# 1NC Sunvite R4

## Offs

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#### Space-Based Solar Power (SBSP) is a megaconstellation, and it’s going to happen within 10 years in the squo. Aff banning private megaconstellations kills the necessary tech – David 21:

David, Leonard. 11/03/21 Space Solar Power’s Time May Finally Be Coming.”https://www.space.com/space-solar-power-research-advances // LHP BT + LHP PS

The sun never sets in space. **The idea of** harvesting solar energyvia power-beaming satelliteshas therefore long intrigued researchers looking for ways to feed an energy-ravenous [Earth](https://www.space.com/54-earth-history-composition-and-atmosphere.html). That reflection has fomented for decades but is now garnering new looks all over the world: Technologists in the U.S. and China, experts in Japan and researchers within the European Space Agency and the United Kingdom Space Agency are all working to make space-based solar power a reality. Related: [Solar power stations in space could be the answer to our energy needs](https://www.space.com/solar-power-stations-in-space-could-be-the-answer-to-our-energy-needs.html) History machine Peter Glaser, the father of the solar power satellite concept. (Image credit: Arthur D. Little Inc.) The idea of wireless power transmission dates back to [Nikola Tesla](https://www.livescience.com/45950-nikola-tesla-biography.html) near the end of the 19th century. Fast-forwarding to 1968, the notion of a solar power satellite was detailed and patented by U.S. space pioneer Peter Glaser. He blueprinted a novel way to collect energy from sunlight using solar cells and beam down an energetic muscle of microwaves to receiving antennas ("rectennas") on Earth. Those microwaves could then be converted to electrical energy and supplied to the power grid. Then, in the mid-1970s, microwave power transmission experiments in the tens of kilowatts were successfully conducted at the Goldstone Deep Space Communications Complex in California, a facility of NASA's [Jet Propulsion Laboratory](https://www.space.com/16952-nasa-jet-propulsion-laboratory.html). And this "power trip" doesn't stop there.The Space Solar Power Incremental and Demonstrations Research (SSPIDR) project is designed to beam power from space to Earth. SSPIDR consists of several small-scale flight experiments that will mature technology needed to build a prototype solar power distribution system. (Image credit: Air Force Research Laboratory (AFRL)) Impressive **advances Over the past decade,** researchers have made impressive advances **that** increase **the** likelihood **that space solar power (**SSP**)** will be realized during the next decade, said John Mankins, president of Artemis Innovation Management Solutions of Santa Maria, California. His view: the longstanding vision for SSP as a sustainable energy alternative should be revisited in light of such recent advances.Bolstering that outlook is a set of key perspectives, Mankins told Space.com. "Climate change is really going to be a disaster. Nations are committed to go [carbon net-zero](https://www.livescience.com/climate-report-net-zero.html) … and they have no idea how to do it."**The** rapidly unfolding value of "NewSpace**" is also** reshaping the landscape of 21st century space activities**, he added. "Two of the biggest hurdles to the realization of SSP have always been the cost of launch and the cost of hardware**," said Mankins. "Add flight rate, and all of a sudden you're looking at numbers always talked about for solar power satellites."Related: [What is climate change?](https://www.livescience.com/climate-change.html) Megaconstellations **Another** recent change isthedawn of the megaconstellations, Mankins added. **That's** exemplified by SpaceX's [Starlink](https://www.space.com/spacex-starlink-satellites.html) broadband network**, a** mass-production effort that now cranks out 30 tons of satellites a month**. SpaceX is on course to potentially manufacture 40,000 satellites within five years, and launch all of them. "The path to low-cost hardware has been shown," Mankins said. "It's modular and mass-produced. The hurdles of less-expensive launch and lowering hardware costs have been overcome.**"Mankins said that the economics of SSP concepts in the near term, within the next decade, have never been more viable. He flagged advances in space launch capabilities; progress in robotics for space assembly, maintenance and servicing systems; and the growth in various component technologies, such as high-efficiency solid state power amplifiers. **As a result, SSP is ready to see the light of day,** Mankins said.Astroelectricity An early entrant in focusing on understanding the energy policy needed and establishment of SSP is James Michael Snead, president of the Spacefaring Institute. He's adopted the use of the term "astroelectricity" to describe the transmitted electrical power produced by SSP systems.In looking at what he terms the "[coming age of astroelectricity](https://www.youtube.com/watch?v=5E-0NYnAaUA)," he sees a world needing a replacement for oil and natural gas, the two primary sources of energy currently maintaining an industrial standard of living. Snead envisions a world in the year 2100 where about 20% of electrical power comes from terrestrial nuclear and renewables, with 80% supplied by astroelectricity."Just as the military, economic and diplomatic control of Middle East oil has substantially influenced world events for the past 80 years, the control of space solar power platforms will come to dominate outer space activities this century," Snead told Space.com. Wanted: high-priority leadershipIf SSP becomes a reality later this century, Snead said, the U.S. military will be required to protect and