## 1NC

### 1NC---OFF

#### Text – Private Appropriation of Outer Space except for Space Elevators is Unjust.

#### Space Elevators constitute Appropriation – they impede orbits.

Matignon 19 Louis de Gouyon Matignon 3-3-2019 "LEGAL ASPECTS OF THE SPACE ELEVATOR TRANSPORTATION SYSTEM" <https://www.spacelegalissues.com/space-law-legal-aspects-of-the-space-elevator-transportation-system/> [PhD in space law (co-supervised by both Philippe Delebecque, from Université Paris 1 Panthéon-Sorbonne, France, and Christopher D. Johnson, from Georgetown University || regularly write articles on the website Space Legal Issues so as to popularise space law and public international law]//Elmer

An Earth-based space elevator would consist of a cable with one end attached to the surface near the equator and the other end in space beyond geostationary orbit. An orbit is the curved path through which objects in space move around a planet or a star. The 1967 Treaty’s regime and customary law enshrine the principle of non-appropriation and freedom of access to orbital positions. Space Law and International Telecommunication Laws combined to protect this use against any interference. The majority of space-launched objects are satellites that are launched in Earth’s orbit (a very small part of space objects – scientific objects for space exploration – are launched into outer space beyond terrestrial orbits). It is important to precise that an orbit does not exist: satellites describe orbits by obeying the general laws of universal attraction. Depending on the launching techniques and parameters, the orbital trajectory of a satellite may vary. Sun-synchronous satellites fly over a given location constantly at the same time in local civil time: they are used for remote sensing, meteorology or the study of the atmosphere. Geostationary satellites are placed in a very high orbit; they give an impression of immobility because they remain permanently at the same vertical point of a terrestrial point (they are mainly used for telecommunications and television broadcasting). A geocentric orbit or Earth orbit involves any object orbiting Planet Earth, such as the Moon or artificial satellites. Geocentric (having the Earth as its centre) orbits are organised as follow: 1) Low Earth orbit (LEO): geocentric orbits with altitudes (the height of an object above the average surface of the Earth’s oceans) from 100 to 2 000 kilometres. Satellites in LEO have a small momentary field of view, only able to observe and communicate with a fraction of the Earth at a time, meaning a network or constellation of satellites is required in order to provide continuous coverage. Satellites in lower regions of LEO also suffer from fast orbital decay (in orbital mechanics, decay is a gradual decrease of the distance between two orbiting bodies at their closest approach, the periapsis, over many orbital periods), requiring either periodic reboosting to maintain a stable orbit, or launching replacement satellites when old ones re-enter. 2) Medium Earth orbit (MEO), also known as an intermediate circular orbit: geocentric orbits ranging in altitude from 2 000 kilometres to just below geosynchronous orbit at 35 786 kilometres. The most common use for satellites in this region is for navigation, communication, and geodetic/space environment science. The most common altitude is approximately 20 000 kilometres which yields an orbital period of twelve hours. 3) Geosynchronous orbit (GSO) and geostationary orbit (GEO) are orbits around Earth at an altitude of 35 786 kilometres matching Earth’s sidereal rotation period. All geosynchronous and geostationary orbits have a semi-major axis of 42 164 kilometres. A geostationary orbit stays exactly above the equator, whereas a geosynchronous orbit may swing north and south to cover more of the Earth’s surface. Communications satellites and weather satellites are often placed in geostationary orbits, so that the satellite antennae (located on Earth) that communicate with them do not have to rotate to track them, but can be pointed permanently at the position in the sky where the satellites are located. 4) High Earth orbit: geocentric orbits above the altitude of 35 786 kilometres. The competing forces of gravity, which is stronger at the lower end, and the outward/upward centrifugal force, which is stronger at the upper end, would result in the cable being held up, under tension, and stationary over a single position on Earth. With the tether deployed, climbers could repeatedly climb the tether to space by mechanical means, releasing their cargo to orbit. Climbers could also descend the tether to return cargo to the surface from orbit.

#### Private Companies are pursuing Space Elevators.

Alfano 15 Andrea Alfano 8-18-2015 “All Of These Companies Are Working On A Space Elevator” <https://www.techtimes.com/articles/77612/20150818/companies-working-space-elevator.htm> (Writer at the Tech Times)//Elmer

Space elevators are solid proof that any mundane object sounds way cooler if you stick the word "space" in front of it. But there's much more than coolness at stake when building a space elevator – this technology has the potential to revolutionize space transportation, and the Canadian private space company Thoth Technology that was recently awarded a patent for its space elevator design isn't the only company in the game. One of the other major players is a U.S.-based company called LiftPort Group, founded by space entrepreneur Michael Laine in 2003. Its plan for a space elevator is vastly different from the one for which Thoth received a patent, however. Whereas Thoth's plans entail tethering a 12-mile-high inflatable space elevator to the Earth, LiftPort is shooting for the moon. Originally, LiftPort had planned to build an Earth elevator, too, but it abandoned the idea in 2007 in favor of building a lunar elevator. The basic design for a lunar elevator is an anchor in the moon that is attached to a cable that extends to a space station situated at a very special point. Known as a Lagrange Point, this is the gravitational tipping point between the Earth and the moon, where their gravitational pulls essentially cancel one another out. A robot could then travel up and down the tether, ferrying cargo between the moon and the station. Out farther in space, a counterweight would balance out the system. Both types of space elevator are intended to increase space access, but in very different ways. Thoth's Earth elevator aims to make launches easier by starting off 12 miles above the Earth's surface. LiftPort's space elevator aims to increase access to the moon in particular, because it is much easier to launch a rocket to the Lagrange Point and dock it at a space station than it is to get to the moon directly. There's a third major company based in Japan called Obayashi Corp. whose plans look like a hybrid of Thoth's and LiftPort's. Obayashi is not a space company, however – it's actually a construction company. Like Thoth, Obayashi plans to build an Earth elevator. But its Earth elevator would consist of a cable tethered to the blue planet, a robotic cargo-carrier, a space station, and a counterweight. It essentially looks like LiftPort's plans, but stuck to the Earth instead of to the moon.

#### They’re feasible.

Smith 17 Vincent Smith 6-21-2017 "3 Challenges for Engineering A Space Elevator" <https://www.engineering.com/story/3-challenges-for-engineering-a-space-elevator> (Engineer)//Elmer

There's a lot of junk orbiting Earth. Thousands of hours have been poured into previous NASA missions, ensuring the least possible contamination by even the tiniest motes of dust and dirt. The kinds of instrumentation that would monitor a space elevator would need to be similarly discerning. However, the fact that it would be a permanent fixture means that sooner or later, a space elevator would cross paths with meteors and even remnants of previous space missions left behind as space debris. The extreme of this phenomenon even has a name: Kessler Syndrome, where the density of low earth debris becomes so large that nothing can pass it safely into outer space. This cascading problem of space debris collisions was featured in the film Gravity. As Bullock and Clooney can tell you, this phenomenon could cause catastrophic damage to the overall structure (or knock it off balance, returning to our 'oscillation' concerns). Edwards recognized this, and devoted an entire section of his report to addressing it. According to the report, part of dealing with this obstacle is recognizing and tracking low-earth orbit objects large enough to do damage to the structure. According to Section 10.3 of the report, “A study was done at Johnson Space Center on the construction of a system that could track objects down to 1cm in size with 100m accuracy using effectively current technology. This is very close to the tracking network we would need for the space elevator.” For situations in which avoidance is not always possible (the amount of low-earth orbit debris increases significantly from altitudes of approximately 300 to 1,000 miles), Edwards posits that increasing the thickness of the cable will make it robust enough to withstand all but the largest of objects, which could be tracked and avoided ahead of time using the systems previously mentioned. Even for these exceptional pieces of debris, Edwards illustrates in a section simply labeled “Meteors” that only (i) direct impact by an object (ii) over 3cm in diameter, (iii) with enough force to stay on the initial plane of impact (as opposed to being deflected or redirected by contact with the elevator apparatus), would create the kind of catastrophic damage that we associate with a complete severing of the cable. Designing the cable with curvature and panels specifically for deflection has been proposed by both Edwards as well as several other survivability reports, including this one, put together for the 2010 International Space Elevator Consortium (ISEC). Definitive answers as to the effectiveness of these measures are hopefully forthcoming, but it's at least comforting to know that there are first, second, and third lines of defense prepared for just such occasions.

#### Regardless of completion, Elevators spur investment in Nanotechnology

Liam O’Brien 16. University of Wollongong. 07/2016. “Nanotechnology in Space.” Young Scientists Journal; Canterbury, no. 19, p. 22.

Nanotechnology is at the forefront of scientific development, continuing to astound and innovate. Likewise, the space industry is rapidly increasing in sophistication and competition, with companies such as SpaceX, Blue Origin and Virgin Galactic becoming increasingly prevalent in what could become a new commercial space race. The various space programs over the past 60 years have led to a multitude of beneficial impacts for everyday society. Nanotechnology, through research and development in space has the potential to do the same. Potential applications of nanotechnology in space are numerous, many of them have the potential to capture and inspire generations to come. One of these applications is the space elevator. By using carbon nanotubes, a super light yet strong material, this concept would be an actual physical structure from the surface of the Earth to an altitude of approximately 36 000 km. The tallest building in the world would fit into this elevator over 42 000 times. The counterweight, used to keep the elevator taught, is proposed to be an asteroid. This would need to be at a distance of 100 000 km, a quarter of the distance to the moon. The benefits of such a structure would be enormous. 95% of a space shuttle's weight at take-off is fuel, costing US$ 20 000 per kilogram to send something into space. However, with a space elevator the cost per kilogram can be reduced to as little as US$ 200. Exploration to other planets can begin at the tower, and travel to and from the moon could become as simple as a morning commute to work. Solar sails provide the means to travel large distances and incredible speeds. Much like sails on a boat use wind, the solar sail uses light as a source of propulsion. Ideally these sails would be kilometres in length and only a few micrometres in thickness. This provides us with the ability to travel at speeds previously unheard of. Using carbon nanotubes once again, a solar sail has the capability to travel at 39 756 km/s which is 13% of the speed of light! This sail could reach Pluto in an astonishing 1.7 days, and Alpha Centauri in just 32 years. Space travel to other planets, other stars, could be possible with solar sails. The Planetary Society is funding for a space sail of itself, and has successfully launched one into orbit. NASA has also sent a sail into orbit, allowing it to burn up in the atmosphere after 240 days. Investing time and resources into nanotechnology for space exploration has benefits for society today. Materials such as graphene are being used in modern manufacturing at an increasing rate as the applications become utilised. Carbon nanotubes will change the way we think about materials and their strength. These nanotubes have a tensile strength one hundred times that of steel, yet are only a sixth of the weight. Imagine light weight vehicles using less petrol and energy as well as being just as strong as regular vehicles. With potentials to revolutionize the way we think about space travel, nanotechnology has a bright future. As a new field of science, it has the capability to push the human race to the outer reaches of our galaxy and hopefully one day to other stars. It will inspire generations of explorers and dreamers to challenge themselves and advance the human race into the next era. As Richard Feynman said in his 1959 talk 'There's Plenty of Room at the Bottom' "A field in which little has been done, but in which an enormous amount can be done. There is still plenty more to achieve.

