# CP

TEXT: The appropriation of outer space by private entities is unjust unless The Outer Space Treaty is amended to establish an international legal trust system governing outer space. The Legal trust would include private property rights and would ensure the sustainable development as well as the equitable distribution of space resources.

Finoa ’20 – Ivan Finoa [Department of Law, University of Turin], “An international legal trust system to deal with the new space era,” 71st International Astronautical Congress (IAC) – The CyberSpace Edition, (12-14 October 2020). <<https://d1wqtxts1xzle7.cloudfront.net/66728932/_IAC_20_E7.VP.8.x58518_An_international_legal_trust_system_to_deal_with_the_new_space_era_BY_IVAN_FINO-with-cover-page-v2.pdf?Expires=1642044926&Signature=asvt6StaK5n9UnpXuJIlo4ziI839WzFYjDZy37bm70ObGy3vFJyHwWNGxhn2beze4QzYDPPX0pVEXAwYvDaINVNxN01Ify8YwG5loNRddlat-grf3iawic7KvwqPowxFe2GuemVvbB-KW8ZVBxigwS-gelSKIVy4KYR9UgiDrM6e6deEBnUTcULSwmsH-JdHNg13ytZ3vNVMMlxZW2MPOCRuB2WlOHdCLoC86VqafSoMwuec-d~Aisbgyt5F2vO-GjvI60bR7h2MSp0iT6P7apIDUUpHUsDGbvcdxp22HSxXdlvr7lSqtLnL5rKxujGDYq~R9B~WuGiorVL2hn74UQ__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA>>CT

Considering the worsening climate change, in the future outer space might be our last Noah’s Ark. Now, humans must look to space as an opportunity to support growing resource requirements. Asteroids are rich in metals, which could be transported back to Earth. Unfortunately, the existing international legal framework discourages investments in the space economy. Once an enterprise invests billions of dollars in discovering and developing a mining site, it cannot claim any ownership because of the non-appropriation principle stipulated in Article 2 of the Outer Space Treaty (OST). Thus, other entities could legally access and exploit the same resource without any participation in the initial financial investment, increasing the risk of potential conflict. Bearing this in mind, the question arises, which legal regime could ensure effective allocation of resources, avoiding a chaotic space race to acquire valuable assets? The aim of this research is to argue that the first two articles of OST should be amended, to set up an international legal trust system which would guarantee different kinds of rights, dependently on the nature of the celestial body. E.g., property rights could be preferable to a lease over asteroids, as they could be exploited to their disappearance. This proposed system would be led by the United Nations Office for Outer Space Affairs (UNOOSA), as the main trustee. The co-trustees would be the nations of the world. Prior to initiating any space activity, every entity would send a request to their national government. If all the legal parameters are respected, the nation would forward the operational request to the UNOOSA. In the case of acceptance, UNOOSA would record the permit on an international public registry. The country in which the company has been registered would investigate whether the activities of its national company are consistent with the permit. This would be the ordinary model. The extraordinary model would be when the applicant for the space activity is a state, then the trustee would be the UN. All lucrative activities would be subject to benefit-sharing. Finally, this research will demonstrate the valuable outcome of the International Legal Trust System and its advantages for all humankind. Private companies would rely on property rights, while the benefit-sharing could be used to finance the 17 Sustainable Development Goals adopted by the UN in 2015, which address peace, climate change, inequalities and poverty.

# Debris DA

#### It’s now or never to clean up debris, but only private companies are capable of making a dent.

Nitin **Sreedhar, 21** - ("The race to clean up outer space," Mintlounge, 16-01-2021, 10-10-2021https://lifestyle.livemint.com/news/big-story/the-race-to-clean-up-outer-space-111610719274127.html)//AW

