Ardrey Kell RG - Laird Lewis 1AC

Framework:

Because unjust in the resolution is defined as - not based on or behaving according to what is morally right and fair. Oxford Lang My value is Morality

The standard is maximizing expected wellbeing
(Read Cards from AC if needed)

Def (if needed)

OST defines appropriation as occupation, use, or any other means – the aff definitely links

Mallick and Rajagopalan 19, (Senjuti Mallick graduated from ILS Law College, Pune, in 2016. She was a Law Researcher at the High Court of Delhi from 2016 to 2018 and is currently pursuing LL.M in International Law at The Fletcher School of Law and Diplomacy, USA. She has been doing research on Outer Space Law since she was a student at ILS. Presently, she is working on different aspects of Space Law, in particular, Space debris mitigation and removal, and the law of the commons. She has published articles on Space Law in the All India Reporter Law Journal and The Hindu. Dr Rajeswari (Raji) Pillai Rajagopalan is the Director of the Centre for Security, Strategy and Technology (CSST) at the Observer Research Foundation, New Delhi. Dr Rajagopalan was the Technical Advisor to the United Nations Group of Governmental Experts (GGE) on Prevention of Arms Race in Outer Space (PAROS) (July 2018-July 2019). She was also a Non-Resident Indo-Pacific Fellow at the Perth USAsia Centre from April-December 2020. As a senior Asia defence writer for *The Diplomat*, she writes a weekly column on Asian strategic issues. Dr Rajagopalan joined ORF after a five-year stint at the National Security Council Secretariat (2003-2007), Government of India, where she was an Assistant Director. Prior to joining the NSCS, she was Research Officer at the Institute of Defence Studies and Analyses, New Delhi. She was also a Visiting Professor at the Graduate Institute of International Politics, National Chung Hsing University, Taiwan in 2012, "If Space is the 'province of mankind', who owns its resources?"), 1-24-19, Observer Research Foundation, https://www.orfonline.org/research/if-space-is-the-province-of-mankind-who-owns-its-resources-47561/ // MNHS NL

Based on the premise of '**res communis**', the magna carta of space law, the OST, illustrates outer space as "the province of all mankind".[i] Under Article I, **States are free to explore and use outer space and to access all celestial bodies "on the basis of equality and in accordance with international law."[I**[i] Although the **OST does not explicitly mention "mining" activities, under Article II, outer space including the Moon and other celestial bodies are "not subject to national appropriation by claim of sovereignty" through use, occupation or any other means.[Iii]** Furthermore, the Moon Agreement, 1979, not only defines outer space as "common heritage of mankind" but also proscribes commercial exploitation of planets and asteroids by States unless an international regime is established to govern such activities for "rational management," "equitable sharing" and "expansion of opportunities" in the use of these resources.[iii]

I negate the resolution: The appropriation of outer space by private entities is unjust

Contention 1:

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

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

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

Back up for a moment. For the record**, space is already being heavily exploited**, because space resources include non-material assets such as orbital locations and abundant sunlight that enable satellites to provide services to Earth. Indeed, satellite-based telecommunications and global positioning systems have become indispensable infrastructure underpinning the modern economy. Mining space for materials, of course, is another matter. In the past several decades, planetary science has confirmed what has long been suspected: **celestial bodies are potential sources for dozens of natural materials that, in the right time and place, are incredibly valuable.** Of these, water may be the most attractive in the near-term, because — with assistance from solar energy or nuclear fission — H2O can be split into hydrogen and oxygen to make rocket propellant, facilitating in-space refueling. **So-called "rare earth" metals are also potential targets of asteroid miners intending to service Earth markets.** Consisting of 17 elements, including lanthanum, neodymium, and yttrium, these critical materials (most of which are today mined in China at great environmental cost) are required for electronics. And they loom as bottlenecks in making the transition

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

Squo private companies are willing to invest, but without the ability to generate returns, investments will fall out

Shaw 13 - Lauren E, J.D. from Chapman University School of Law, "Asteroids, the New Western Frontier: Applying Principles of the General Mining Law of 1872 to Incentive Asteroid Mining", JOURNAL OF AIR LAW AND COMMERCE, Volume 78, Issue 1, Article 2, https://scholar.smu.edu/cgi/viewcontent.cgi?article=1307&context=jalc // recut MNHS NL

