” “I think, frankly, after repeated calls for that engagement, it is of concern to me, and to a number of other members, that the FAA has decided not to do that,” said Alexander. Both Coleman and his deputy, Dorothy Reimold, said at the COMSTAC meeting that they intended to stick to the schedule in SPD-2. That would require the formal publication of the draft revised regulations, known as a notice of proposed rulemaking (NPRM), in less than three months. “The target and intent—and we view it not as anything less than an obligation to follow the requirements under SPD-2—is to publish an NPRM on February 1,” said Reimold. That’s created some concerns in industry, though, that the process might actually be going too fast. For example, to support the development of the draft rule, the FAA established an Aviation Rulemaking Committee, or ARC, earlier this year to solicit industry input on how to revise existing launch and reentry regulations. That committee, though, hasn’t been given the opportunity to meet again with the FAA to follow up on its earlier input. “Frankly, as we’ve said many times to individuals and to groups, time has not been on our side,” Reimold said. “We have not been able to bring the ARC back together to have the kind of venue that I think was being sought, not for lack of wanting to but simply because time has not allowed us to do that.” Some on COMSTAC, whose members include representatives of major commercial launch providers and related companies, said they’re [they are] concerned about not knowing more about the development of the proposed rule. They said they’re worried that the FAA might release a draft rule next February with language that doesn’t match the intent of the regulatory reform. “I want to really register a strong concern with how the FAA is approaching the upcoming NPRM,” said Brett Alexander, director of business development for Blue Origin, citing what he said was a “lack of dialogue, insight, transparency and engagement” by the FAA. “I think, frankly, after repeated calls for that engagement, it is of concern to me, and to a number of other members, that the FAA has decided not to do that.” Reimold said there had been “internal discussions” about ways discuss the development of the rule and get additional industry input. “The pace that we’re at right now to pull this off is just extraordinary,” she said. “It frankly just didn't allow any kind of natural opportunities” for discussion. “It is not a lack of good intent or willingness. We’re not trying to hide anything,” she added. “We’re simply trying to get the job done.” “The balance that we have to be careful of here is that we certainly want to get these out as quickly as humanly possible, and we don’t want to do anything that would delay that process,” said Mike Gold, chairman of COMSTAC. “At the same time, we want to get industry feedback in.” Industry—and everyone else—will have a chance to comment once the NPRM is released in February. The details of how long the comment period would be, and how those comments will be incorporated into development of a final rule, haven’t been announced.

#### No impact to tech innovation – it’s industry optimism that ignores political barriers to solving existential threats

Bliss & Citylab 16 [Laura Bliss is CityLab’s West Coast bureau chief. She also writes MapLab, a biweekly newsletter about maps (subscribe here). Her work has appeared in The New York Times, The Atlantic, Los Angeles magazine, and beyond. "Innovation Is Overrated." https://www.theatlantic.com/business/archive/2016/04/innovation-is-overrated/477702/]

New technologies and their inventors are often celebrated as society’s heroes. Steve Jobs, Bill Gates, Elon Musk, Larry Page: These are all contemporary “innovators” whose “visionary ideas” and “creative leaps” led to “disruptive realities”—that is, if one buys the rhetoric of certain books and novelty-oriented publications.

But those who’ve questioned whether technology really is society’s salve aren’t alone. Lee Vinsel, an assistant professor of science and technology at the Stevens Institute of Technology, wrote a dissertation on innovation and regulation in the early days of the automobile. But lately, he finds that the word “innovation” is overused to the point of meaninglessness—and worse, that it can obfuscate the bleak realities of the status quo. “In a culture where we forget about things like crumbling infrastructure and wage inequality, those narratives about technological change can be really dangerous,” Vinsel says.