Space debris poses a danger not only to exploration missions but also to newer activities such as private space tourism. In the near future, space travel will be open to individuals. Companies like Virgin Galactic hope to make space tourism affordable—but space junk presents a unique risk. “It’s getting bigger and bigger. Current data says there are some 3,000 dead satellites and a little over 30,000 pieces of junk which are larger than 10cm in size. The number is critical,” says Jahnavi Phalkey, science and technology historian and director of Science Gallery Bengaluru. “It’s dangerous also to newer missions. The speed at which these things travel, it could damage a new satellite, a manned-space mission or the International Space Station (ISS), where you actually have people living,” she says on the phone. There are very real fears that there may be so much space debris soon that it could inhibit new launches. In fact, the Kessler Syndrome, a term proposed by astrophysicist and former Nasa scientist Donald J. Kessler in 1978, describes a situation where the amount of man-made space debris reaches such a critical point that just one instance of collision between space debris could lead to a cascade of collisions—and ultimately, a runaway chain reaction. Think of it as a domino effect in space. The ESA’s Annual Space Environment Report, released in September, notes that while the amount of mission-related objects, such as payloads and rockets, released into space since the 1960s is declining steadily, the number of pieces, the debris’ combined mass and area has only grown. This has resulted in “involuntary collisions” between operational payloads and space debris. After a point, even limiting the number of new space launches will not help. Collisions between existing debris will continue to produce more pieces of space junk. In 1978, astrophysicist and former Nasa scientist Donald J. Kessler described a situation where the amount of man-made space debris could reach such a critical point that just one instance of collision between space debris could lead to a cascade of collisions. (Photo credit: ESA) This is something space missions in certain Earth orbits already have to factor in daily, says Stijn Lemmens, a senior space debris mitigation analyst at ESA’s Space Debris Office in Darmstadt, Germany. “In particular in low Earth orbits, i.e. orbits with an altitude below 2,000km above Earth’s surface, missions need to be prepared to receive, and in some cases act when the risk of collision is too high.... For example, in ESA’s fleet this implies on average one collision avoidance manoeuvre per satellite per year, and a 24 hours by 7 days monitoring of the risk,” Lemmens explains on email. The ISS, for instance, has had to make 28 collision avoidance manoeuvres since 1999, data from Nasa’s Orbital Debris Program Office shows; this includes three such manoeuvres last year. It’s almost like avoiding a rogue vehicle on a highway that might hit you head on. The fact that these have to be done more frequently now only highlights how severe the problem has become. Space-faring nations around the world have begun to acknowledge the issue, while some startups and private companies are devising technologies to deal with space waste. A different kind of race is unfolding now: a race to clean up space. ClearSpace SA, a Switzerland-based startup founded in 2018, is aiming to launch the world’s first active debris removal mission in collaboration with ESA by 2025. The mission, which actually hopes to remove a piece of space debris, will be the first of its kind. In India, a young Bengaluru-based space startup, Digantara Research and Technologies, is working on setting up orbit debris tracking and monitoring services. Japanese company Astroscale’s ELSA-d mission, all set to launch from Kazakhstan’s Baikonur Cosmodrome in March, hopes to demonstrate multiple ways of capturing and removing defunct objects from orbit. Another company from Japan, Sumitomo Forestry, working with researchers from Kyoto University, is hoping to develop and launch the world’s first wooden satellites, called LignoSat, by 2023 to cut down on space junk. They believe these satellites, made from wooden material that is highly resistant to temperature and harsh environments, will burn up during re-entry, without releasing harmful elements into the atmosphere. The Indian Space Research Organisation (Isro) has also firmed up its space situational awareness capabilities—knowing the exact location of your space assets, tracking and predicting any possible threats—in recent months, launching a dedicated centre and project to protect its space assets from debris. One of the worst space collisions occurred in February 2009 when two communications satellites collided approximately 800km above Siberia. One of them was a decommissioned Russian communications satellite, Cosmos (Kosmos) 2251, the other a still-functioning US commercial communications satellite, Iridium 33. Their combined weight was around 1,560kg. The collision produced around 2,000 pieces of space debris. While some of the trackable satellite fragments eventually re-entered Earth’s atmosphere and burnt up, this accidental hypervelocity, or high-speed collision of two orbiting satellites, became a prime example of the threat that space debris poses to functioning satellites and other spacecraft. Anti-satellite (Asat) testing, which involves intercepting and destroying a satellite, as well as destruction of spacecraft that are no longer operational, has contributed to the problem. China’s 2007 Asat test on one of its own old weather satellites, the Fengyun-1C, created some 3,000 fragments of space debris. In March 2019, India conducted a similar Asat test demonstration, dubbed Mission Shakti, using a ballistic missile to destroy its Microsat-R satellite. The demonstration reportedly created more than 400 pieces of debris, most of which re-entered the atmosphere. India currently has 100 active and defunct spacecraft in orbit and 121 spent rocket bodies and catalogued debris, according to Nasa’s November 2020 Orbital Debris Quarterly News, which publishes the latest in orbital debris research, including data from the US Space Surveillance Network. Figures from 2019 indicate that India had 163 rocket bodies and pieces of debris in space. Explosions caused by leftover batteries and energy sources in rockets and spacecraft too cause more fragments to scatter in space. (Photo credit: ESA) ESA has noted that explosions caused by leftover batteries and energy sources in rockets and spacecraft too cause more fragments to scatter in space. As is the case every year, hundreds of space missions and rocket launches are planned for 2021. China’s main space contractor, the China Aerospace Science and Technology Corporation, is aiming for 40 orbital launches this year. Isro is not only planning its Chandrayaan-3 launch this year, it also hopes to execute India’s first manned mission in December. Kessler’s “collision cascading” scenario becomes an important factor here. “It is difficult to predict when we will reach, or indeed if we have already crossed the point that certain regions (in space) become too cluttered with space debris to effectively use them,” says Lemmens. “However, it is clear that our current global practices of leaving too many objects stranded in orbit or at risk of explosion are not sustainable, and that once the point of ‘too much’ is reached, it will be very hard to undo it.” Cleaning up the mess There appears to be no single solution to the problem of exponential increase in space debris. But initiatives like ClearSpace SA are trying to tackle the problem. In December, ESA signed an €86 million (around ₹766 crore) contract with an industrial team of companies led by ClearSpace to purchase the world’s first active debris removal mission, ClearSpace-1, scheduled to be launched in 2025. Apart from the Swiss outfit, the industrial team includes companies from European countries like the Czech Republic,Germany, Sweden, Poland, Portugal and Romania. The UK too is part of the exercise. “ClearSpace’s goal is to bring in a solution to clean (space debris) and prevent this exponential (growth). We want to make sure that we never get to the full end of that exponential. Where we are today, collisions between space debris will keep on happening,” says Muriel Richard-Noca, co-founder of ClearSpace SA, in a video call from Lausanne. “We want to diminish that effect as much as we can. We are at the point where, if we don’t do anything today, there will be big consequences tomorrow. If we don’t start cleaning now, in a few decades it is going to be really hard for us to place more satellites in space.” The ClearSpace-1 chaser