To some, **the mining of asteroids** might sound like the premise of a science fiction novel' or the solution to the heartwrenching, fictional scenario depicted in the film Armageddon.2 To others, it **evokes a fantastical idea that may come to fruition** in a distant reality. **However impressively funded companies have plans to send spacecraft to begin prospecting on asteroids** within the next two years.' **The issues associated with the mining of asteroids should be addressed before these plans are set in motion**. Much has been written about the issues that might arise from allowing nations to own these space bodies and the minerals they contain; one such issue is the impact on international treaties.4 However, little has been written about the applicability of preexisting mining laws-which provide a basic property right scheme for the private sector-such as the General Mining Law of 1872 (Mining Law) to the management of asteroid mining.' The literature to date on how to legally address asteroid mining is minimal.' The **articles** that do address it **propose** the creation of different systems, such as a "property rights-based system that relies on the doctrine of first possession"7 or **an international authority that would regulate mining operations**.' **Implementing a scheme that offers ownership of extracted resources** without bestowing complete sovereignty **is necessary to avoid an impending legal limbo-that is, an outer space "Wild West" equivalent where there is neither certainty nor security in who owns what**.9 **If private sector miners of asteroids know this right** already **exists, they will have more incentive to extract resources**.' 0 **This**, in turn, **would increase the chances of successful missions, resulting in numerous scientific and explorative benefits, along with the potential replenishment of key elements that are becoming**

increasingly depleted on Earth yet are still needed for modern industry. Scientists speculate that **key elements needed for modern industry, including platinum, zinc, copper, phosphorus, lead, gold, and indium, could become depleted on Earth within the next fifty to sixty years**.[11] **Many of these** metals, such as platinum, are chemical elements that, unlike oil or diamonds, **have no synthetic alternative**.[12] Once the reserves on Earth are mined to complete depletion, **industries will be forced to recycle the existing supply of minerals, which will result in increased costs due to increased scarcity**.[13] However, evidence is accumulating that **asteroids only a few hundred thousand miles away from Earth may be composed of an abundance of natural resources-including many of the minerals being mined to depletion on Earth-that could lead to vast profits**.[14] Most of the minerals being mined on Earth, including gold, iron, platinum, and palladium, originally came from the many asteroids that hit the Earth after the crust cooled during the planet's formation.'

Space mining is the only way to solve climate change

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

Going to net zero means that more mining is needed. Experts have said that the current supply cannot support the necessary metals demand for the green transition. As a result, new mining alternatives have gained greater relevance, among them is space mining. Several countries, including Mexico, have shown their interest in this alternative, creating a new space race. "**The solar system can support a billion times greater industry than we have on Earth. When you go to vastly larger scales of civilization, beyond the scale that a planet can support, then the types of things that civilization can do are incomprehensible to us … We would be able to promote healthy societies all over the world at the same time that we would be reducing the environmental burden on the Earth,**" said Dr. Phil Metzger, Planetary Scientist at the University of Central Florida. **Currently, there are several attempts to address global warming and transition to a net zero carbon economy. There has been an increasing interest in renewable energy and infrastructure, which has increased demand for various minerals, especially lithium, cobalt, nickel, copper and rare earth elements.** However, according to experts, **the world is close to entering a metals supercycle, where demand will exceed available supply, causing prices to skyrocket. Consequently, the mining industry has sought alternatives to achieve the required supply**. Options include recycling and improved mine waste management, sea mining and **space mining**. The latter **is considered** one of **the alternatives with the greatest potential.** However, a regulatory framework is still lacking and there is almost no experience in this regard. Despite the lack of knowledge regarding **space mining, it has become a very attractive option since the planet is running out of resources. While some people believe that land-based mining is cheaper than space mining, experts believe this may change in the long term. Furthermore, within the solar system there are countless bodies rich in minerals, ores and elements that will accelerate the fight against climate change. "There will come a point when there is nothing left to mine on the surface, prompting mines to reach even further below. But even those resources are destined to run out and so we will aim toward ocean mining, which already has specific technologies that are being developed.** Nevertheless, even those mines are limited as well. The mine of the future, which today may seem unlikely, will no longer be on our planet. **There will be a time when space mining will be as common as an open leach mine,**" Eder Lugo, Minerals Head at

Siemens, told MBN. More than 150 million asteroids measuring approximately 100m are believed to be in the inner solar system alone. **In addition, astronomers have also identified abundant minerals near the Earth's space and the Main Asteroid Belt.** There are three main groups into which asteroids are divided: C- type, S- type, and M- type. **The last two groups are the most abundant in minerals such as gold, platinum, cobalt, zinc, tin, lead, indium, silver, copper and rare earth metals. "Energy is limited here.** Within just a few hundred years, you will have to cover all of the landmass of Earth in solar cells. So, what are you going to do? Well, what I think you are going to do is you are going to move out in space … all of our heavy industry will be moved off-planet and Earth will be zoned residential and light-industrial," said Jeff Bezos, Founder of Amazon and the Space Launch Provider Blue Origin.

