## 1

#### Interpretation: Topical affirmatives must defend the appropriation of outer space

#### Outer space starts 372 miles above the surface of earth.

National Geographic No Date [National Geographic Society, "Atmosphere," <https://www.nationalgeographic.org/encyclopedia/atmosphere/>] Sachin

Earth’s atmosphere stretches from the surface of the planet up to as far as 10,000 kilometers (6,214 miles) above. After that, the atmosphere blends into space. Not all scientists agree where the actual upper boundary of the atmosphere is, but they can agree that the bulk of the atmosphere is located close to Earth’s surface—up to a distance of around eight to 15 kilometers (five to nine miles). While oxygen is necessary for most life on Earth, the majority of Earth’s atmosphere is not oxygen. Earth’s atmosphere is composed of about 78 percent nitrogen, 21 percent oxygen, 0.9 percent argon, and 0.1 percent other gases. Trace amounts of carbon dioxide, methane, water vapor, and neon are some of the other gases that make up the remaining 0.1 percent. The atmosphere is divided into five different layers, based on temperature. The layer closest to Earth’s surface is the troposphere, reaching from about seven and 15 kilometers (five to 10 miles) from the surface. The troposphere is thickest at the equator, and much thinner at the North and South Poles. The majority of the mass of the entire atmosphere is contained in the troposphere—between approximately 75 and 80 percent. Most of the water vapor in the atmosphere, along with dust and ash particles, are found in the troposphere—explaining why most of Earth’s clouds are located in this layer. Temperatures in the troposphere decrease with altitude. The stratosphere is the next layer up from Earth’s surface. It reaches from the top of the troposphere, which is called the tropopause, to an altitude of approximately 50 kilometers (30 miles). Temperatures in the stratosphere increase with altitude. A high concentration of ozone, a molecule composed of three atoms of oxygen, makes up the ozone layer of the stratosphere. This ozone absorbs some of the incoming solar radiation, shielding life on Earth from potentially harmful ultraviolet (UV) light, and is responsible for the temperature increase in altitude. The top of the stratosphere is called the stratopause. Above that is the mesosphere, which reaches as far as about 85 kilometers (53 miles) above Earth’s surface. Temperatures decrease in the mesosphere with altitude. In fact, the coldest temperatures in the atmosphere are near the top of the mesosphere—about -90°C (-130°F). The atmosphere is thin here, but still thick enough so that meteors will burn up as they pass through the mesosphere—creating what we see as “shooting stars.” The upper boundary of the mesosphere is called the mesopause. The thermosphere is located above the mesopause and reaches out to around 600 kilometers (372 miles). Not much is known about the thermosphere except that temperatures increase with altitude. Solar radiation makes the upper regions of the thermosphere very hot, reaching temperatures as high as 2,000°C (3,600°F). The uppermost layer, that blends with what is considered to be outer space, is the exosphere. The pull of Earth’s gravity is so small here that molecules of gas escape into outer space.

#### Starlink’s satelites reach 340 Miles above earth’s surface.

Mann 19, [Adam Mann, 5-24-2019, "Starlink: SpaceX's satellite internet project," Space, <https://www.space.com/spacex-starlink-satellites.html>] Sachin

The first 60 Starlink satellites were launched on May 23, 2019, aboard a SpaceX Falcon 9 rocket. The satellites successfully reached their operational altitude of 340 miles (550 kilometers) — low enough to get pulled down to Earth by atmospheric drag in a few years so that they don't become space junk once they die.

#### Violation: 340 miles is less than the 372 miles necessary to be considered outer space; they explicitly defend only LEO

#### Vote neg:

#### 1] Limits and ground: the aff interpretation explodes the topic to allow any aff about space generally which structurally alters the neg research burden because there’s a qualitative difference between outer space and the atmosphere. Means we get no ground bc of how unpredictable the AC could be from round to round – kills core neg generics like space col bad and mining that don’t link if you specify a part of space

#### 2] Precision – Justifies the aff arbitrarily doing away with words in the resolution which gives way to affs about anything which obliterates neg prep.

#### Use competing interps - Topicality is a binary question, you can’t be reasonably topical and it invites a race to the bottom of intervention

#### Drop the debater – dropping the argument doesn’t rectify abuse since winning T proves why we don’t have the burden of rejoinder against their aff.

#### No RVIS – it’s your burden to be topical which outweighs because logic is a meta-constraint on argumentation

## 2

#### Xi is tightening control over the PLA but completing goals are critical.

Krishnan 21 – Ananth, 11/18/21, [‘Xi tightened control over the PLA’, TheHindu, <https://www.thehindu.com/news/international/xi-tightened-control-over-the-pla/article37549460.ece>] Justin

The new resolution on history passed last week by China’s ruling Communist Party has said that President Xi Jinping had tightened control over the military to address the party’s “obviously lacking” leadership of the armed forces under his predecessors.

The full text of the resolution, released on Tuesday evening, listed some of the actions taken by the People’s Liberation Army (PLA) under Mr. Xi, who is also the chairman of the Central Military Commission. These included what the document described as “major operations related to border defence”.

No specifics

It did not specify what those major operations were. China has unresolved land borders with India and Bhutan. In April 2020, the PLA mobilised two divisions and carried out multiple transgressions across the Line of Actual Control (LAC) in Eastern Ladakh, sparking the worst crisis along the border in many years. Talks to resolve the tensions are still on-going.

“The armed forces have remained committed to carrying out military struggles in a flexible manner to counter military provocations by external forces, and they have created a strong deterrent against separatist activities seeking ‘Taiwan independence,’” the resolution said.

“They have conducted major operations related to border defence, protecting China’s maritime rights, countering terrorism and maintaining stability, disaster rescue and relief, fighting COVID-19, peacekeeping and escort services, humanitarian assistance, and international military cooperation.”

Last week’s resolution on history was only third such document putting forth the official view on party history, following resolutions passed by Mao Zedong in 1945 and Deng Xiaoping in 1981.

The new resolution dealt more with the future than the past. It essentially reaffirmed the official view on history, saying that the “basic points and conclusions” of past resolutions “remain valid to this day.”

It repeated the conclusion reached in 1981 on Mao’s errors noting that “mistakes were made” and that “Mao Zedong’s theoretical and practical errors concerning class struggle in a socialist society became increasingly serious” leading to the disasters of the Cultural Revolution.

Criticism of predecessors

Much of the new resolution focuses on emphasising Mr. Xi’s leadership and calling for the party to support his “core” status. It only briefly mentioned Mr. Xi’s predecessors Jiang Zemin and Hu Jintao, and implicitly critcised some aspects of their leadership including on military matters.

“For a period of time, the party’s leadership over the military was obviously lacking,” it noted. “If this problem had not been completely solved, it would not only have diminished the military’s combat capacity, but also undermined the key political principle that the party commands the gun.”

The document said Mr. Xi’s leadership had tightened supervision on the military including boosting “troop training and battle preparedness”, and it repeated China’s stated goals of completing the modernisation of its armed forces by 2035 and building a “world class” military by 2050, which observers see as meaning on par with the U.S.

‘Working vigorously’

“To build strong people’s armed forces, it is of paramount importance to uphold the fundamental principle and system of absolute party leadership over the military, to ensure that supreme leadership and command authority rest with the party Central Committee and the Central Military Commission (CMC), and to fully enforce the system of the CMC chairman assuming overall responsibility,” the resolution said, adding that “setting their sights on this problem, the Central Committee and the CMC have worked vigorously to govern the military with strict discipline in every respect.”

#### The commercial space sector is one of the PLAs central goals – the plan is a 180.

Bartholomew & Cleveland 19 – Carolyn and Robin, 4/25/19, Chairmen and Vice Chairmen. Section is written from Michael A. McDevitt, US Congressperson, [“HEARING ON CHINA IN SPACE: A STRATEGIC COMPETITION?,” <https://www.uscc.gov/sites/default/files/transcripts/April%2025%2C%202019%20Hearing%20Transcript%20%282%29.pdf>] Justin

As the Chairman said, China is determined to become a leading space power, which requires continuing to boost its innovation capabilities, both in its civilian and military sectors. The People’s Liberation Army is closely involved in most if not every aspect of China’s space program, from helping formulate and execute national space goals to overseeing China’s human spaceflight program. Coverage of China’s space program must treat seriously the implications of the reality that in many cases the boundaries between the military and civil silos of China’s program are thin, if they exist at all.

Our second panel today will address the application of what China calls its “military-civil fusion” strategy to its space sector. Military-civil fusion, a strategic concept designed to harness civilian sector innovation to power China’s military and technological modernization with the goal of leapfrogging the United States and becoming a technological powerhouse. Space has been designated as an especially important sector for military-civil fusion, and the impacts of this campaign on China’s burgeoning commercial space sector—itself a recipient of generous government support and protection—will be crucial as Chinese companies increasingly seek to compete in the international marketplace. Military-civil fusion is especially worthy of attention due to its continued reliance on technology transfer, by hook or by crook, to fuel China’s industrial and military growth.