defend these new sources of national energy security just as it guards oil infrastructure in the Persian Gulf today."While some people are developing SSP concepts that would be launched from the Earth and autonomously assembled in geostationary Earth orbit, I do not see this as a successful proposition," said Snead. He believes that building the thousands of SSP platforms needed requires a substantial [space industrialization effort](https://www.space.com/nasa-low-earth-orbit-iss-commercialization.html) involving more than a million people in space by the end of the century. The starting point, Snead said, will be establishing the enabling "astrologistics" infrastructure operating throughout the Earth-moon system. He stressed that those astrologistics require high-priority U.S. Air Force — not [Space Force](https://www.space.com/42089-space-force.html) — leadership to draw upon nearly a century of human flight/operational logistics experience and expertise.That is necessary to manage industry's efforts to design and build the required new human spaceflight systems, with a clearly needed emphasis on safety and effectiveness, Snead said. As these new military astrologistics capabilities begin, Snead contends, commercialization of these capabilities will extend these safety and operational benefits to support the coming space industrial revolution needed to undertake SSP. "This is exactly what happened to enable U.S. airline manufacturers to dominate the airline and air cargo industry for decades. It is a successful model to now replicate in space — a model that neither NASA nor the U.S. Space Force can effectively execute," Snead said. The U.S. Naval Research Laboratory’s Paul Jaffe holds a module designed for space solar power investigations in front of a customized vacuum chamber used to test the device. (Image credit: NRL/Jamie Hartman) 'Performing like a champ' While new artwork, economic plots and conceptual SPS thinking and visions flow, there's an in-space technology experiment already underway. On its latest mission, which launched in May 2020, the Space Force's robotic [X-37B space plane](https://www.space.com/25275-x37b-space-plane.html) is toting the Photovoltaic Radio-frequency Antenna Module Flight Experiment (PRAM-FX), a Naval Research Laboratory (NRL) investigation into transforming solar power into radio-frequency microwave energy. The focus of that X-37B investigation is not establishing an actual power-beaming link, but more on appraising the performance of sunlight-to-microwave conversion. "It is performing like a champ," said Paul Jaffe, an NRL electronics engineer working on power beaming and solar power satellites. "We are getting data regularly, and that data is exceeding our expectations," he told Space.com. [PRAM-FX](https://www.space.com/x-37b-space-plane-solar-power-beaming) is principally made out of commercial parts, not "space-grade" hardware. "The fact that it is continuing to operate and give us positive results is quite encouraging," Jaffe said. Commercial parts are mass-produced, while many space-grade parts are one-offs. Solar power satellites, like those envisioned in high Earth orbit, would have thousands of elements made out of similar components being tested onboard the X-37B, Jaffe said. [The US Space Force's secretive X-37B space plane: 10 surprising facts](https://www.space.com/x-37b-military-space-plane-surprising-facts) Space-based solar power could help the UK achieve net-zero emissions by 2050, according to a leading British systems, engineering and technology company. (Image credit: Frazer-Nash Consultancy) Making the economics work There's much more work ahead, of course. "The big strike against space solar power has always been making the economics work. People who have looked at the idea seriously do understand that, from a physics standpoint, there is no reason you couldn't do it," Jaffe said. "With mass production of space hardware, and with the cost reduction of space access, it is more plausible that it could work," he added. "I would caution against excessive optimism … but also point out that things are changing. There are a lot of encouraging developments." SPS will assuredly be compared to a "levelized cost of energy" metric, Jaffe concluded. "There's just not enough data to come up with a levelized cost of energy basis for space solar power. It's premature. What you are seeing now is laying the foundation for that sort of evaluation." Clear, affordable path To that end, Mankins of Artemis Innovation Management Solutions has rolled out SPS-ALPHA ("Solar Power Satellite by means of Arbitrarily Large Phased Array"), a design he showcased at the 72nd International Astronautical Congress, which was held from Oct. 25 to Oct. 29 in Dubai, United Arab Emirates. Detailing a business model and step-by-step SSP roadmap, he feels the concept promises a clear, affordable path to deploying a critically needed new energy option. "**I believe you could have operational solar power satellites to scale within a decade,"** Mankins said. That possibility, combined with the fact that multiple nations are eying SSP as a promising power generation system of the future, begs a question: Is there a solar power satellite race afoot? It is close to that, Mankins said. "I think it has to be cooperation among friends and allies. But I think it's very likely to end up being competition with China. The longer we wait with regard to the urgency of policies on [climate change](https://www.space.com/climate-change-dimming-earth), the more likely it is we're going to miss the boat." Mankins is a 26-year veteran of assessing SSP and the technologies required. "The moment has come," he said. "I think the right answer is really clear: We need to just go do it."