Warming causes extinction

Krosofsky '21 [Andrew, Green Matters Journalist, "How Global Warming May Eventually Lead to Global Extinction", Green Matters, 03-11-2021, https://www.greenmatters.com/p/will-global-warming-cause-extinction]//pranav

Eventually, yes. **Global warming will invariably result in the mass extinction of millions of different species,** humankind included. In fact, **the Center for Biological Diversity says that global warming is currently the greatest threat to life on this planet**. **Global warming causes a number of detrimental effects on the environment that many species won't be able to handle long-term**. Extreme weather patterns are shifting climates across the globe, eliminating habitats and altering the landscape. **As a result, food and fresh water sources are being drastically reduced**. Then, of course, **there are the rising global temperatures themselves, which many species are physically unable to contend with**. Formerly frozen arctic and antarctic regions are melting, increasing sea levels and temperatures. Eventually, **these effects will create a perfect storm of extinction conditions**. The melting glaciers of the arctic and the searing, **unmanageable heat indexes being seen along the Equator are just the tip of the iceberg, so to speak. The species that live in these climate zones have already been affected by the changes caused by global warming.** Take polar bears for example, whose habitats and food sources have been so greatly diminished that they have been forced to range further and further south. **Increased carbon dioxide levels in the atmosphere and oceans have already led to ocean acidification**. **This has caused many species of crustaceans to either adapt or perish and has led to the mass bleaching of more than 50 percent of Australia's Great Barrier Reef**, according to National Geographic. According to the Center for Biological Diversity, the current trajectory of global warming predicts that more than 30 percent of Earth's plant and animal species will face extinction by 2050. By the end of the century, that number could be as high as 70 percent. We won't try and sugarcoat things, humanity's own prospects aren't looking that great either. According to The Conversation, **our species has just under a decade left to get our CO_2 emissions under control. If we don't cut those emissions by half before 2030, temperatures will rise to potentially catastrophic levels. It may only seem like a degree or so, but the worldwide ramifications are immense.** The human species is resilient. We will survive for a while longer, even if these grim global warming predictions come to pass, **but it will mean less food, less water, and increased hardship across the world — especially in low-income areas and developing countries. This increase will also mean more pandemics, devastating storms, and uncontrollable wildfires.**

Contention 2:

CP: The appropriation of outer space by private entities is unjust in all instances except Active Debris Removal. (1:28)

Governments ought to permit the appropriation of outer space for designated safety zones for active debris removal by private entities.

Debris removal is necessary and only private entities have the incentive and capability to do it. Affirming forecloses the possibility.

Giordano 21 (David Giordano is the Vice President of Mentorship for CBLA. Elsewhere at Columbia Law School, he serves on the Columbia Journal of Transnational Law, and is the Treasurer of Columbia OutLaws. During his 1L Summer, David was an intern at the Securities and Exchange Commission's Division of Corporation Finance. Prior to law school, David worked as a Corporate Paralegal at the New York office of Cleary Gottlieb Steen & Hamilton LLP. David attended The George Washington University where he obtained a B.A. in psychology. "Space Debris: Another Frontier in the Commercialization of Space". October 31, 2021.)