#### Nanotech solves every existential threat

**Miller 17** Gina Miller, She has written articles and provided interviews on the subject of nanotechnology and created digital artwork, videos and animations to illustrate future applications. Her work has been featured in various media including the History Channel, Japanese television, international documentaries, Wired, PC Magazine, Fast Company, and various books such as “Nanofuture” by J. Storrs Hall, the inventor of the “utility fog” concept. Miller has collaborated with other nanotechnology pioneers such as Robert A. Freitas Jr., author of “Nanomedicine,” and is a frequent collaborator of the Foresight Institute co-founded by K. Eric Drexler the “founding father of nanotechnology”.. 2-26-2017, accessed on 1-28-2021, Nanotechnology Industries, "Nanotechnology, the real science of miracles, the end of disease, aging, poverty and pollution - Nanotechnology Industries", http://nanoindustries.com/nanotechnology\_science\_of\_miracles/ //Adam

The current status of disease and death is staggering. We do know that in the documented world 56 million people die every year. Dissecting the statistics of disease provided by the World Health Organization is overwhelming to weed through. There is a solution. Or there may be in the future. One day there could be a cure for all disease, and you may be able to live forever, in a healthy youthful state. One day it may be possible that scientists will be able to create nanorobots using nanotechnology. Nanotechnology is the ability to see and move atoms around. Everything is made of atoms, the chair you are sitting in, your food, your body, the air we breathe, everything. Atoms are so small they cannot be seen by the human eye. Atoms are on the nanoscale, that's a teeny, tiny size. There are 25,400,000 nanometers in an inch, a sheet of newspaper is 100,000 nanometers thick, human hair is about 80,000 nanometers in diameter. Atoms are the building blocks. Different atoms, arranged in different ways, make molecules that make the different things you see and experience. In the human body atoms come together to make many things, for example water, fats, hair, bones, and DNA. DNA and other molecules build cells; sometimes cells malfunction and cause disease. Where does nanotechnology fit in? That's a self realizing question, that's how, it fits in! Think of it this way, if you were King Kong, could you grab one grain of sand easily? Your hands would be too big. That's how medicine is currently treating disease. Nanotechnology is on the same size and scale as disease. A nanorobot can grab a cell and repair it. This will allow us to cure diseases that have never been cured before. Nanorobots could be released into the blood stream via pill or injection to find and repair damage and then break down and disintegrate. Or nanorobots could remain in the body at all times, perpetually monitoring, identifying and repairing problems immediately, without any external treatment. Nanorobots would cure the aliment so early on that you would never even know you were going to get sick. Chemotherapy releases toxic chemicals throughout the entire body rather than just the affected area, such as a tumor. This process destroys the cancer but also the immune system. Chemotherapy makes patients very sick, and there is risk of permanent damage or death from the treatment itself. There is also a risk of the cancer returning. A nanorobot could have radiation inside of it, locate the tumor, inject it and destroy it directly. Molecular nanorobots wouldn't leave one cancerous cell behind. That's one of the benefits of getting down to the molecular level. Doctors cannot see on the molecular level and could easily miss some cancer cells, which is often the case and the cancer returns. A nanotech gene therapy has successfully killed ovarian cancer in mice; if successful in human clinical trials it could save the lives of 15000 women a year. But it doesn't stop with cancer. Every disease is made out of the same atoms that everything else is. All medical conditions are a result of atoms being out of place; a nanorobot could put them back where they belong, thus immediately alleviating the problem without the side effects that current day medication and treatments cause. What else can be repaired in the human body? EVERYTHING. From cancer to the common cold. There is nothing that nanotechnology could not repair. The injuries or illnesses you have right now will have the capability to be repaired or cured by nanotechnology. Nanotechnology could eliminate diseases, disabilities, and illnesses such as diabetes, malaria, HIV, cardiovascular disease, damage from injuries and accidents, heal wounds, reduce child mortality, regenerate limbs and organs, eliminate inflammatory/infectious diseases, and so on and so forth. Nanotechnology offers hope to people suffering from Alzheimer’s, Parkinson's, brain injuries, tumors and neurological disorders. Nanoconstructs could deliver neuroprotective molecules directly to the brain to recover or protect nerve cells from damage or degeneration. Nanotechnology has been emerging in this field in the form of nanoengineered scaffolds that could one day result in a tool for rewiring the intricate neuronal network. Research by Dr. Samuel I. Stupp designed molecules using nanomaterials and injected them into mice who were paralyzed due to spinal cord injury. After 6 weeks the mice regained the ability to walk. Research like this could one day evolve into real cures for people. 65 billion dollars is wasted every year due to low bioavailability. Meaning that the drug or treatment used is not absorbed into or accessed by the body properly due to a multitude of reasons. For example drug interactions, different molecular arrangements and manufacturing processes by different brands. Drugs with more moisture may form lumps in the stomach which decreases absorption, and a highly compressed pill will slow absorption. Different level changes in the body at any given time may cause drug toxicity. Metabolism, age, activity, stress, previous surgery and syndromes are also factors. These are huge challenges that can be alleviated by using nanotechnology to target the specific areas. Nanorobots can take their cues from mother nature; she is the first nanotechnologist. She is an expert at creating molecular machines. Geneticists have been taking advantage of viruses for use in gene therapy for some time. They modify a virus by removing the viral gene so it doesn't cause disease. They replace it with healthy genes to transport to the faulty cell and cure diseases. This strategy of hacking viruses could be exploited by nanotech. Viruses are biological molecular machines that could be modified into becoming nanorobots or they could become transportation for a nanorobot. Another means is a nanorobot could attach itself to a traveling white blood cell and ride shotgun to assist in the tissue repair of injured tissue. Nanotechnology could even be involved in tissue engineering, creating scaffolds for artificial organs and implants. Tissue from your own body could be used to make new tissue, which assures that your body doesn't reject it. The surgeries of today are painful, costly, can leave scars and can even be life threatening. Repairing nanorobots would eliminate the need for surgeries, incisions, side effects and recovery time. According to the American Academy of Periodontology there are links to poor dental health and stroke, heart disease, respiratory disease, osteoporosis, some cancers and diabetes. Nanorobots as nanodentistry could repair damage without large needles or drills. Nanorobots could also constantly and invisibly maintain and clean your teeth to avoid any dental problems. Hygiene is important for good health; your skin and hair could be cleaned by nanorobots eliminating the need for showers. Spider bites and ticks carrying lyme disease would be detected by nanorobots, blocking penetration. Other skin problems such as eczema would be repaired by dermal nanorobots. Is aging a disease? Could aging be cured? Yes. Since nanorobots would be able to repair single cells on the molecular level they would be able to repair damages created by aging. It's all the same to a nanorobot. Nanotechnology could repair damaged cells. Dead cells are the primary reason for aging and death; nanorobots could replace senescent (old) cells with non-senescent cells, or reprogram cells so they do not senescensce, which would keep the body from aging. Not only would the inside of your body never get sick or age, but neither will the outside. Your skin will be young, elastic, dewy and wrinkle-free. Your hair will be thick, without gray, and intact. Your hearing, your eyesight and memory will be in perfect shape. You wouldn't get arthritis, turkey neck, or saggy parts. You could go out dancing when you are 93 and not worry about sore feet, low energy or suffering any consequences. Unless you party too hard, but that's on you, not the nano. So if you never get sick and never get old could you live forever? Yes. nanorobots could be programmed to rebuild older cells into younger copies on a regular basis thereby the human body could become immortal. You could live a disease-free youthful life, forever. Of course immortality isn't for everyone and everyone should have the right to decide what they want or don't want for their own body. Death will be a choice rather than a requirement. There are well funded countries that have access to researchers and high tech equipment that would love to figure out how to create the nanotechnology that will repair bodies and end disease. In the US despite having a lot of financial resources it's not always easy to get funding. If you are at a university, you need to write a grant, go through a lot of red tape, and there are a lot more near-term projects that seem to get prioritized when it comes to funding. For companies looking for investors, unfortunately not all investors can foresee the amazing future that nano will have because they are used to funding things they can see. For example a company that makes desks seeking an investor can show the investor the money they need for each piece of wood, bolt, and the quantity of desks that will be manufactured within a specific time frame. Nanotechnology is in development and isn't readily available like a piece of wood, the piece of wood has to be built. And the individual processes of each emerging development will have their own variables. Once the recipe has been figured out and formulated, the investment we have made will then be very inexpensive and easy to reproduce. Third world countries would have easy access to nanomedicine. Mother nature puts atoms together all the time and it doesn't cost her anything. The raw materials for making nanorobots would be essentially cost-free because they will be made mostly of carbon. Because nanotechnology would be created on the very small atomic level, traveling to provide treatment would not require large equipment. The size and portability would make treatment easily accessible across the world. The environment and living conditions also impact health. Since nanotechnology is on the atomic level and atoms are everywhere, it can be beneficial to the world all around us, as well as our bodies. Nanotechnology could enrich depleted soil in places like Africa, which is currently facing a food crisis. Vitamins, nutrients and minerals could be delivered to rebuild soil to a fertile state and thus have the ability to grow food. Hunger could one day be a solvable problem. Nanotechnology would make it possible to provide meat and animal products inexpensively without killing animals. E.coli and other pathogens could be detected in soil and eliminated so that food is not harmful. Currently nanomaterials are in development to release fertilizers for plants and nutrients for livestock, nano sensors for monitoring the health of crops and farm animals, and magnetic nanoparticles to remove soil contaminants. According to water.org 750 million people around the world lack access to safe water; approximately one in nine people. 840,000 people die each year from water-related disease. A portable non-chemical nano-filtration water purification device has been developed by Micheal Pritchard. It creates safe and sterile water out of dirty water and would make the cost of water per household an estimated 3 dollars a year. His company has provided clean water to countries who have gone through natural disasters, such as Haiti and the Philippines. In the future nanotechnology particles could destroy bacteria that often cause fatal disease. Pollution in general, global warming, nuclear waste, oil spills, smog, and acid rain, could be remedied and prevented by nanotechnological advances. Large quantities of nanorobots could come together to remove pollutant atoms from the atmosphere, earth and water. These groups of nanorobots could swim in contaminated waters and be released into the polluted atmosphere to destroy or remove contaminating molecules. Nanorobots could pull apart the bad molecules and reassemble the atoms into good molecules for other positive purposes. As a first indicator of the possibility, Brian Mercer created a new pollution control technology using nanofibres that greatly reduce industrial pollution by trapping and removing the pollutants. Currently nanotech is being used to reduce emissions from car fuels. Since nanotechnology builds atom by atom; the process is pollution free. Nanotechnology will not be manufactured in the way we use manufacturing plants today. There will be no chemical by product, no emission, hazardous waste and no pollution.