#### SBSP key to solve climate change – Katete 21 – the evidence is from December 17:

Katete, Esthere. (December 17 2021) “Space-Based Solar Power: The Future Source of Energy?”https://www.greenmatch.co.uk/blog/2020/02/space-based-solar-power // LHP BT + LHP PS

Space-based solar power (SBSP) involves collecting the sun’s energy in space, and then wirelessly transmitting it to Earth. There are several [advantages to solar energy](https://www.greenmatch.co.uk/blog/2014/08/5-advantages-and-5-disadvantages-of-solar-energy). Although expensive, it **is** **a** great source of [clean energy](https://www.greenmatch.co.uk/blog/clean-energy) that has the capacity to provide more energythan the world consumes **or is predicted to consume in the future**. A space-based solar power technological process includes using [solar panels](https://www.greenmatch.co.uk/solar-energy/solar-panels) to collect solar energy in space with reflectors or inflatable mirrors that direct solar radiation onto solar panels, and then beaming it on Earth through a microwave or laser. The energy is then received on Earth via a microwave antenna (a rectenna). **According to the** [**National Space Society**](https://space.nss.org/space-solar-power/)**,** space-based solar power **has the** potential to dwarf all the other sources of energy combined**. They argue that space-based solar power can provide large quantities of energy** with very little negative environmental impact**. It can also** solve our current energy and greenhouse gas emissions problems**.** The infographic below highlights information about space-based solar power, current related trends, and what different countries are doing in terms of research and funding. Current Global Energy Consumption and Trends **The** world’s energy consumption is only growing. According to a report by the University of Oxford’s Our World in Data, on the global primary energy consumption, the current world consumption is over 160,000 TWh annually. Solar energy contributes only 585 TWh. Although there is an increase in renewable energy solutions, investments, and usage, oil, coal, and gas still generate more than 80% of the global energy that is consumed - with solar energy generating less than 1%. Between 2004 and 2015, investments in renewable energy increased by 600% from £36.2 billion (US$46.7 billion) to £220.6 billion (US$284.8 billion). Current predictions indicate that the world population will reach [9.7 billion by 2050](https://www.un.org/development/desa/en/news/population/world-population-prospects-2019.html). With the increase in population, the world energy consumption is also predicted to grow by 50% by 2050. In addition, climate change impacts are accelerating. Although we generate a big percentage of the world energy from fossil fuels, fossil fuels contribute significantly to the increase of climate change. **Comparatively,** solar energy is the [safest source of energy](https://ourworldindata.org/uploads/2020/02/Safest-source-of-energy.png) today - though it still only contributes a small percentage of the global energy production. The death rates from solar production are 1,230 times lower than coal, and it has one of the lowest CO2 emissions, at 5g CO2 eq per kWh. Why Space-Based Solar Power? Space-based solar power has several benefits; unlike solar panels on our roofs that can only generate electricity during the day, space-based solar power can generate continuous electricity, 24 hours a day, 99% of the year. This is because, unlike Earth, the space environment does not have night and day, and the satellites are in the Earth's shadow for only a maximum of 72 minutes per night. **Space-based solar panels can generate** 2,000 gigawatts of power constantly. This is **40 times more energy than a solar panel would generate on Earth annually**. This is also several folds higher than the [efficiency of solar panels](https://www.greenmatch.co.uk/blog/2014/11/how-efficient-are-solar-panels) today. **What’s more, is that space-based** solar power would generate [0% greenhouse gas emissions](https://space.nss.org/space-solar-power/) unlike other alternatives **energy like nuclear, coal, oil, gas, and ethanol**. The current source of energy that generates the lowest CO2 is nuclear power, which generates CO2 of 5g CO2 eq per kWh. **Space-based solar power** generates almost 0% hazardous waste to our environment **compared to nuclear power**. Why Are We Not There Yet? While space-based solar power is an innovative concept, we are not able to fully launch a system into space yet. Launching a space-based solar system is very expensive. In fact, the cost is estimated to be about 100 times too high to compete with current utility costs. One of the causes of the high costs is the high cost of launching the panels to space, which is mostly due to the high mass per watt generated by the current solar panels. In other words, the solar panels are currently too heavy per watt generated to make it feasible. Currently, the cost of launching in space is estimated to be £7,716 per kilogram - approximately £154 per watt. In comparison to the cost that homeowners pay today, which is approximately £2 per watt peak, the cost in space is extremely high to be competitive. In UK homes, the [installation cost of solar panels](https://www.greenmatch.co.uk/blog/2014/08/what-is-the-installation-cost-for-solar-panels) can be as low as £1.5 per watt. Other reasons for high costs include the overall high transport costs to space. This is because transporting all other materials that are needed to space would require many space shuttle launches, and these space shuttles are currently not reusable. So, not only is the launch of solar panels themselves expensive, but the additional materials needing to be transported is also expensive. A lot of research and engineering is still ongoing to find the most feasible way to launch space-based solar panels and launch systems, at a lower cost. The environment out in space also has several hazards that could cause damage to the solar panels. These include space debris and extreme solar radiation, which could degrade the solar panels up to 8 times faster than panels installed on Earth. Finally, there is a potential of wasting large amounts of energy when transporting or during transmission from space to Earth. Therefore, scientists and engineers must continue their R&D efforts to ensure little to no energy is lost during the process. Current SBSP Projects and Progress The key players in SBSP include China, the US, and Japan, who have shown progress in terms of technology advancements, partnerships, and launch plans. China is already progressing to launch into space. The China Aerospace Science and Technology Corporation plans to launch small to medium solar satellites in the stratosphere that can harness energy in space between 2021 and 2025. China also plans to generate one megawatt of energy from space-based solar panels by 2030, and to be operating a commercially viable solar space station by 2050. In the US, there are ongoing partnerships and investments. For example, a $100 million partnership between Northrop Grumman and U.S. Air Force Research Laboratory has been established to provide advanced technology for SBSP. Also in the US, a $17.5 million collaboration between Northrop Grumman Corporation and Caltech was set up to develop the space solar power project called ‘The Space Solar Power Initiative’. The initiative’s goal was to develop scientific and technological innovations that would enable a space-based solar power system generate electricity at a cost comparable to current sources of electricity. There has been ongoing research and technological advancements. In the US, the development of the SPS-ALPHA Mark-II concept is underway. This, if successful, would enable construction of huge platforms in space that can remotely deliver tens of thousands of megawatts of electricity to Earth, using wireless power transmissions. This will also enable delivery of affordable power to Earth and on space missions. In addition, progress is being made to build reusable launch systems. Success in this will lower the cost of transport to space and overall cost of space-based solar power. An example is SpaceX, that is currently working on reusable launch vehicles that can be used for transport to space. In Japan, researchers successfully transmitted electric power wirelessly using microwaves. Researchers transformed 1.8 kW of electric power into microwaves and accurately transmitted it into a receiver that was 55 metres away. This was a technological advancement towards bringing SBSP closer to reality. Japan also made space-based solar systems part of its future space exploration vision. Future Outlook for SBSP Fossil fuels are finite and can eventually run out. According to predictions, oil and natural gas could run out in 50 years and coal production in 115 years. With ongoing research and investments, there is a high possibility that space-based solar power is the viable [future of solar power](https://www.greenmatch.co.uk/blog/2015/01/the-future-for-solar-power-in-the-uk). If the cost of space-based solar power can be lowered, it is likely to be a major source of sustainable energy that cannot diminish. Major players like China, who already have timelines of implementing the technology in space, may be able to provide some key learnings for future improvements in the technology.