As **satellites** and other projectiles blast into orbit, upon collision they **can disintegrate into** shards, sometimes just centimeters wide, that remain in orbit, risking further collision. Hollywood captured the potential perils of **fairly large pieces of space debris** in the opening minutes of the 2013 film *Gravity*, where space junk threatens the lives of astronauts on a mission. Outside the realms of fictional space-thrillers, **even the smallest pieces of space junk can present real danger**. In 2016, a tiny piece of **space junk**, believed to be a paint chip or a piece of metal no more than a few thousandths of a millimeter across, cracked the window of the International Space Station. In May 2021, a piece of space **debris** punctured **the robotic arm of the I**nternational **S**pace **S**tation. This is seriously concerning, as, according to the European Space Agency, there are 670,000 pieces of space debris larger than 1cm and 170,000,000 between 1mm and 1cm in width. Unfortunately, **public action and policy struggles to keep up with these risks**. International law affords little clarity on the problem, as its control is a novel, emerging field with many technical tracking and removal challenges. **None of the existing space treaties** directly tackle the issue, rendering responsibility for it ambiguous. Absent such responsibility, legal incentives are non-existent. Guidelines are occasionally issued by international governing bodies, but provide little legal significance and are more targeted at the practicalities of tracking and removal. The nation best positioned to notify space actors of collision risks is the United States, and the burden of that task currently falls on the Department of Defense. However, the Trump administration issued a directive in 2018, shifting the responsibility from the DoD to the Department of Commerce, and the transition has yet to materialize, leaving DoD struggling to keep pace with increasing commercial activity. **In the face of public paralysis, addressing the problem through industry looks more and more attractive.** This has led some to call for a new legal order that still leaves room for government, but reframes who the rules exist to serve. Rather than our current, rudimentary treaty regime designed to prevent international conflict, commentators have called for an additional regime resembling maritime law that preserves the interests of a more diverse set of stakeholders, including those in the future that can bring technology and interests to space that may not yet exist. These commentators shun the common conception that space regulation should resemble air-traffic control, which is suited to a narrower set of uses (transport). Under such a "maritime" regime, the light touch of central regulatory bodies, and perhaps their non-existence, is preferred, just as it has been on the seas. This way, individual nations have a degree of flexibility in instituting controls they see fit while leaving room for industry to address problems and introduce new uses for space. Furthermore, **governments seem ready and willing to construct the legal and incentive framework in concert with such private action.** In a joint statement this summer, **G7 members expressed openness to resolving** the technical aspects of the **debris** problem **with private institutions, and there is** some **promising progress**. Apple co-founder Steve Wozniak signaled his plans to address the problem through a new company with a telling name: Privateer Space. **Astroscale**, a UK-based company, successfully **launched a pair of satellites** in the Spring of 2021 that will remove certain space debris from orbit. Astroscale also stated their desire to work with governments and international governing bodies to craft policy with private efforts to control the problem top of mind. In light of public policy's silence on space debris, the initiative of actors like Astroscale involving themselves in policy may be advised, as it could promote further private investment in technology for space **debris removal**. A popular policy recommendation among experts is the establishment of public-private partnerships, and Astroscale has entered several such agreements including with Japan and the European Space Agency. Other **actors**

include ClearSpace, OneWeb, **and** D-Orbit. Some may want to push back against further private involvement. The congestion of space is, in part, industry's fault, and if we conceptualize orbital space as a common resource, it might be right to fear the effects of the Tragedy of the Commons. Critics may seek to bolster international treaties, give legal teeth to the guidelines occasionally issued by the UN, and preserve the public posture of the heavens. These may be welcome adjustments, but unlike a pond that industry overfishes or a well that industry dries up, here industry is working to add more fish and water. Moreover, governments stand to benefit from this private decluttering, as well, as they are expected to be major customers of some of these private actors. As for the public posture, space has long been a commercial place. Telecommunications companies and government contractors historically depend on space. As the number of commercial satellites set to launch skyrockets, it seems natural to craft policies that are responsive to their interests and provide incentives to remedy issues created in the course of spacefaring, such as space debris. **In light of the** long silence of international law on such issues and the demonstrated **motivation by private actors**, **space debris represents the latest frontier in the abdication of space from the public concern to the private.**

Increased space debris makes future space exploration impossible- quick removal is key

Webb 18 [(Amy Webb is a professor at the NYU Stern School of Business and is the chief executive of the Future Today Institute, a strategic foresight and research group in Washington, D.C.), "Space Oddities: We Need a Plan to Stop Polluting Space Before It's Too Late" WIRED Science April 12, 2018 https://www.wired.com/story/we-need-a-plan-to-stop-polluting-space-before-its-too-late/] TDI

