# TOC R5 Neg vs Strake JS

# 1NC

### 1

#### 1] Interp – the Affirmative may not condition the act of Appropriation in the Plan on a potential effect of such Appropriation.

#### 2] Violation – the Aff conditions removing Appropriation on the effect of “producing debris”.

#### 3] Standards:

#### a] Negative Ground – Aff’s that condition on potential Effects artificially fiat Internal Links – makes it impossible for us to mitigate the 1AC Advantages since they’re functionally fiat-ing U/Q and ANY press we’ll make will just be answered with either “doesn’t apply” or “the Plan only applies IF it does”. This zeros Neg Ground since anything that competes HAS to bite the Aff – allowing Affs to condition on effects forces both a] allows the Aff to irreparably be ahead in Impact Calculus since they don’t have to worry about Internal Link or U/Q and b] incentivizes teams to condition on Impacts that are impossible to contest like Affs that condition on Appropriation not being Racist or Oppressive.

#### b] Limits – There’s an infinite amount of conditions/possible effects on infinite appropriation – Neg Link debating HAS to be specific to the Condition – means Appropriation Good doesn’t spill-down – explodes predictable stasis of the topic.

#### 4] Paradigm Issues:

#### a] Use Competing Interps – Reasonability invites arbitrary judge intervention and a race to the bottom of questionable argumentation.

#### b] No RVI’s - 1] Forces the 1NC to go all-in on Theory which kills substance education, 2] Encourages Baiting since the 1AC will purposely be abusive, and 3] Illogical – you shouldn’t win for not being abusive.

### 2

#### Text – Private Appropriation of Outer Space except for painted Space Elevators is Unjust. Private entities ought to heavily invest in the construction of painted Space Elevators. We will defend an Orbital Use Fee per the 1AC’s Normal Means Mechanism.

#### It Competes:

#### 1] 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.

#### 2] Space Elevators produce Debris:

#### a] Paint flakes off

O'Callaghan 19 Jonathan O'Callaghan September 2019 “What is space junk and why is it a problem?” <https://www.nhm.ac.uk/discover/what-is-space-junk-and-why-is-it-a-problem.html#:~:text=All%20space%20junk%20is%20the,it%20re%2Denters%20the%20atmosphere.&text=When%20two%20satellites%20collide%2C%20they,creating%20lots%20of%20new%20debris>. (freelance space and science journalist based in the UK)//Elmer

Finally, under the influence of extreme ultraviolet radiation, impinging atomic oxygen and impacting micro particles erode the surfaces of space objects. This leads to mass loss of surface coatings and to the detachment of paint flakes with sizes from micrometre to mm.

#### Paint is Debris.

Fedde 16 Corey Fedde 5-13-2016 "Space debris danger: Fast-moving paint flake dings window of space station" <https://www.csmonitor.com/Science/2016/0513/Space-debris-danger-Fast-moving-paint-flake-dings-window-of-space-station> (Corey Fedde interned for The Christian Science Monitor's business desk and rapid response team from 2015 to 2016. He received a Bachelor's Degree in English from Principia College in 2015. His hobbies include reading, writing, and long walks on the beach.)//Elmer

Space debris danger: Fast-moving paint flake dings window of space station A small paint flake orbiting Earth chipped one of the windows on the International Space Station. Space debris could be a growing danger to future space missions. Space travel brings with it a list of potential dangers, but astronaut Tim Peake added one more on Thursday: paint chips. The International Space Station (ISS) was struck sometime last month by a flake of paint or small metal fragment that caused a chip in the windows of the Cupola, "the best room with a view anywhere," the European Space Agency (ESA) said in a press release. Besides its official duty as the control room for the ISS's robotic arms, the Cupola room also serves as an observation area for astronauts on board to get a good view of Earth and approaching spacecraft. The ISS and the view from the Cupola are largely unharmed and safe. The ISS' most crucial areas for crew and technical equipment are built with shielding to withstand small strikes in orbit. Space debris, however, remains a danger. "While a chip like the one shown here may be minor, larger debris would pose a serious threat," the ESA said.

#### b] Space Elevators require Spacecraft Launches.

Edwards 3 Bradley C. Edwards 3-1-2003 "The Space Elevator NIAC Phase II Final Report" http://www.niac.usra.edu/files/studies/final\_report/521Edwards.pdf (PhD and works at Eureka Scientific)//Elmer

Propulsion One of the major components that impacts the construction, risk, cost, schedule, and complexity of the space elevator is the propulsion system on the deployment spacecraft. The reason this single component has such a dramatic effect on the program is because it can be the largest mass component that needs to be deployed on conventional rockets and thus limits the initial ribbon size that can be deployed from space. A reduction in the initial ribbon size ripples throughout the system and impacts everything else. With this in mind we have worked hard to understand and reduce the size and risks associated with the propulsion system. Initially, we had proposed a very conventional chemical rocket system of liquid and solid engines. This system was very massive and required some complex maneuvers on-orbit. It was viable but obviously a system driver. An alternative to chemical systems that has been around for decades but only used in limited numbers is electric propulsion in various forms.

#### Spacecraft Launches produce Debris.

Polyakov 21 Max Polyakov 5-5-2021 "We’re polluting our future home – before we even live there. Here’s why we need to clean up our space junk." <https://www.weforum.org/agenda/2021/05/why-we-need-to-clean-up-space-junk-debris-low-earth-orbit-pollution-satellite-rocket-noosphere-firefly/> (Founder, Noosphere Ventures, Firefly Aerospace, EOS Data Analytics)//Elmer

Where does space junk come from? As long as humans launch objects into orbit, space debris is inevitable. Rocket launches leave boosters, fairings, interstages, and other debris in LEO. So do rocket explosions, which currently account for seven of the top 10 debris-creating events.

#### 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.

#### Nano tech solves warming

Bhavya Khullar. September 4, 2017. Nanomaterials Could Combat Climate Change and Reduce Pollution. https://www.scientificamerican.com/article/nanomaterials-could-combat-climate-change-and-reduce-pollution/