spacecraft will attempt to rendezvous and capture a piece of space debris with the help of four robotic arms. (Photo: ClearSpace SA) The ClearSpace-1 chaser spacecraft will initially be launched into a lower 500km orbit. It will then be raised to a target orbit of 660km, where it will attempt to rendezvous and capture the upper part of a Vespa (or Vega Secondary Payload Adapter), which was used for a rocket launch in 2013, with the help of four robotic arms. This object, which weighs around 112kg ( almost as much as a small satellite), has been in a “gradual disposal” orbit—where satellites or objects are placed when they are no longer operational. Once it has been captured, both the piece of debris and chaser spacecraft will de-orbit and burn up during re-entry. Studies conducted by ESA and Nasa have shown that active debris removal missions can be efficient in eventually stabilising the space environment. But planning a removal sequence—based on the size of the debris or object, the kind of collision threat it poses and whether it’s located in a densely populated orbit—will be crucial. Several active debris removal demonstrations—with mock pieces of debris—have been conducted in the past. The University of Surrey’s RemoveDEBRIS mission in 2018-19, which was led by researchers at the Surrey Space Centre, is a case in point. It successfully demonstrated multiple technologies that could be used to capture debris, including a tethered space harpoon and nets. Astroscale too is aiming to showcase multiple techniques of spotting and capturing pieces of orbital debris through its ELSA-d mission. "Technology-wise, ELSA-d is the first end-to-end debris removal demonstration mission. When the servicer satellite is up there, it first needs to identify and approach an object or piece of debris," says Nobu Okada, founder and CEO, Astroscale, in a video call from Tokyo. "After a synchronised capture, the object will then be stabilised and de-orbited. We will be carrying a mock object—a client satellite—which will be separated in space and then captured by the servicer using proximity-rendezvous technology and a magnetic docking mechanism," he explains. Capturing a moving piece of debris in space, however, is by no means easy. “There are two main challenges. What we are creating is a space robot that will reach the target debris, look at it and calculate how it is tumbling,” says Richard-Noca. “Objects in space are free-floating and they can tumble on every axis at quite high speeds or low speeds…. The intent here is to analyse and reconstruct the object’s movement once we get there with advanced image processing techniques such as deep-neural networks. These techniques will enable autonomous navigation around the debris and its capture. That is the image-processing challenge,” she adds. The second technological obstacle—how do you capture an object in space that is tumbling? “When a cargo mission goes to the ISS, both of them talk (or communicate) to each other and remain stable. In our case, the capture is what we call ‘uncooperative’. There is no signal coming from the debris to help us and we have to catch up with its tumbling. The capture is the most critical operational challenge,” says Richard-Noca. India's space debris horizon The race to tackle orbital debris has seen space agencies place greater emphasis on space situational awareness and traffic management. Today, we rely on satellites in low Earth orbit for a host of key services: telecommunications, the global positioning system, weather and meteorological data, among other things. In such a scenario, protecting space assets becomes all the more important. However, there are no safeguards against a piece of space debris generated by one country damaging the assets of another nation. “There are no natural boundaries in space,” says Phalkey. In December, Isro set up a dedicated directorate of space situational awareness and management (DSSAM), which includes the NEtwork for space object TRacking and Analysis project, also known as Netra. This project’s control centre, set up within the Isro Telemetry, Tracking and Command Network (Istrac) campus in Bengaluru, will act as a hub for space situational awareness activities in the country. A radar and optical telescope facility will help the organisation safeguard its operational assets and predict the atmospheric re-entry of derelict satellites and rocket bodies, a press note explains. S. Chandrashekar, a former Isro scientist and visiting chair professor at the National Institute of Advanced Studies, Bengaluru, says tracking space debris is a problem for every country. “All space-operating entities and agencies need such systems today,” he says. “Without knowing what’s happening in space, how can any space agency function? If it is a transmitting satellite, you can locate and track it easily. The moment a satellite starts drifting, and at some stage it may not transmit at all, then you have a problem... It’s going to take a long time to come down but you still need to know where it is,” says Chandrashekar, who was with Isro for almost 20 years, on the phone. “In the earlier days, space was much less populated. When I was at Isro, I never heard of a satellite colliding with another satellite. Even if two satellites were in the same orbit, it’s highly unlikely they were going to hit each other. It was not such a problem. But space is very crowded now.” While ground-based monitoring systems are good at tracking orbital debris, this activity can be executed with much more precision from space. Recently, Canadian firm NorthStar Earth & Space announced that it was partnering with French-Italian aerospace manufacturer Thales Alenia Space to develop a commercial satellite system that would help track objects, such as other satellites, from space. The “Skylark constellation” is expected to launch in 2022, with a full system of 12 satellites expected in 2024, NorthStar’s co-founder Stewart Bain was quoted as saying in a Reuters report. Digantara is working on a similar system that would rely on a constellation of 40 satellites and Lidar (light detection and ranging) technology to create a database and visualisation platform that will help track and map objects in low Earth orbit. “You can think of it as something like Google Maps, but for space,” says Anirudh Sharma, co-founder of Digantara. The firm, founded in 2018, also offers services like early-launch support and orbit determination to satellite operators and launch companies. “Ground-based monitoring systems (that track objects in space) have certain limitations when it comes to line of sight, range, atmospheric disruption… That is why we are building a space platform which uses Lidar,” he says. How long could it take to stabilise the situation? Internal studies done by ESA show that if continuous debris removal actions or missions start as late as 2060, they will only have a 75% beneficial effect compared to an immediate start—so it’s a case of now or never The company hopes to launch its first satellite payload in December to demonstrate its “in-orbit space debris monitor” technology. The eventual goal is to send out the 40 satellites across three phases. “We haven’t decided where we will launch from yet. That decision will be taken six months before launch but we are hoping that our timing matches with Isro’s PSLV launch. We are looking at a window between December 2021 to February 2022,” says Sharma. To ensure its own solution doesn’t add to or create more space junk, Sharma says Digantara’s satellites will use propulsion systems to de-orbit at the end of their lifespan. How long could it take to stabilise the situation? Internal studies done by ESA show that if continuous debris removal actions or missions start as late as 2060, they will only have a 75% beneficial effect compared to an immediate start—so it’s a case of now or never. Phalkey says: “We have to go as far as required and conduct space-cleaning activities for as long as it’s required. While we create new technologies to ensure that this doesn’t happen in the future, the past needs to be cleaned up.” The task at hand, however, remains enormous. Take Vanguard-1, for instance—launched in 1958, it’s the oldest human-made object still in space. It orbits Earth as space junk and even though it doesn’t pose any significant threat or collision risk, it won’t de-orbit before 2198. It’s a problem of our own making, says Phalkey. “Instead of looking spacewards, look inwards. What have we done to the planet, the resources on Earth.... We are making it unliveable.” Like our effort now to limit climate change, clean our polluted oceans and air, the effort to clean up space for future exploration will have to be a sustained one.