Space is our next dumping ground. As many as **170 million fragments of metal and astro debris necklace Earth.** That includes 20,000 pieces larger than a softball, and 500,000 about the size of a marble, according to NASA. Old satellites, like Tiangong-1, are the biggest and highest-profile lumps of rubbish, but most of it comes from rocket parts and even lost astronaut tools. **Size doesn't always matter—a fleck of paint, orbiting at a high velocity, cracked the Space Shuttle's windshield.** This **debris will pose a navigation hazard for many centuries to come**. At least 200 objects roar back into the atmosphere each year, including pieces of solar panels and antennas and **fragments** of metal. All of them **pose dangers for** future **astronauts**. **One plum-sized piece of gnarled space trash traveling faster than a speeding bullet could rip a five-foot hole into a spacecraft.** And that collision, then, would hatch its own spectacle of shrapnel, which would join the rushing river of junk already circling the planet. It's not just Americans doing the dumping. China and Russia each have dozens of decommissioned satellites overhead, though the US certainly does it with style. Like everyone, I marveled at the successful launch of SpaceX's Falcon Heavy rocket, whose cargo included Elon Musk's Tesla Roaster and a mannequin driver named Starman. I'll admit, I teared up listening to David Bowie as the rockets separated from the payload. It was an incredible technological achievement, one proving that the system could someday transport people and goods—perhaps real cars, and real people—into space. Now that Tesla and its driver are overhead, in America's junkyard in the sky. To be sure, space is big. Really big. Most debris soars about 1,250 miles above the Earth's surface, so you have better odds scoring a seat on Virgin Galactic's maiden voyage than witnessing Starman crash into your next door neighbor's house. But it's our behavior back here on Earth—our insistence on sending things up, without really thinking how to safely contain or send them back down—that should concern you. We weren't always so short-sighted. Ancient Native Americans lived by the Seventh Generation Principal, a way of long-term thinking that considered how every decision would affect their descendants seven generations into the future. In Japan, Buddhist monks devoted part of their daily rituals and work to ensuring the longevity of their communities, even planting and tending to bamboo forests, which would eventually be harvested, treated and used to repair temple roofs many decades hence. With each new generation, we live life faster than our ancestors. As a result, we spend less time thinking about the farther future of humanity. **We now have our sights set on colonizing** Mars, mining asteroids for research and commerce, **and venturing out to the furthest reaches of our galaxy. Space is no longer the final frontier; we're already exploring it. Our current approach is about getting there**, rather than considering what "getting there" could mean for future generations of humans, not to mention other life in the universe. Where all that junk winds up isn't something we can predict accurately. We could be unintentionally wreaking havoc on civilizations far away from Earth, catalyzing future intergalactic wars. Or, we might cause far less scintillating problems. Space junk could start to behave in unpredictable ways, reflecting sunlight the wrong direction, or changing our atmosphere, or impacting the universe in ways that don't fit into our current understanding of physics. Last week—30 years after my friends and I created an imaginary net to capture space debris—SpaceX launched RemoveDEBRIS, its own prototype, an experimental net to collect junk in orbit. It's a neat idea, but even as middle schoolers, we knew it was an impractical one. Individual nets can't possibly scale to address the hundreds of millions of particles of debris already in orbit. The challenge is that all of our space agencies are inextricably tied to national governments and militaries. Seeking a global agreement on how to mitigate debris would involve each country divulging exactly what it was launching and when—an unlikely

scenario. **The private sector could collaborate to build grand-scale orbital cleaners**, but their commercial interests are driven by immediate launches. Given all the planned launches in our near future, we don't have much time to wait. We must learn to be better stewards of our own planet—and commit to very long-term thinking—before we try to colonize any others.

Removing debris is a prerequisite to all space travel since its presence presents a massive occupational hazard.

Case:

Contention 1

The OST is falling apart, nations will be able to go do what they want in space soon enough

Ward 19

https://www.sciencefocus.com/space/the-unintended-consequences-of-privatising-space/

Imagine a colony on the Moon or Mars run by a corporation. That one company would control everything the colonists need to survive, from the water to the oxygen to the food. That's a dangerous amount of power for any company, but it's a very real scenario. So what stops a major corporation landing on the Moon and setting up a colony? One very old document. **The Outer Space Treaty was signed in 1967 by all of the major space-faring nations, and explicitly states nobody can go to another planet or the Moon and claim that territory for their own. It's a very important document, but it's flawed**. For one thing, the private space sector wasn't around when the treaty was written so **it's not clear how some of the rules would be applied to private companies. And secondly, given the ambitions of many countries and corporations, there's no way it's going to last much longer. Anyone with a plan to land on the Moon or Mars and stay there is going to run into the Outer Space Treaty, and the smart money is on the wealthy and powerful winning out against an old loophole-ridden document.** Politicians such as Ted Cruz in the United States have already called for changes to be made to the treaty, and given the increasing amounts of money private space companies spend on lobbying in the United States, more such attempts will follow. It's imperative that the space community as a whole takes this issue on to ensure the needs of all, and not just the private sector, are taken into account should any alterations be made. The further we look into the future of humans in space, the more reality resembles science fiction. That's why it's difficult to make people take the issues which could potentially arise seriously. But **now is the time to consider the problems that could arise from a commercially-led space race, and take the necessary small steps now to avoid potentially disastrous consequences in the future**.