The list of environmental problems that the world faces may be huge, but some strategies for solving them are remarkably small. First explored for applications in microscopy and computing, nanomaterials—materials made up of units that are each thousands of times smaller than the thickness of a human hair—are emerging as useful for tackling threats to our planet’s well-being. Scientists across the globe are developing nanomaterials that can efficiently use carbon dioxide from the air, capture toxic pollutants from water and degrade solid waste into useful products. “Nanomaterials could help us mitigate pollution. They are efficient catalysts and mostly recyclable. Now, they have to become economical for commercialization and better to replace present-day technologies completely,” says [Arun Chattopadhyay](http://www.iitg.ac.in/arun/), a member of the chemistry faculty at the Center for Nanotechnology, Indian Institute of Technology Guwahati. To help slow the climate-changing rise in atmospheric CO2levels, researchers have developed nanoCO2 harvesters that can suck atmospheric carbon dioxide and deploy it for industrial purposes. “Nanomaterials can convert carbon dioxide into useful products like alcohol. The materials could be simple chemical catalysts or photochemical in nature that work in the presence of sunlight,” says Chattopadhyay, who has been working with nanomaterials to tackle environmental pollutants for more than a decade. Many research groups are working to address a problem that, if solved, could be a holy grail in combating climate change: how to pull CO2 out of the atmosphere and convert it into useful products. Chattopadhyay isn’t alone. Many research groups are working to address a problem that, if solved, could be a holy grail in combating climate change: how to pull CO2 out of the atmosphere and convert it into useful products. Nanoparticles offer a promising approach to this because they have a large surface-area-to-volume ratio for interacting with CO2 and properties that allow them to facilitate the conversion of CO2into other things. The challenge is to make them economically viable. Researchers have tried everything from metallic to carbon-based nanoparticles to reduce the cost, but so far they haven’t become efficient enough for industrial-scale application. One of the most recent points of progress in this area is work by scientists at the CSIR-Indian Institute of Petroleum and the Lille University of Science and Technology in France. The researchers developed a nanoCO2 harvester that uses water and sunlight to convert atmospheric CO2 into methanol, which can be employed as an engine fuel, a solvent, an antifreeze agent and a diluent of ethanol. Made by wrapping a layer of modified graphene oxide around spheres of copper zinc oxide and magnetite, the material looks like a miniature golf ball, captures CO2 more efficiently than conventional catalysts and can be readily reused, according to Suman Jain, senior scientist of the Indian Institute of Petroleum, Dehradun in India, who developed the nanoCO2harvester. Jain says that the nanoCO2 harvester has a large molecular surface area and captures more CO2 than a conventional catalyst with similar surface area would, which makes the conversion more efficient. But due to their small size, the nanoparticles have a tendency to clump up, making them inactive with prolonged use. Jain adds that synthesizing useful nanoparticle-based materials is also challenging because it’s hard to make the particles a consistent size. Chattopadhyay says the efficiency of such materials can be improved further, providing hope for useful application in the future. CLEANSING WATER Most toxic dyes used in textile and leather industries can be captured with nanoparticles. “Water pollutants such as dyes from human-created waste like those from tanneries could get to natural sources of water like deep tube wells or groundwater if wastewater from these industries is left untreated,” says Chattopadhyay. “This problem is rather difficult to solve.” An international group of researchers led by professor Elzbieta Megiel of the University of Warsaw in Poland reports that nanomaterials have been widely studied for removing heavy metals and dyes from wastewater. According to the research team, adsorption processes using materials containing magnetic nanoparticles are highly effective and can be easily performed because such nanoparticles have a large number of sites on their surface that can capture pollutants and don’t readily degrade in water. Chattopadhyay adds that appropriately designed magnetic nanomaterials can be used to separate pollutants such as arsenic, lead, chromium and mercury from water. However, the nanotech-based approach has to be more efficient than conventional water purification technology to make it worthwhile. In addition to removing dyes and metals, nanomaterials can also be used to clean up oil spills. Researchers led by Pulickel Ajayan at Rice University in Houston, Texas, have developed a reusable nanosponge that can remove oil from contaminated seawater.

#### Counterplan solves the Case - Space Elevators net reduce Space Debris – reduces overall Rocket Launches which is an independent alt cause to the aff

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).

### 3

#### Plan – The appropriation of outer space through the production of orbital debris by private entities except for terrestrially accessible blockchain verification computing centers and cryptocurrency mining centers are unjust. Private Entities should significantly invest in the creation of terrestrially accessible blockchain verification computing centers and cryptocurrency mining centers on the Moon and Deep Space.

#### Climate-motivated terrestrial mining regulations kill crypto now – those don’t get applied to space because of unique environments – that saves crypto with sufficient private investment

Greene 21 Greene, Tristan. Tristan covers human-centric artificial intelligence advances, quantum computing, STEM, Spiderman, physics, and space stuff. As far as I can tell his highest level of education was that he was in the Navy for a while. "What happens to Bitcoin when billionaires build cryptocurrency miners on the Moon?" TNW | Hardfork, 8 June 2021, thenextweb.com/news/bitcoin-billionaires-build-cryptocurrency-miners-on-moon-bitcoin.

Space exploration and exploitation have traditionally been nationalist endeavors. But the rise of the 12-digit billionaire has suddenly made outer space look like open territory. The players Jeff Bezos is stepping down from his position as the CEO of Amazon after 25 years ahead of his imminent launch into space aboard one of his own Blue Origin spaceships. This will be the future of fintech 6 trends that will dominate fintech in 2022 While it’s easy to imagine the long-time leader retiring to live out a childhood fantasy, there’s nothing in Bezos’ history as an incredibly ambitious person and businessman to indicate his he’ll just blast off into the sunset to live a life of quiet leisure. Simply put, Bezos’ interest in the space sector likely won’t end with offering consumer thrill rides. While it’s impossible to know where the soon-to-be-former CEO might take his ambition, it’s likely Amazon and/or Blue Origin is already looking for ways to exploit the space sector for profit. But, obviously, Bezos isn’t the only private citizen with a spaceship company. Elon Musk’s SpaceX has spent the last decade becoming the belle of NASA’s ball and he’s already all-in on the idea of sending humans to Mars. And we can’t forget Richard Branson. He may only be worth a paltry $5 billion (lol), but his Virgin Galactic company’s been banking on making some money in space tourism for a long time. Let’s also not forget that Virgin’s dabbled in everything from railroad technology to record labels. And the list goes on. Anyone with a few billion dollars has business options and opportunities that extend beyond our planet’s surface. Space for profit In the past, we’ve discussed the idea of mining space asteroids for profit. Some experts believe there are unimaginable fortunes floating around in space in the form of resource-rich asteroids. In fact, you can even get a degree in asteroid mining. And even Goldman Sachs has considered getting in on the action. But, at the end of the day, we still have to figure out where these resources are, build machines capable of extracting them, and get them safely to somewhere they can be useful. Right now, there’s not much value in investing in asteroid mining futures because the technology either doesn’t exist or isn’t ready yet. However, there’s more than one kind of mining you can do in space. Enter cryptocurrency and the future Elon Musk recently got involved in a friendly space race, but this time it has nothing to do with competition over rockets or government contracts. He’s racing against BitMEX, a cryptocurrency exchange and derivative platform, to see who can get a cryptocurrency on the Moon first. If you’re curious about how that works, here’s a snippet from BitMEX’s official announcement: BitMEX will mint a one-of-a-kind physical bitcoin, similar to the Casascius coins of 2013, which will be delivered to the Moon by Astrobotic. The coin will hold one bitcoin at an address to be publicly released, underneath a tamper-evident hologram covering. The coin will proudly display the BitMEX name, the mission name, the date it was minted and the bitcoin price at the time of minting. According to BitMEX, this isn’t just a ceremonial or token delivery. The coin itself is a hardware wallet containing an actual Bitcoin, so its value will change with the value of the BTC here on Earth. In other words, BitMEX is sending a literal treasure to the Moon for anyone brave (or rich) enough to retrieve it. Per the company’s blog post: A moon surface background with text superimposed, quote below Credit: BitMEX Come and Get It. When the physical coin lands, it will remain on the Moon until anyone deems it worthy of retrieval. Decades from now, what will it be worth? It’s a great question. Some experts have predicted a single bitcoin will one day be worth $100K, $1M, or even more. But an even better question is this: What’s the end game for cryptocurrency in space? Billionaires want to be trillionaires Back in 1999 Wired ran a feature about the imminent rise of the world’s first trillionaire. At the time, everyone assumed the richest man in the world, Microsoft CEO Bill Gates, would be the first trillionaire by a long shot. Here’s a quote from that article: The value of Bill’s Microsoft stake has grown from $233.9 million at the time of Microsoft’s 1986 IPO to $72.2 billion as of June 15, 1999 (disregarding stock sales). At this rate – 58.2 percent a year – he will become a trillionaire in March 2005, at age 49, and his Microsoft holdings will be valued at $1 quadrillion in March 2020, when he is 64. Of course, we still haven’t seen a trillionaire in modern history. As of the time of this writing, the richest person in the world is France’s Bernard Arnault, whose $193.6 billion empire edges out Jeff Bezos’ $189 billion. At some point, if Bezos wants to pull away with it or Elon Musk wants to close the widening gap between his $151.4 billion and a first place finish, the world’s richest people are going to have to do more than squeeze terrestrial markets for every last drop of profit. That’s why many experts view Elon Musk’s heavy involvement in cryptocurrency as the potential difference maker. On any given day the Tesla, SpaceX, and Neuralink founder’s total worth can skyrocket or plummet by tens of billions of dollars based on how his cryptocurrency holdings are performing. When you consider that market movements can be directly tied to Musk’s social media statements, the power proposition for billionaires holding cryptocurrency is unbridled. Simply put: Elon Musk has more control over the so-called “volatile” world of cryptocurrency than most. Putting a cryptocurrency in space, much like firing a Tesla off into the galaxy, is a PR move meant to generate interest in the burgeoning cryptomarket. But that’s not the only purpose they serve. These acts remind us that people like Musk and Bezos can do anything they want. If they want to put a coin on the Moon, they have the means to do it. And, for example, if Musk or Bezos suddenly wanted to solve the biggest problems with cryptocurrency mining – power consumption, carbon footprint, developing powerful-enough hardware – they’re in a unique position to do so. In space, no one can hear you mine Arguably, one of the biggest things stopping an apex whale like Elon Musk from spending a fair portion of his billions on cryptomining centers is the fact that such an operation would almost certainly draw universal condemnation for its potential effect on the global climate crisis. But the Moon’s atmosphere isn’t necessarily as fragile as the Earth’s. Hypothetically speaking, there’s nothing to stop a billionaire from building a facility on the Moon to mine cryptocurrency. They would, of course, need to be able to build their own batteries, have experience with artificial intelligence and supercomputers, and already have their own satellite network set up in space – all boxes Elon Musk can tick today. And, in the near-future, as we perfect deep space transmission technology, what’s to stop a billionaire from putting a supercomputer on a satellite and sending it somewhere in deep space to mine cryptocurrency 24/7 at near absolute-zero temperatures? All of this is conjecture, but the writing is on the wall. Cryptocurrency enthusiasts fear what the experts are consistently warning: regulation is coming. Eventually, it’s possible cryptocurrency mining could become regulated with harsh policies designed to keep mining operations from further damaging the environment. This could seriously hinder the market. If humanity walks away from terrestrial mining to save the planet, we’ll be leaving unfathomable amounts of money on table. Billionaires don’t become billionaires by doing that. The only logical path forward, barring some unknown new green mining technology, may be moving the cryptocurrency industry to space.