#### Under I-Law, it is appropriation for private entities to remove space junk, means the aff severely limits private junk capture ability.

Ramin **Skibba, 21** - ("The US Space Force Wants to Clean Up Junk in Orbit," Wired11-17-2021, 1-2-2022https://www.wired.com/story/the-us-space-force-wants-to-clean-up-junk-in-orbit/)//AW

The answer lies in “remediation”: removing just five large objects per year, for example, could prevent a chain reaction. If governments attempt to clean up this mess themselves, the cost could run into the trillions. Intergovernmental organizations and space agencies alike are discussing the merits of active removal, which would see new spacecraft launched specifically to take other, redundant satellites out of orbit. Other options being discussed include the use of nets, harpoons, tethers, ion thrusters and lasers, all of which would be costly to build and tedious to implement. Even so, the international community needs to sort through the myriad legal issues that would currently frustrate attempts to clean up space. At the moment, international law permits only the launching nation or agency to come into contact with a specific object in orbit, something that would prevent, for example, commercial debris-removal activities. The framework for this international law began with the Outer Space Treaty, which was established in 1967. The treaty involves 96 state parties that are working to “limit activities on the Moon and other celestial bodies exclusively to those for peaceful purposes and forbids the development of military bases, installations, fortifications or weapons testing of any kind on any celestial body.” Therefore, it would be beneficial for a large international agency such as the United Nations to create an international space union that could coordinate all of the debris-removal activity and create a framework for equitable use of orbits among all countries engaged in space exploration. Another critical weakness in the international law on space debris lies in the fact that existing space law is related to the use of space and not to debris regulation itself. The rules within the Outer Space Treaty are helpful in facilitating boundaries in space use, but they do not directly apply to the space debris issue. Until the legal issues are sorted out, all proposed solutions will remain hypothetical, or at best, limited to a small number of debris pieces. In the meantime, the threat continues to grow. Government regulations covering orbital debris are still rudimentary. For now, the federal agencies that have authority over commercial launches are waiting to see if the private sector can deal with the problem on its own.

#### Space debris will inevitably set off a chain of collisions.

Chelsea **MuñOz-Patchen, 19** - ("Regulating the Space Commons: Treating Space Debris as Abandoned Property in Violation of the Outer Space Treaty," University of Chicago, 2019, 12-6-2021, https://cjil.uchicago.edu/publication/regulating-space-commons-treating-space-debris-abandoned-property-violation-outer-space)//AW

Debris poses a threat to functioning space objects and astronauts in space, and may cause damage to the earth’s surface upon re-entry.29 Much of the small debris cannot be tracked due to its size and the velocity at which it travels, making it impossible to anticipate and maneuver to avoid collisions.30 To remain in orbit, debris must travel at speeds of up to 17,500 miles per hour.31 At this speed even very small pieces of debris can cause serious damage, threatening a spacecraft and causing expensive damage.32 There are millions of these very small pieces, and thousands of larger ones.33 The small-to-medium pieces of debris “continuously shed fragments like lens caps, booster upper stages, nuts, bolts, paint chips, motor sprays of aluminum particles, glass splinters, waste water, and bits of foil,” and may stay in orbit for decades or even centuries, posing an ongoing risk.34 Debris ten centimeters or larger in diameter creates the likelihood of complete destruction for any functioning satellite with which it collides.35 Large nonfunctional objects remaining in orbit are a collision threat, capable of creating huge amounts of space debris and taking up otherwise useful orbit space.36 This issue is of growing importance as more nations and companies gain the ability to launch satellites and other objects into space.37 From February 2009 through the end of 2010, more than thirty-two collision-avoidance maneuvers were reportedly used to avoid debris by various space agencies and satellite companies, and as of March 2012, the crew of the International Space Station (ISS) had to take shelter three times due to close calls with passing debris.38 These maneuvers require costly fuel usage and place a strain on astronauts.39 Furthermore, the launches of some spacecraft have “been delayed because of the presence of space debris in the planned flight paths.”40 In 2011, Euroconsult, a satellite consultant, projected that there would be “a 51% increase in satellites launched in the next decade over the number launched in the past decade.”41 In addition to satellites, the rise of commercial space tourism will also increase the number of objects launched into space and thus the amount of debris.42 The more objects are sent into space, and the more collisions create cascades of debris, the greater the risk of damage to vital satellites and other devices relied on for “weather forecasting, telecommunications, commerce, and national security.”43 The Space Debris Mitigation Guidelines44 were created by UNCOPUOS with input from the IADC and adopted in 2007.45 The guidelines were developed to address the problem of space debris and were intended to “increase mutual understanding on acceptable activities in space.”46 These guidelines are nonbinding but suggest best practices to implement at the national level when planning for a launch. Many nations have adopted the guidelines to some degree, and some have gone beyond what the guidelines suggest.47 While the guidelines do not address existing debris, they do much to prevent the creation of new debris. The Kessler Syndrome is the biggest concern with space debris. The Kessler Syndrome is a cascade created when debris hits a space object, creating new debris and setting off a chain reaction of collisions that eventually closes off entire orbits.48 The concern is that this cascade will occur when a tipping point is reached at which the natural removal rate cannot keep up with the amount of new debris added.49 At this point a collision could set off a cascade destroying all space objects within the orbit.50 In 2011, The National Research Council predicted that the Kessler Syndrome could happen within ten to twenty years.51 Donald J. Kessler, the astrophysicist and NASA scientist who theorized the Kessler Syndrome in 1978, believes this cascade may be a century away, meaning that there is still time to develop a solution.52

#### Laundry list of impacts.

George **Dvorsky, 15** - ("What Would Happen If All Our Satellites Were Suddenly Destroyed?," 6-4-2015, 12-10-2021https://gizmodo.com/what-would-happen-if-all-our-satellites-were-suddenly-d-1709006681)//AW