#### Cross apply 1AC Kareiva for Warming

#### Conflicts coming over water scarcity---extinction

Daniel Darling 19, senior international military markets analyst at Forecast International Incorporated, an aerospace and defense consulting firm located in Newtown, Connecticut, where he covers the Europe and Asia-Pacific markets, “The Coming Wars over Water,” The National Interest, 4/14/19, https://nationalinterest.org/blog/buzz/coming-wars-over-water-52147

But another looming issue confronting global leaders involves the earth’s most precious resource: water. In many regions of the globe—from Northern Africa to the Middle East to Central and South Asia—efforts to manage internal freshwater supplies or conserve transboundary water agreements are under strain as scarcity rises in parallel with population growth, consumption and warming temperatures. A World Bank study on the global water picture in 2016 noted that entire regions may see their gross domestic product decline by up to 6 percent by 2050 due to water-related losses in agriculture, health, income and property. The areas highlighted consist of many of the world’s largest population concentrations, regions with developing economies, intensive and unsustainable agricultural practices and high occurrences of drought. Dam-building and its downstream effects across national borders—as in the case of Ethiopia’s Grand Ethiopian Renaissance Dam and China’s water diversion project from the Yarlung Tsangpo River in southern Tibet—threaten to escalate tensions or redefine national claims over disputed regions. Such disputes could mushroom across the globe in the face of broader demographic and resource shifts. According to the Pacific Institute’s water conflict chronology database, eighteen water-related incidents occurred in 2018 alone, ranging from violence erupting at protests over water management to outright fighting between competing communities over access to water and herding rights. These incidents appear destined to become more a norm than an outlier as water resources are consumed faster than rainfall replenishment in some areas and limitations exacerbate longstanding tensions, be they ethnic, tribal or national-based. Delicate tradeoff systems between nations located upstream and downstream of major rivers threaten to be undone by disruptions, as in the case of Central Asian countries sharing parts of the Fergana Valley. In addition, scarcity issues may create internal security pressures by leading to radicalization amongst vulnerable population sectors. With water a vital and finite resource, the world’s industrialized nations are naturally protective of local supply and place a premium on water security in instances where water flows across shared borders. When mixed with political disputes or rivalries, resource pressures may act as a catalyst for armed conflict. Wars over water resources are not without precedent. The Six-Day War of 1967, for instance, was in part an Israeli military response to a Syrian attempt to dam the Yarmuk River, a tributary of the Jordan River, a crucial water source for Israel. Another potential flashpoint exists in one of the world’s most tense arenas: the border between India and Pakistan. There the potential repudiation of a water-sharing agreement brokered by the World Bank in 1960, the Indus Waters Treaty, would serve to further damage relations between Pakistan and India, potentially sending the two rivals spiraling into a conflict that might draw in other nations. The treaty remains in place despite two wars conducted over that time between the neighboring rivals. This is a credit to the cornerstone of the agreement: the rational self-interest of both signatories. With water at a premium for both, any war over it would threaten the supply of each actor, thus ostensibly negating the pretense for armed conflict. But with Pakistan facing declining water availability and blaming its situation on India's “water terrorism,” the potential for crisis increases. India, which plans for a presumptive “collusive threat” on both its northeast and northwest borders from China and Pakistan, must tread carefully in order to avoid reciprocity from Beijing should the latter turn its back on water rationality. While India holds an upstream riparian advantage over Pakistan in regards to the Sutlej, Beas and Ravi Rivers, so too does China as it relates to major rivers flowing into India from Tibet. Considering Pakistan’s water vulnerability—which involves exploding population growth, poor water utilization and infrastructure maintenance, and unsustainable usage patterns—any threat by India to abrogate the treaty or maximize its use of water from any of the rivers covered under the IWT would be seen by Islamabad as tantamount to an act of war. Factor in Pakistan’s strategic alignment with China and any outbreak of conflict might draw Beijing into the scrum, thereby resulting in India confronting the two-front war its planners most fear. Under this scenario, in which three nuclear-armed nations conduct military operations at some level of intensity, the rest of the world would be left scrambling to mediate the crisis at zero hour.

#### Space Elevators solve Space Debris – reduces Rocket Launches

Forgan 19, Duncan H. Solving Fermi's Paradox. Vol. 10. Cambridge University Press, 2019. (Associate Lecturer at the Centre for Exoplanet Science at the University of St Andrews, Scotland, founding member of the UK Search for Extra-terrestrial Intelligence (SETI) research network and leads UK research efforts into the search)//Elmer

All objects in HEO reside beyond the geostationary orbit (GEO). The orbital period at GEO (w'hich is aligned with the Earth's equator) is equal to the Earth’s rotational period. As a result, from a ground observer’s perspective the satellite resides at a fixed point in the sky, with clear advantages for uses such as global communication. Activities at HEO are considerably less than at LEO and MEO. Earth's orbital environment does contain a natural component - the meteoroids. These pose little to no threat to space operations - the true threat is self-derived. The current limitations of spacefaring technology ensure that every launch is accompanied by substantial amounts of space debris. This debris ranges in size from dust grains to paint flecks to large derelict spacecraft and satellites. According to NASA’s Orbital Debris Program Office, some 21.000 objects greater than 10 cm in size are currently being tracked in LEO. with the population below 10 cm substantially higher. Most debris produced at launch tends to be deposited with no supplemental velocity - hence these objects tend to follow the initial launch trajectory, which often orbits with high eccentricity and inclination. However, these orbits do intersect with the orbits of Earth’s artificial satellite population, resulting in impacts w'hich tend to produce further debris. The vast majority of the low-size debris population is so-called fragmentation debris. This is produced during spacecraft deterioration, and in the most abun- dance during spacecraft break-up and impacts. The first satellite-satellite collision occurred in 1961. resulting in a 400% increase in fragmentation debris (Johnson et al.. 2008). Most notably, a substantial source of fragmentation debris was the deliberate destruction of the Fengyun 1C satellite by the People’s Republic of China, which created approximately 2.000 debris fragments. As with collisions of ‘natural debris’, debris-debris collisions tend to result in an increased count of debris fragments. Since the late 1970s, it has been understood that man-made debris could pose an existential risk to space operations. Kessler and Cour-Palais (1978) worked from the then-population of satellites to extrapolate the debris production rate over the next 30 years. Impact rates on spacecraft at any location. /, can be calculated if one knows the local density of debris p, the mean relative velocity vrei\* and the cross-sectional area ct: [[EQUATION 13.5 OMITTED]] Each impact increases p without substantially altering vrel or o. We should there- fore expect the impact rate (and hence the density of objects) to continue growing at an exponential rate: [[EQUATION 13.6 OMITTED]] Kessler and Cour-Palais (1978) predicted that by the year 2000, p would have increased beyond the critical value for generating a collisional cascade. As new collisions occur, these begin to increase ^jjp, which in turn increases resulting in a rapid positive feedback, with p and I reaching such large values that LEO is rendered completely unnavigable. This has not come to pass - LEO remains navigable, partially due to a slight overprediction of debris produced by individual launches. The spectre of a collisional cascade (often referred to as Kessler syndrome) still looms over human space exploration, as debris counts continue to rise. Without a corresponding dedicated effort to reduce these counts, either through mitigating strategies to reduce the production of debris during launches, or through removal of debris fragments from LEO. we cannot guarantee the protection of the current flotilla of satellites, leaving our highly satellite-dependent society at deep risk. What strategies can be deployed to remove space debris? Almost all debris removal techniques rely on using the Earth’s atmosphere as a waste disposal sys- tem. Most debris is sufficiently small that atmospheric entry would result in its complete destruction, with no appreciable polluting effects. Atmospheric entry requires the debris fragments to be decelerated so that their orbits begin to intersect with lower atmospheric altitudes. Once a critical altitude is reached, atmospheric drag is sufficiently strong that the debris undergoes runaway deceleration and ultimately destruction. There are multiple proposed techniques for decelerating debris. Some mechani- cal methods include capturing the debris using either a net or harpoon, and applying a modest level of reverse thrust. These are most effective for larger fragments, and especially intact satellites (Forshaw et al., 2015). Attaching sails to the debris is also a possibility if the orbit is sufficiently low for weak atmospheric drag. The Japanese space agency JAXA’s Kounotori Integrated Tether Experiment (KITE) will trail a long conductive cable. As a current is passed through the cable, and the cable traverses the Earth’s magnetic field, the cable experiences a magnetic drag force that will de-orbit the spacecraft. Orbiting and ground-based lasers can decelerate the debris through a variety of means. For small debris fragments, the radiation pressure produced by the laser can provide drag. A more powerful laser can act on larger debris fragments through ablation. As the laser ablates the debris, the resulting recoil generated by the escaping material produces drag and encourages de-orbit. A more lateral solution is to ensure that launches and general space-based activity no longer generate debris. These approaches advocate lower-energy launch mechanisms that do not rely on powerful combustion. The most famous is the space elevator (see Aravind. 2007). Originally conceived by Tsiolkovsky, the ele- vator consists of an extremely durable cable extended from a point near the Earth’s equator, up to an anchor point located at GEO (most conceptions of the anchor point envision an asteroid parked in GEO). ‘Climber’ cars can then be attached to the cable and lifted to LEO, MEO and even GEO by a variety of propulsion methods. Most notably, the cars can be driven to GEO without the need for chemical rockets or nuclear explosions - indeed, a great deal of energy can be saved by having coupled cars, one ascending and one descending. Space elevators would solve a great number of problems relating to entering (and leaving) Earth orbit, substantially reducing the cost of delivering payload out of the Earth's atmosphere. The technical challenges involved in deploying a cable tens of thousands of kilometres long are enormous, not to mention the material science required to produce a cable of sufficient tensile strength and flexibility in the first place. The gravitational force (and centrifugal force) felt by the cable will vary significantly along its length. As cars climb the cable, the Coriolis force will move the car (and cable) horizontally also, providing further strain on the cable material. The relatively slow traversal of the biologically hazardous Van Allen Belt on the route to GEO is also a potential concern for crewed space travel. Whatever the means, a spacefaring civilisation (or at least, a civilisation that utilises its local orbital environment as we do) must develop a non-polluting solution to space travel, whether that is via the construction of a space elevator, a maglev launch loop, rail gun, or some other form of non-rocket acceleration. If it cannot perform pollution-free spacecraft launches (or fully clean up its pollution), then it will eventually succumb to Kessler syndrome, with potentially drastic consequences for future space use, with likely civilisation-ending effects (Solution C.13).

#### 1AR theory is skewed towards the aff – a) the 2NR must cover substance and over-cover theory, since they get the collapse and persuasive spin advantage of the 3min 2AR, b) their responses to my counter interp will be new, which means 1AR theory necessitates intervention. Implications – a) drop the arg to minimize the chance the round is decided unfairly, b) use reasonability with a bar of defense or the aff always wins since the 2AR can line by line the whole 2NR without winning real abuse

#### Infinite abuse claims are wrong- A] Spikes solve-you can just preempt paradigms in the 1AC B] Functional limits- 1nc is only 7 minutes long

#### Condo is good proving a CP is bad doesn’t prove the plan is good, a logical policy maker can always choose not to act. Logic outweighs – it’s the basis of all rational arguments.

#### Pics are good they encourage innovative research that avoids stale debates and bridges different parts of the literature. Our PIC directly engages the literature base of the AC

### 1NC---OFF

#### Commercial Space Race favors American Companies that cements space dominance – shift away endangers our lead – losing green-lights Chinese Dominance across the board.