Our third and final panel today will examine China’s military space and counterspace activities. Since its direct-ascent kinetic antisatellite test in 2007, which was responsible for a large amount of all space debris currently in Earth’s orbit, China has continued to invest in a variety of offensive antisatellite capabilities. Indeed, China’s counterspace arsenal contains many options: earlier this month, Acting Secretary of Defense Patrick Shanahan said China “has exercised and continues to develop” jamming capabilities; is deploying directed-energy counterspace weapons; has deployed an operational ground-based antisatellite missile system; and is prepared to use cyberattacks against U.S. space systems.

#### That triggers backlash – they don’t support restrictions on the space sector and will do everything to convince leaders not to do the plan.

Cheng 14 [Dean Cheng, Senior Research Fellow in the Asia Studies Center at the Heritage Foundation, Former Senior Analyst at the China Studies Division of the Center for Naval Analyses, Former Senior Analyst with Science Applications International Corporation, “Prospects for U.S.-China Space Cooperation”, Testimony before the Committee on Commerce, Science, and Transportation, United States Senate, 4/9/2014, https://www.heritage.org/testimony/prospects-us-china-space-cooperation]

At the same time, space is now a sector that enjoys significant political support within the Chinese political system. Based on their writings, the PLA is clearly intent upon developing the ability to establish “space dominance,” in order to fight and win “local wars under informationized conditions.”[8] The two SOEs are seen as key parts of the larger military-industrial complex, providing the opportunities to expose a large workforce to such areas as systems engineering and systems integration. It is no accident that China’s commercial airliner development effort tapped the top leadership of China’s aerospace corporations for managerial and design talent.[9] From a bureaucratic perspective, this is a powerful lobby, intent on preserving its interests. China’s space efforts should therefore be seen as political, as much as military or economic, statements, directed at both domestic and foreign audiences. Insofar as the PRC has scored major achievements in space, these reflect positively on both China’s growing power and respect (internationally) and the CCP’s legitimacy (internally). Efforts at inducing Chinese cooperation in space, then, are likely to be viewed in terms of whether they promote one or both objectives. As China has progressed to the point of being the world’s second-largest economy (in gross domestic product terms), it becomes less clear as to why China would necessarily want to cooperate with other countries on anything other than its own terms. Prospects for Cooperation Within this context, then, the prospects for meaningful cooperation with the PRC in the area of space would seem to be extremely limited. China’s past experience of major high-technology cooperative ventures (Sino–Soviet cooperation in the 1950s, U.S.–China cooperation in the 1980s until Tiananmen, and Sino–European space cooperation on the Galileo satellite program) is an unhappy one, at best. The failure of the joint Russian–Chinese Phobos–Grunt mission is likely seen in Beijing as further evidence that a “go-it-alone” approach is preferable. Nor is it clear that, bureaucratically, there is significant interest from key players such as the PLA or the military industrial complex in expanding cooperation.[10] Moreover, as long as China’s economy continues to expand, and the top political leadership values space efforts, there is little prospect of a reduction in space expenditures—making international cooperation far less urgent for the PRC than most other spacefaring states. [FOOTNOTE] [10]It is worth noting here that the Chinese Ministry of Foreign Affairs is not a part of the CCP Politburo, a key power center in China. Thus, the voice of the Ministry of Foreign Affairs is muted, at best, in any internal debate on policy. [END FOOTNOTE] If there is likely to be limited enthusiasm for cooperation in Chinese circles, there should also be skepticism in American ones. China’s space program is arguably one of the most opaque in the world. Even such basic data as China’s annual space expenditures is lacking—with little prospect of Beijing being forthcoming. As important, China’s decision-making processes are little understood, especially in the context of space. Seven years after the Chinese anti-satellite (ASAT) test, exactly which organizations were party to that decision, and why it was undertaken, remains unclear. Consequently, any effort at cooperation would raise questions about the identity of the partners and ultimate beneficiaries—with a real likelihood that the PLA would be one of them.

#### An unhinged PLA triggers Himalayan war – goes global

Chellaney 17 [Dr. Brahma Chellaney, Professor of Strategic Studies at the Center for Policy Research and Fellow at the Robert Bosch Academy, PhD in International Studies from Jawaharlal Nehru University, “Why the Chinese Military’s Rising Clout Troubles Xi Jinping”, The National, 9/9/2017, https://www.thenational.ae/opinion/why-the-chinese-military-s-rising-clout-troubles-xi-jinping-1.626815?videoId=5754807360001]

China’s president Xi Jinping has stepped up his domestic political moves in the run-up to the critical 19th national congress of the Chinese Communist Party next month, but he is still struggling to keep the People’s Liberation Army (PLA) in line. China’s political system makes it hard to get a clear picture, yet Mr Xi’s actions underscore the troublesome civil-military relations in the country. Take the recent standoff with India that raised the spectre of a Himalayan war, with China threatening reprisals if New Delhi did not unconditionally withdraw its forces from a small Bhutanese plateau, which Beijing claims is Chinese territory. After 10 weeks, the face-off on the Doklam Plateau ended with both sides pulling back troops and equipment from the site on the same day, signalling that Beijing, not New Delhi, had blinked. The mutual-withdrawal deal was struck just after Mr Xi replaced the chief of the PLA’s joint staff department. This key position, equivalent to the chairman of the US joint chiefs of staff, was created only last year as part of Mr Xi’s military reforms to turn the PLA into a force “able to fight and win wars”. The Doklam pullback suggests that the removed chief, Gen Fang Fenghui, who has since been detained for alleged corruption, was an obstacle to clinching a deal with India. To be sure, this was not the first time that the PLA’s belligerent actions in the Himalayas imposed diplomatic costs on China. A classic case happened when Mr Xi reached India on a state visit in September 2014. He arrived on Indian prime minister Narendra Modi’s birthday with a strange gift for his host, a predawn Chinese military encroachment deep into India’s northern region of Ladakh. The encroachment, the worst in many years in terms of the number of intruding troops, overshadowed Mr Xi’s visit. It appeared bizarre that the military of an important power would seek to mar the visit of its own head of state to a key neighbouring country. Yet Chinese premier Li Keqiang’s earlier visit to New Delhi in 2013 was similarly preceded by a PLA incursion into another part of Ladakh that lasted three weeks. Such provocations might suggest that they are intentional, with the Chinese government in the know, thus reflecting a preference for blending soft and hard tactics. But it is also possible that these actions underscore the continuing “disconnect between the military and the civilian leadership” in China that then US defence secretary Robert Gates warned about in 2011. During his 2014 India trip, Mr Xi appeared embarrassed by the accompanying PLA encroachment and assured Mr Modi that he would sort it out upon his return. Soon after he returned, the Chinese defence ministry quoted Mr Xi as telling a closed-door meeting with PLA commanders that “all PLA forces should follow the president’s instructions” and that the military must display “absolute loyalty and firm faith in the party”. Recently Xi conveyed that same message yet again when he addressed a parade marking the 90th anniversary of the PLA’s creation on August 1, 1927. Donning military fatigues, Mr Xi exhorted members of his 2.3-million-strong armed forces to “unswervingly follow the absolute leadership of the party.” Had civilian control of the PLA been working well, would Mr Xi repeatedly be demanding “absolute loyalty” from the military or asking it to “follow his instructions”? China does not have a national army; rather the party has an army. So the PLA has traditionally sworn fealty to the party, not the nation. Under Mr Xi’s two immediate predecessors, Hu Jintao and Jiang Zemin, the PLA gradually became stronger at the expense of the party. The military’s rising clout has troubled Mr Xi because it hampers his larger ambition. As part of his effort to reassert party control over the military, Mr Xi has used his anti-corruption campaign to ensnare a number of top PLA officers. He has also cut the size of the ground force and established a new command-and-control structure. But just as a dog’s tail cannot be straightened, asserting full civil control over a politically ascendant PLA is proving unachievable. After all, the party depends on the PLA to ensure domestic order and sustain its own political monopoly. The regime’s legitimacy increasingly relies on an appeal to nationalism. But the PLA, with its soaring budgets and expanding role to safeguard China’s overseas interests, sees itself as the ultimate arbiter of nationalism. To make matters worse, Mr Xi has made many enemies at home in his effort to concentrate power in himself, including through corruption purges. It is not known whether the PLA’s upper echelon respects him to the extent to be fully guided by his instructions. In the past decade, the PLA’s increasing clout has led China to stake out a more muscular role. This includes resurrecting territorial and maritime disputes, asserting new sovereignty claims, and using construction activity to change the status quo. China’s cut-throat internal politics and troubled civil-military relations clearly have a bearing on its external policy. The risks of China’s rise as a praetorian state are real and carry major implications for international security.