#### The CP competes:

#### Bitcoin is private property in space – appropriation is key

Rule & LeClair 21 [Dylan LeClair And Sam Rule Bitcoin Magazine. "Bitcoin’s Private Property Rights." https://www.nasdaq.com/articles/bitcoins-private-property-rights-2021-09-28]

Bitcoin’s Superior Private Property Rights

For the first time in history, bitcoin offers us a property option that does not rely on a local authority or legal system to enforce or protect it. It’s protected by the natural incentives of those participating in the network.

“Satoshi Nakamoto has created a form of property that can exist without relying on the state, centralized authority, or traditional legal structures.” - Eric D. Chason,"How Bitcoin Functions As Property Law"

It provides us with a store of value and savings technology where no government, central institution or voting bloc can seize, freeze or access it through violence or force when properly secured. Anyone in the world with an internet connection can secure this property without permission, and no other person or institution may take it away or erode its value. Whether it’s real estate, cash, equities, bonds, or gold, no other asset on the market provides this level of assurance and security.

What we know of strong, well-defined property rights is that they are the basis of human cooperation and economic activity. When private property rights flourish, so do the people. When we look at the nations of the world with the lowest ranking of property rights, we also find some of the key regions where bitcoin is making its mark.

#### Bitcoin mining produces E-Waste

BBC 21 9-20-2021 "Bitcoin mining producing tonnes of waste" <https://www.bbc.com/news/technology-58572385> (BBC)//ELmer

Miners of the cryptocurrency each year produce 30,700 tonnes of e-waste, Alex de Vries and Christian Stoll estimate. That averages 272g (9.5oz) per transaction, they say. By comparison, an iPhone 13 weighs 173g (6.1oz). Miners earn money by creating new Bitcoins, but the computing used consumes large amounts of energy. They audit Bitcoin transactions in exchange for an opportunity to acquire the digital currency. Attention has been focused on the electricity this consumes - currently more than the Philippines - and the greenhouse gas pollution caused as a result. But as the computers used for mining become obsolete, it also generates lots of e-waste. The researchers estimate Bitcoin mining devices have an average lifespan of only 1.29 years. As a result, the amount of e-waste produced is comparable to the "small IT and telecommunication equipment" waste of a country like the Netherlands researchers said - a category that includes mobile phones, personal computers, printers, and telephones. The research is published in the journal Resources, Conservation & Recycling.

#### E-Waste is Debris.

Leary 19 Amy Leary “Is Space Becoming the New E-Waste Landfill?” <https://www.ebom.com/is-space-becoming-the-new-e-waste-landfill/> (Marketing Manager at eBOM.com)//Elmer

According to BBC, there are over half a million pieces of debris floating around the Earth’s orbit. Most debris within the atmosphere are lost parts from space crafts, disused rocket stages or waste from astronauts. The Earth is currently facing a climate emergency due to increasing greenhouse gasses, loss of natural resources and rising sea levels. According to the EPA, in 2018, the US produced 292.4 million tons of municipal solid waste (MSW) and almost half of that waste (49.997%) went to landfills around the country. Year after year since recording first began in the 1960s—and the US has never had a national recycling rate (recovered material + composting) higher than 35%. Not only this, according to cbenvironmental, the UK produces more than 100 million tonnes of waste every year. As of now, there are minimal laws on disposing waste into the atmosphere. Does this mean that we can solve all our waste problems by disposing them into space? Within this article, I am going to explain the advantages and disadvantages of disposing waste in space and whether it is becoming the latest e-waste landfill trend.

#### Cryptocurrency reaching a wide rollout builds resilience to survive inevitable existential filters.

Alex McShane 21, Writer and Head of Video for Bitcoin Magazine, BA from the University of Iowa, Degree from the University College Dublin, Degree from Kirkwood Community College, “Bitcoin and Existential Risk”, Bitcoin Magazine, 9/5/2021, https://bitcoinmagazine.com/culture/bitcoin-and-existential-risk-alex-mcshane