Autry and Kwast 19 Greg Autry and Steve Kwast 8-22-2019 "America Is Losing the Second Space Race to China" (Greg Autry, a clinical professor of space leadership, policy, and business at Arizona State University’s Thunderbird School of Global Management, and Steve Kwast)//Elmer

America Is Losing the Second Space Race to China The private sector can give the United States a much-needed rocket boost. The current U.S. space defense strategy is inadequate and on a path to failure. President Donald Trump’s vision for a Space Force is big enough. As he said on June 18, “It is not enough to merely have an American presence in space. We must have American dominance in space.” But the Air Force is not matching this vision. Instead, the leadership is currently focused on incremental improvements to existing equipment and organizational structures. Dominating the vast and dynamic environment of space will require revolutionary capabilities and resources far deeper than traditional Department of Defense thinking can fund, manage, or even conceive of. Success depends on a much more active partnership with the commercial space industry— and its disruptive capabilities. U.S. military space planners are preparing to repeat a conflict they imagined back in the 1980s, which never actually occurred, against a vanished Soviet empire. Meanwhile, China is executing a winning strategy in the world of today. It is burning hard toward domination of the future space markets that will define the next century. They are planning infrastructure in space that will control 21st-century telecommunications, energy, transportation, and manufacturing. In doing so, they will acquire trillion-dollar revenues as well as the deep capabilities that come from continuous operational experience in space. This will deliver space dominance and global hegemony to China’s authoritarian rulers. Despite the fact that many in the policy and intelligence communities understand exactly what China is doing and have been trying to alert leadership, Air Force leadership has convinced the White House to fund only a slightly better satellite command with the same leadership, while sticking a new label onto their outmoded thinking. A U.S. Space Force or Corps with a satellite command will never fulfill Trump’s call to dominate space. Air Force leadership is demonstrating the same hubris that Gen. George Custer used in convincing Congress, over President Ulysses S. Grant’s better experience intuition, that he could overtake the Black Hills with repeating rifles and artillery. That strategy of technological overconfidence inflamed conflict rather than subduing it, and the 7th Cavalry were wiped out at the Battle of the Little Bighorn. The West was actually won by the settlers, ranchers, miners, and railroad barons who were able to convert the wealth of the territory itself into the means of holding it. They laid the groundwork that made the 20th century the American Century and delivered freedom to millions of people in Europe and Asia. Of course, they also trampled the indigenous people of the American West in their wake—but empty space comes with no such bloody cost. The very emptiness and wealth of this new, if not quite final, frontier, however, means that competition for resources and strategic locations in cislunar space (between the Earth and moon) will be intense over the next two decades. The outcome of this competition will determine the fate of humanity in the next century. China’s impending dominance will neutralize U.S. geopolitical power by allowing Beijing to control global information flows from the high ground of space. Imagine a school in Bolivia or a farmer in Kenya choosing between paying for a U.S. satellite internet or image provider or receiving those services for free as a “gift of the Chinese people.” It will be of little concern to global consumers that the news they receive is slanted or that searches for “free speech” link to articles about corruption in Western democracies. Nor will they care if concentration camps in Tibet and the Uighur areas of western China are obscured, or if U.S. military action is presented as tyranny and Chinese expansion is described as peacekeeping or liberation. China’s aggressive investment in space solar power will allow it to provide cheap, clean power to the world, displacing U.S. energy firms while placing a second yoke around the developing world. Significantly, such orbital power stations have dual use potential and, if properly designed, could serve as powerful offensive weapons platforms. China’s first step in this process is to conquer the growing small space launch market. Beijing is providing nominally commercial firms with government-manufactured, mobile intercontinental ballistic missiles they can use to dump launch services on the market below cost. These start-ups are already undercutting U.S. pricing by 80 percent. Based on its previous success in using dumping to take out U.S. developed industries such as solar power modules and drones, China will quickly move upstream to attack the leading U.S. launch providers and secure a global commercial monopoly. Owning the launch market will give them an unsurmountable advantage against U.S. competitors in satellite internet, imaging, and power. The United States can still build a strategy to win. At this moment, it holds the competitive advantage in every critical space technology and has the finest set of commercial space firms in the world. It has pockets of innovative military thinkers within groups like the Defense Innovation Unit, under Mike Griffin, the Pentagon’s top research and development official. If the United States simply protects the intellectual property its creative minds unleash and defend its truly free markets from strategic mercantilist attack, it will not lose this new space race. The United States has done this before. It beat Germany to the nuclear bomb, it beat the Soviet Union to the nuclear triad, and it won the first space race. None of those victories was achieved by embracing the existing bureaucracy. Each of them depended on the president of the day following the only proven path to victory in a technological domain: establish a small team with a positively disruptive mindset and empower that team to investigate a wide range of new concepts, work with emerging technologies, and test innovative strategies. Today that means giving a dedicated Space Force the freedom to easily partner with commercial firms and leverage the private capital in building sustainable infrastructure that actually reduces the likelihood of conflict while securing a better economic future for the nation and the world.

#### Public sector space growth undermines innovation necessary to maintain U.S space dominance.

**Beames 21** [Charles Beames, Charles is currently the Executive Chairman of York Space Systems, a leader in commercial satellite design and manufacturing, as well as Chairman of the SmallSat Alliance. He is also a retired Air Force Colonel, having served 23 years in space & intelligence leadership positions around the world, 9-30-2021, Forbes, "It Is Time Our Government Stops Competing Against The Commercial Space Industry", <https://www.forbes.com/sites/charlesbeames/2021/09/30/it-is-time-our-government-stops-competing-against-the-commercial-space-industry/> accessed on 12-21-2021] Adam

* A2 Public sector fill in

With its fiery engines and impressive reusable rockets, SpaceX is the most visible example of the power of private enterprise in space. Every month, SpaceX makes another great leap further into the stars with another launch and often carrying satellites from other companies. Conservative estimates suggest that tens of thousands more are scheduled to be launched over the next five years to perform missions limited to the providence of major nations only a decade ago.

An outstanding example of an agency leveraging corporate R&D rather than spending its own capital is the Space Development Agency (SDA). When devising its strategy to build the nation’s next-generation missile tracking and communication systems, SDA mandated that the satellites hosting the specialized instruments onboard must be built on an off-the-shelf commodity bus already in rate production. SDA has already awarded four successful companies at a fixed price contract with 10 others deemed competitive, which means we can expect that very little development is required.

Every time the government develops their own version of the same technologies, it inhibits the investment and creative thinking necessary for America’s next big play in space. The boldest and most innovative investors and engineers in the commercial sector shy away from space as a business opportunity when the government insists on staying in the ring, because there are no longer the 10-20X multiples on private investment that commercial opportunities in the tech sector can deliver. Institutional investors do still pour capital into traditional defense companies, especially in times of increasing hostilities. Unfortunately for them, however, the valuation multiples on revenue are far lower – about 2X – and only match the pace of government expansion.

We must rethink the policy incentive structure of last century’s space industrial model to reward unbounded free market economic growth instead of companies whose market cap only grows with more national defense spending. Admittedly, there are instances in which it is still necessary for the government to develop their own satellite, component or rocket, but it is increasingly rare.

The U.S. government once again must transition to become a consumer of commercial space goods and services so that America’s space industry outpaces its adversaries. An organic, commercial space marketplace exists now and must be rewarded, not stifled. We are on a tight schedule, because near-peer competitors like China (and others) are aware of this strategic competition and instead choose to [leverage their nascent technologies to outpace us](https://www.forbes.com/sites/charlesbeames/2020/10/14/the-dragon-is-breathing-down-our-neck-action-is-americas-best-weapon/?sh=67a437724cb5).

The role for the government is larger and more strategic than ever before, but it is our capital markets that are our biggest advantage in Great Power competition. We must maximize this strength by encouraging private investments in the new space economy, promoting competition among commercial providers, and not competing against the very technologies we hope to leverage to secure America’s promising future in space.

#### Alternatives to U.S. global power cause nuclear war.

Hal Brands 18. Henry A. Kissinger Distinguished Professor of Global Affairs at the Johns Hopkins University School of Advanced International Studies, Senior Fellow at the Center for Strategic and Budgetary Assessments and the Foreign Policy Research Institute, Ph.D. in history from Yale University. “Chapter 6: Does America Have Enough Hard Power?” American Grand Strategy in the Age of Trump; pp. 129-133.