#### Extinction.

Caldicott 17 – Helen, 2017, Founder of Physicians for Social Responsibility [“The new nuclear danger: George W. Bush's military-industrial complex,” The New Press]//Elmer

The use of Pakistani nuclear weapons could trigger a chain reac­tion. **Nuclear-armed India, an ancient enemy, could respond** in kind. China, India's hated foe, could react if India used her nuclear weapons, triggering a nuclear [war] ~~holocaust~~ on the subcontinent. If any of either **Russia** or **America**'s 2,250 strategic weapons on hair-trigger alert were launched either **accidentally** or **purposefully** in response, **nuclear winter** would ensue, meaning the **end of most life on earth**.

## 3

#### CP Text – States ought to

#### Tax revenue from private appropriation of outer space under a corporate tax scheme and use that to fund sustainable development initiatives at the UN for the benefit of people on earth

#### implement cooperative active debris removal measures aimed at mitigating debris from mega-constellations.

#### Taxing Private space companies allows for viable long-term funding for the UN

**Illopoulos & Esteban 20** Iliopoulos, Nikolaos; Esteban, Miguel  (2020). Sustainable space exploration and its relevance to the privatization of space ventures. Acta Astronautica, 167(), 85–92. doi:10.1016/j.actaastro.2019.09.037 (Graduate Program in Sustainability Science– Global Leadership Initiative, The University of Tokyo, Building of Environmental Studies, 5-1-5 Kashiwanoha, Kashiwa City, Chiba 277-8563 Japan. Miguel Esteban has published 41 articles on ScienceDirect) //Aadit

4. International space law Francis Lyall and Paul B. Larsen [84] assert that the concept of space law has been a subject of debate since as early as 1926. According to these authors the very scope of space law was initially ill-defined, was limited to dealing with the practical problems of venturing towards outer space, and could technically be applied to everything from commercial contracts to more general issues such as a state's behavior in space [84]. An important precedent for the development of international space law was the 1959 Antarctic Treaty which sets aside Antarctica as a scientific preserve, establishes freedom of scientific investigation and bans all military activities on the continent [85]. These objectives were exactly what the world leaders were concerned about during the era of the space race and were interested in accomplishing through an international agreement governing space activities. This became evident when the launch of the Soviet Union's Sputnik 1 on October 4, 1957 and Sputnik 2 on November 5th acted as a catalyst for the establishment of NASA by the U.S congress [86]. President Eisenhower proposed to use the principles of the Antarctic Treaty as a stepping stone in order to design an independent agency that regulates all space activities within the United States [87]. The United Nations then established the UN Office of Outer Space Affairs (UNOOSA) to promote international cooperation in space [88], and founded COPUOS in 1959 to oversee future treaties and agreements and generally ensure the peaceful use of outer space. At present, five international treaties and a number of other agreements have laid the framework of space law under the jurisdiction of COPUOS [89]. These five major treaties have been designed to produce some semblance of order by taking into account the different legal systems, values, interests and debates of the parties involved in space activities [90]: 1. The 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty or “OST”) 2. The 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement) 3. The 1972 Convention on International Liability for Damage Caused by Space Objects (Liability Convention) 4. The 1976 Convention on Registration of Objects Launched into Outer Space (Registration Convention) 5. The 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Treaty). The Outer Space Treaty (OST), which forms the basis of international space law entered force on October 1967 and was signed by 104 nations across the globe. Article I of the OST provides that “exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interest of all mankind alike” [91]. However, at the time of the Treaty's adoption two states held a monopoly on space activities, namely the United States and the former Soviet Union [92]. Thus, the true source of interest for the rest of the nations to sign such a treaty stemmed from the fear that the two space powers would exploit outer space to gain a decisive advantage over other nations [93]. Additionally, some parties to the treaty, particularly the old Soviet Union, wanted space activities to be the sole preserve of governments. However, after several negotiations with the United States a compromise was achieved in article VI of the treaty that “Paved the way for the private sector to conduct space activities side by side with the government and the intergovernmental organizations” [1]. The treaties following the OST extended it to reflect the pace of technological evolution and applied its generalities to particular situations. Particularly, the Rescue Agreement (1968) requires that any state party of the convention that becomes aware that the personnel of a spacecraft are in distress must notify the launching authority and the Secretary General of the United Nations [94]. The Liability Convention (1972) [95] defined terms such as “damage”, “launching” and “space object” among others, and highlights who will be responsible for the damage caused by the launching of objects into outer space (a treaty that was widely accepted by states that were not capable of space flight). The Registration Convention (1976) stated that all objects launched into earth orbit or beyond must be recorded by an appropriate space authority [96]. Another important piece of legislation was the Moon treaty, which does not only apply to the Earth's satellite but to all celestial bodies in the solar system and which entered into force in 1984 [97]. The principle behind this treaty is centered around the idea that the resources or territories that are outside the boundaries of Earth are the common heritage of mankind and as such their exploitation would have to be governed by the international community. Due to its severe stance against the ownership of property in space it has been referred to as the “arch-enemy of space exploration” [98] and is considered a failure, as of 2019 it has not been ratified by any state that engages in self-launched manned space exploration missions or has future plans to do so (i.e. the United States, European Space Agency, Russia, People's Republic of China, Japan and India) [99]. Nevertheless, this document remains important as it is the only treaty that contemplates at all the issue of ownership of property in space. Despite the existence of the aforementioned international legislation, as with all international laws the actual efficacy of these treaties is debatable as nations often ignore their precepts or disagree on the N. Iliopoulos and M. Esteban Acta Astronautica 167 (2020) 85–92 89 meaning of their substance [84]. In the specific context of international space law, the legal debate over the regulations regarding private property in space is indeed intricate. Although the OST sets out a number of general principles to be expanded upon, it did not mention specifically any guidance with respect to the ownership of extraterrestrial property. Even when the OST strictly mentions that no member of the treaty shall own celestial bodies, it does not mention anything about private entities per se. According to Stephen Gorove's comment in 1969, “The Outer Space Treaty in its present form appears to contain no prohibition regarding individual appropriation or acquisition by a private association or an international organization” [100]. Further, the very existence of the Moon Treaty indicates that its predecessor, the Outer Space Treaty, did not outlaw private ownership of extra-terrestrial bodies, for if it did there would be no need to ratify the Moon treaty in the first place. Thus, it can be noted that currently the Outer Space Treaty does not explicitly prohibit private property in space. Despite such evidence, the international community is still puzzled by the concept of private ownership in space as many governmental and non-governmental agencies maintain that the Outer Space Treaty specifically states that appropriation of space property is not permitted [101], on the grounds that the private sector is an extension of the state that they represent and as such private ownership in the realm of outer space is prohibited [102]. Others assess that this ambiguity constitutes a “loophole” that allows the private sector to utilize the resources of outer space freely and for personal benefit [100]. Furthermore, the increasing number of claims and attempts to sell, buy or even keep extraterrestrial properties illustrate the problem of ambiguity regarding ownership of property in space [103]. The legal premise of the Eros Project is a fine example of this, portraying the complexity of the matter [104]. Gregory Nemitz claimed ownership of a near Earth asteroid called 433 Eros on the Archimedes Institute's Private Property Rights Registry in 2000. Eleven months after the incident, NASA permanently parked the NEAR shoe-maker probe on the asteroid on February 12, 2001 [105]. Mr Nemitz, being aware that the probe had no way of removing itself from the asteroid by utilizing its own propulsion system, charged NASA twenty dollars as a fee for parking the probe on his property. NASA, as was expected, refused to pay the fees by claiming that such a request has no foundation in law. Another similar example portraying the complexity of the issue involves the Apollo astronauts. When the mission's crew brought moon rocks back to Earth NASA declared them to be property of the U.S government. Ever since their landing, the international community has acquiesced to the United States claim of ownership over rocks harvested from the Moon [63]. In light of such ambiguity and the fact that regulatory certainty is a vital component for the success of non-traditional space ventures, the United States' Senate Commerce, Science, and Transportation space subcommittee held a number of hearings in an attempt to identify which legislative alterations could foster growth in the commercial space industry [106,107]. The results indicated that although there was consensus regarding the general preservation of the 50-year old OST, there was indeed a need for “light hand” adjustments [106]. The hearings culminated in the establishment of Spurring Private Aerospace Competitiveness and Entrepreneurship (SPACE) Act of 2015, which among other legislative changes, allowed US citizens to: “engage in commercial exploration for and commercial recovery of space resources (including water and minerals, but excluding biological life)” [108]. Although this act reiterates that the United States has no sovereignty over objects in space, it has ignited a heated controversy amongst scholars with respect to whether the law truly conforms to international space law, specifically the OST. The U.S House Committee on Science, Space and Technology denies such allegations on the ground that the right to extract natural resources from extraterrestrial bodies is: “Affirmed by the State practice and by the U.S State Department in Congressional testimony and written correspondence” [109]. Further, Frans von der Dunk, a law professor at the University of Nebraska, claims that although the Act does not explicitly violate any laws, it as of yet unclear whether private efforts towards space mining are legal [110]. On the other side of the spectrum, Fabio Tronchetti, a professor at the Harbin Institute of Technology, argues that the SPACE Act constitutes an unlawful act of sovereignty, as it violates the provisions in OST which prohibit the ownership of extraterrestrial property [111]. It thus seem that a “light” revision of the current international space law with respect to private property rights in space is necessary to stimulate growth in the private space industry and encourage private entities to take on the risks involved with the development of space technologies [112]. Essentially, the endorsement of a given law is often contingent on its ability to set coherent goals and requisite targets. As stated by Lyall and Larsen, who use the Law of the Sea as an informative analogy, “the practice [of a law] need not be wholly uniform, but must be undertaken in the belief that it is binding and required by law as opposed to being merely convenient or mutually beneficial” [84]. Particularly, the international community could utilize one of the existing laws (i.e. OST or Moon Treaty) as a steppingstone towards explicitly recognizing the extra-terrestrial property claims of corporations that meet certain specified conditions, thus paving the way for a sustainable privatization of outer space. However, questions would nevertheless arise as to which country should these corporations be paying tax to, given that their extraterrestrial activities take place in an environment of ambiguous geopolitical boundaries. To that end the authors would like to venture the possibility of establishing a platform which enables such commercial entities to forward wholly or partially their corporate tax to the United Nations directly. This would ensure that the profits of such ventures could clearly be channeled to the sustainable development of mankind on planet Earth, and provide a viable long-term source of funding to the U.N. 5. Concluding remarks Although the concept of the “Earth's environment” is one with which most people feel some affinity, many would find it rather difficult to identify with an unfamiliar topic such as “space environment”, let alone its sustainable development. Additionally, given the confusion within the scientific community surrounding the term “space sustainability”, to say that sustainable space exploration is not well understood would be an understatement. Sustainability in the context of space exploration is at the bare minimum understood as an activity of contentious importance that depending on the author, limits the risk of human extinction, minimizes space pollution or environmental degradation in space (such as space debris) and/or increases the welfare of humanity on Earth (by technological advancements in fields such as medicine or environmental management). However, regardless of its perceived importance, the budget of individual space actors (both public and private) is severely constrained and as such tend to focus only on what is strictly necessary to remain operational (such as abiding by technical specifications, government policy and other strictly defined requirements). Therefore, if sustainability is not quickly identified as a requirement it is more likely than not that it will not be provided for. Thus, a coordinated effort to develop a strategy to ensure the sustainability of space exploration activities is required, and the first step towards achieving that goal would be to make space relevant to problems on Earth in a way that it can be understood by the general public. Moreover, a phenomenon that can significantly affect the financial sustainability of space exploration (which can, as explained earlier, affect the long-term sustainability of the human race on Earth) is the issue of privatization of space which is itself dependent on current N. Iliopoulos and M. Esteban Acta Astronautica 167 (2020) 85–92 90 international space laws. As of today, space treaties and agreements strive to address a variety of matters, such as the preservation of space and Earth's environment, liability for damages caused by space objects, the settlement of disputes, the use of space-related technologies and international cooperation. However, despite the attempt of the United Nations and the international community to reach a mutual agreement on the controversial domain of property ownership, the treaties remain a potential disincentive to the economic utilization of space and find the major spacefaring countries in disagreement. The envisioned legal regime to encourage private firms to undertake the high risk and high cost involved in activities of space exploration would have to explicitly recognize extra-terrestrial property claims of individuals and corporations that meet specified conditions. As such, based on the conclusions made through this paper, it is considered that with the right negotiation terms, the current treaties can be revised so as to become steppingstones for the advancement of space exploration that could potentially bring forth significant changes to the environment surrounding planet Earth. Finally, one way that such privatization efforts could be seen to benefit of mankind as a whole is that any taxation resulting from it should be paid directly to the United Nations, or that at least some fraction of the profits should fund this organization.