TL;DR - An existential risk is the possibility of an event or series of events that could drastically curtail humanity’s potential. A hypothetical global catastrophe could be anthropogenic or non-anthropogenic and internal or external in nature. The adoption of Bitcoin will better position us to address these risks as a society. EXTERNAL NON-ANTHROPOGENIC A catastrophic collision with an astronomical object, such as an asteroid impact would be an external non-anthropogenic risk. This has already occurred here several times. During the Permian Triassic period (ending 250 million years ago) an astronomical impact killed 90 percent of the species on Earth. It took tens of millions of years for life on Earth to repopulate and Earth’s intelligence potential to recover. One interesting external non-anthropogenic risk is Earth’s reflected light, which could be measured by an external intelligence who then come to extinguish us. (The topic of our own signal bringing about this death by misadventure is discussed further below.) What does this have to do with Bitcoin? Generally, hard money facilitates greater innovation and technological process. At this point one might argue that if we do not migrate to some degree from Earth as a species, and are subsequently wiped out by an astronomical object impact or a super-volcanic event, the risk becomes anthropogenic in nature. We are a centralized species on a grand scale, and at this point one could say we have through consensus chosen to remain vulnerable to a single vector of attack by staying here. Bitcoin is not only the hardest money known to man, it is the most responsible from this standpoint. Bitcoin as it currently operates is currency that can provide a monetary framework on which humans can achieve greater capital growth, collaboration, resource allocation, and therefore technological progress. Because the terminal supply of Bitcoin is capped, we can store value in it indefinitely as a society. 66 Million years ago the Cretaceous-Paleogene Extinction Event extinguished the life and intelligence potential of the non-avian dinosaurs. This series of events was external, and broadly non-anthropogenic in the sense that no form of life on Earth at the time contributed to its own demise, but more specifically, at the time of those astronomical impacts the first humans hadn’t split from chimpanzee lineages. This split is thought to have occurred between between 4 and 8 million years ago. An important distinction between astronomical impacts or super-volcanic events of the past and such events if they were to happen today is that one could argue that our intelligence potential is now mature enough to tackle certain of the external existential risks. Today, the risk posed by an asteroid impact or something similar would still be external in its origin, but at what point does the burden of responsibility to migrate off of the planet fall upon our population? We can surely solve for some external existential risks, and in any case, no one is going to do it for us. You could say that failing to collectively pursue a solution when technically we could have would recategorize a civilization-extinguishing asteroid impact as an external but anthropogenic risk. At what point do innovation dampening authoritarian states and their mandated broken money cause society to stall at a local optimum? Surely the government has already caused this. It’s only a matter of time before another object strikes the Earth with devastating consequence. I would argue it is irresponsible to continue life here with government money. Government money is an existential risk. Bitcoin is not only a solution, it is a societal responsibility. INTERNAL ANTHROPOGENIC Nuclear war is one example of an internal anthropogenic risk. That is, should nuclear war arise, it would be both self destructive, and relatively self contained on a cosmic scale. It follows that biological warfare is an internal anthropogenic risk, the reality of which we as a species can surely understand now. If I were to hazard a guess I would say virtual emergencies and cyber pandemics are next. These self constructed catastrophes are the government’s misguided attempts at proof of work. This is a topic for another time. Do not surrender your ability to think and speak freely. The second law of thermodynamics can summed thus, processes that involve the transfer or conversion of heat energy are irreversible. The law indicates we have not observed a spontaneous transfer of energy from cold to hot. Another way to think of this is that there is no such thing as cold, only lesser degrees of hot. Nothing cannot transfer. So broadly, within a closed system, the second law of thermodynamics would indicate that all differences tend to level out. So what has this got to do with Bitcoin? Well firstly, all hardware is subject to entropy. The distributed nature of the blockchain increases the probability that it will survive centralized entropy. At Bitcoin’s inception, imagine a failure because Satoshi’s computer randomly crashed. Distributed networks are inherently hedged against this particular centralized form of existential risk. The second law of thermodynamics also suggests that on a grander scale, relatively isolated (centralized) systems will degenerate more and more into disordered states. Proof of work, and network growth are two ways Bitcoin fights against falling into disrepair. Bitcoin uses proof of work to stave off entropy. The system cannot stay dormant. It must continue to use proof of work to advance the state of the chain, and to fight entropy to secure the monetary value all of the users have stored in the network. The U.S. dollar, as many have pointed out, relies on proof of war, or distributed political energies to maintain dominance. Its methodology can be described as haphazard at best. INTERNAL NON-ANTHROPOGENIC One internal non-anthropogenic risk is that of a super-volcanic eruption, provided it wasn’t humans who brought about the eruption. Just like with external non-anthropogenic risks, Bitcoin alone cannot prevent them, but it can help humans prepare for them such that we may survive these relatively small intelligence filters the universe throws our way. Bitcoin allows for fundamental capital accumulation and human innovation, and promotes collaboration to such a degree that we will find an increased collective problem solving power as humans the further Bitcoin adoption spreads. It is worth mentioning that Bitcoin also maintains and appreciates wealth to such a degree that often those of us to chose to live our lives on a Bitcoin standard will experience relatively greater freedoms, and vastly greater amounts of free time than our peers who chose to continue their lives on a fiat standard, and are perpetually working to outpace their chronic debt. Many Bitcoiners will likely forego that newfound free time to work and continue to provide value to others in whatever area interests them, because Bitcoin incentivizes the collaborative accumulation of capital but also the responsible reallocation of it. EXTERNAL ANTHROPOGENIC An external anthropogenic risk has the least probability of occurring. This is a problem of reach. Imagine human intelligence being sent into the cosmos and signaling or generally causing an external intelligence or astronomical object to come back to extinguish us. This is a most improbable extinction by misadventure. The probability that we send messages of consequence into the cosmos that in turn cause some other far-flung intelligence, with knowledge enough to reach us, to come and bring about our own destruction is next to zero, but it isn’t zero. I would posit that the probability increases every day that Bitcoin survives, with each person that chooses to hold Bitcoin over fiat, because on a fiat standard we are again, stuck at a local optimum at best, and each day the global monetary system devolves further into chaos. The fiat world may continue to be habitable chaos, but our technological progress and our greatest capacity for innovation cannot be achieved on a fiat standard. A Bitcoin standard is not only our current best bet, it is the only monetary vehicle that will take us from here, or enable us to build technology that can effectively communicate with places in the universe where other intelligence has emerged. The other reason this fatal miscommunication is unlikely to occur is that once through a Bitcoin standard we have manage to build a society that can effectively reach and communicate at greater depths of the cosmos we will at that time have already become a multi-planetary, if not transitory, if not multi-solar system species. The topic of Bitcoin in space and planetary interoperability will be discussed in a later essay. The most distant human made object from the earth is the Voyager 1, which is over 13 billion miles away. (For perspective, Apha Centuri, the nearest star system to Earth, is 25 trillion miles away.) Human radio signals have announced our presence and our intelligence to the cosmos since around 1900. The first human radio signals have all ready traveled 114 light years, that is 681,920,540,000,000 miles. Although the reach of our radio signals is very great, the probability of us being heard and subsequently extinguished is negligible. External anthropogenic risks are the least of our concerns at the moment. As Bitcoin adoption grows, it serves to promote advances in artificial intelligence and nanotechnology. External anthropogenic risks will become more relevant to human intelligence at a much later time. External non-anthropogenic risks are similarly out of our hands for the time being. That is, at the moment there is nothing we can do to prevent the Sun from becoming a red giant star and subsuming the Earth. But we do already have the monetary technology upon which to engineer solutions to some of these problems. We have the potential as humans to prevent internal global catastrophes, both those set on by us and not. Survival and longevity is arguably our greatest task as a species. Adopting Bitcoin, and protecting this network is proceeding with diligence and a long eye toward the future in all of our political and scientific affairs. The existential risks of living are great, though it is human nature for our ambitions to out pace our current abilities. The only evidence of life is change. To change is to exit fiat currency, it is to use Bitcoin instead.

## Case

#### 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) reject 1AR theory since it can’t be a legitimate check for abuse, b) drop the arg to minimize the chance the round is decided unfairly, c) 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

#### No Solvency:

#### 1] “Produce Debris” is vague – what does it mean to “produce?” is it intentional/unintentional – is a spec of dust enough – failure to delineate means actors will interpret the plan as narrowly as possible circumventing the Aff.

#### 2] No way to prove what “produces debris” – Companies will just deny meaning no enforcement.

#### Orbital use fees fail.

Stilwell 20, Ruth [Dr. Ruth Stilwell is a Senior Non-Resident Scholar at the Space Policy Institute of George Washington University and Adjunct Professor at Norwich University.] Orbital use fees won’t solve the space debris problem. Jun 22, 2020, <https://www.thespacereview.com/article/3971/1> TG

State, commercial, and non-government users of space have a shared interest in creating the long-term sustainability of space operations, and global progress requires international agreement. Proposers for an orbital use tax mention that it would need to be globally harmonized but fail to recognize the difficulty in reaching such an agreement—if such an agreement is even possible. The recent collapse of the OPEC pact and the subsequent oil price war illustrates the fragility of international economic collaboration. By contrast, international agreements on standards and regulation for international operators, as we see in the maritime and aviation industries, tend to endure. It is important to recognize that diplomatic resources are limited and efforts to reach international agreement should focus on areas that can provide the most benefit and have the greatest chance for success. For the long-term sustainability of space, the answer is not to make space more expensive to use, but rather to ask the users, both civilian and military, to be responsible to the goal of sustainable use. This requires a focus in three critical areas: collision avoidance, limiting debris-generating behaviors, and debris removal. As we ask the space community to be more responsible, it is important to define what that means. As illustrated by recent anti-satellite missile tests, the community can be alarmed, but we are functionally unable to hold each other to standards of behavior if those standards do not exist. Efforts at international agreement should be focused on reaching agreement in these areas if we are to have a sustainable and accountable orbital domain. The space debris problem is complex and will not be solved by targeting one section of the industry. It is important to look at primary contributors to the problem. Leaving non-maneuverable objects in orbit creates an unresolvable collision risk as illustrated in January, when two intact satellites that had been in orbit for decades came within meters of colliding (see [“Will we hit the snooze button on an orbital debris wakeup call?”](https://www.thespacereview.com/article/3885/1), The Space Review, February 17, 2020). By contrast, days before the potential collision, a damaged DirecTV satellite at risk of exploding was maneuvered to a graveyard orbit where it did not pose a debris hazard to other operators. An orbital use tax would put an additional financial penalty on the user that is able to prevent the collision risk but do nothing to change the behavior that created the collision risk. The orbital fees not only don’t solve the problem but, by and large, they are asking the commercial sector to pay for the pollution that was created by legacy users who were largely governments.