Much contemporary commentary favors the first option—reducing commitments—and denounces the third as financially ruinous and perhaps impossible.5 Yet significantly expanding American capabilities would not be nearly as economically onerous as it may seem. Compared to the alternatives, in fact, this approach represents the best option for sustaining American primacy and preventing a slide into strategic bankruptcy that will eventually be punished. Since World War II, the United States has had a military second to none. Since the Cold War, America has committed to having overwhelming military primacy. The idea, as George W. Bush declared in 2002, that America must possess “strengths beyond challenge” has featured in every major U.S. strategy document for a quarter century; it has also been reflected in concrete terms.6 From the early 1990s, for example, the United States consistently accounted for around 35 to 45 percent of world defense spending and maintained peerless global power-projection capabilities.7 Perhaps more important, U.S. primacy was also unrivaled in key overseas strategic regions—Europe, East Asia, the Middle East. From thrashing Saddam Hussein’s million-man Iraqi military during Operation Desert Storm, to deploying—with impunity—two carrier strike groups off Taiwan during the China-Taiwan crisis of 1995– 96, Washington has been able to project military power superior to anything a regional rival could employ even on its own geopolitical doorstep. This military dominance has constituted the hard-power backbone of an ambitious global strategy. After the Cold War, U.S. policymakers committed to averting a return to the unstable multipolarity of earlier eras, and to perpetuating the more favorable unipolar order. They committed to building on the successes of the postwar era by further advancing liberal political values and an open international economy, and to suppressing international scourges such as rogue states, nuclear proliferation, and catastrophic terrorism. And because they recognized that military force remained the ultima ratio regum, they understood the centrality of military preponderance. Washington would need the military power necessary to underwrite worldwide alliance commitments. It would have to preserve substantial overmatch versus any potential great-power rival. It must be able to answer the sharpest challenges to the international system, such as Saddam’s invasion of Kuwait in 1990 or jihadist extremism after 9/11. Finally, because prevailing global norms generally reflect hard-power realities, America would need the superiority to assure that its own values remained ascendant. It was impolitic to say that U.S. strategy and the international order required “strengths beyond challenge,” but it was not at all inaccurate. American primacy, moreover, was eminently affordable. At the height of the Cold War, the United States spent over 12 percent of GDP on defense. Since the mid-1990s, the number has usually been between 3 and 4 percent.8 In a historically favorable international environment, Washington could enjoy primacy—and its geopolitical fruits—on the cheap. Yet U.S. strategy also heeded, at least until recently, the fact that there was a limit to how cheaply that primacy could be had. The American military did shrink significantly during the 1990s, but U.S. officials understood that if Washington cut back too far, its primacy would erode to a point where it ceased to deliver its geopolitical benefits. Alliances would lose credibility; the stability of key regions would be eroded; rivals would be emboldened; international crises would go unaddressed. American primacy was thus like a reasonably priced insurance policy. It required nontrivial expenditures, but protected against far costlier outcomes.9 Washington paid its insurance premiums for two decades after the Cold War. But more recently American primacy and strategic solvency have been imperiled. THE DARKENING HORIZON For most of the post–Cold War era, the international system was— by historical standards—remarkably benign. Dangers existed, and as the terrorist attacks of September 11, 2001, demonstrated, they could manifest with horrific effect. But for two decades after the Soviet collapse, the world was characterized by remarkably low levels of great-power competition, high levels of security in key theaters such as Europe and East Asia, and the comparative weakness of those “rogue” actors—Iran, Iraq, North Korea, al-Qaeda—who most aggressively challenged American power. During the 1990s, some observers even spoke of a “strategic pause,” the idea being that the end of the Cold War had afforded the United States a respite from normal levels of geopolitical danger and competition. Now, however, the strategic horizon is darkening, due to four factors. First, great-power military competition is back. The world’s two leading authoritarian powers—China and Russia—are seeking regional hegemony, contesting global norms such as nonaggression and freedom of navigation, and developing the military punch to underwrite these ambitions. Notwithstanding severe economic and demographic problems, Russia has conducted a major military modernization emphasizing nuclear weapons, high-end conventional capabilities, and rapid-deployment and special operations forces— and utilized many of these capabilities in conflicts in Ukraine and Syria.10 China, meanwhile, has carried out a buildup of historic proportions, with constant-dollar defense outlays rising from US$26 billion in 1995 to US$226 billion in 2016.11 Ominously, these expenditures have funded development of power-projection and antiaccess/area denial (A2/AD) tools necessary to threaten China’s neighbors and complicate U.S. intervention on their behalf. Washington has grown accustomed to having a generational military lead; Russian and Chinese modernization efforts are now creating a far more competitive environment. Second, the international outlaws are no longer so weak. North Korea’s conventional forces have atrophied, but it has amassed a growing nuclear arsenal and is developing an intercontinental delivery capability that will soon allow it to threaten not just America’s regional allies but also the continental United States.12 Iran remains a nuclear threshold state, one that continues to develop ballistic missiles and A2/AD capabilities while employing sectarian and proxy forces across the Middle East. The Islamic State, for its part, is headed for defeat, but has displayed military capabilities unprecedented for any terrorist group, and shown that counterterrorism will continue to place significant operational demands on U.S. forces whether in this context or in others. Rogue actors have long preoccupied American planners, but the rogues are now more capable than at any time in decades. Third, the democratization of technology has allowed more actors to contest American superiority in dangerous ways. The spread of antisatellite and cyberwarfare capabilities; the proliferation of man-portable air defense systems and ballistic missiles; the increasing availability of key elements of the precision-strike complex— these phenomena have had a military leveling effect by giving weaker actors capabilities which were formerly unique to technologically advanced states. As such technologies “proliferate worldwide,” Air Force Chief of Staff General David Goldfein commented in 2016, “the technology and capability gaps between America and our adversaries are closing dangerously fast.”13 Indeed, as these capabilities spread, fourth-generation systems (such as F-15s and F-16s) may provide decreasing utility against even non-great-power competitors, and far more fifth-generation capabilities may be needed to perpetuate American overmatch. Finally, the number of challenges has multiplied. During the 1990s and early 2000s, Washington faced rogue states and jihadist extremism—but not intense great-power rivalry. America faced conflicts in the Middle East—but East Asia and Europe were comparatively secure. Now, the old threats still exist—but the more permissive conditions have vanished. The United States confronts rogue states, lethal jihadist organizations, and great-power competition; there are severe challenges in all three Eurasian theaters. “I don’t recall a time when we have been confronted with a more diverse array of threats, whether it’s the nation state threats posed by Russia and China and particularly their substantial nuclear capabilities, or non-nation states of the likes of ISIL, Al Qaida, etc.,” Director of National Intelligence James Clapper commented in 2016. Trends in the strategic landscape constituted a veritable “litany of doom.”14 The United States thus faces not just more significant, but also more numerous, challenges to its military dominance than it has for at least a quarter century.

## Case

### 1NC---AT: Solvency

#### No internal to the commons – requires new property rights regimes and blockchain ip management that the plan doesn’t do – blue

#### Rhimbassen 21

Maria Rhimbassen, 6-6-2021, "An Introduction to Space Antitrust," Open Lunar, https://www.openlunar.org/library/an-introduction-to-space-antitrust#anti-monopoly-law

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.

#### The ISS evidence is just blatantly power tagged – it’s a reason that the ISS specifically allows for public private partnerships due to national lab designation not why regulating private entities causes that

#### ISS National Lab n.d.

"Public-Private Partnerships in Space," ISS National Lab, https://www.issnationallab.org/research-on-the-iss/public-private-partnerships-in-space/

PUBLIC-PRIVATE PARTNERSHIPS IN SPACE Public-private partnerships are a key component to driving innovation and national leadership. With the potential to address a wide array of modern challenges from technology development to infrastructure modernization, and from education to the economic development of space, public-private partnerships unlock new possibilities unavailable when we rely solely on public or private investment. The International Space Station (ISS) National laboratory is a great example of a public-private partnership model that is working in space. The ISS National Lab opens up the incredible possibilities of the space station research environment to a diverse range of researchers, entrepreneurs, and innovators that could create entirely new markets in space. The ISS National Laboratory – Accelerating Utilization of the ISS The ISS offers a unique research and development platform, unlike any on Earth, enabling research that benefits both exploration and life on Earth. In an effort to expand the research opportunities this unparalleled platform provides to the nation, the ISS United States Orbital Segment, through bipartisan legislation, was designated as a U.S. National Laboratory in 2005, enabling research and development access to a broad range of commercial, academic, and government users. After final assembly of the ISS in 2011, the Center for the Advancement of Science in Space, a (501)(c)(3) organization, was selected by NASA to manage the ISS U.S. National Laboratory. The ISS National Lab fulfills its mission to accelerate space-based research by engaging a variety of nontraditional space users, operating in the fields of life science, physical science, technology development, and remote sensing. The ISS National Lab engages primarily with organizations that pay toward the value obtained on the ISS, as well as with other organizations addressing national science and research priorities. This research serves commercial and entrepreneurial needs and other important goals such as the pursuit of new knowledge and education. Since 2011, the ISS National Lab has stewarded more than 200 ISS research projects, ranging from developing new drug therapies, to monitoring tropical cyclones, to improving equipment for first-responders, to producing unique fiber-optics materials in space. Working together with NASA, the ISS National Lab aims to advance the nation’s leadership in commercial space, pursue groundbreaking science not possible on Earth, and leverage the space station to inspire the next generation. Prior to the ISS National Lab model, NASA traditionally funded all aspects of ISS research, whether it was research needed to further exploration, or discovery-based space research that expanded upon its scientific agenda. As the ISS evolved into a National Laboratory, the ISS National Lab has increased the diversity of users by accelerating utilization of the ISS as an innovation platform for a wide variety of partners. These include Fortune 500 organizations, small businesses, educational institutions, philanthropic and research foundations, federal and state government agencies, and other thought leaders in pursuit of groundbreaking technology and innovation who are interested in leveraging microgravity to solve complex research problems on Earth. The ISS National Lab plays a role in not only attracting a diverse set of users, including private companies, to utilize the ISS, but also in engaging the private sector through various research and cost-sharing arrangements. **Sponsored Programs – Accelerating Third-Party Funding for Space Research** The ISS National Lab has developed a successful [Sponsored Program model](https://www.issnationallab.org/research-on-the-iss/sponsored-programs/) that attracts third-party funding from private industry and other government agencies to solve big problems or address target challenges. These programs translate into projects on the ISS National Lab. The Sponsored Program model enables an organization to ask new questions and explore key variables, using the ISS National Lab environment as a tool in their innovation portfolio. In return, the organization creates opportunities for targeted research and development projects and STEM education projects or fosters novel ideas of startup companies. Fortune 500 companies, government agencies, and regional incubators have successfully used the ISS National Lab Sponsored Program model. This unique research and development model is flexible to meet the needs and budget of a partnering organization. Successful Sponsored Programs include Boeing Mass Challenge, Massachusetts Life Sciences Center, National Science Foundation (NSF) fluid dynamics and combustion Sponsored Program, and the National Institutes of Health (NIH) National Center for Advancing Translational Sciences (NCATS) organ-on-chip technologies Sponsored Program, totaling more than $20 million in third-party funding over the last two years. Additional Sponsored Programs totaling close to $5 million in 2017 with Fortune 500 organizations are imminent and will target major challenges to humankind as well as STEM education initiatives. **New Pathways for Space R&D Demand** Much of the ISS National Lab portfolio consists of organizations starting new space commercial activities. Over the last five years, the ISS National Lab has made concerted efforts to educate a wide variety of organizations about the opportunity that the ISS National Lab represents. Many of these organizations are now using the ISS National Lab as part of their research and technology development process for the first time. Demand for space projects is being seen in the following areas: Better targeting and quick-to-fail models in drug development that can lead to breakthroughs in curing disease and better drug delivery systems that can lead to increased access of therapies throughout the world Accelerated disease modeling associated with aging and chronic disease Regenerative medicine breakthroughs that can repair, restore, or replace damaged tissues and organs by creating ways to expand and grow cells in a three-dimensional environment Crop science breakthroughs that can lead to ways to feed the growing world population with less land, water, etc. An improved understanding of fundamental material properties that can lead to novel materials and better manufacturing processes on Earth Creation of commercially relevant microgravity enabled materials that may transform many U.S. industries including telecommunication semiconductor manufacturing 3D-metal printing and other additive manufacturing capacity in space Quantum satellite technology that could benefit national security Remote sensing capability that can impact a variety of downstream applications including maritime security (jamming, spoofing), weather, agriculture productivity, energy, and urban development **Commercial Services Providers** – A Competitive Marketplace for Space Services As the demand for space research and development projects increases, the supply of access to space and research and development facilities will need to be augmented. In space, private-sector commercial research and development facility operators are on the forefront of a new era of space research on the ISS and future space platforms. These organizations operate their facilities internally and externally on the ISS. They provide users with more choices to address unique research needs and are the pathfinders for a marketplace in low Earth orbit. Many of these companies have used their own resources to invest in in-orbit research and development facilities, reducing the risk for the federal sector to develop these facilities and services. In its first five years, the ISS National Lab has supported growth in the number of these research and development facility operators from one in FY12 to five in FY16—with four additional facilities expected to begin in-orbit operations by FY18. The ISS National Lab fosters healthy competition between these supply partners by allowing them to bid on each commercial customer project, seeking the best solution for the customer. The current commercial facility operators are: **NanoRacks** – Since 2009, NanoRacks has provided hardware and services for the International Space Station National Laboratory. Three internal research platforms can house plug-and-play NanoLabs and provide critical capabilities such as centrifugation and microscopy. Additionally, the NanoRacks External Platform was launched in FY15 and provides capabilities for Earth and deep space observation, sensor development, and testing for advanced electronics and materials. **BioServe** – In-orbit offerings from BioServe include multiple life sciences facilities and kits, including the multi-purpose Space Automated Bioproduct Laboratory (SABL), launched in FY15. SABL supports myriad initiatives for commercial life sciences research as well as physical and material science experiments. **TechShot** – Launched in FY15, the TechShot Bone Densitometer is a commercial bone-density scanner for use in spaceflight rodent research. In just one year, the successful operation of this facility has already demonstrated its utility as a catalyst for disease modeling research and commercial biomedical initiatives in space. **Made In Space** – In FY16, the Additive Manufacturing Facility developed by Made In Space launched to the International Space Station, enabling 3D printing projects from commercial, educational, and government entities interested in the development of objects for experiments and technology demonstrations. These objects will be produced onboard the International Space Station in a fraction of the time currently required to have such objects manifested and delivered to the station using traditional ground preparation and launch. **Space Tango** – TangoLab-1 is a general research platform launched in FY16. This facility from Space Tango allows multiple automated experiments in the life and physical sciences to run simultaneously. This architecture minimizes crew member interaction and reduces complexity while increasing scalability, enabling improved throughput for users. In addition to currently available capabilities, a growing pipeline of commercial ISS National Lab facilities in preparation (from Teledyne Brown, AlphaSpace, STaArS, and HNu Photonics) will advance research in remote sensing, materials testing, molecular biology, and tissue culture. Companies are exploring how these capabilities might transition onto future low Earth orbit platforms, from free-flying spacecraft to expandable modules. Through support of such companies, the ISS National Lab and NASA are enabling the International Space Station National Laboratory to serve as an incubator for the low Earth orbit market and U.S. private sector spaceflight interests, and are using public-private partnership funding models to share the risk and benefits of these emerging human space flight activities. **ISS National Laboratory – Bringing Scientific and Economic Value to the Nation** The ISS National Lab is executing congressional intent by leveraging public-private partnerships to get the most out of the ISS. With the active involvement of our partners, the ISS National Lab is helping deliver advances of scientific and economic value to the nation. As our outreach leads more organizations to form public-private partnerships to use the ISS National Lab, the nation’s return on its investment in the ISS will continue to increase. And as the ISS approaches the end of its planned service life, Congress will have an opportunity to consider the value of maintaining a national laboratory on another platform.