#### 2nd plank solves debris

Hardy 20, Brian Patrick. Long-term effects of satellite megaconstellations on the debris environment in low earth orbit. Diss. 2020. (Master of Science in Aerospace Engineering in the Graduate College of the University of Illinois at Urbana-Champaign)//Elmer

The results of this thesis demonstrate that satellite megaconstellations have the potential to leave a significant mark on the LEO debris environment, even centuries after they cease operations. Various test cases for the Starlink megaconstellation were analyzed in a new, medium-fidelity simulation for orbital debris evolution, and a variety of PMD and ADR rates for Starlink were considered. It was shown that if Starlink adheres only to the minimum regulatory requirement of 90% PMD for large constellations, then LEO debris levels will grow almost twice as fast as the baseline scenario with no megaconstellations. Improving Starlink’s PMD rate to 95% would lead to only 19% more debris, while 99% PMD is the preferred option that prevents any significant debris contributions at all. Importantly, Starlink’s choice of PMD strategy will affect its own collision risk very little over the short term, but the impact will be noticeable on multi-century timescales by the overall LEO environment. Finally, in scenarios with 90% and 95% PMD, active debris removal of non-operating Starlink satellites yields significant, if limited, benefits. The 90% PMD scenario combined with an ADR rate of 5 Starlink satellites per year, for example, is able to reduce debris levels to those seen for the 95% PMD scenario. This result suggests that active debris removal could be a viable mitigation strategy for megaconstellations with sub-optimal PMD rates.

## 4

#### Internet is open to massive vulnerabilities now

Griffiths 19 James Griffiths 7-26-2019 "The global internet is powered by vast undersea cables. But they’re vulnerable." <https://www.cnn.com/2019/07/25/asia/internet-undersea-cables-intl-hnk/index.html> (CNN Analyst)//ELmer