#### The government needs to endorse property rights in space – not enforce treaties that prevent private ownership

Jeff Greason and James C. Bennett 19, CTO of Electric Sky and CEO of Agile Aero, and Space Fellow of Economic Policy Centre in London, respectively, 6-5-2019, "The Economics of Space: An Industry Ready to Launch," Reason Foundation, https://reason.org/policy-study/the-economics-of-space/

Given a functioning transportation infrastructure, as the private sector develops space industry, government’s role changes to fostering that industry. What space commerce needs from government is a legal framework in which to operate that defines and defends property rights and research (especially on human health in space) that leads to more diverse space activities. Taking cues from agreements on the way various nations regard the bounty of the seas, government can ensure a sustainable and equitable free market environment. With models from other frontier exploration, government should focus on creating the legal framework to allow commerce and private endeavor to flourish. We cannot imagine how profoundly, comprehensively and quickly technological advancement—when it is commercialized—changes our everyday lives. Every single time, and by orders of magnitude, we underestimate its power to improve ordinary people’s lives once it becomes widely used through commercialization. For example, we cannot each own a jet, but today almost all of us can afford a plane ticket. This is due to the tangible effects of the synergy of technology and commerce. These effects occur so universally that any discussion of new technological frontiers should assume a blind but well-grounded expectation of manifold global rewards if only we have the foresight to encourage its proliferation. Examples from sea, land and air transportation, the Digital Age and countless other endeavors prove that technology combined with commerce triggers comprehensive advancement at a lower cost. America’s future success in space depends on restructuring our approach to accommodate such a vision. Commercialization Creates a Self-Sustaining Space Industry Despite the best current efforts of the private sector in this direction, it’s not yet an industry. Yet, launch companies have managed to create a profitable service focusing on occasional launches of very high-value payloads at very high prices. For example, the geosynchronous orbital position for telecommunications is so valuable that even our current highly inefficient way of accessing it is profitable. SpaceX’s Falcon 9 launch success at one-third the price of a traditional NASA-contracted launch demonstrates the private-sector capability to fulfill many current NASA functions at a fraction of the cost. Such achievement frees up NASA to concentrate on its core research and exploration missions in space and allows the private sector to invest in self-sustaining space-based industry. Developing the industry depends on a certain amount of infrastructure, which can pay for itself by freeing up funds currently used for NASA’s SLS (Space Launch System)/Orion program. This redistribution of current NASA funding is the key to paradigm change, although there are political problems with terminating the current SLS/Orion program in closely contested states in the 2020 presidential elections—states like Alabama and Florida. A compromise solution might be to push for increased spending on commercial service purchase, while SLS proceeds to flight status since the SLS will run out of surplus Shuttle engines by the early 2020s. Moving our funding of space activity from solely the exploration function to a mixture of privately funded commercial industry and publicly funded research is signaled by the private sector’s current capabilities, and the commercial-quality resources already identified in space that the current paradigm prevents us from harnessing. Also, changing to a commercial approach allows for efficiencies such as mass production of equipment and standardized designs that can carry cargo or humans with few modifications—which is much cheaper and more effective than what we do now. No matter how much money Congress sinks into status-quo space activities now, utility will continue to decline, making funding increasingly ineffective, and keeping the U.S. space program confined. The first step in progress is systemic change, beginning with policy change. Every single change that makes space operations more like airline operations bears fruit in lower costs, and those changes, in turn, trigger further reductions in costs.

#### Strong commercial space catalyzes tech innovation – progress at the margins and spinoff tech change global information networks

Joshua Hampson 2017, Security Studies Fellow at the Niskanen Center, 1-25-2017, “The Future of Space Commercialization”, Niskanen Center, https://republicans-science.house.gov/sites/republicans.science.house.gov/files/documents/TheFutureofSpaceCommercializationFinal.pdf