Lastly, there’s the Kessler Syndrome to consider. This scenario was portrayed in the 2013 film Gravity. In the movie, a Russian missile strike on a defunct satellite inadvertently causes a cascading chain reaction that formed an ever-growing cloud of orbiting space debris. Anything in the cloud’s wake—including satellites, space stations, and astronauts—gets annihilated. Disturbingly, the Kessler Syndrome is a very real possibility, and the likelihood of it happening is steadily increasing as more stuff gets thrown into space. Given these grim prospects, it’s fair to ask what might happen to our civilization if any of these things happened. At the risk of gross understatement, the complete loss of our satellite fleet would instigate a tremendous disruption to our current mode of technological existence—disruptions that would be experienced in the short, medium, and long term, and across multiple domains. Compromised Communications Almost immediately we’d notice a dramatic reduction in our ability to communicate, share information, and conduct transactions. A visualization from the Opte Project showing the various routes through a portion of the Internet (Opte/cc) “If our communications satellites are lost, then bandwidth is also lost,” Jonathan McDowell tells io9. He’s an astrophysicists and Chandra Observatory scientist who works out of the Harvard-Smithsonian Center for Astrophysics. McDowell says that, with telecommunication satellites wiped out, the burden of telecommunications would fall upon undersea cables and ground-based communication systems. But while many forms of communication would disappear in an instant, others would remain. All international calls and data traffic would have to be re-routed, placing tremendous pressure on terrestrial and undersea lines. Oversaturation would stretch the capacity of these systems to the limit, preventing many calls from going through. Hundreds of millions of Internet connections would vanish, or be severely overloaded. A similar number of cell phones would be rendered useless. In remote areas, people dependent on satellite for television, Internet, and radio would practically lose all service. Submarine cable map (TeleGeography) “Indeed, a lot of television would suddenly disappear,” says McDowell. “A sizable portion of TV comes from cable whose companies relay programming from satellites to their hubs.” It’s important to note that we actually have a precedent for a dramatic—albeit brief —disruption in com-sat capability. Back in 1998, there was a day in which a single satellite failed and all the world’s pagers stopped working. Get Out Your Paper Maps We would also lose the Global Positioning System. In the years since its inception, GPS has become ubiquitous, and a surprising number of systems have become reliant on it. Lockheed-Martin’s GPS-III-AHI satellite “Apart from the fact that everyone has forgotten to navigate without GPS in their cars, many airplanes use GPS as well,” says McDowell. Though backup systems exist, airlines use GPS to chart the most fuel-efficient and expeditious routes. Without GPS and telecomm-sats, aircraft controllers would have tremendous difficulty communicating with and routing airplanes. Airlines would have to fall back to legacy systems and procedures. Given the sheer volume of airline traffic today, accidents would be all but guaranteed. Other affected navigation systems would include those aboard cargo vessels, supply-chain management systems, and transportation hubs driven by GPS. But GPS does more than just provide positioning—it also provides for timing. Ground-based atomic clocks can perform the same function, but GPS is increasingly being used to distribute the universal time standard via satellites. Within hours of a terminated service, any distributing networks requiring tight synchronization would start to suffer from “clock drift,” leading to serious performance issues and outright service outages. Such disruptions could affect everything from the power grid through to the financial sector. A somewhat alarmist video produced by the Marshall Institute, but one that raises some relevant points. In the report, “A Day Without Space: Economic and National Security Ramifications,” Ed Morris, the Executive Director of the Office of Space Commerce at the Department of Commerce, writes: If you think it is hard to get work done when your internet connection goes out at the office, imagine losing that plus your cell phone, TV, radio, ATM access, credit cards, and possibly even your electricity. [...] Wireless services, especially those built to CDMA standard, would fail to hand off calls from one cell to the next, leading to dropped connections. Computer networks would experience slowdowns as data is pushed through finite pipelines at reduced bit rates. The same would be true for major networks for communication and entertainment, since they are all IP-based today and require ultra-precise timing to ensure digital traffic reaches its destination. The lack of effective synch would hit especially hard in banking, where the timing of transactions needs to be recorded. Credit card payments and bank accounts would likely freeze, as billions of dollars could be sucked away from businesses. A financial crash is not out of the question. The Loss of Military Capability The sudden loss of satellite capability would have a profound effect on the military. Useless without GPS: The U.S. Navy’s Harpoon missile (U.S. Navy) The Marshall Institute puts it this way: “Space is a critical enabler to all U.S. warfare domains,” including intelligence, navigation, communications, weather prediction, and warfare. McDowell describes satellite capability as as the “backbone” of the U.S. military. And as 21st century warfare expert Peter W. Singer from New America Foundation tells io9, “He who controls the heavens will control what happens in the battles of Earth.” Singer summarized the military consequences of losing satellites in an email to us: Today there are some 1,100 active satellites which act as the nervous system of not just our economy, but also our military. Everything from communications to GPS to intelligence all depend on it. Potential foes have noticed, which is why Russia and China have recently begun testing a new generation of anti-satellite weapons, which in turn has sparked the U.S. military to recently budget $5 billion for various space warfare systems. What would happen if we lost access to space? Well, the battles would, as one U.S. military officer put it, take us back to the “pre digital age.” Our drones, our missiles, even our ground units wouldn’t be able to operate the way we plan. It would force a rewrite of all our assumptions of 21st century high tech war. We might have a new generation of stealthy battleships...but the loss of space would mean naval battles would in many ways be like the game of Battleship, where the two sides would struggle to even find each other. Moreover, and as McDowell explains to io9, the loss of satellite capability would have a profound effect on arms control capabilities. Space systems can monitor compliance; without them, we’d be running blind. “The overarching consideration is that you wouldn’t really know what’s going on,” says McDowell. “Satellites provide for both global and local views of what’s happening. We would be less connected, less informed—and with considerably degraded situational awareness.” Compromised Weather Prediction and Climate Science One great thing satellites have done for us is improve our ability to forecast weather. Predicting a slight chance of cloudiness is all well and good, but some areas, like India, Pakistan, and Bangladesh, are dependent on such systems to predict potentially hazardous monsoons. And in the U.S., the NOAA has estimated that, during a typical hurricane season, weather satellites save as much as $3 billion in lives and property damage. Hurricane Ivan (NOAA) There’s also the effect on science to consider. Much of what we know about climate change comes from satellites. As McDowell explains, the first couple of weeks without satellites wouldn’t make much of a difference. But over a ten-year span, the lack of satellites would preclude our ability to understand and monitor such things as the ozone layer, carbon dioxide levels, and the distribution of polar ice. Ground-based and balloon-driven systems would help, but much of the data we’re currently tracking would suddenly become much spottier. Without satellites, you can say goodbye to maps like this (NOAA) “We’re quite dependent on satellites for a global view of what’s happening on our planet—and at a time when we really, really need to know what’s happening,” says McDowell. It’s also worth pointing out that, without satellites, we also wouldn’t be able to monitor space weather, such as incoming space storms. Time to Recover With all the satellites gone, both governmental and private interests would work feverishly to restore space-based capabilities. Depending on the nature of the satellite-destroying event, it could take decades or more to get ourselves back to current operational standards. It would take a particularly long time to recover from a Carrington Event, which would zap many ground-based electronic systems as well. The U.S. military is already thinking along these lines, which is why it’s working on the ability to quickly send up emergency assets, such as small satellites parked in Low Earth Orbit (LEO). Cube satellites are increasingly favored, as an easy-to-launch, affordable, and effective solution—albeit a short-term one. The U.S. Operationally Responsive State Office is currently working on the concept of emergency replenishment and the ability to “rapidly deploy capabilities that are good enough to satisfy warfighter needs across the entire spectrum of operations, from peacetime through conflict.” Cubesats in orbit (NASA) As for getting full-sized, geostationary satellites back into orbit, that would prove to be a greater challenge. It can take years to built a new satellite, which typically requires a big, costly rocket to get it into space. Lastly, if a Kessler Syndrome wipes out the satellites, that would present an entirely different recovery scenario. According to McDowell, it would take a minimum of 11 years for LEO to clear itself of the debris cloud; any objects below 500 km (310 miles) would eventually fall back to Earth. Thus, we would only be able to start re-seeding LEO in a little over a decade following a Kessler event. Unfortunately, the area above 600 km (372 miles) would remain out of touch for a practically indefinite period of time; objects orbiting at that height tend to stay there for a long, long time. We’d probably lose this band for good—unless we manually removed the debris field, using clean-up satellites or other techniques. It’s worth noting that a single Kessler event could hit the LEO zone or the GEO zone (geosynchronous orbit) but realistically not both; LEO debris could never reach GEO, and vice versa—though a spent rocket in GTO (geosynchronous transfer orbit) or SSTO (supersynchronous transfer orbit) passes through or near both zones and could potentially affect either of them. The spent rockets in GTO do not stay too close to the GEO arc for long due to orbital perturbations, so a GEO Kessler event is very unlikely to be triggered by one of them. Suffice to say, we should probably take the prospect of a Kessler Syndrome more seriously, and be aware of what could happen if we’re no longer able to use these spaces.