Hong Kong (CNN) - On July 29, 1858, two steam-powered battleships met in the middle of the Atlantic Ocean. There, they connected two ends of a 4,000 kilometer (2,500 mile) long, 1.5 centimeter (0.6 inch) wide cable, linking for the first time the European and North American continents by telegraph. Just over two weeks later, the UK’s Queen Victoria sent a congratulatory message to then US President James Buchanan, which was followed by a parade through the streets of New York, featuring a replica of a ship which helped lay the cable and fireworks over City Hall. In their inaugural cables, Queen Victoria hailed the “great international work” by the two countries, the culmination of almost two decades of effort, while Buchanan lauded a “triumph more glorious, because far more useful to mankind, than was ever won by conqueror on the field of battle. The message took over 17 hours to deliver, at 2 minutes and 5 seconds per letter by Morse code, and the cable operated for less than a month due to a variety of technical failures, but a global communications revolution had begun. By 1866, new cables were transmitting 6 to 8 words a minute, which would rise to more than 40 words before the end of the century. In 1956, Transatlantic No. 1 (TAT-1), the first underwater telephone cable, was laid, and by 1988, TAT-8 was transmitting 280 megabytes per second – about 15 times the speed of an average US household internet connection – over fiber optics, which use light to transmit data at breakneck speeds. In 2018, the Marea cable began operating between Bilbao, Spain, and the US state of Virginia, with transmission speeds of up to 160 terabits per second – 16 million times faster than the average home internet connection. Today, there are around 380 underwater cables in operation around the world, spanning a length of over 1.2 million kilometers (745,645 miles). Underwater cables are the invisible force driving the modern internet, with many in recent years being funded by internet giants such as Facebook, Google, Microsoft and Amazon. They carry almost all our communications and yet – in a world of wireless networking and smartphones – we are barely aware that they exist. Yet as the internet has become more mobile and wireless, the amount of data traveling across undersea cables has increased exponentially. “Most people are absolutely amazed” by the degree to which the internet is still cable-based, said Byron Clatterbuck, chief executive of Seacom, a multinational telecommunications firm responsible for laying many of the undersea cables connecting Africa to the rest of the world. “People are so mobile and always looking for Wi-Fi,” he said. “They don’t think about it, they don’t understand the workings of this massive mesh of cables working together. “They only notice when it’s cut.” Network down In 2012, Hurricane Sandy slammed into the US East Coast, causing an estimated $71 billion in damage and knocking out several key exchanges where undersea cables linked North America and Europe. “It was a major disruption,” Frank Rey, director of global network strategy for Microsoft’s Cloud Infrastructure and Operations division, said in a statement. “The entire network between North America and Europe was isolated for a number of hours. For us, the storm brought to light a potential challenge in the consolidation of transatlantic cables that all landed in New York and New Jersey.” For its newest cable, Marea, Microsoft chose to base its US operation further down the coast in Virginia, away from the cluster of cables to minimize disruption should another massive storm hit New York. But most often when a cable goes down nature is not to blame. There are about 200 such failures each year and the vast majority are caused by humans. “Two-thirds of cable failures are caused by accidental human activities, fishing nets and trawling and also ships’ anchors,” said Tim Stronge, vice-president of research at TeleGeography, a telecoms market research firm. “The next largest category is natural disaster, mother nature – sometimes earthquakes but also underwater landslides.” A magnitude-7.0 earthquake off the southwest coast off Taiwan in 2006, along with aftershocks, cut eight submarine cables which caused internet outages and disruption in Taiwan, Hong Kong, China, Japan, Korea and the Philippines. Stronge said the reason most people are not aware of these failures is because the whole industry is designed with it in mind. Companies that rely heavily on undersea cables spread their data across multiple routes, so that if one goes down, customers are not cut off. How a cable gets laid Laying a cable is a years-long process which costs millions of dollars, said Seacom’s Clatterbuck. The process begins by looking at naval charts to plot the best route. Cables are safest in deep water where they can rest on a relatively flat seabed, and won’t rub against rocks or be at risk of other disturbances. “The deeper the better,” Clatterbuck said. “When you can lay the cable down in deep water you rarely have any problems. It goes down on the bottom of the seabed and just stays there.” Things become more difficult the closer you get to shore. A cable that is only a few centimeters thick on the bottom of the ocean must be armored from its environment as reaches the landing station that links it with the country’s internet backbone. “Imagine a long garden hose, inside of which are very small tubes that house a very, very thin fiber pair,” Clatterbuck said. That hose is wrapped in copper, which conducts the direct current that powers the cable and its repeaters, sometimes up to 10,000 volts. “The fibers are wrapped in urethane and wrapped in copper and wrapped again in urethane,” he said. “If we’re going to have to put that cable on a shoreline that is very shallow and has a lot of rocks, you’re now going to have to armor coat that cable so no one can hack through it.” Cables in less hospitable areas can be far thicker than garden hoses, wrapped in extra plastic, kevlar armor plating, and stainless steel to ensure they can’t be broken. Depending on the coast, cable companies might also have to build concrete trenches far out to sea, to tuck the cable in to protect it from being bashed against rocks. “Before the cable-laying vessels go out they send out another specialized ship that maps the sea floor in the area when they want to go,” said TeleGeography’s Stronge. “They want to avoid areas where there’s a lot of undersea currents, certainly want to avoid volcanic areas, and avoid a lot of elevation change on the sea floor.” Once the route is plotted and checked, and the shore connections are secure, huge cable laying ships begin passing out the equipment. “Imagine spools of spools of garden hose along with a lot of these repeaters the size of an old travel trunk,” Clatterbuck said. “Sometimes it can take a month to load the cable onto a ship.” The 6,600 kilometer (4,000 mile) Marea cable weighs over 4.6 million kilograms (10.2 million pounds), or the equivalent of 34 blue whales, according to Microsoft, which co-funded the project with Facebook. It took more than two years to lay the entire thing. Malicious cuts The blackout came without warning. In February 2008, a whole swath of North Africa and the Persian Gulf suddenly went offline, or saw internet speeds slow to a painful crawl. This disruption was eventually traced to damage to three undersea cables off the Egyptian coast. At least one – linking Dubai and Oman – was severed by an abandoned, 5,400 kilogram (6-ton) anchor, the cable’s owner said. But the cause of the other damage was never explained, with suggestions it could have been the work of saboteurs. That raises the issue of another threat to undersea cables: deliberate human attacks. In a 2017 paper for the right-wing think tank Policy Exchange, British lawmaker Rishi Sunak wrote that “security remains a challenge” for undersea cables. “Funneled through exposed choke points (often with minimal protection) and their isolated deep-sea locations entirely public, the arteries upon which the Internet and our modern world depends have been left highly vulnerable,” he said. “The threat of these vulnerabilities being exploited is growing. A successful attack would deal a crippling blow to Britain’s security and prosperity.” However, with more than 50 cables connected to the UK alone, Clatterbuck was skeptical about how useful a deliberate outage could be in a time of war, pointing to the level of coordination and resources required to cut multiple cables at once. “If you wanted to sabotage the global internet or cut off a particular place you’d have to do it simultaneously on multiple cables,” he said. “You’d be focusing on the hardest aspect of disrupting a network.”

#### SpaceX satellites are key to internet access

James Pethokoukis 11/30 [James Pethokoukis, a columnist and an economic policy analyst, is the Dewitt Wallace Fellow at the American Enterprise Institute, where he writes and edits the AEIdeas blog and hosts a weekly podcast, “Political Economy with James Pethokoukis.” He is also a columnist for The Week and an official contributor to CNBC. “Why a SpaceX bankruptcy would hurt the global poor” Faster, Please! November 30, 2021 <https://fasterplease.substack.com/p/-why-a-spacex-bankruptcy-would-hurt>

I don’t have enough deep knowledge about SpaceX’s business or financials to reliably gauge the actual bankruptcy risk here, and the piece’s reporter is skeptical. I will note, however, that although the company is currently valued at around $100 billion, the bank Morgan Stanley assigns it a valuation “of somewhere between $5bn and $200bn, with uncertainty about its success accounting for the wide range,” according to The Economist. Starship and Starlink are key to that upper bound. (Also: A Morgan Stanley survey of “institutional investors and industry experts” expect SpaceX to become more valuable than Tesla, currently a trillion-dollar company. We’ll see.) So it’s not surprising that Musk emphasizes the importance of the Starlink internet satellite venture here, especially its next incarnation. Now go and Twitter search on the terms “Musk,” “ruining,” and “sky,” and you’ll find plenty of complaints about the Starlink constellation — with currently more than 1,700 satellites in low-Earth orbit. For many of these keyboard critics, Starlink is nothing more than an uberbillionaire's reckless effort to become an even wealthier uberbillionaire. Or maybe it’s just another Muskian vanity project, like building rockets to Mars. Either way, these diehard anti-Muskers see a cluttered sky for visual astronomers, both amateur and professional, as a horrific tradeoff just so the entrepreneur can sell global internet access. Now, the extreme version of this critique is unserious, little more than anti-billionaire emoting. The profit potential of Starlink is unclear, though it seems to be Musk’s goal that the telecom business will one day help fund his Mars ambitions. But the venture isn’t there yet. Last summer, Musk estimated that Starlink would likely need between $20 billion and $30 billion in investment. "If we succeed in not going bankrupt, then that'll be great, and we can move on from there," Musk said. For now, Starlink aims to add another 1,000 satellites a year, even more when Starship is operational. That is, assuming Starship become operational. But the astronomy issue is a real one, as SpaceX has acknowledged. And after astronomer complaints about the brightness of the first group of 60 satellites launched in 2019, SpaceX developed a work-around to minimize the glare from solar reflection on subsequent launches. Of course, some scientists don’t want to rely on the goodwill of SpaceX and other satellite companies. They see an international regulatory agreement, perhaps a new protocol under the Outer Space Treaty, as a necessity. But as such an add-on is unlikely to happen anytime soon, notes The Economist, “not least because other issues raised by the mega constellations, such as risks from debris, will doubtless seem more pressing.” Here’s one of the many pictures floating around the Internet showing the impact of Starlink satellites — “the 333-second exposure shows at least 19 satellites passing overhead” — on astronomical observations, via the IFLScience website: Of course, framing the trade-off as the above picture vs. “better global internet” doesn’t quite capture the benefits of the latter. And they are considerable. There remains a stark digital divide in global internet access. As the World Economic Forum notes: “Globally, only just over half of households (55 percent) have an internet connection, according to UNESCO. In the developed world, 87 percent are connected compared with 47 percent in developing nations, and just 19 percent in the least developed countries.” It seems pretty clear that broadband internet access brings considerable economic gains, particularly to poorer countries. (Musk has specifically said this is a goal of Starlink.) Here are a few examples from the August 2021 analysis “The Economic Impact of Internet Connectivity in Developing Countries” by Jonas Hjort (Columbia University) and Lin Tian (INSEAD): Quite a few studies convincingly estimate the effect on consumption of specific internet-enabled technologies (rather than internet connectivity itself) through model-based approaches, and a few do so more directly. Jack & Suri (2014) show that access to mobile money decreased consumption poverty by two percentage points in Kenya. In contrast, Couture et al. (2021) finds that expansion of e-commerce in China has little effect on income to rural producers and workers. Different areas of Sub-Saharan Africa got access to basic internet at different times starting in the early 2000s. Exploiting variation arising from the gradual arrival of submarine cable connections and using nighttime satellite image luminosity as a proxy for economic activity, Goldbeck & Lindlacher (2021) estimate that basic internet availability leads to about a two percentage point increase in economic growth. As we briefly discussed in Sub-section 3.1.1, Bahia et al. (2020) show evidence that the gradual roll-out of mobile broadband in Nigeria between 2010 and 2016 increased labor force participation and employment. The paper also shows that household consumption simultaneously increased and poverty decreased. Households that had at least one year of mobile broadband coverage experienced an increase in total consumption of about 6 percent. Masaki et al. (2020) document a similarly striking result. Combining household expenditure surveys with data on the location of fiber-optic transmission nodes and coverage maps of 3G mobile technology, they show that 3G coverage is associated with a 14 percent increase in total consumption and a 10 percent decline in extreme poverty in Senegal. Finally, Bahia et al. (2021) use a similar empirical approach to study the effect of mobile broadband roll-out in Tanzania and find a comparable increase in household consumption and decline poverty in this setting. The eventual endgame here is that there are going to be many tens of thousands more satellites in orbit, enabling total global internet coverage. And they will be joined by all manner of human-occupied installations for tourist, commercial, and scientific endeavors. (You may have missed the late October announcement that Blue Origin, the space company owned by Jeff Bezos, is teaming up with other firms to build a space station in Earth orbit.) Stargazing from Earth will never be the way it used to be. Then again, people still complain about shadows from skyscrapers even as humanity continues to build them. But recall one of the running themes of this newsletter: Technology solves one problem, creates another, then solves that one — rinse and repeat — even as the overall direction is forward. More astronomy in the future will be space based. And if all those space objects and structures make even low-Earth orbit astronomy difficult, more of it will need to be performed further out, as with the James Webb Space Telescope. Or maybe via telescopes on the Moon, such as the proposed Lunar Crater Radio Telescope, which would deploy robots to transform a half-mile wide crater into an observatory by attaching a wire mesh along the crater walls. And once there are lots of satellites around a fully colonized Moon, off to Mars — which might be accessible thanks to Starlink funding Musk’s deep-space ambitions. Meanwhile, there will be a lot less global poverty here on Earth than otherwise.