Contention 2

Rockets getting cleaner

Clean Space Travel is possible, but only private entities are leading the innovative charge.

https://astronomy.com/news/2019/10/nasa-paying-four-companies-to-learn-how-to-make-fuel-on-the-moon
NASA is paying companies to get clean liquid Oxygen fuel from Lunar Regolith, but it relies on mining

https://www.space.com/biofuel-powered-rockets-reduce-spaceflight-carbon-footprint
British Startups Skyrora and Orbex are working on making biofuels to make spaceflight green. Their prototype reduced emissions by 86%

https://hothardware.com/news/australian-space--junk-recycling-start-up-aims-to-make-rocket-fuel-cleaning-up-earths-orbit
Australian startup Newmann is working on renewable, electric propulsion systems, while simultaneously cleaning the orbit of space junk and dead sats.

https://www.forbes.com/sites/afdhelaziz/2020/10/27/from-vodka-to-space-flight-air-co-launches-sustainable-rocket-fuel-to-help-us-get-to-marsand-beyond/?sh=335d20232e4c
American company AirCompany has won multiple awards from NASA for their renewable rocket fuel conversions

Link Turn: Only Private Companies are interested in making their fuel green, Russia and China prove they still burn.

Aziz 20

However, **in the fight to protect the environment while furthering space exploration, organizations like SpaceX and Blue Origin have begun to look for new propellants for their rocket engines for commercial spaceflight** and Mars exploration.

1] Time frame – Kessler effect 200 years away

Stubbe 17 [(Peter, PhD in law @ Johann Wolfgang Goethe University Frankfurt) "State Accountability for Space Debris: A Legal Study of Responsibility for Polluting the Space Environment and Liability for Damage Caused by Space Debris," Koninklijke Brill Publishing, ISBN 978-90-04-31407-8, p. 27-31] TDI

The prediction of possible scenarios of the future evolution of the debris p o p ulation involves many uncertainties. Long-term forecasting means the prediction of the evolution of the future debris environment in time periods of decades or even centuries. Predictions are based on models84 that work with certain assumptions, and altering these parameters significantly influences the outcomes of the predictions. Assumptions on the future space traffic and on the initial object environment are particularly critical to the results of modeling efforts.85 A well-known pattern for the evolution of the debris population is the so-called Kessler effect', which assumes that there is a certain collision probability among space objects because many satellites operate in similar orbital regions. These collisions create fragments, and thus additional objects in the respective orbits, which in turn enhances the risk of further collisions. Consequently, the num ber of objects and collisions increases exponentially and eventually results in the formation of a self-sustaining debris belt aroundthe Earth. While it has long been assumed that such a process of collisional cascading is likely to occur only in a very long-term perspective (meaning a time 1 n of several hundred years),87 a consensus has evolved in recent years that an uncontrolled growth of the debris population in certain altitudes could become reality much sooner.88 In fact, a recent cooperative study undertaken by various space agencies in the scope of i a d c shows that the current l e o debris population is unstable, even if current mitigation measures are applied. The study concludes: Even with a 90% implementation of the commonly-adopted mitigation measures [...] the l e o debris population is expected to increase by an average of 30% in the next 200 years. The population growth is primarily driven by catastrophic collisions between 700 and 1000 km altitudes and such collisions are likely to occur every 5 to 9 years.

2] No risk of a debris impact---

Stuff blows up in space all the time, and almost none of it involves objects we care about---robust modeling found a .001% chance of collisions---that's Wein

Probability – 0.1% chance of a collision.

Salter 15 – Assistant Professor of Economics & Comparative Economics Research Fellow at Texas Tech University

Alexander W. Salter, Space Debris: A Law and Economics Analysis of the Orbital Commons, Mercatus Working Paper, Mercatus Center at George Mason University, 19 STAN. TECH. L. REV. 221 (2016), https://law.stanford.edu/wp-content/uploads/2017/11/19-2-2-salter-final_0.pdf

*numbers replaced with English words

The probability of a collision is currently **low**. Bradley and Wein estimate that the **maximum probability** in LEO of a collision over the lifetime of a spacecraft remains **below one in one thousand**, conditional on

continued compliance with NASA's deorbiting guidelines.3 However, the possibility of a future "snowballing" effect, whereby debris collides with other objects, further congesting orbit space, remains a significant concern.4 Levin and Carroll estimate the average immediate destruction of wealth created by a collision to be approximately $30 million, with an additional $200 million in damages to all currently existing space assets from the debris created by the initial collision.5 The expected value of destroyed wealth because of collisions, currently small because of the low probability of a collision, can quickly become significant if future collisions result in runaway debris growth.