#### Their study ignored every thumper.

1AC Rao et al 20. Akhil, Matthew Burgess, and Daniel Kaffine \*Department of Economics, Middlebury College, Middlebury \*\*Cooperative Institute for Research in Environmental Sciences, University of Colorado, Environmental Studies Program, and Department of Economics \*\*\*Department of Economics. 2020 [PNAS, “Orbital-use fees could more than quadruple the value of the space industry,” <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7293599/>] CHECK SUPPLEMENTARY FILE UNDER ASSOCIATED DATA [pnas.1921260117.sapp.pdf (923K) GUID: 3003E287-42FC-440B-97AD-22F2880ADB69]

We ignore the possibility of collisions between debris objects for two reasons. First, the data we have do not allow us to identify the effective number of fragments from such collisions, or the probability of such collisions, using our calibration approach. Second, our focus here is not on the probability of Kessler Syndrome, but on launch patterns and their response to the extant stock of orbiting satellites and debris. Our estimates of the optimal OUF path and the benefits of implementing it are likely understated due to this omission. Incorporating the possibility of Kessler Syndrome is an important piece of optimal orbit use analysis and policy design, and will likely require higher-fidelity physical modeling than the “aggregate calibration” approach we take here. This is an important area for future research. Equations 3, 4, and 5 can be viewed as reduced-form statistical models which recreate the results of higher-fidelity physics models of debris growth and the collision probability. While higher-fidelity physics models may use similar functional forms, the key difference between our approach and the approach in such models is how we calibrate the models: rather than derive the appropriate parameter values from physical first principles given the data, we estimate the values of those parameters which maximize the fit between the data and model-predicted collision probabilities, satellite evolution, and debris stocks. Though our approach is computationally convenient, it likely sacrifices some predictive power. While we model a collision probability, we do not formally include uncertainty (e.g. as a probability measure over collisions to be integrated) in the decision-making processes of satellite launchers/operators. Formal uncertainty of this type could be important when modeling untracked debris. However, our data do not include estimates of untracked debris. Our lack of formal uncertainty could therefore be interpreted as assuming all data are tracked. We also do not observe the history of near-hits, making it challenging to calibrate the stochastic process of collision events directly. Finally, the linearity of per-period profit functions in our model suggests behavioral effects like risk aversion will not matter to launch rates.

#### 1AC Rao says debris clean up programs increase debris from collision risk but the only way to mitigate Kessler is through ADR, prove debris is inevitable since the Rao evidence uses the OUF for ADR programs.

#### Squo debris thumps

**Wall 21** [Mike Wall, Michael Wall is a Senior Space Writer with [Space.com](http://space.com/) and joined the team in 2010. He primarily covers exoplanets, spaceflight and military space. He has a Ph.D. in evolutionary biology from the University of Sydney, Australia, a bachelor's degree from the University of Arizona, and a graduate certificate in science writing from the University of California, Santa Cruz. 11/15/21, "Kessler Syndrome and the space debris problem," Space, [https://www.space.com/kessler-syndrome-space-debris accessed 12/10/21](https://www.space.com/kessler-syndrome-space-debris%20accessed%2012/10/21)] Adam

Earth orbit is getting more and more crowded as the years go by. Humanity has launched about 12,170 satellites since the dawn of the space age in 1957, [according to the European Space Agency](https://www.esa.int/Safety_Security/Space_Debris/Space_debris_by_the_numbers) (ESA), and 7,630 of them remain in orbit today — but only about 4,700 are still operational. That means there are nearly 3,000 defunct spacecraft zooming around Earth at tremendous speeds, along with other big, dangerous pieces of debris like upper-stage rocket bodies. For example, orbital velocity at 250 miles (400 kilometers) up, the altitude at which the ISS flies, is about 17,100 mph (27,500 kph). At such speeds, even a tiny shard of debris can do serious damage to a spacecraft — and there are huge numbers of such fragmentary bullets zipping around our planet. ESA estimates that Earth orbit harbors at least 36,500 debris objects that are more than 4 inches (10 centimeters) wide, 1 million between 0.4 inches and 4 inches (1 to 10 cm) across, and a staggering 330 million that are smaller than 0.4 inches (1 cm) but bigger than 0.04 inches (1 millimeter). These objects pose more than just a hypothetical threat. From 1999 to May 2021, for example, the ISS conducted 29 debris-avoiding maneuvers, including three in 2020 alone, [according to NASA officials](https://www.nasa.gov/mission_pages/station/news/orbital_debris.html). And that number continues to grow; the station performed [another such move in November 2021](https://www.space.com/space-station-dodging-chinese-space-junk-spacex-crew-3), for example. Many of the smaller pieces of space junk were spawned by the explosion of spent rocket bodies in orbit, but others were more actively emplaced. In January 2007, for instance, China intentionally destroyed one of its defunct weather satellites in a much-criticized test of anti-satellite technology that generated [more than 3,000 tracked debris objects](https://swfound.org/media/9550/chinese_asat_fact_sheet_updated_2012.pdf) and perhaps 32,000 others too small to be detected. The vast majority of that junk remains in orbit today, experts say. Spacecraft have also collided with each other on orbit. The most famous such incident occurred in February 2009, when Russia's defunct Kosmos 2251 satellite slammed into the operational communications craft Iridium 33, producing [nearly 2,000 pieces of debris](https://swfound.org/media/6575/swf_iridium_cosmos_collision_fact_sheet_updated_2012.pdf) bigger than a softball. That 2009 smashup might be evidence that the Kessler Syndrome is already upon us, though a cataclysm of "Gravity" proportions is still a long way off. "The cascade process can be more accurately thought of as continuous and as already started, where each collision or explosion in orbit slowly results in an increase in the frequency of future collisions," [Kessler told Space Safety Magazine in 2012](http://www.spacesafetymagazine.com/space-debris/kessler-syndrome/don-kessler-envisat-kessler-syndrome/).

#### Debris creates deterrence by raising the bar for conflict – international norms fail

Miller 7/31 [(Gregory, Chair of the Department of Space Power at the Air Command and Staff College, Ph.D. in Political Science from The Ohio State University) “Deterrence by Debris: The Downside to Cleaning up Space,” Space Policy, 7/31/2021] JL

The danger of kinetic strikes increasing orbital debris is a common theme in the literature, but the positive deterrent effects of some debris are often overlooked. The debris resulting from destroyed satellites, or other space objects, creates a deterrent effect on actors who might otherwise violate international norms and strike at objects in space, either to test their capabilities or as an act of hostilities. This is not deterrence in the traditional sense, of one actor publicly threatening punishment in response to another actor’s unwanted actions. It is not deterrence by denial since the attacker is not damaged and may even achieve its objective. Nor is it deterrence by punishment because the debris itself does not threaten to punish the attacker’s country. But debris can increase the future costs to the aggressor, even if their initial attack succeeds, and thus it has a similar restraining effect on certain behavior. Like the automated response of the U.S. tripwire in West Germany, the threat that debris can pose to state interests acts as a form of deterrence, at least to prevent some actors from taking certain types of actions. Removing the danger of debris will weaken that restraint and thus weaken deterrence, making ASAT tests and hostile actions in space more likely.