### 1NC---AT: Innovation

#### 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.

#### Attacks on the commercial space industry harm the entire sector

**Berteau and Kiley 10** [David Berteau and Gregory Kiley, David is senior adviser and director of the CSIS Defense-Industrial Initiatives Group. He is an adjunct professor at Georgetown and also served on the secretary of the army’s Commission on Army Acquisition and Program Management in Expeditionary Operations. He is currently a director of the Procurement Round Table, a fellow of the National Academy of Public Administration, and a senior fellow of the Robert S. Strauss Center for International Security and Law, University of Texas at Austin. He was the senior vice president at Science Applications International Corporation for several years and served in the DOD for many years. Gregory is a senior associate at CSIS, focusing on national security and economics. Gregory spent six years as a senior staff member for the Senate Armed Services Committee. He was also an analyst for the National Security Division of the Congressional Budget office. 7-26-2010, "National Security and the Commercial Space Sector," Center for Strategic International Studies, [https://www.csis.org/analysis/national-security-and-commercial-space-sector accessed 12/14/21](https://www.csis.org/analysis/national-security-and-commercial-space-sector%20accessed%2012/14/21)] Adam

* You can read this card as a link magnifier/2nr link on any da if the 1ar goes for public sector solves type arguments or against tiny plan affs

A.5. All of the segments of the U.S. space community are highly interdependent. As dem- onstrated in Figure 1.1, the defense, intelligence, civil, and commercial sectors of space overlap in many critical areas. This means that damage to any one of these sectors reverberates through all the others.

A.6. A strong space industrial base is important. While the Cold War era was characterized by mostly military activity in space, the post–Cold War era has seen a surge in the private sector’s involvement in space activities. Today, when space-based capabilities are increasingly important for national security and the economy, government agencies worldwide are contracting space pro- grams and services out to the private sector.3

A.7. The space industry—though small compared with other manufacturing sectors— possesses strategic significance beyond its size. In addition to its critical role in providing systems and services to government, it also generates knowledge and innovation; by establishing new companies based on that innovation, the U.S. space industrial base is an important element of national security and in generating the nation’s economic growth.

A.8. The United States must have unimpeded access to the technologies, both global and domestic, that are needed for developing, operating, and maintaining national security space systems. Although some—possibly most—of these technologies can be provided by the domestic science, technology, and industrial bases, others, including critical systems, subsystems, and com- ponents, may only be available overseas.

The enduring relevance of these principles is highlighted by the 2010 National Security Strategy, which emphasized the importance of U.S. space capabilities and touched on most of the themes in the 2008 CSIS report:

For over 50 years, our space community has been a catalyst for innovation and a hallmark of U.S. technological leadership. Our space capabilities underpin global commerce and scientific advancements and bolster our national security strengths and those of our allies and partners. . . . We must continue to encourage cutting-edge space technology by investing in the people and industrial base that develops them. We will invest in the research and development of next-generation space technologies and . . . we will promote a unified effort to strengthen our space industrial base and work with universities to encourage students to pursue space-related careers.4

#### Tech innovation solves every existential threat – cumulative extinction events outweigh the aff

Dylan **Matthews 18**. Co-founder of Vox, citing Nick Beckstead @ Rutgers University. 10-26-2018. "How to help people millions of years from now." Vox. https://www.vox.com/future-perfect/2018/10/26/18023366/far-future-effective-altruism-existential-risk-doing-good

If you care about improving human lives, you should overwhelmingly care about those quadrillions of lives rather than the comparatively small number of people alive today. The 7.6 billion people now living, after all, amount to less than 0.003 percent of the population that will live in the future. It’s reasonable to suggest that those quadrillions of future people have, accordingly, hundreds of thousands of times more moral weight than those of us living here today do. That’s the basic argument behind Nick Beckstead’s 2013 Rutgers philosophy dissertation, “On the overwhelming importance of shaping the far future.” It’s a glorious mindfuck of a thesis, not least because Beckstead shows very convincingly that this is a conclusion any plausible moral view would reach. It’s not just something that weird utilitarians have to deal with. And Beckstead, to his considerable credit, walks the walk on this. He works at the Open Philanthropy Project on grants relating to the far future and runs a charitable fund for donors who want to prioritize the far future. And arguments from him and others have turned “long-termism” into a very vibrant, important strand of the effective altruism community. But what does prioritizing the far future even mean? The most literal thing it could mean is preventing human extinction, to ensure that the species persists as long as possible. For the long-term-focused effective altruists I know, that typically means identifying concrete threats to humanity’s continued existence — like unfriendly artificial intelligence, or a pandemic, or global warming/out of control geoengineering — and engaging in activities to prevent that specific eventuality. But in a set of slides he made in 2013, Beckstead makes a compelling case that while that’s certainly part of what caring about the far future entails, approaches that address specific threats to humanity (which he calls “targeted” approaches to the far future) have to complement “broad” approaches, where instead of trying to predict what’s going to kill us all, you just generally try to keep civilization running as best it can, so that it is, as a whole, well-equipped to deal with potential extinction events in the future, not just in 2030 or 2040 but in 3500 or 95000 or even 37 million. In other words, caring about the far future doesn’t mean just paying attention to low-probability risks of total annihilation; it also means acting on pressing needs now. For example: We’re going to be better prepared to prevent extinction from AI or a supervirus or global warming if society as a whole makes a lot of scientific progress. And a significant bottleneck there is that the vast majority of humanity doesn’t get high-enough-quality education to engage in scientific research, if they want to, which reduces the odds that we have enough trained scientists to come up with the breakthroughs we need as a civilization to survive and thrive. So maybe one of the best things we can do for the far future is to improve school systems — here and now — to harness the group economist Raj Chetty calls “lost Einsteins” (potential innovators who are thwarted by poverty and inequality in rich countries) and, more importantly, the hundreds of millions of kids in developing countries dealing with even worse education systems than those in depressed communities in the rich world. What if living ethically for the far future means living ethically now? Beckstead mentions some other broad, or very broad, ideas (these are all his descriptions): Help make computers faster so that people everywhere can work more efficiently Change intellectual property law so that technological innovation can happen more quickly Advocate for open borders so that people from poorly governed countries can move to better-governed countries and be more productive Meta-research: improve incentives and norms in academic work to better advance human knowledge Improve education Advocate for political party X to make future people have values more like political party X ”If you look at these areas (economic growth and technological progress, access to information, individual capability, social coordination, motives) a lot of everyday good works contribute,” Beckstead writes. “An implication of this is that a lot of everyday good works are good from a broad perspective, even though hardly anyone thinks explicitly in terms of far future standards.” Look at those examples again: It’s just a list of what normal altruistically motivated people, not effective altruism folks, generally do. Charities in the US love talking about the lost opportunities for innovation that poverty creates. Lots of smart people who want to make a difference become scientists, or try to work as teachers or on improving education policy, and lord knows there are plenty of people who become political party operatives out of a conviction that the moral consequences of the party’s platform are good. All of which is to say: Maybe effective altruists aren’t that special, or at least maybe we don’t have access to that many specific and weird conclusions about how best to help the world. If the far future is what matters, and generally trying to make the world work better is among the best ways to help the far future, then effective altruism just becomes plain ol’ do-goodery.\*

#### 1AC Tennen says the OST is sufficient – blue

P.M. Sterns, L.I. Tennen, Privateering and profiteering on the moon and other celestial bodies: Debunking the myth of property rights in space, Advances in Space Research, Volume 31, Issue 11, 2003, Pages 2433-2440, ISSN 0273-1177, https://doi.org/10.1016/S0273-1177(03)00567-2. (https://www.sciencedirect.com/science/article/pii/S0273117703005672)

If claims of private appropriation are ineffective, in contravention of the corpus juris spatialis, and contrary to the long term interests of space commercialization, than it must be asked what is the benefit of making such claims? There are two economic aspects which would be positively impacted by private appropriation of celestial bodies: the first is the increase in the net worth of the privateering company, artificially inflated by the optimistic valuation of the claimed space assets; and second is the pursuit of profit by the trade in “subsidiary rights” such as leasehold interests, mining rights, easements, and other traditionally alienable property rights. Neither of these economic considerations is directly related to the use of celestial resources, nor to the providing of a product or service uniquely available in the celestial environment. If the intent of the entrepreneur is to capitalize on these economic considerations, that intent should be clearly stated at the outset. Any other course would be disingenuous and deceptive. The private ownership of unlimited rights to celestial property would add a significant element to the cost of conducting an entrepreneurial venture. That is, the ability of all states to explore and utilize areas on or below the surface of celestial bodies, as guaranteed by the corpus juris spatialis, no longer would be a right, but a commodity available only to the highest bidder. Monopolies and other anti-competitive practices would restrict rather than enhance space commercialization. These anti-competitive effects of private appropriation arc exemplified by the activities of the Lunar Embassy itself: The cost for a piece of the moon has gone up astronomically. Before 200 1, Hope sold 17,700-acre tracts for $16, the price he now charges for one acre (The Arizona Republic, section D, p. 2). Thus, even while operating in a vacuum, the price structure of the Lunar Embassy has not been stable, but has been arbitrarily manipulated. One can only imagine the proliferation of anti-competitive practices if private appropriation were officially permitted. CONCLUSION The assertion that private entities are not subject to the non-appropriation principle, as expressed in article II of the Outer Space Treaty, is a myth, and lacks a cogent analytical foundation. Not only would so called private appropriation be in violation of the corpus juris spatialis, but the arguments which have been presented in opposition to article II lack either a legal justification, a factual predicate, or both. Moreover, the abrogation or renunciation of the non-appropriation principle would be antithetical to the interests of space commercialization. Conflicting, competing and overlapping claims would create international tensions, and potentially lead to armed conflict, both on and off this planet. The extant law of outer space, both international and domestic, provide a basic framework for the development of regulation of space commerce. Domestic licensing regimes, together with international commitments regarding authorization and supervision of private entities in space, prevention of harmful interference, and participation in consultations concerning potentially harmful interference, grant a significant measure of protection for private ventures in space. Claims of fee simple ownership of space property are unnecessary and ineffective to protect private interests from interference. Those who advocate the renunciation and abandonment of the non-appropriation principle are either seeking to increase their own bottom line by disingenuous and deceptive constructs, or lack an appropriate appreciation and respect for international processes. Perhaps most significant in this regard is the tangible benefit the corpus juris spatialis has made in maintaining outer space exclusively for peaceful purposes.