#### Answers 1AC Pre-empt – proves that there is a profit incentive to sending starlink in space

#### Internet access checks multiple existential threats

Eagleman ’10 [Dr. David; 11/9/2010; PhD in Neuroscience @ Baylor University, Adjunct Professor of Neoroscience @ Stanford University, Former Guggenheim Fellow, Director of the Center for Science and Law, BA @ Rice University; “Six Ways The Internet Will Save Civilization”; https://www.wired.co.uk/article/apocalypse-no]

Many great civilisations have fallen, leaving nothing but cracked ruins and scattered genetics. Usually this results from: natural disasters, resource depletion, economic meltdown, disease, poor information flow and corruption. But we’re luckier than our predecessors because we command a technology that no one else possessed: a rapid communication network that finds its highest expression in the internet. I propose that there are six ways in which the net has vastly reduced the threat of societal collapse.

Epidemics can be deflected by telepresence

One of our more dire prospects for collapse is an infectious-disease epidemic. Viral and bacterial epidemics precipitated the fall of the Golden Age of Athens, the Roman Empire and most of the empires of the Native Americans. The internet can be our key to survival because the ability to work telepresently can inhibit microbial transmission by reducing human-to-human contact. In the face of an otherwise devastating epidemic, businesses can keep supply chains running with the maximum number of employees working from home. This can reduce host density below the tipping point required for an epidemic. If we are well prepared when an epidemic arrives, we can fluidly shift into a self-quarantined society in which microbes fail due to host scarcity. Whatever the social ills of isolation, they are worse for the microbes than for us.

The internet will predict natural disasters

We are witnessing the downfall of slow central control in the media: news stories are increasingly becoming user-generated nets of up-to-the-minute information. During the recent California wildfires, locals went to the TV stations to learn whether their neighbourhoods were in danger. But the news stations appeared most concerned with the fate of celebrity mansions, so Californians changed their tack: they uploaded geotagged mobile-phone pictures, updated Facebook statuses and tweeted. The balance tipped: the internet carried news about the fire more quickly and accurately than any news station could. In this grass-roots, decentralised scheme, there were embedded reporters on every block, and the news shockwave kept ahead of the fire. This head start could provide the extra hours that save us. If the Pompeiians had had the internet in 79AD, they could have easily marched 10km to safety, well ahead of the pyroclastic flow from Mount Vesuvius. If the Indian Ocean had the Pacific’s networked tsunami-warning system, South-East Asia would look quite different today.

Discoveries are retained and shared

Historically, critical information has required constant rediscovery. Collections of learning -- from the library at Alexandria to the entire Minoan civilisation -- have fallen to the bonfires of invaders or the wrecking ball of natural disaster. Knowledge is hard won but easily lost. And information that survives often does not spread. Consider smallpox inoculation: this was under way in India, China and Africa centuries before it made its way to Europe. By the time the idea reached North America, native civilisations who needed it had already collapsed. The net solved the problem. New discoveries catch on immediately; information spreads widely. In this way, societies can optimally ratchet up, using the latest bricks of knowledge in their fortification against risk.

Tyranny is mitigated

Censorship of ideas was a familiar spectre in the last century, with state-approved news outlets ruling the press, airwaves and copying machines in the USSR, Romania, Cuba, China, Iraq and elsewhere. In many cases, such as Lysenko’s agricultural despotism in the USSR, it directly contributed to the collapse of the nation. Historically, a more successful strategy has been to confront free speech with free speech -- and the internet allows this in a natural way. It democratises the flow of information by offering access to the newspapers of the world, the photographers of every nation, the bloggers of every political stripe. Some posts are full of doctoring and dishonesty whereas others strive for independence and impartiality -- but all are available to us to sift through. Given the attempts by some governments to build firewalls, it’s clear that this benefit of the net requires constant vigilance.

Human capital is vastly increased

Crowdsourcing brings people together to solve problems. Yet far fewer than one per cent of the world’s population is involved. We need expand human capital. Most of the world not have access to the education afforded a small minority. For every Albert Einstein, Yo-Yo Ma or Barack Obama who has educational opportunities, uncountable others do not. This squandering of talent translates into reduced economic output and a smaller pool of problem solvers. The net opens the gates education to anyone with a computer. A motivated teen anywhere on the planet can walk through the world’s knowledge -- from the webs of Wikipedia to the curriculum of MIT’s OpenCourseWare. The new human capital will serve us well when we confront existential threats we’ve never imagined before.

Energy expenditure is reduced

Societal collapse can often be understood in terms of an energy budget: when energy spend outweighs energy return, collapse ensues. This has taken the form of deforestation or soil erosion; currently, the worry involves fossil-fuel depletion. The internet addresses the energy problem with a natural ease. Consider the massive energy savings inherent in the shift from paper to electrons -- as seen in the transition from the post to email. Ecommerce reduces the need to drive long distances to purchase products. Delivery trucks are more eco-friendly than individuals driving around, not least because of tight packaging and optimisation algorithms for driving routes. Of course, there are energy costs to the banks of computers that underpin the internet -- but these costs are less than the wood, coal and oil that would be expended for the same quantity of information flow.

The tangle of events that triggers societal collapse can be complex, and there are several threats the net does not address. But vast, networked communication can be an antidote to several of the most deadly diseases threatening civilisation. The next time your coworker laments internet addiction, the banality of tweeting or the decline of face-to-face conversation, you may want to suggest that the net may just be the technology that saves us.

## Case

### Collisions

#### Status quo solves debris:

#### 1] Updated guidelines and launch plans.

Tangermann 18 – Victor is a Toronto-based staff writer and photo editor for Futurism.com. 11/9/18. [The Byte, “SPACEX FOUND A WAY TO KEEP ITS SATELLITES FROM CLUTTERING UP SPACE,” <https://futurism.com/the-byte/spacex-starlink-satellites-space-debris>] Justin

But the Verge reports that SpaceX might have a solution: fly more than 1,500 Starlink satellites at half the originally planned altitude of 1,110 km (690 miles). In a filing to the FCC, SpaceX argues that the advantages are twofold.

First, its satellites will be orbiting out of the harm of the majority of existing space debris. Second, orbiting at 550 km (342 miles) will make the satellites far easier to retire once their days are up — and according to NASA, that will happen on average after only five years in orbit. At that altitude, the Earth’s atmosphere will dispose of SpaceX’s trash automatically by slowly pushing the satellites out of orbit.

#### 2] Russia’s ASATs are a massive alt cause but autonomous collision avoidance solves.

Kan 12/1 – Michael has been a PCMag reporter since October 2017. He covers a wide variety of news topics, including consumer devices, the PC industry, cybersecurity, online communities, and gaming. 12/1/21. [PC Mag, “Starlink Satellite Orbits Changed to Avoid Debris After Russia's Missile Test,” <https://www.pcmag.com/news/starlink-satellite-orbits-changed-to-avoid-debris-after-russias-missile>] Justin

SpaceX has altered the orbits for its Starlink satellites, likely to prevent them from colliding with debris from Russia’s anti-satellite missile test.

On Tuesday, SpaceX CEO Elon Musk mentioned the issue after NASA abruptly delayed a spacewalk on the International Space Station due to the threat of space debris. In his tweet, Musk said: “We had to shift some Starlink satellite orbits to reduce probability of collision. Not great, but not terrible either.”

Musk didn’t explicitly blame the space debris on Russia’s anti-satellite missile test. Nevertheless, the “Not great, but not terrible” quote may be a subtle jab at the Russian government. The same line is used in the HBO series Chernobyl, which dramatizes the 1986 nuclear plant disaster in the Soviet Union. (In the show, a nuclear plant worker utters the line “Not great, but not terrible,” when in reality the conditions at the facility are catastrophic.)

Last month, the US was quick to condemn Russia’s anti-satellite missile test, which involved the Kremlin sending up a missile to destroy one of its own defunct satellites. The ensuing impact caused hundreds of thousands of pieces of debris to spill out into orbit, according to the US.