#### Several factors may deter a state from launching kinetic tests or striking against an adversary’s interests in space. For one thing, if a state’s adversary has similar capabilities to destroy objects in space, deterrence would be a function of not wanting to escalate tensions. Although international law only explicitly prohibits states from placing weapons of mass destruction in orbit, international space law, like the Outer Space Treaty [30], does provide a framework for addressing the activities of one state that lead to the damage of another state’s property. Likewise, there are international norms (informal but expected rules of behavior) against the weaponization of space. But these norms seem to be in decline [31], and such norms only deter a state from engaging in certain types of behavior if the state cares about following norms, if it cares about how states perceive its behavior, or if it believes other states are willing to enforce the norms. The beauty of debris as a deterrent is that it does not rely on the enforcement of norms or the credibility of states to succeed.

#### Lack of attribution means no retal

Schwarzer et al ’19 [Daniela, Eva-Marie McCormack, and Torben Schutz; Director, Editor, and Associate Fellow in the Security, Defense, and Armaments Program at the German Council of Foreign Relations; Deutsche Gesellschaft fur Auswartige Politik, “Technology and Strategy: The Changing Security Environment in Space Demands New Diplomatic and Military Answers,” [https://www.ssoar.info/ssoar/bitstream/handle/document/63288/ssoar-2019-schutz-Technology\_and\_Strategy\_the\_Changing.pdf](https://www.ssoar.info/ssoar/bitstream/handle/document/63288/ssoar-2019-schutz-Technology_and_Strategy_the_Changing.pdf?sequence=1&isAllowed=y&lnkname=ssoar-2019-schutz-Technology_and_Strategy_the_Changing.pdf);]

However, even a (misinterpreted) threat to space assets could start a chain reaction and quickly escalate an incident in space to a wider war. Successful deterrence, therefore, requires situational awareness, attribution capabilities and resilient assets. Especially the latter two are notoriously difficult to achieve in space. While it might be easy to attribute a kinetic attack executed with a missile, the same is not true for ASAT attacks by other satellites, and, especially, not for cyberattacks and electronic warfare measures. Without clear attribution, however, it is difficult to deter any adversary, since he could speculate that an attack cannot be traced back to him – making deterrence and retaliation more difficult. Although cross-domain deterrence, i.e. threatening an actor through potential retaliation attacks on or by other-than-space assets, is always possible, it also amplifies the problems involved in traditional deterrence: A response has to be timely and proportionate, and it should not further expand of the conflict.

#### Liu cites multiple alt causes – burnoff from boosters AND returning booster rockets – space debris is a drop in the bucket

#### Debris that reenters also isn’t orbital so the plan defintially cant solve

#### No space war – prefer data over political rhetoric

Klimas interviewing Weeden 18 [Brian Weeden, smart space guy. Is the space war threat being hyped? August 3, 2018. https://www.politico.com/story/2018/08/03/space-war-threat-hype-force-760781]

There’s been increasing rhetoric...about the militarization of space and the potential for conflicts on Earth to extend into space. That’s driven in part by reports about anti-satellite testing in Russia and China...The report really grew out of our frustration at the level of publicly available information on this topic. A lot of what you get are public statements from military leadership or politicians, or sometimes news articles talking about something and it’s really hard to get down to details and...sort through what might be real, what might be hype. Our goal was to dig into the open source material and see what we could determine from a factual standpoint was really going on -- what types of capabilities were being developed and how might they be used in a future conflict. Ultimately we hoped that would lead to a more informed debate about what U.S. strategy should be to address those threats. What sort of feedback have you gotten so far? A lot of the feedback has been either informal or private because a lot of the issues we talk about, people in the government research using classified materials. So it’s difficult for them to give detailed feedback. In general, the feedback we’ve gotten has been pretty positive. People have said they like the fact that this sort of stuff is being put in the public domain and encouraged us to continue. Were your findings better or worse than the picture public discourse paints? In general, it’s a little bit better. A lot of political rhetoric and news stories focus on the most extreme examples, so using kinetic weapons to blow up satellites. While there is research and development going on to develop those capabilities, what we found is there’s yet to be any publicly-known example of them being used. What is being used and what seems to be of the most utility are the non-kinetic things, like jamming and cyber attacks. The good news is we have yet to see the most destructive kinetic attacks that can cause really harmful long-term damage to the space environment, but unfortunately we are seeing non-kinetic attacks being used, and that’s likely to continue.

#### Droughts – we don’t use data even if we have it

Starr 14 - psychologist, journalist, and professor emeritus at the City University of New York, Brooklyn College (Bernard, “Our Oceans Are Dying: Mobilizing an Indifferent Public to Confront This Crisis,” Huffington Post, 6-27-14, http://www.huffingtonpost.com/bernard-starr/our-oceans-are-dying\_b\_5533322.html)

After an eighteen-month investigation, the Commission, made up of former heads of state, government officials, and prominent business leaders concluded that our oceans are dying from climate change, pollution, and over-fishing. The Commission proposes an eight point program to rescue the oceans over the next five years. Why should we be concerned? José María Figueres, Co-chair of the Commission and former president of Costa Rica, has summed up the dire situation with these words: "The ocean provides 50 percent of our oxygen and fixes 25 percent of global carbon emissions. Our food chain begins in that 70 percent of the planet." He added that "a healthy ocean is key to our well-being, and we need to reverse its degradation." He warned: "Unless we turn the tide on ocean decline within five years, the international community should consider turning the high seas into an off-limits regeneration zone until its condition is restored." A Commission video states the crisis even more starkly: "No ocean, no us!" In his brief talk at the reception, David Miliband, also co-chair of the Ocean Commission and former UK Foreign Secretary, urged politicians, scientists, journalists, and ordinary citizens to rally behind the salvation of our oceans and the planet -- and to get the message out to others. Will getting the message out turn the tide in the battle to save the planet? I doubt it. **We are swimming in information and messages**. Earlier the this year leading scientists declared that we are fast approaching the critical point of no return for climate change -- a point with predictable devastating consequences. But **who is listening?** The public continues to be **frighteningly indifferent**. Who among the public is willing to place the salvation of the planet over immediate personal concerns? That question was dramatically called to my attention recently when I presented a list of critical issues to a group of seniors enrolled in a life-long learning program and asked them which one they would place first. The list included: terrorism and national defense, global warming, jobs, vanishing icebergs, protecting Social Security, income inequality, ocean pollution, sustaining Medicare, protecting the Amazon rain forests, reducing fossil fuel emissions, regulating Wall Street and the banks, stopping fracking (shale gas drilling), protecting wildlife (elephants, lions, whales, etc.), eliminating genetically modified foods (GMOs), campaign finance reform, free college education for all, national healthcare (Medicare for all). I was particularly interested in the seniors' answers since popular wisdom says that seniors are more concerned than other age groups with the welfare of children, grandchildren, and future generations. And no issue is more vital for the well-being of future generations than the viability of life on the planet. Psychologist Erik Erikson called this concern of older adults "generativity." But the seniors defied conventional wisdom. Jobs, Social Security, and income inequality topped their listings. Only one person, toward the end of the discussion, cited climate change -- and his response seemed almost gratuitous in recognition that we were about to screen a documentary on the melting of icebergs. Perhaps I should not have been surprised. Politicians avoid talking about environmental issues for fear of losing favor with their constituents, who are clamoring for jobs, mortgage relief, and financial security. During the 2012 presidential debates between Barack Obama and Mitt Romney environmental issues took a far **back** seat; in fact, they were barely mentioned. Both candidates knew instinctively that in the throes of an economic crisis placing the salvation of the planet high on the national agenda would not generate votes. It might even take away votes from people who feared the candidate would be indifferent to their personal struggles. So where does this leave us? If more environmental studies and more alarming news will not mobilize leaders and the public for an all-out commitment to the preservation of our small vulnerable corner of the universe, what will? Perhaps we need to shift our focus from information to changing human behavior. Let's enlist leading behavioral scientists and psychological associations to address how to awaken the public to the urgency of protecting the planet. Let's launch a campaign to make this the number-one priority. And let's adopt these mantras: No planet, no jobs; no planet, no Social Security; no planet, no mortgages; no planet, no corporate bonus packages. No planet, no us.