3] Space is huge---nothing will collide

Albrecht 16 – Chairman of the board of USSpace LLC & fmr. head of the National Space Council

Mark Albrecht, chairman of the board of USSpace LLC, head of the White House National Space Council from 1989 to 1992, and Paul Graziani, CEO and founder of Analytical Graphics, a company that develops software and provides mission assurance through the Commercial Space Operations Center (ComSpOC), Congested space is a serious problem solved by hard work, not hysteria, 2016, https://spacenews.com/op-ed-congested-space-is-a-serious-problem-solved-by-hard-work-not-hysteria/

There are over a half million pieces of human-made material in orbit around our planet. Some are the size of school buses, some the size of BB gun pellets. They all had a function at some point, but now most are simply space debris littered from 100 to 22,000 miles above the Earth. Yet, all behave perfectly according to the laws of physics. Many in the space community have called the collision hazard caused by space debris a crisis. Popular culture has embraced the risks of collisions in space in films like Gravity. Some participants have dramatized the issue by producing graphics of Earth and its satellites, which make our planet look like a fuzzy marble, almost obscured by a dense cloud of white pellets meant to conceptualize space congestion. Unfortunately, for the sake of a good visual, satellites are depicted as if they were hundreds of miles wide, like the state of Pennsylvania (for the record, there are no space objects the size of Pennsylvania in orbit). Unfortunately, this is the rule, not the exception, and almost all of these articles, movies, graphics, and simulations are **exaggerated and misleading**. Space debris and collision risk is real, but it **certainly** is **not a crisis.** So what are **the facts?** On the positive side, space is **empty** and it is **vast**. At the altitude of the **International Space Station**, **one half a degree** of Earth longitude is almost **40 miles long**. That same **one half a degree at geo**stationary orbit, some 22,000 miles up is **over 230 miles long**. Generally, **we don't** intentionally **put satellites closer together than one-half degree**.

4] Tracking debris exists now and solves collisions.

Mosher ’19 [Dave; September 3rd; Journalist with more than a decade of experience reporting and writing stories about space, science, and technology; Business Insider, “Satellite collisions may trigger a space-junk disaster that could end human access to orbit. Here’s How,” https://www.usafa.edu/app/uploads/Space_and_Defense_2_3.pdf; GR]

The **Kessler syndrome** plays center-stage in the movie "Gravity," in which an accidental **space collision** endangers a crew aboard a large space station. But Gossner said that type of a runaway **space-junk catastrophe** is **unlikely**. "Right now I don't think we're **close to that**," he said. "I'm not saying we couldn't get there, and I'm not saying we don't need to be smart and manage the problem. But I don't see it **ever** becoming, anytime soon, an unmanageable problem." There is no current system to remove old satellites or sweep up bits of debris in order to prevent a Kessler event. Instead, space debris is monitored from Earth, and new rules require satellites in low-Earth orbit be deorbited after 25 years so they don't wind up adding more space junk. "Our current plan is to manage the problem and not let it get that far," Gossner said. "I don't think that we're even close to needing to **actively remove** stuff. There's lots of research being done on that, and maybe some day that will happen, but I think that — at this point, and in my humble opinion — an unnecessary expense." A major part of the effort to prevent a Kessler event is the **S**pace **S**urveillance **N**etwork (SSN). The project, led by the **US military**, uses **30** different systems around the **world** to **identify**, **track**, and share **info**rmation about **objects** in space. Many objects are tracked **day and night** via a network of radar observatories around the globe. Optical telescopes on the ground also keep an eye out, but they aren't always run by the government. "The commercial sector is actually putting up lots and lots of telescopes," Gossner said. The government pays for their debris-tracking services. Gossner said one major debris-tracking company is called **Exoanalytic**. It uses about 150 small telescopes set up around the globe to **detect**, **track**, and **report** space debris to the SSN. Telescopes in space track debris, too. Far less is known about them because they're likely top-secret military satellites. Objects detected by the government and companies get added to a **catalog** of space debris and **checked** against the orbits of other known bits of **space junk**. New orbits are calculated with **supercomputers** to see if there's a **chance** of **any collisions**. Diana McKissock, a flight lead with the US Air Force's 18th Space Control Squadron, helps track space debris for the SSN. She said the surveillance network issues warnings to NASA, satellite companies, and other groups with spacecraft, based on two levels of emergency: basic and advanced. The SSN issues a basic emergency report to the **public three days ahead** of a 1-in-10,000 chance of a **collision**. It then provides **multiple updates** per day until the risk of a collision **passes**. To qualify for such reporting, a rogue object must come within a certain distance of another object. In low-Earth orbit, that distance must be less than 1 kilometer (0.62 mile); farther out in deep space, where the precision of orbits is less reliable, the distance is less than 5 kilometers (3.1 miles). Advanced emergency reports help satellite providers see possible collisions much more than **three days ahead**. "In **2017**, we provided **data** for **308,984 events**, of which only **655** were **emergency**-reportable," McKissock told Business Insider in an email. Of those, 579 events were in low-Earth orbit (where it's relatively crowded with satellites).