Because space debris can travel up to 17,500 miles per hour, even a small artifact can cause serious damage if strikes a spacecraft or an astronaut. "Russia's dangerous and irresponsible behavior jeopardizes the long-term sustainability of outer space,” the US State Department said at the time.

However, Russia claims the resulting debris poses no danger to any space activity. The Kremlin also points out other countries have embarked on their own anti-satellite missile tests too.

To avoid space debris, SpaceX has equipped each Starlink satellite with an “autonomous collision avoidance” system. The same satellites will eventually descend and burn up in Earth’s atmosphere within one to five years if the propulsion system on board ever fails.

In his tweet, Musk added that the International Space Station and SpaceX’s own Dragon craft possess “micrometeorite shields,” which can withstand high-velocity impacts. However, spacesuits lack such protection, hence the need for NASA to cancel the spacewalk.

#### Physics and math proofs prove no impact.

Cairncross 17 [Duncan Cairncross, Retired Planetary Science Engineer, BSc in Mechanical Engineering from the University of Glasgow, Diploma in Management DMS, Business Administration and Management, General from Teeside University, Former Asset Management Officer for the Gore District Council, “Is the Kessler Syndrome Disputed By Some Scientists?”, Quora, 10/25/2017, https://www.quora.com/Is-the-Kessler-Syndrome-disputed-by-some-scientists

Lets look at some numbers - we are talking LEO - so anything very small will de-orbit itself quite fast from atmospheric drag

These lumps are going the same direction - at similar speeds - as our satellites - so we are not talking about km/sec impacts - just rifle bullet speeds - 300 m/sec at maximum and the vast majority would have much much lower speeds

Everything is in a torus

Altitude 100 km to 300 km, - 1000 km North to 1000 km South - and about 40,000 km long

200 x 2000 x 40,000 = volume 16 billion cubic km -

18,000 Big bits - 100 mm - including 1,200 satellites

750,000 “bullets” - 10 mm

150 million bits 1 mm

Small bits we will ignore as they will not be going fast enough relative to our satellite to cause damage - and they will de-orbit quite fast

So one “bullet” for every 21,000 cubic km

That does not sound like too dangerous a neighborhood!

What happens if start some sort of cascade?

There is not much to cascade - 18,000 - “big bits” - if each of them became 1000 “bullets” then we would have 18 million “bullets” + the existing 750,000 bullets

And that is erring on the generous side - these bits are mostly metallic and metals don’t shatter into lots of 10 mm bits when hit by rifle bullets

That would be one “bullet” for every 853 cubic km AND most of the “bullets” will not actually be going very fast

Some time in the future when we have a lot mor,e as in a 100,000 times as much stuff in orbit then the Kessler Syndrome may be possible

If you are worried about communication satellites way up there in geostationary orbit then the situation is even better - there is a LOT more space up there and we have boosted a lot less junk up to those orbits

It is worth tracking the big bits and making sure that most satellites are safely de-orbited? - YES

But worrying about a Kessler Syndrome? - no not really

#### They don’t care about a downed satellite – their evidence is hysteria.

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.

#### Dialogue, CBMs and empirics thump the impact

Marie Baezner and Patrice Robin 17 (Cyber Defense Project (CDP) Center for Security Studies (CSS), ETH Zürich “Cyber-conflict between the United States of America and Russia” https://www.research-collection.ethz.ch/bitstream/handle/20.500.11850/184547/Cyber-Reports-2017-02.pdf?sequence=1//)hbj

On the other hand, both states might not desire further escalation, preferring to restrain the conflict to cyberspace. Each would follow the “tit-for-tat” logic and accuse each other while never reaching a tipping point where the conflict spills over to a conventional war. Such a tipping point would be linked to the intensity of the attack or the nature of the targets. Both nations would keep the cyberattacks small enough not to trigger a bigger reaction. The same would be observed on the choice of targets, with both avoiding certain critical or sensitive targets, for instance critical infrastructures. In order to contain the conflict in cyberspace, both states would have to demonstrate their restraint by selecting options with low risk of miscalculation (Lin, 2012, pp. 64–66). In the future, it might also be possible to see a deescalation in the form of the emergence of an international treaty or at least further bilateral treaties between the USA and Russia on cyberattacks. For example, during the last few years, businesses in the USA were often hacked and spied on by the Chinese military. These intrusions were mostly cyber-economic-espionage and were said to have supported the theft of billions of dollars’ worth of intellectual property (Bamford, 2016). In September 2015, the USA and China signed an agreement engaging both countries not to support or conduct cyber-theft of intellectual property. Moreover, the parties have made the commitment not to use cyberattacks against each other’s critical infrastructures in peace-time and to support the establishment of international behavioral norms in cyberspace (Rosenfeld, 2015). Both states also highlighted the fact that they could not control each individual in their country and therefore could not be held responsible for individual acts. Since then it seems that the number of attacks on commercial targets has diminished (Timm, 2016). Former President Obama suggested the creation of a position of cybersecurity ambassador to deal with bilateral or multilateral treaties concerning cyber-norms (Lee, 2016). For this kind of de-escalation to take effect, the termination of the conflict at hand must be the stated aim of both parties. A clear common understanding of the terms of agreement is required and must be based on trust-building efforts, as well as the assurance of mutual adherence. The difficulty of tracking the implementation of such agreements in cyberspace has been an obstacle preventing more states consenting to such solutions (Lin, 2012, pp. 62–64). Nevertheless, a dialogue on cyberspace already exists between the USA and Russia since July 2013. This cooperation includes Confidence Building Measures (CBM) such as the creation of working groups on the issue of ICT security, exchange of information between the two national Computer Emergency Response Teams (CERT), and the creation of a direct communication line to directly manage ICT incidents (Segal, 2016; The White House, Office of the Press Secretary, 2013). In October 2016, former President Obama used the latter to inform Russian President Putin that the USA was accusing Russia of interference in the election process (Ignatius, 2016). Furthermore, Russia and the USA take part in the UN GGE supporting the future establishment of international norms on actions in cyberspace. They stated that international law can be applied in cyberspace and therefore, the rules of proportionality and limited collateral damage should also be respected in cyberattacks (Ignatius, 2016; United Nations General Assembly, 2015). These examples demonstrate that even though the two states are involved in a “tit-for-tat” logic in their relations on a tactical level, there was still a dialogue on the strategic level, at least until 2015. The recent cyberattacks in USA and the election of Donald Trump as US President, bring new uncertainties.

### Asteroids

No extinction –

#### 1. New studies prove it’s far away and nearly impossible

Robert **Walker 16**. Software Developer of Tune Smithy, Wolfson College, Oxford. 12-14-2016. "Why Resilient Humans Would Survive Giant Asteroid Impact." Science 2.0. https://www.science20.com/robert\_inventor/we\_wont\_go\_extinct\_after\_a\_major\_asteroid\_impact\_even\_96\_of\_species\_extinct\_0\_chance\_of\_humans\_extinct-187383

This is something you hear said so often - that we risk being hit by an asteroid that could make humans extinct. But do we really? This is the article I’m commenting on, a recently breaking news story: Earth woefully unprepared for surprise comet or asteroid, Nasa scientist warns. Some are already worrying that it means that we are all due to die in the near future from an asteroid impact. Well, no, it doesn't mean that. So, what is the truth behind it? The source of all this is a comment by Dr Joseph Nuth who warns: “But on the other hand they are the extinction-level events, things like dinosaur killers, they’re 50 to 60 million years apart, essentially. You could say, of course, we’re due, but it’s a random course at that point.” Photograph of comet Siding Spring by Hubble - right hand image is more processed. This comet did a close flyby of Mars and at one point was predicted to have a tiny chance of hitting Mars. In the end it missed Mars by more than a quarter of the distance from Earth to the Moon If you read the rest of the article, it’s a worthy goal, to prepare us for asteroid impacts of all sizes from the small Chelyabinsk one up to really large 10 km ones. There are a number of things potentially confusing about this statement however, if you read it as a non scientist. Although there is a risk of “mass extinction” if a large asteroid hit Earth, “mass extinction” there doesn’t mean “extinction of humans”, we are such a resilient species that we would certainly survive a giant asteroid impact. We are not “due” an extinction at all. Next giant impact is most likely to happen many millions of years into the future. As we'll see, there is almost zero chance of a giant impact in the next century. There is however much we can do to protect ourselves from smaller asteroids. As a result of extensive asteroid surveys over the last couple of decades: We can be pretty sure (as in perhaps 99.999999% sure) that there isn’t an extinction level asteroid headed our way in the next century. We know the orbits of all the Near Earth Asteroids that could do this and none will hit Earth over that timescale. That leaves comets, and the chance of that is something like 1 in 100 million per century, as a very rough guess (since 99% of the impacts are thought to be from asteroids). This risk has been pretty much retired due to the automated asteroid searches by the likes of Pan STARRS. But the chance of a smaller asteroid impact is still high enough to make it worth working on it, especially since this is the one natural hazard we can not only predict to the minute, decades in advance, with enough information but also prevent also, given a long enough timeline. We are already close to completing the survey of 1 km asteroids (90% done). With a bit more funding we could also find most of the asteroids down to 45 meters in diameter. As a result of new developments in the science of asteroid detection, this could be done for a cost of only $50 million to protect the entire Earth. We would then be able to deflect asteroids decades before they are due to hit, which is a far easier task than a last minute deflection. First when he said "You could say, of course, we’re due, but it’s a random course at that point.”" - that is a scientist speaking as a scientist. But of course people sharing this on social media, retweeting, writing new stories about it, pick up the “we are due” and omit the scientific qualification “but it’s a random course at that point”. To say that we are “due” a mass extinction is a bit like saying that after you throw nine heads, you are due to throw a tail. Not true. The chance that the next coin toss is a tail is always going to be 50/50 for a fair coin no matter how many heads you throw. It's the same with extinctions. So long as it is a random process, then an extinction that happens every 60 million years could happen tomorrow or it could be 60 million years or 120 million years before it happens. On average we would still expect to wait 60 million years for the next such mass extinction even if the last one happened hundreds of millions of years ago. It’s just as for the coin toss. Same for an extinction event of a size that happens every 100 million years. If you look at the diagram the big five are irregularly spaced. The last one happened 66 million years ago. But they are irregularly spaced so we can't conclude either that we need to wait 44 million years for the next big extinction either. Some scientists have tried to discern a periodicity in the extinctions of perhaps 26 to 30 million years. If they are right then we are due the next extinction perhaps 15 million years or so from now. But that is very controversial and if true, it wouldn’t cover all mass extinctions. At any rate that's so far into the future it makes no difference to us now, if they are right or wrong. We could get a mass extinction in the next few millions of years. But it is nearly impossibly unlikely in the next century.