#### Conflicts non uq – tensions over wtaer4 for decades

#### No WMD or escalation

**Weiss 15**—Visiting scholar at the Center for International Security and Cooperation at Stanford University, a member of the National Advisory Board of the Center for Arms Control and Non-Proliferation in Washington, DC, and a former professor of applied mathematics and engineering at Brown and the University of Maryland [Leonard, “On fear and nuclear terrorism,” *Bulletin of the Atomic Scientists*, March/April, Vol. 71, No. 2, p. 75-87]

If the fear of nuclear war has thus had some positive effects, the fear of nuclear terrorism has had mainly negative effects on the lives of millions of people around the world, including in the United States, and even affects negatively the prospects for a more peaceful world. Although there has been much commentary on the interest that Osama bin Laden, when he was alive, reportedly expressed in obtaining nuclear weapons (see Mowatt-Larssen, 2010), and some terrorists no doubt desire to obtain such weapons, *evidence* of any terrorist group *working seriously* toward the theft of nuclear weapons or the acquisition of such weapons by other means is *virtually nonexistent*. This may be due to a combination of reasons. Terrorists understand that it is not hard to terrorize a population without committing mass murder: In 2002, a single sniper in the Washington, DC area, operating within his own automobile and with one accomplice, killed 10 people and changed the behavior of virtually the entire populace of the city over a period of three weeks by instilling fear of being a randomly chosen shooting victim when out shopping. Terrorists who believe the commission of violence helps their cause have access to many explosive materials and conventional weapons to ply their “trade.” If public sympathy is important to their cause, an apparent plan or commission of mass murder is not going to help them, and indeed will make their enemies even more implacable, reducing the prospects of achieving their goals. The acquisition of nuclear weapons by terrorists is not like the acquisition of conventional weapons; it requires significant *time*, *planning*, *resources*, and *expertise*, with no guarantees that an acquired device would work. It requires putting aside at least some aspects of a group’s more immediate activities and goals for an attempted operation that no terrorist group has previously accomplished. While absence of evidence does not mean evidence of absence (as then-Secretary of Defense Donald Rumsfeld kept reminding us during the search for Saddam’s nonexistent nuclear weapons), it is reasonable to conclude that the fear of nuclear terrorism has swamped realistic consideration of the threat. As Brian Jenkins, a longtime observer of terrorist groups, wrote in 2008: Nuclear terrorism … turns out to be a world of truly worrisome particles of truth. Yet it is also a world of fantasies, nightmares, urban legends, fakes, hoaxes, scams, stings, mysterious substances, terrorist boasts, sensational claims, description of vast conspiracies, allegations of coverups, lurid headlines, layers of misinformation and disinformation. Much is inconclusive or contradictory. Only the terror is real. (Jenkins, 2008: 26) The three ways terrorists might get a nuke To illustrate in more detail how fear has distorted the threat of nuclear terrorism, consider the three possibilities for terrorists to obtain a nuclear weapon: steal one; be given onecreated by a nuclear weapon state; manufacture one.