# On Case

## Space Col

#### Space col is different. The reason why claiming land on Earth is bad is because there were people already living there, but space is empty and Mars to our knowledge doesn’t have life.

Pat to ass- horrific dehumanization

Entire Spencer card is that they ‘will be incentivizd” but if we elim

#### Space col is the only feasible version of decolonization because it is the only way to leave the land without invading a different country.

## Cap

Fw thing

#### They have No solvency, Capitalism will expand elsewhere if not in space bcz simply minimizing private entities in space they’re just allowing capitalism to expand in other ways

**Shamas & Holden, 2019**, Victor Shamas &, Oslo Metropolitan University, Work Research Institute (AFI), Oslo, Norway; Thomas Holden, Independent scholar, Oslo, Norway, 2019, Palgrave Communications, One giant leap for capitalistkind: private enterprise in outer space, https://www.nature.com/articles/s41599-019-0218-9

Outer space serves at least two purposes in this regard. In the short-to medium-term, it allows for the export of surplus capital into emerging industries, such as satellite imaging and communication. These are significant sites of capital accumulation: global revenues in the worldwide satellite market in 2016 amounted to $260 billion (SIA, 2017, p. 4). Clearly**, much of this activity is taking place ‘on the ground'; it is occurring in the ‘terrestrial economy'. But all that capital would have to find some other meaningful or productive outlet were it not for the expansion of capital into space**.

#### Meanwhile private entities working with governments better address the symptoms of capitalism by collaborating to solve climate change.

Maanas **Sharma, 21** - ("The Space Review: The privatized frontier: the ethical implications and role of private companies in space exploration," No Publication, 9-7-2021, 12-6-2021https://www.thespacereview.com/article/4238/1)//AW

In recent years, private companies have taken on a larger role in the space exploration system. With lower costs and faster production times, they have displaced some functions of government space agencies. Though many have levied criticism against privatized space exploration, it also allows room for more altruistic actions by government space agencies and the benefits from increased space exploration as a whole. Thus, we should encourage this development, as the process is net ethical in the end. Especially if performed in conjunction with adequate government action on the topic, private space exploration can overcome possible shortcomings in its risky and capitalistic nature and ensure a positive contribution to the general public on Earth. Critics contend that companies must answer to their shareholders and justify their profits. This contributes to a larger overall psyche that prioritizes cost and speed above all else, resulting in significantly increased risks The implications of commercial space exploration have been thrust into the limelight with the successes and failures of billionaire Elon Musk’s company SpaceX. While private companies are not new to space exploration, their prominence in American space exploration efforts has increased rapidly in recent years, fueled by technological innovations, reductions in cost, and readily available funding from government and private sources.[1] In May 2020, SpaceX brought American astronauts to space from American soil for the first time in almost 10 years.[2] Recognizing the greatly reduced costs of space exploration in private companies, NASA’s budget has shifted to significantly relying on private companies.[3] However, private space companies are unique from government space agencies in the way they experience unique sets of market pressures that influence their decision-making process. Hence, the expansion of private control in the space sector turns into a multifaceted contestation of its ethicality. The most obvious ethical concern is the loss of human life. Critics contend that companies must answer to their shareholders and justify their profits. This contributes to a larger overall psyche that prioritizes cost and speed above all else, resulting in significantly increased risks.[4] However, the possible increase in mishaps is largely overstated. Companies recognize the need for safety aboard their expeditions themselves.[5] After all, the potential backlash from a mishap could destroy the company’s reputation and significantly harm their prospects. According to Dr. Nayef Al-Rodhan, Head of the Geneva Centre for Security Policy’s Geopolitics and Global Futures Programme, “because there were no alternatives to government space programs, accidents were seen to some degree as par for the course… By comparison, private companies actually have a far more difficult set of issues to face in the case of a mishap. In a worst case scenario, a private company could make an easy scapegoat.” [6] Another large ethical concern is the prominence capitalism may have in the future of private space exploration and the impacts thereof. The growth of private space companies in recent years has been closely intertwined with capitalism. Companies have largely focused on the most profitable projects, such as space travel and the business of space.[7] Many companies are funded by individual billionaires, such as dearMoon, SpaceX’s upcoming mission to the Moon.[8] Congress has also passed multiple acts for the purpose of reducing regulations on private space companies and securing private access to space. From this, many immediately jump to the conclusion that capitalism in space will recreate the same conditions in outer space that plague Earth today, especially with the increasing push to create a “space-for-space” economy, such as space tourism and new technologies to mine the Moon and asteroids. Critics, such as Jordan Pearson of VICE, believe that promises of “virtually unlimited resources” are only for the rich, and will perpetuate the growing wealth inequality that plagues the world today.[9] However, others contend that just because private space exploration has some capitalist elements, it is by no means an embodiment of unrestricted capitalism. A healthy balance of restricted capitalism—for example, private space companies working through contracts with government agencies or independently under monitoring and regulation by national and international agreements—will avoid the pitfalls that capitalist colonialism faced down here on Earth. Even those who are generally against excessive government regulation should see the benefits of them in space. Lacking any consensus on definitions and rights in space will create undue competition between corporations as well as governments that will harm everyone rather than helping anyone. To create a conducive environment for new space-for-space exploration, one without confrontation but with protection for corporate astronauts, infrastructure, and other interests, governments must create key policies such as a framework for property rights on asteroids, the Moon, and Mars.[7,10] hough there is no one set way governments will interact with companies, the consensus is that they must radically reimagine their main purpose as the role of private space exploration continues to grow. Another key matter to note is restricted capitalism in space “could also be our salvation.”[11] Private space exploration could reap increased access to resources and other benefits that can be used to solve the very problems on Earth that critics of capitalism identify. Since governments offset some of their projects to private companies, government agencies can focus on altruistic projects that otherwise would not fit in the budget before and do not have the immediate commercial use that private companies look for. Scott Hubbard, an adjunct professor of aeronautics and astronautics at Stanford University, discusses how “this strategy allows the space agency to continue ‘exploring the fringe where there really is no business case’” but still has important impacts on people down on Earth.[12] Indeed, this idea is a particularly powerful one when considering the ideal future of private companies in space exploration. Though there is no one set way governments will interact with companies, the consensus is that they must radically reimagine their main purpose as the role of private space exploration continues to grow. As governments utilize services from private space companies, “[i]nstead of being bogged down by the routine application of old research, NASA can prioritize their limited budget to work more on research of other unknowns and development of new long-term space travel technologies.”[13] According to the Council on Foreign Relations, such technologies have far-reaching benefits on Earth as well. Past developments obviously include communications satellites, by themselves a massive benefit to society, but also “refinements in artificial hearts; improved mammograms; and laser eye surgery… thermoelectric coolers for microchips; high-temperature lubricants; and a means for mass-producing carbon nanotubes, a material with significant engineering potential; [and h]ousehold products.”[2] Agencies like NASA are the only actors able to pursue the next game-changing missions, “where the profit motive is not as evident and where the barriers to entry are still too high for the private sector to really make a compelling business case.”[8] These technologies have revolutionized millions, if not billions, of lives, demonstrating the remarkable benefits of space exploration. It follows then that it is net ethical to prioritize these benefits.