#### Non UQ – squo debris thumps – 1AC Orwig

Orwig 16 [(Jessica, MS in science and tech journalism from Texas A&M, BS in astronomy and physics from Ohio State) “Russia says a growing problem in space could be enough to spark a war,” Insider,’ January 26, 2016, https://www.businessinsider.com/russia-says-space-junk-could-spark-war-2016-1] TDI

NASA has already warned that the large amount of space junk around our planet is growing beyond our control, but now a team of Russian scientists has cited another potentially unforeseen consequence of that debris: War.

Scientists estimate that anywhere from 500,000 to 600,000 pieces of human-made space debris between 0.4 and 4 inches in size are currently orbiting the Earth and traveling at speeds over 17,000 miles per hour.

If one of those pieces smashed into a military satellite it "may provoke political or even armed conflict between space-faring nations," Vitaly Adushkin, a researcher for the Institute of Geosphere Dynamics at the Russian Academy of Sciences, reported in a paper set to be published in the peer-reviewed journal Acta Astronautica, which is sponsored by the International Academy of Astronautics.

#### No reason miscalc goes nuclear – 1AC Orwig says satellites have been damaged before with no consequences

Orwig 16 [(Jessica, MS in science and tech journalism from Texas A&M, BS in astronomy and physics from Ohio State) “Russia says a growing problem in space could be enough to spark a war,” Insider,’ January 26, 2016, https://www.businessinsider.com/russia-says-space-junk-could-spark-war-2016-1] TDI

**In the report, the Adushkin said that there have already been repeated "sudden failures" of military spacecraft in the last two decades that cannot be explained.**

**"So, there are two possible explanations," he wrote. The first is "unregistered collisions with space objects." The second is "machinations" [deliberate action] of the space adversary.**

"**This is a politically dangerous dilemma**," he added.

#### 1AC Intagliata is about squo debris – you don’t solve

Intagliata 17 ~~[(Christopher Intagliata, MA Journalism from NYU, Editor for NPRs All Things Considered, Reporter/Host for Scientific American’s 60 Second Science) "The Sneaky Danger of Space Dust," Scientific American, May 11, 2017, <https://www.scientificamerican.com/podcast/episode/the-sneaky-danger-of-space-dust/>~~] TDI

Aside from all the satellites, and the space station orbiting the Earth, there's a lot of trash circling the planet, too. Twenty-one thousand baseball-sized chunks of debris, according to NASA. But that number's dwarfed by the number of small particles. There's hundreds of millions of those.

"And those smaller particles tend to be going fast. Think of picking up a grain of sand at the beach, and that would be on the large side. But they're going 60 kilometers per second."

#### Squo solves – your evidence says the US and Russia have infrastructure to keep track of debris – either conflict’s inevitable because they can’t track all debris or they can track debris produced by mining, too

#### Uncertainty from debris collisions creates restraint not instability.

MacDonald 16, B., et al. "Crisis stability in space: China and other challenges." Foreign Policy Institute. Washington, DC (2016). (senior director of the Nonproliferation and Arms Control Project with the Center for Conflict Analysis and Prevention)//Elmer

In any crisis that threatens to escalate into major power conflict, political and military leaders will face uncertainty about the effectiveness of their plans and decisions. This uncertainty will be compounded when potential conflict extends to the space and cyber domains, where weapon effectiveness is largely untested and uncertain, infrastructure interdependencies are unclear, and damaging an adversary could also harm oneself or one’s allies. Unless the stakes become very high, no country will likely want to gamble its well-being in a “single cosmic throw of the dice,” in Harold Brown’s memorable phrase. 96 The novelty of space and cyber warfare, coupled with risk aversion and worst-case assessments, could lead space adversaries into a situation of what can be called “hysteresis,” where each adversary is restrained by its own uncertainty of success. This is conceptually shown in Figures 1 and 2 for offensive counter-space capabilities, though it applies more generally. 97 These graphs portray the hypothetical differences between perceived and actual performance capabilities of offensive counter-space weapons, on a scale from zero to one hundred percent effectiveness. Where uncertainty and risk aversion are absent for two adversaries, no difference would exist between the likely performance of their offensive counter-space assets and their confidence in the performance of those weapons: a simple, straight-line correlation would exist, as in Figure 1. The more interesting, and more realistic, case is notionally presented in Figure 2, which assumes for simplicity that the offensive capabilities of each adversary are comparable. In stark contrast to the case of Figure 1, uncertainty and risk aversion are present and become important factors. Given the high stakes involved in a possible large-scale attack against adversary space assets, a cautious adversary is more likely to be conservative in estimating the effectiveness of its offensive capabilities, while more generously assessing the capabilities of its adversary. Thus, if both side’s weapons were 50% effective and each side had a similar level of risk aversion, each may conservatively assess its own capabilities to be 30% effective and its adversary’s weapons to be 70% effective. Likewise, if each side’s weapons were 25% effective in reality, each would estimate its own capabilities to be less than 25% effective and its adversary’s to be more than 25% effective, and so on. In Figure 2, this difference appears, in oversimplified fashion, as a gap that represents the realistic worry that a country’s own weapons will under-perform while its adversary’s weapons will over-perform in terms of effectiveness. If both countries face comparable uncertainty and exhibit comparable risk aversion, each may be deterred from initiating an attack by its unwillingness to accept the necessary risks. This gap could represent an “island of stability,” as shown in Figure 2. In essence, given the enormous stakes involved in a major strike against the adversary’s space assets, a potential attacker will likely demonstrate some risk aversion, possessing less confidence in an attack’s effectiveness. It is uncertain how robust this hysteresis may prove to be, but the phenomenon may provide at least some stabilizing influence in a crisis. In the nuclear domain, the immediate, direct consequences of military use, including blast, fire, and direct radiation effects, were appreciated at the outset. Nonetheless, significant uncertainty and under-appreciation persisted with regard to the collateral, indirect, and climatological effects of using such weapons on a large scale. In contrast, the immediate, direct effects of major space conflict are not well understood, and potential indirect and interdependent effects are even less understood. Indirect effects of large-scale space and cyber warfare would be virtually impossible to confidently calculate, as the infrastructures such warfare would affect are constantly changing in design and technology. Added to this is a likely anxiety that if an attack were less successful than planned, a highly aggrieved and powerful adversary could retaliate in unanticipated ways, possibly with highly destructive consequences. As a result, two adversaries facing potential conflict may lack confidence both in the potential effectiveness of their own attacks and in the ineffectiveness of any subsequent retaliation. Such mutual uncertainty would ultimately be stabilizing, though probably not particularly robust. This is reflected in Figure 2, where each side shows more caution than the technical effectiveness of its systems may suggest. Each curve notionally represents one state’s confidence in its offensive counter-space effectiveness relative to their actual effectiveness. Until true space asset resilience becomes a trusted feature of space architectures, deterrence by risk aversion, and cross-domain deterrence, may be the only means for deterrence to function in space.

### 1NC---AT: Cosmic Colonialism

#### No Pollution from rockets

NSS 21 7-23-2021 "Why Space Tourism?" <https://space.nss.org/why-space-tourism/> (National Space Society)//Elmer

Space Tourism Will Not Be a Pollution Disaster It is possible to accept all the benefits above, and still express concern about the potential that a really successful space tourism industry will pollute the air and contribute to global warming. Fortunately, Blue Origin’s New Shepard produces only water as an exhaust, so neither is going to be an issue even if there are 1,000s of flights per year. Some have claimed that space tourism will be more polluting per passenger mile since there are fewer passengers per vehicle at the current time, but (a) New Shepard has zero carbon/zero pollution, and (b) over time space tourism vehicles will grow in capacity, just like airliners did. The Virgin Galactic engine is more problematic, but will most likely be replaced by a more sustainable engine before flight volumes become large. Some might be more worried about SpaceX’s StarShip/SuperHeavy driving global warming when used for point-to-point travel on the Earth, and for space tourism. Elon Musk has declared his intention to produce the methane fuel it uses directly from the atmosphere using solar power, assuring that the fuel cycle is carbon-neutral. In terms of air pollution, StarShip in a point-to-point mode will to a large degree replace airplanes currently flying while using cleaner burning methane, potentially resulting in less pollution than is the case currently. In any case, trips to space will likely always remain a minor part of point-to-point travel on the Earth. Currently, in the U.S. alone, there are about 5,700 passenger flights PER DAY. Even if we are simultaneously supporting dozens of orbital hotels, building a city on Mars, and constructing a network of space solar power satellites, we will be hard

#### Two External Alt Causes:

#### 1] Copper

Berkeley 1/13 (Robert Rhew and Berkeley geo chemists, [UC Berkeley professor of geography and of environmental science, policy and management], 1-13-2022, “Copper-based chemicals may be contributing to ozone depletion: Some ozone-destroying chemicals are unaccounted for. Are copper-based fungicides producing them?“, ScienceDaily, accessed: 1-15-2022, https://www.sciencedaily.com/releases/2022/01/220113151441.htm) ajs

In a paper appearing this week in the journal Nature Communications, UC Berkeley geochemists show that copper in soil and seawater acts as a catalyst to turn organic matter into both methyl bromide and methyl chloride, two potent halocarbon compounds that destroy ozone. Sunlight worsens the situation, boosting production of these methyl halides by a factor of 10. The findings answer, at least in part, a long-standing mystery about the origin of much of the methyl bromide and methyl chloride in the stratosphere. Since the worldwide ban on chlorofluorocarbon (CFC) refrigerants and brominated halons used in fire extinguishers starting in 1989, these methyl halides have become the new dominant sources of ozone-depleting bromine and chlorine in the stratosphere. As the long-lived CFCs and halons slowly disappear from the atmosphere, the role of methyl halides increases. "If we don't know where methyl bromide and methyl chloride are coming from, then how can we make sure that those compounds are reduced along with CFCs?" said the paper's senior author, Robert Rhew, UC Berkeley professor of geography and of environmental science, policy and management. "By 2050, we should be back to relatively normal ozone, but things like the continued emissions of methyl bromide and methyl chloride are road bumps in the road to recovery. Copper usage in the environment is projected to increase rapidly in the next few years, and this should be considered when predicting future halogen load and ozone recovery."