*None* *of these possibilities has a high probability of* *occurring*. Stealing nukes. Nothing is better protected in a nuclear weapon state than the weapons themselves, which have multiple layers of safeguards that, in the United States, include intelligence and surveillance, electronic locks (including so-called “permissive action links” that prevent detonation unless a code is entered into the lock), gated and locked storage facilities, armed guards, and teams of elite responders if an attempt at theft were to occur. We know that most weapon states have such protections, and there is *no reason* to believe that such protections are missing in the remaining states, since no weapon state would want to put itself at risk of an unintended nuclear detonation of its own weapons by a malevolent agent. Thus, the likelihood of an unauthorized agent secretly planning a theft, without being discovered, and getting access to weapons with the intent and physical ability to carry them off in the face of such layers of protection is *extremely low*—but it isn’t impossible, especially in the case where the thief is an insider. The insider threat helped give credibility to the stories, circulating about 20 years ago, that there were “loose nukes” in the USSR, based on some statements by a Soviet general who claimed the regime could not account for more than 40 “suitcase nukes” that had been built. The Russian government denied the claim, and at this point there is no evidence that any nukes were ever loose. Now, it is unclear if any such weapon would even work after 20 years of corrosion of both the nuclear and non-nuclear materials in the device and the radioactive decay of certain isotopes. Because of the large number of terrorist groups operating in its geographic vicinity, Pakistan is frequently suggested as a possible candidate for scenarios in which a terrorist group either seizes a weapon via collaboration with insiders sympathetic to its cause, or in which terrorists “inherit” nuclear weapons by taking over the arsenal of a failed nuclear state that has devolved into chaos. Attacks by a terrorist group on a Pakistani military base, at Kamra, which is believed to house nuclear weapons in some form, have been referenced in connection with such security concerns (Nelson and Hussain, 2012). However, the Kamra base contained US fighter planes, including F-16s, used to bomb Taliban bases in tribal areas bordering Afghanistan, so the planes, not nuclear weapons, were the likely target of the terrorists, and in any case the mission was a failure. Moreover, Pakistan is not about to collapse, and the Pakistanis are known to have received *major international assistance* in technologies for protecting their weapons from unauthorized use, store them in somewhat disassembled fashion at multiple locations, and have a *sophisticated nuclear security structure* in place (see Gregory, 2013; Khan, 2012). However, the weapons are assembled at times of high tension in the region, and, to keep a degree of uncertainty in their location, they are moved from place to place, making them more vulnerable to seizure at such times (Goldberg and Ambinder, 2011). (It should be noted that US nuclear weapons were subject to such risks during various times when the weapons traveled US highways in disguised trucks and accompanying vehicles, but such travel and the possibility of terrorist seizure was never mentioned publicly.) Such scenarios of seizure in Pakistan would require a major security breakdown within the army leading to a takeover of weapons by a nihilistic terrorist group with little warning, while army loyalists along with India and other interested parties (like the United States) stand by and do not intervene. This is not a particularly realistic scenario, but it’s also not a reason to conclude that Pakistan’s nuclear arsenal is of no concern. It is, not only because of an internal threat, but especially because it raises the possibility of nuclear war with India. For this and other reasons, intelligence agencies in multiple countries spend considerable resources tracking the Pakistani nuclear situation to reduce the likelihood of surprises. But any consideration of Pakistan’s nuclear arsenal does bring home (once again) the folly of US policy in the 1980s, when stopping the Pakistani nuclear program was put on a back burner in order to prosecute the Cold War against the Soviets in Afghanistan (which ultimately led to the establishment of Al Qaeda). Some of the loudest voices expressing concern about nuclear terrorism belong to former senior government officials who supported US assistance to the mujahideen and the accompanying diminution of US opposition to Pakistan’s nuclear activities. Acquiring nukes as a gift. Following the shock of 9/11, government officials and the media imagined many scenarios in which terrorists obtain nuclear weapons; one of those scenarios involves a weapon state using a terrorist group for delivery of a nuclear weapon. There are at least two reasons why this scenario is unlikely: First, once a weapon state loses control of a weapon, it cannot be sure the weapon will be used by the terrorist group as intended. Second, the state cannot be sure that the transfer of the weapon has been undetected either before or after the fact of its detonation (see Lieber and Press, 2013). The use of the weapon by a terrorist group will ultimately result in the transferring nation becoming a nuclear target just as if it had itself detonated the device. This is *a powerful deterrent* to such a transfer, making the transfer a low-probability event. Although these first two ways in which terrorists might obtain a nuclear weapon have very small probabilities of occurring (there is no available data suggesting that terrorist groups have produced plans for stealing a weapon, nor has there been any public information suggesting that any nuclear weapon state has seriously considered providing a nuclear weapon to a sub-national group), the probabilities cannot be said to be zero as long as nuclear weapons exist. Manufacturing a nuclear weapon. To accomplish this, a terrorist group would have to obtain an appropriate amount of one of the two most popular materials for nuclear weapons, highly enriched uranium (HEU) or plutonium separated from fuel used in a production reactor or a power reactor. Weapon-grade plutonium is found in weapon manufacturing facilities in nuclear weapon states and is very highly protected until it is inserted in a weapon. Reactor-grade plutonium, although still capable of being weaponized, is less protected, and in that sense is a more attractive target for a terrorist, especially since it has been produced and stored in prodigious quantities in a number of nuclear weapon states and non-weapon states, particularly Japan. But terrorist use of plutonium for a nuclear explosive device would require the construction of an implosion weapon, requiring the fashioning of an appropriate explosive lens of TNT, a *notoriously difficult* technical problem. And if a high nuclear yield (much greater than 1 kiloton) is desired, the use of reactor-grade plutonium would require a still more sophisticated design. Moreover, if the plutonium is only available through chemical separation from some (presumably stolen) spent fuel rods, additional technical complications present themselves. There is at least one study showing that a small team of people with the appropriate technical skills and equipment could, in principle, build a plutonium-based nuclear explosive device (Mark et al., 1986). But even if one discounts the high probability that the plan *would be discovered* at some stage (missing plutonium or spent fuel rods would put the authorities and intelligence operations under high alert), translating this into a real-world situation suggests an *extremely low probability of technical success*. More likely, according to one well-known weapon designer,4 would be the death of the person or persons in the attempt to build the device. There is the possibility of an insider threat; in one example, a team of people working at a reactor or reprocessing site could conspire to steal some material and try to hide the diversion as MUF (materials unaccounted for) within the nuclear safeguards system. But this scenario would require intimate knowledge of the materials accounting system on which safeguards in that state are based and adds another layer of complexity to an operation with low probability of success. The situation is different in the case of using highly enriched uranium, which presents fewer technical challenges. Here an implosion design is not necessary, and a “gun type” design is the more likely approach. Fear of this scenario has sometimes been promoted in the literature via the quotation of a famous statement by nuclear physicist Luis Alvarez that dropping a subcritical amount of HEU onto another subcritical amount from a distance of five feet could result in a nuclear yield. The probability of such a yield (and its size) would depend on the geometry of the HEU components and the amount of material. More likely than a substantial nuclear explosion from such a scenario would be a criticality accident that would release an intense burst of radiation, killing persons in the immediate vicinity, or (even less likely) a low-yield nuclear “fizzle” that could be quite damaging locally (like a large TNT explosion) but also carry a psychological effect because of its nuclear dimension. In any case, since the critical mass of a bare metal perfect sphere of pure U-235 is approximately 56 kilograms, stealing that much highly enriched material (and getting away without detection, an armed fight, or a criticality accident) is *a major problem* for any thief and one significantly greater than the stealing of small amounts of HEU and lower-enriched material that has been reported from time to time over the past two decades, mostly from former Soviet sites that have since had their security greatly strengthened. Moreover, fashioning the material into a form more useful or convenient for explosive purposes could likely mean a need for still more material than suggested above, plus a means for machining it, as would be the case for HEU fuel assemblies from a research reactor. In a recent paper, physics professor B. C. Reed discusses the feasibility of terrorists building a low-yield, gun-type fission weapon, but admittedly avoids the issue of whether the terrorists would likely have the technical ability to carry feasibility to realization and whether the terrorists are likely to be successful in stealing the needed material and hiding their project as it proceeds (Reed, 2014). But this is the crux of the nuclear terrorism issue. There is no argument about feasibility, which has been accepted for decades, even for plutonium-based weapons, ever since Ted Taylor first raised it in the early 1970s5 and a Senate subcommittee held hearings in the late 1970s on a weapon design created by a Harvard dropout from information he obtained from the public section of the Los Alamos National Laboratory library (Fialka, 1978). Likewise, no one can deny the terrible consequences of a nuclear explosion. The question is the level of risk, and what steps are acceptable in a democracy for reducing it. Although the attention in the literature given to nuclear terrorism scenarios involving HEU would suggest major attempts to obtain such material by terrorist groups, there is only one known case of a major theft of HEU. It involves a US government contractor processing HEU for the US Navy in Apollo, Pennsylvania in the 1970s at a time when security and materials accounting were extremely lax. The theft was almost surely carried out by agents of the Israeli government with the probable involvement of a person or persons working for the contractor, not a sub-national terrorist group intent on making its own weapons (Gilinsky and Mattson, 2010). The circumstances under which this theft occurred were unique, and there was significant information about the contractor’s relationship to Israel that should have rung alarm bells and would do so today. Although it involved a government and not a sub-national group, the theft underscores the importance of security and accounting of nuclear materials, especially because the technical requirements for making an HEU weapon are less daunting than for a plutonium weapon, and the probability of success by a terrorist group, though low, is certainly greater than zero. Over the past two decades, there has been *a significant effort* to increase protection of such materials, particularly in recent years through the efforts of nongovernmental organizations like the International Panel on Fissile Materials6 and advocates like Matthew *Bunn* working within the Obama administration (Bunn and Newman, 2008), though the administration has apparently not seen the need to make the materials as secure as the weapons themselves. Are terrorists even interested in making their own nuclear weapons? A recent paper (Friedman and Lewis, 2014) postulates a scenario by which terrorists might seize nuclear materials in Pakistan for fashioning a weapon. While jihadist sympathizers are known to have worked within the Pakistani nuclear establishment, there is *little to no evidence* that terrorist groups in or outside the region are seriously trying to obtain a nuclear capability. And Pakistan has been operating a uranium enrichment plant for its weapons program for nearly 30 years with no credible reports of diversion of HEU from the plant. There is one stark example of a terrorist organization that actually started a nuclear effort: the Aum Shinrikyo group. At its peak, this religious cult had a membership estimated in the tens of thousands spread over a variety of countries, including Japan; its members had scientific expertise in many areas; and the group was well funded. Aum Shinrikyo obtained access to natural uranium supplies, but the nuclear weapon effort stalled and was abandoned. The group was also interested in chemical weapons and did produce sarin nerve gas with which they attacked the Tokyo subway system, killing 13 persons. Aum Shinrikyo is now a small organization under continuing close surveillance. What about highly organized groups, designated appropriately as terrorist, that have acquired enough territory to enable them to operate in a quasi-governmental fashion, like the Islamic State (IS)? Such organizations are certainly dangerous, but how would nuclear terrorism fit in with a program for building and sustaining a new caliphate that would restore past glories of Islamic society, especially since, like any organized government, the Islamic State would itself be vulnerable to nuclear attack? Building a new Islamic state out of radioactive ashes is an unlikely ambition for such groups. However, now that it has become notorious, apocalyptic pronouncements in Western media may begin at any time, warning of the possible acquisition and use of nuclear weapons by IS. Even if a terror group were to achieve technical nuclear proficiency, the *time, money, and infrastructure* needed to build nuclear weapons creates *significant risks of discovery* that would put the group at risk of attack. Given the ease of obtaining conventional explosives and the ability to deploy them, a terrorist group is unlikely to *exchange a big part of its operational program* to engage in a risky nuclear development effort with such doubtful prospects. And, of course, 9/11 has heightened sensitivity to the need for protection, lowering further the probability of a successful effort.

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