#### Turn: The only way to solve is to actively mitigate effects of climate change; The private sector is essential for space exploration – competition is key and government development is not effective, efficient, or cheap enough. Thiessen 21:

Marc Thiessen, 6-1, 21, Washington Post, Opinion: SpaceX’s success is one small step for man, one giant leap for capitalism, https://www.washingtonpost.com/opinions/2020/06/01/spacexs-success-is-one-small-step-man-one-giant-leap-capitalism/

It was one small step for man, one giant leap for capitalism. Only three countries have ever launched human beings into orbit. This past weekend, SpaceX became the first private company ever to do so, when it sent its Crew Dragon capsule into space aboard its Falcon 9 rocket and docked with the International Space Station. This was accomplished by a company Elon Musk started in 2002 in a California strip mall warehouse with just a dozen employees and a mariachi band. At a time when our nation is debating the merits of socialism, SpaceX has given us an **incredible testament to the power of American free enterprise.** While the left is advocating unprecedented government intervention in almost every sector of the U.S. economy, from health care to energy, **today Americans are celebrating the successful privatization of space travel.** If you want to see the difference between what government and private enterprise can do, consider: It took a private company to give us the first space vehicle with touch-screen controls instead of antiquated knobs and buttons. It took a private company to give us a capsule that can fly entirely autonomously from launch to landing — including docking — without any participation by its human crew. It also took a private company to invent a reusable rocket that can not only take off but land as well. When the Apollo 11 crew reached the moon on July 20, 1969, Neil Armstrong declared “the Eagle has landed.” On Saturday, SpaceX was able to declare that the Falcon had landed when its rocket settled down on a barge in the Atlantic Ocean — ready to be used again. That last development will save the taxpayers incredible amounts of money. The cost to NASA for launching a man into space on the space shuttle orbiter was $170 million per seat, compared with just $60 million to $67 million on the Dragon capsule. The cost for the space shuttle to send a kilogram of cargo into to space was $54,500; with the Falcon rocket, the cost is just $2,720 — a decrease of 95 percent. And while the space shuttle cost $27.4 billion to develop, the Crew Dragon was designed and built for just $1.7 billion — making it the lowest-cost spacecraft developed in six decades. SpaceX did it in six years — far faster than the time it took to develop the space shuttle. ***The private sector does it better, cheaper, faster and more efficiently than government***. Why? Competition. Today, SpaceX has to compete with a constellation of private companies — including legacy aerospace firms such as Orbital ATK and United Launch Alliance and innovative start-ups such as Blue Origin (which is designing a Mars lander and whose owner, Jeff Bezos, also owns The Post) and Virgin Orbit (which is developing rockets than can launch satellites into space from the underside of a 747, avoiding the kinds of weather that delayed the Dragon launch). In the race to put the first privately launched man into orbit, upstart SpaceX had to beat aerospace behemoth Boeing and its Starliner capsule to the punch. It did so — for more than $1 billion less than its competitor. **That spirit of competition and innovation will revolutionize space travel in the years ahead.** Indeed, Musk has his sights set far beyond Earth orbit. Already, SpaceX is working on a much larger version of the Falcon 9 reusable rocket called Super Heavy that will carry a deep-space capsule named Starship capable of carrying up to 100 people to the moon and eventually to Mars. Musk’s goal — the reason he founded SpaceX — is to colonize Mars and make humanity a multiplanetary species. He has set a goal of founding a million-person city on Mars by 2050 complete with iron foundries and pizza joints. Can it be done? Who knows. But this much is certain: **Private-sector innovation is opening the door to a new era of space exploration**. Wouldn’t it be ironic if, just as capitalism is allowing us to explore the farthest reaches of our solar system, Americans decided to embrace socialism back here on Earth?