#### 2] Illegal CFC sources

Mcglaun 21 (Shane Mcglaun, [Slash Gear Writer], 5-19-2021, “MIT study suggests illegal production of CFCs has continued“, SlashGear, accessed: 1-15-2022, https://www.slashgear.com/mit-study-suggests-illegal-production-of-cfcs-has-continued-19673398/) ajs

Researchers at MIT have discovered that ozone-depleting chlorofluorocarbons known as CFCs stay in the atmosphere for less time than previously estimated. CFCs were phased out globally in 2010, and the research suggests they should be in the atmosphere in much lower concentrations than recent measurements suggest. The study suggests that new and illegal production of CFCs has likely occurred in recent years. The study specifically points out [new emissions](https://news.mit.edu/2021/cfc-atmosphere-ozone-0518) of CFC-11, CFC-12, and CFC-113 that would represent a violation of the Montréal Protocol. That protocol was designed to phase out the production and consumption of CFCs along with other ozone-damaging chemicals. The study estimates that new global CFC-11 emissions is higher than previous studies reported. MIT’s study is also the first to quantify new global emissions of CFC-12 and CFC-113. Lead study author Megan Lickley says the team found total emissions coming from new production is around 20 gigagrams a year for each of those molecules. The study also identified new emissions of CFC-12 and CFC-113, which Lickley says were previously overlooked. In the past, CFCs were used commonly in manufacturing refrigerants, aerosol sprays, chemical solvents, and building insulation. When they are emitted into the atmosphere, the chemicals can stay in the stratosphere interacting with ultraviolet light and releasing chlorine atoms that erode the protective ozone layer surrounding the earth. Today, most CFCs are emitted by “banks,” old refrigerators, air conditioners, and insulation manufactured before the ban. For the study, the researchers calculated the amount of CFCs remaining in banks today by developing a model analyzing industry production of CFCs over time and how quickly various types of equipment release CFCs. That value was then incorporated in the current recommended values for the lifetime of the chemicals to calculate concentrations of bank-derived CFCs that could be expected in the atmosphere over time. The team says the calculated lifetimes for CFC-11, 12, and 113 are 49 years, 85 years, and eight years respectively, compared to current values of 52, 100, and 85 years respectively. The results imply emissions are likely higher than the best estimates have suggested.

#### Cap Good

#### 1---It’s sustainable Absolute decoupling is possible and happening now.

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Over the past 15 years, however, something has begun to change. Rather than a 21st century dominated by coal that energy modelers foresaw, global coal use peaked in 2013 and is now in structural decline. We have succeeded in making clean energy cheap, with solar power and battery storage costs [falling 10-fold](https://twitter.com/hausfath/status/1333545456568176641) since 2009. The world [produced more electricity](https://www.carbonbrief.org/solar-is-now-cheapest-electricity-in-history-confirms-iea) from clean energy — solar, wind, hydro, and nuclear — than from coal over the past two years. And, [according to](https://www.reuters.com/article/us-oil-demand-factbox/factbox-pandemic-brings-forward-predictions-for-peak-oil-demand-idUSKBN2870NY) some major oil companies, peak oil is upon us — not because we have run out of cheap oil to produce, but because demand is falling and companies expect further decline as consumers increasingly shift to electric vehicles.

The world has [long been experiencing](https://ourworldindata.org/emissions-drivers?country=) a relative decoupling between economic growth and CO2 emissions, with the emissions per unit of GDP falling for the past 60 years. This is the case even in countries like India and China that have been undergoing rapid economic growth. But relative decoupling alone is inadequate in a world where global CO2 emissions need to peak and decline in the next decade to give us any chance at limiting warming to well below 2℃, in line with Paris Agreement targets.

Thankfully, there is increasing evidence that the world is on track to absolutely decouple CO2 emissions and economic growth — with global CO2 emissions [potentially having peaked in 2019](https://thebreakthrough.org/issues/energy/peak-co2-emissions-2019) and unlikely to increase substantially in the coming decade. While an emissions peak is just the first and easiest step towards eventually reaching the net-zero emissions [required to stop](https://www.biogeosciences.net/17/2987/2020/) the world from continuing to warm, it demonstrates that linkages between emissions and economic activity are not an immutable law, but rather simply a result of our current means of energy production.

In recent years we have seen more and more examples of absolute decoupling — economic growth accompanied by falling CO2 emissions. Since 2005, 32 countries with a population of at least one million people have absolutely decoupled emissions from economic growth, both for terrestrial emissions (those within national borders) and consumption emissions (emissions embodied in the goods consumed in a country). This includes the United States, Japan, Mexico, Germany, United Kingdom, France, Spain, Poland, Romania, Netherlands, Belgium, Portugal, Sweden, Hungary, Belarus, Austria, Bulgaria, El Salvador, Singapore, Denmark, Finland, Slovakia, Norway, Ireland, New Zealand, Croatia, Jamaica, Lithuania, Slovenia, Latvia, Estonia, and Cyprus. Figure 1, below, shows the declines in territorial emissions (blue) and increases in GDP (red).

#### ---Physical limits aren’t absolute---laundry list of warrants.

Bailey 18 [Ronald; February 16; B.A. in Economics from the University of Virginia, member of the Society of Environmental Journalists and the American Society for Bioethics and Humanities, citing a compilation of interdisciplinary research; Reason, “Is Degrowth the Only Way to Save the World?” https://reason.com/2018/02/16/is-degrowth-the-only-way-to-save-the-wor; RP]

Unless us folks in rich countries drastically reduce our material living standards and distribute most of what we have to people living in poor countries, the world will come to an end. Or at least that's the stark conclusion of a study published earlier this month in the journal Nature Sustainability. The researchers who wrote it, led by the Leeds University ecological economist Dan O'Neill, think the way to prevent the apocalypse is "degrowth."

Vice, pestilence, war, and "gigantic inevitable famine" were the planetary boundaries set on human population by the 18th-century economist Robert Thomas Malthus. The new study gussies up old-fashioned Malthusianism by devising a set of seven biophysical indicators of national environmental pressure, which they then link to 11 indicators of social outcomes. The aim of the exercise is to concoct a "safe and just space" for humanity.

Using data from 2011, the researchers calculate that the annual per capita boundaries for the world's 7 billion people consist of the emission of 1.6 tons of carbon dioxide per year and the annual consumption of 0.9 kilograms of phosphorus, 8.9 kilograms of nitrogen, 574 cubic meters of water, 2.6 tons of biomass (crops and wood), plus the ecological services of 1.7 hectares of land and 7.2 tons of material per person.

On the social side, meanwhile, the researchers say that life satisfaction in each country should exceed 6.5 on the 10-point Cantril scale, that healthy life expectancy should average at least 65 years, and that nutrition should be over 2,700 calories per day. At least 95 percent of each country's citizens must have access to good sanitation, earn more than $1.90 per day, and pass through secondary school. Ninety percent of citizens must have friends and family they can depend on. The threshold for democratic quality must exceed 0.8 on an index scale stretching from -1 to +1, while the threshold for equality is set at no higher than 70 on a Gini Index where 0 represents perfect equality and 100 implies perfect inequality. They set the threshold for percent of labor force employed at 94 percent.

So how does the U.S. do with regard to their biophysical boundaries and social outcomes measures? We Americans transgress all seven of the biophysical boundaries. Carbon dioxide emissions stand at 21.2 tons per person; we each use an average of 7 kilograms of phosphorus, 59.1 kilograms of nitrogen, 611 cubic meters of water, and 3.7 tons of biomass; we rely on the ecological services of 6.8 hectares of land and 27.2 tons of material. Although the researchers urge us to move "beyond the pursuit of GDP growth to embrace new measures of progress," it is worth noting that U.S. GDP is $59,609 per capita.

On the other hand, those transgressions have provided a pretty good life for Americans. For example, life satisfaction is 7.1; healthy life expectancy is 69.7 years; and democratic quality stands at 0.8 points. The only two social indicators we just missed on were employment (91 percent) and secondary education (94.7 percent).

On the other hand, our hemisphere is home to one paragon of sustainability—Haiti. Haitians breach none of the researchers' biophysical boundaries. But the Caribbean country performs abysmally on all 11 social indicators. Life satisfaction scores at 4.8; healthy life expectancy is 52.3 years; and Haitians average 2,105 calories per day. The country tallies -0.9 on the democratic quality index. Haiti's GDP is $719 per capita.

Other near-sustainability champions include Malawi, Nepal, Myanmar, and Nicaragua. All of them score dismally on the social indicators, and their GDPs per capita are $322, $799, $1,375, and $2,208, respectively.

The country that currently comes closest to the researchers' ideal of remaining within its biophysical boundaries while sufficient social indicators is…Vietnam. For the record, Vietnam's per capita GDP is $2,306.

"Countries with higher levels of life satisfaction and healthy life expectancy also tend to transgress more biophysical boundaries," the researchers note. A better way to put this relationship is that more wealth and technology tend to make people happier, healthier, and freer.

O'Neill and his unhappy team fail drastically to understand how human ingenuity unleashed in markets is already well on the way toward making their supposed planetary boundaries irrelevant. Take carbon dioxide emissions: Supporters of renewable energy technologies say that their costs are already or will soon be lower than those of fossil fuels. Boosters of advanced nuclear reactors similarly argue that they can supply all of the carbon-free energy the world will need. There's a good chance that fleets of battery-powered self-driving vehicles will largely replace private cars and mass transit later in this century.

Are we about to run out of phosphorous to fertilize our crops? Peak phosphorus is not at hand. The U.S. Geological Survey (USGS) reports that at current rates of mining, the world's known reserves will last 266 years. The estimated total resources of phosphate rock would last over 1,140 years. "There are no imminent shortages of phosphate rock," notes the USGS. With respect to the deleterious effects that using phosphorus to fertilize crops might have outside of farm fields, researchers are working on ways to endow crops with traits that enable them to use less while maintaining yields.

O'Neill and his colleagues are also concerned that farmers are using too much nitrogen fertilizer, which runs off fields into the natural environment and contributes to deoxygenated dead zones in the oceans, among other ill effects. This is a problem, but one that plant breeders are already working to solve. For example, researchers at Arcadia Biosciences have used biotechnology to create nitrogen-efficient varieties of staples

like rice and wheat that enable farmers to increase yields while significantly reducing fertilizer use. Meanwhile, other researchers are moving on projects to engineer the nitrogen fixation trait from legumes into cereal crops. In other words, the crops would make their own fertilizer from air.

Water? Most water is devoted to the irrigation of crops; the ongoing development of drought-resistant and saline-tolerant crops will help with that. Hectares per capita? Humanity has probably already reached peak farmland, and nearly 400 million hectares will be restored to nature by 2060—an area almost double the size of the United States east of the Mississippi River. In fact, it is entirely possible that most animal farming will be replaced by resource-sparing lab-grown steaks, chops, and milk. Such developments in food production undermine the researchers' worries about overconsumption of biomass.

And humanity's material footprint is likely to get smaller too as trends toward further dematerialization take hold. The price system is a superb mechanism for encouraging innovators to find ways to wring ever more value out less and less stuff. Rockefeller University researcher Jesse Ausubel has shown that this process of absolute dematerialization has already taken off for many commodities.

After cranking their way through their models of doom, O'Neill and his colleagues lugubriously conclude: "If all people are to lead a good life within planetary boundaries, then the level of resource use associated with meeting basic needs must be dramatically reduced." They are right, but they are entirely backward with regard to how to achieve those goals. Economic growth provides the wealth and technologies needed to lift people from poverty while simultaneously lightening humanity's footprint on the natural world. Rather than degrowth, the planet—and especially its poor people—need more and faster economic growth.