Innovation is generally hard to predict; some new technologies seem to come out of nowhere and others only take off when paired with a new application. It is difficult to predict the future, but it is reasonable to expect that a growing space economy would open opportunities for technological and organizational innovation. In terms of technology, the difficult environment of outer space helps incentivize progress along the margins. Because each object launched into orbit costs a significant amount of money—at the moment between $27,000 and $43,000 per pound, though that will likely drop in the future —each 19 reduction in payload size saves money or means more can be launched. At the same time, the ability to fit more capability into a smaller satellite opens outer space to actors that previously were priced out of the market. This is one of the reasons why small, affordable satellites are increasingly pursued by companies or organizations that cannot afford to launch larger traditional satellites. These small 20 satellites also provide non-traditional launchers, such as engineering students or prototypers, the opportunity to learn about satellite production and test new technologies before working on a full-sized satellite. That expansion of developers, experimenters, and testers cannot but help increase innovation opportunities. Technological developments from outer space have been applied to terrestrial life since the earliest days of space exploration. The National Aeronautics and Space Administration (NASA) maintains a website that lists technologies that have spun off from such research projects. Lightweight 21 nanotubes, useful in protecting astronauts during space exploration, are now being tested for applications in emergency response gear and electrical insulation. The need for certainty about the resiliency of materials used in space led to the development of an analytics tool useful across a range of industries. Temper foam, the material used in memory-foam pillows, was developed for NASA for seat covers. As more companies pursue their own space goals, more innovations will likely come from the commercial sector. Outer space is not just a catalyst for technological development. Satellite constellations and their unique line-of-sight vantage point can provide new perspectives to old industries. Deploying satellites into low-Earth orbit, as Facebook wants to do, can connect large, previously-unreached swathes of 22 humanity to the Internet. Remote sensing technology could change how whole industries operate, such as crop monitoring, herd management, crisis response, and land evaluation, among others. 23 While satellites cannot provide all essential information for some of these industries, they can fill in some useful gaps and work as part of a wider system of tools. Space infrastructure, in helping to change how people connect and perceive Earth, could help spark innovations on the ground as well. These innovations, changes to global networks, and new opportunities could lead to wider economic growth.

#### 1AC Matthews says warming, AI, supervirus, etc – none of which they have any terminal impacts for. Tech innovation also takes centuries and this card is broadly about innovation

#### Launches inevitable

Helsinki Times 21 – “Global orbital rocket launches surge by 44% in H1 2021, U.S. leads,” 7/15/2021, https://www.helsinkitimes.fi/business/19596-global-orbital-rocket-launches-surge-by-44-in-h1-2021-u-s-leads.html

Space missions are increasingly becoming popular, with companies moving towards enabling private citizens to have a glimpse of the orbit away from the professional astronauts. The interest in space travel is increasing the number of orbital launches.

Data acquired by Finbold indicates that the global number of orbital rockets launched in 2021 H1 surged 43.9% compared to the first half of 2020.

As of 2021, the orbital rocket launches stood at 59, while last year, the figure was at 41.

In 2021, the United States showed dominance, accounting for about 49% of the launches at 29. China recorded 18 launches, followed by Russia at seven. French space company Arianespace accounts for four orbital launches. The numbers are based on RocketLaunch.live data, which tracks orbital rocket launches worldwide.

Space tourism driving increase in orbital launches

The increase in orbital launches during the period highlights the increasing focus to make space travel a routine. The sector has witnessed the entry of private companies working towards making space travel available for private citizens and not just the professional astronauts of space agencies like NASA.

Worth mentioning is that despite 2020 being a challenging year due to the coronavirus pandemic, several space missions were initiated, with some arriving at their destination in 2021.

The increase in orbital launches also correlates with the entry of private companies into the sector that are jostling to make a name for themselves in space. For instance, Jeff Bezos’ Blue Origin company is expected to have the inaugural space flight with the founder on board on July 20, 2021.

Notably, Virgin Galactic (SPCE) offered a glimpse of space tourism after the company’s aircraft successfully conducted a space mission with founder Sir Richard Branson on board.

Virgin Galactic may begin flying the first paying passengers next year after two more test flights. However, with tickets running into hundreds of thousands of dollars, the space experience remains viable for financially able individuals. But when the companies begin commercial operations, Blue Origin and Virgin Galactic will be direct competitors.

Elsewhere, Elon Musk’s SpaceX is also an active player in the space industry with a reputation for conducting multiple short test flights over the past year. The company’s next step is to reach orbit. Furthermore, competition between private companies is also heating up.

For instance, Arianespace, the world’s first commercial launch company that dominated the market for sending big communications satellites into orbit, is now shifting its focus to smaller satellites. This shift is likely to give companies like SpaceX a run for their money.