#### Continued private space development is the only way to make sustainable energy feasible – empirics prove. Autry 19:

Greg Autry {the director of the Southern California Commercial Spaceflight Initiative at the University of Southern California, vice president at the National Space Society, and chair of the International Space Development Conference, }, 19 - ("Space Research Can Save the Planet—Again," Foreign Policy, 7-20-2019, <https://foreignpolicy.com/2019/07/20/space-research-can-save-the-planet-again-climate-change-environment/)//marlborough-wr/>

Today conservationists and other critics are more likely to see space programs as militaristic splurges that squander billions of dollars better applied to solving problems on Earth. These well-meaning complaints are misguided, however. Earth’s problems—most urgently, climate change—can be solved only from space. That’s where the tools and data already being used to tackle these issues were forged and where the solutions of the future will be too. Space research has already been critical in averting one major environmental disaster. It was NASA satellite data that revealed a frightening and growing hole in the ozone layer over the South Pole, galvanizing public concern that, in 1987, produced the Montreal Protocol: the first international agreement addressing a global environmental problem. Since then, thanks to worldwide restrictions on damaging chlorofluorocarbons, the ozone situation has stabilized, and a full planetary recovery is expected. As this case showed, space can provide the vital information needed to understand a problem—and a surprising range of ways to solve it. Climate change is a poster child for the critical role of space data. Trekking across the globe to measure ice sheets with drills and gauge sea temperatures from the sides of ships is an expensive, slow, and insufficient way to assay the state of the planet. Satellites operated by NASA, the U.S. National Oceanic and Atmospheric Administration, and an increasing number of commercial firms provide a plethora of multispectral imaging and radar measurements of developments such as coral reef degradation, harmful plankton blooms, and polar bears negotiating thinning ice. Much of the technology involved in observing the Earth today was initially developed for probes sent to explore other planets in our solar system. Indeed, understanding the evolution of other planets’ climates is essential for modeling possible outcomes on Earth. NASA probes revealed how, roughly 4 billion years ago, a runaway greenhouse gas syndrome turned Venus into a hot, hellish, and uninhabitable planet of acid rain. Orbiters, landers, and rovers continue to unravel the processes that transformed a once warm and wet Mars into a frigid, dry dust ball—and scientists even to conceive of future scenarios that might terraform it back into a livable planet. Discovering other worlds’ history and imagining their future offers important visions for climate change mitigation strategies on Earth, such as mining helium from the moon itself for future clean energy. Spinoff technologies from space research, from GPS to semiconductor solar cells, are already helping to reduce emissions; the efficiency gains of GPS-guided navigation shrink fuel expenditures on sea, land, and air by between 15 and 21 percent—a greater reduction than better engines or fuel changes have so far provided. Modern solar photovoltaic power also owes its existence to space. The first real customer for solar energy was the U.S. space program; applications such as the giant solar wings that power the International Space Station have continually driven improvements in solar cell performance, and NASA first demonstrated the value of the sun for powering communities on Earth by using solar in its own facilities. Promisingly, space-based solar power stations could overcome the inconvenient truth that wind and solar will never get us anywhere near zero emissions because their output is inherently intermittent and there is, so far, no environmentally acceptable way to store their power at a global scale, even for one night. Orbital solar power stations, on the other hand, would continually face the sun, beaming clean power back through targeted radiation to Earth day or night, regardless of weather. They would also be free from clouds and atmospheric interference and therefore operate with many times the efficiency of current solar technology. Moving solar power generation away from Earth—already possible but held back by the current steep costs of lifting the materials into space—would preserve land and cultural resources from the blight of huge panel farms and save landfills from the growing problem of discarded old solar panels. Sustainable energy advocates in the U.S. military and the Chinese government are actively pursuing space-based solar power, but just making solar cells damages the environment due to the caustic chemicals employed. Space technology offers the possibility of freeing the Earth’s fragile biosphere and culturally important sites from the otherwise unavoidable damage caused by manufacturing and mining. The U.S. start-up Made in Space is currently taking the first steps toward manufacturing in orbit. The company’s fiber-optic cable, produced by machinery on the International Space Station, is orders of magnitude more efficient than anything made on Earth, where the heavy gravity creates tiny flaws in the material. Made in Space and others are eventually planning to build large structures, such as solar power stations, in space. As these technologies develop, they will augment each other, bringing costs down dramatically; space manufacturing, for instance, slashes the cost of solar installations in space. Eventually, firms will be able to supply endeavors in space with materials from the moon and asteroids, avoiding the cost and environmental impact of lifting them into orbit. Mining the solar system comes with its own potential impacts, but extracting resources from distant and lifeless worlds is clearly preferable to the continued degradation of the Earth.

#### Also could uniquely be better bcz anyone can invest

#### No link: Governments solve the excesses of capitalism in space. Fernolz 19

Tim Fernolz, 2019, How to build a space economy that avoids the mistakes of terrestrial capitalism, https://qz.com/work/1767415/can-nasa-build-a-space-economy-that-leaves-capitalisms-problems-behind/

The good news is that **we aren’t close to a world like the one depicted in the movie Elysium, where the ultra-wealthy repair to space and leave the rest of us behind. Our public and private interests will be far more intertwined**, in part because governments have designed it that way. **Most of the major space agencies are compelled by law in their home countries to support private economic activity, which means for example that NASA, by law, views the success of US companies in space as part of its mission, and not a distraction or a threat.** The reality is that **public space agencies, particularly NASA in the United States, remain the largest spenders in space and control the conditions for private organizations acting in orbit. Their challenge—and opportunity—is to manage the transition to a new, multi-stakeholder world in orbit by successfully subsidizing new initiatives without letting the benefits escape the public at large. Much of the work of establishing our space economy is prosaically earthly: Competition policy, labor rights, and corporate taxation. But with critiques of capitalism’s distributional failures at the center of public discourse, there are also sweeping challenges to address: Namely, can the orbital economy be structured better than its terrestrial analogue?**

#### Non uq climate crisis in squo , solve bet