#### 2. They are not likely or avoidable enough to justify allowing other existential risks

Kent 4 [Department of Applied Mathematics and Theoretical Physics, Centre for Mathematical Sciences, University of Cambridge. A Critical Look at Risk Assessments for Global Catastrophes. 2004. https://onlinelibrary.wiley.com/doi/full/10.1111/j.0272-4332.2004.00419.x?casa\_token=7YtWdAgcOtEAAAAA%3ALsFF220rqWTeap5nJ2SLRlOFEsQkxvr1NCR5JVPEuMyrF6EbaYs7wxArpuxejPYs2D\_sKqC6f8PSr7c]

Large asteroid impact seems to be the greatest known natural extinction risk that can be reasonably well estimated. The risk of the Earth being hit by an asteroid of diameter 10 km is estimated to be 10−8 per year.(17) Such an impact would be so devastating that it is generally thought very likely that it would cause mass extinctions of species, and very plausible that we would be among the species extinguished. Accepting that last hypothesis, perhaps at the price of another order of magnitude, gives an estimate of 10−8–10−9 per year for this natural extinction risk. Following the argument of dominant risk leads to the so‐called asteroid test, according to which an artificial extinction risk is acceptable if smaller than ≈10−9 per year, or in the more conservative version, very small compared to 10−9 per year.10 My impression from discussions is that many thoughtful people find some version of the argument of dominant risk reasonable, but that many equally thoughtful people find this line of argument entirely irrational. My sympathies are with the latter. Why should the existence of one risk, which may be distressingly high, justify taking another easily avoidable risk,

### Grid

#### Read their secondary impacts very skeptically – their Friedemann evidence never justifies which part of a cascade would cause extinction – at best their terminal impact is “creating anarchic conditions” which doesn’t outweigh the disads

#### No grid collapse---

1. No EMP impact – it pales in comparison to nuclear war and current measures solve – this answers geomagnetic storms

* Risk is nothing compared to nukes themselves
* EMP think tanks massively inflate risks
* Hardening electronics is possible and widespread [faraday cages anyone]
* The gov is aware of the risk and is prepared

Atherton 20 D. Kelsey D. Atherton is a defense technology journalist based in Albuquerque, New Mexico. "Don't Fear Electromagnetic Pulses, Fear Nuclear Oblivion." Foreign Policy, 21 July 2020, foreignpolicy.com/2020/07/21/electromagnetic-pulses-emp-weapons-nuclear-explosion.

It is hard to pinpoint what, specifically, the electromagnetic pulse did to the electronic infrastructure of Hiroshima, Japan, on Aug. 6, 1945. In the days and months after the blast, the first use of a nuclear weapon in war, electrical power remained out in the city. If no specific attention was paid to the particular way that part of a nuclear blast interacts with the electrical grid, it is because the effect of the weapon was total and horrific. Amid the rubble, the radiation, the fire and ruin and mass death, fried electronics were barely noticed. The electromagnetic pulse that comes from the sundering of an atom, potentially destroying electronics within the blast radius with some impact miles away from ground zero, is just one of many effects of every nuclear blast. What is peculiar about these pulses, often referred to as EMPs, is the way the side effect of a nuclear blast is treated as a in its own right by bodies such as the Task Force on National and Homeland Security, which, despite the official-sounding name, is a privately funded group. These groups continue a decadelong tradition of obsession over EMPs, one President Donald Trump and others have picked up on. These EMP-specific fears are wholly divorced from the normal risk calculations of a war between nuclear-armed states and the threat of nuclear oblivion. Doing so obscures the history—and misunderstands the dangers. EMPs were anticipated before they existed. Enrico Fermi of the Manhattan Project hardened sensors at the Trinity test site so that the detonation would remain useful science. Later nuclear tests would look at the way this pulse risked disabling other warheads in flight, and what would happen if a warhead was detonated so high above Earth that the pulse was its primary effect. For the early planners of the apocalypse, the greatest risk posed by an EMP was to nuclear warheads themselves. Strategic planning called for multiple warheads to obliterate a city, and the engineers were worried about what might happen if the first nuke to explode disabled the electronics inside the other warheads, causing them to land inert instead. This was called “warhead fratricide,” and researchers at the Lawrence Livermore National Laboratory ran Monte Carlo simulations to estimate the odds. Once understood, the problem of nuclear weapons disabling other nuclear weapons was solved, primarily, by engineering around the known parameters of EMPs. Hardening electronics, with special shielding that directs current around sensitive parts of machines, has been a staple of nuclear weapon design for decades. It is a known, solvable problem. The U.S. Department of Defense absolutely requires hardening for military electronics critical to nuclear command and control, while standards exist to harden other electronics, as well as civilian infrastructure that the military depends on for non-nuclear threats. That hasn’t stopped it becoming a perpetual bugbear of strategists. Then-Rep. Trent Franks argued before Congress in 2012 that terrorists might acquire and then use a nuclear weapon to create an EMP. The logic goes like this: A nonstate actor simultaneously in possession of a nuclear weapon, a missile, and a freighter brings all three close to a port in the United States. Then, that terrorist group uses the missile to loft a nuke into space above the United States, detonating it, causing an electromagnetic pulse that wipes out electronics across the country. This Rube Goldberg-style fear is dependent not only on a catastrophic failure of intelligence, but also on the group in possession of the nuke exercising a strange logic themselves. Why, after obtaining a nuclear weapon, would they not simply use the blast to kill hundreds of thousands of people directly? Franks argued that the American dependence on modern technology poses a unique vulnerability enemies might exploit, unlike the common vulnerability every human being has to their flesh being disintegrated by fire and heat. High-altitude nuclear EMPs were discovered as part of the atmospheric Operation Fishbowl testing series in 1962. The most famous of these, Starfish Prime, was detonated at nearly 250 miles above the planet’s surface. The electromagnetic pulse was far-reaching, shutting down some streetlights in Oahu almost 900 miles away from the detonation. The partial test ban treaty of 1963 meant that the Fishbowl series were the last live explosion high-altitude tests by the United States, but the potential of using a nuclear weapon blown up high in the sky to disable electronics became a dedicated part of nuclear war planning for ever afterward. By the 1970s, EMP effects were fully incorporated in the U.S. planning about nuclear war. Following the broadcast of the TV special The Day After in 1983, New York Times columnist John Corry launched EMP concerns into the public eye by specifically worrying that an EMP could wipe out U.S. second-strike capabilities. In response, Richard Garwin, who in 1954 wrote one of the first theoretical papers at the Los Alamos National Laboratory on the origin of EMPs from nuclear explosions, sought to dispel the unique fear of EMPs in a letter to the editor published by the Times. “Since 1962, the delicacy of some electronics has increased because of the use of transistors and integrated circuits, but our understanding of electromagnetic pulse has matured so that specific equipment and systems can be tested and guaranteed against disruption by EMP,” Garwin wrote. This hardening included the communication links for the nuclear chain of command and the hardening of the silos and aircraft themselves against the dangerous effects from the pulse. That some electronics would fail in the event of a high-altitude EMP attack on the United States did not mean that the whole of the nuclear enterprise would be rendered inert, no matter how many hyperbolic pronouncements claimed it would be a Pearl Harbor-