Contention 3

8] No ‘space war’ – Insurmountable barriers and everyone has an interest in keeping space peaceful

Dobos 19 [(Bohumil Doboš, scholar at the Institute of Political Studies, Faculty of Social Sciences, Charles University in Prague, Czech Republic, and a coordinator of the Geopolitical

Studies Research Centre) “Geopolitics of the Outer Space, Chapter 3: Outer Space as a Military-Diplomatic Field,” Pgs. 48-49] TDI

Despite the **theorized potential for the achievement of the terrestrial dominance throughout the utilization of the ultimate high ground and the ease of destruction of space-based assets by the potential space weaponry, the utilization of space weapons is with current technology and no effective means to protect them far from fulfilling this potential** (Steinberg 2012, p. 255). **In current global international political and technological setting, the utility of space weapons is very limited,** even if we accept that the ultimate high ground presents the potential to get a decisive tangible military advantage (which is unclear). **This stands among the reasons for the lack of their utilization so far**. Last but not the least, it must be pointed out that **the states also develop passive defense systems designed to protect the satellites on orbit or critical capabilities they provide. These further decrease the utility of space weapons**. These systems include larger maneuvering capacities, launching of decoys, preparation of spare satellites that are ready for launch in case of ASAT attack on its twin on orbit, or attempts to decrease the visibility of satellites using paint or materials less visible from radars (Moltz 2014, p. 31). **Finally, we must look at the main obstacles of connection of the outer space and warfare. The first set of barriers is comprised of physical obstructions**. As has been presented in the previous chapter, **the outer space is very challenging domain to operate in. Environmental factors still present the largest threat to any space military capabilities if compared to any man-made threats** (Rendleman 2013, p. 79). **A following issue that hinders military operations in the outer space is the predictability of orbital movement. If the reconnaissance satellite's orbit is known, the terrestrial actor might attempt to hide some critical capabilities-an option that is countered by new surveillance technique**s (spectrometers, etc.) (Norris 2010, p. 196)-**but the hide-and-seek game is on.** This same principle is, however, in place for **any other space asset-any nation with basic tracking capabilities may quickly detect whether the military asset or weapon is located above its territory or on the other side of the planet and thus mitigate the possible strategic impact of space weapons not aiming at mass destruction. Another possibility is to attempt to destroy the weapon in orbit. Given the level of development for the ASAT technology, it seems that they will prevail over any possible weapon system for the time to come. Next issue**, directly connected to the first one, **is the utilization of weak physical protection of space objects that need to be as light as possible to reach the orbit and to be**

able to withstand harsh conditions of the domain. This means that their protection against ASAT weapons is very limited, and, **whereas some avoidance techniques are being discussed, they are of limited use in case of ASAT attack. We can thus add to the issue of predictability also the issue of easy destructibility of space weapons and other military hardware** (Dolman 2005, p. 40; Anantatmula 2013, p. 137; Steinberg 2012, p. 255). Even if the high ground was effectively achieved and other nations could not attack the space assets directly, there is still a need for communication with those assets from Earth. There are also ground facilities that support and control such weapons located on the surface. **Electromagnetic communication with satellites might be jammed or hacked and the ground facilities infiltrated or destroyed thus rendering the possible space weapons useless** (Klein 2006, p. 105; Rendleman 2013, p. 81). This issue might be overcome by the establishment of a base controlling these assets outside the Earth-on Moon or lunar orbit, at lunar L-points, etc.-but **this perspective remains, for now, unrealistic.** Furthermore, **no contemporary actor will risk full space weaponization in the face of possible competition and the possibility of rendering the outer space useless. No actor is dominant enough to prevent others to challenge any possible attempts to dominate the domain by military means**. To quote 2016 Stratfor analysis, "(a) war in space would be devastating to all, **and preventing it, rather than finding ways to fight it, will likely remain the goal**" (Larnrani 20 16). This stands true unless some space actor finds a utility in disrupting the arena for others.