#### Warming causes extinction - Xu 17:

Yangyang Xu 17, Assistant Professor of Atmospheric Sciences at Texas A&M University; and Veerabhadran Ramanathan, Distinguished Professor of Atmospheric and Climate Sciences at the Scripps Institution of Oceanography, University of California, San Diego, 9/26/17, “Well below 2 °C: Mitigation strategies for avoiding dangerous to catastrophic climate changes,” Proceedings of the National Academy of Sciences of the United States of America, Vol. 114, No. 39, p. 10315-10323

We are proposing the following extension to the DAI risk categorization: warming greater than 1.5 °C as “dangerous”; warming greater than 3 °C as “catastrophic?”; and warming in excess of 5 °C as “unknown??,” with the understanding that changes of this magnitude, not experienced in the last 20+ million years, pose **existential threats** to a majority of the population. The question mark denotes the subjective nature of our deduction and the fact that catastrophe can strike at even lower warming levels. The justifications for the proposed extension to risk categorization are given below. From the IPCC burning embers diagram and from the language of the Paris Agreement, we infer that the DAI begins at warming greater than 1.5 °C. Our criteria for extending the risk category beyond DAI include the potential risks of climate change to the physical climate system, the ecosystem, human health, and **species extinction**. Let us first consider the category of catastrophic (3 to 5 °C warming). The first major concern is the issue of **tipping points**. Several studies (48, 49) have concluded that 3 to 5 °C global warming is likely to be the threshold for tipping points such as the collapse of the western Antarctic ice sheet, shutdown of deep water circulation in the North Atlantic, dieback of Amazon rainforests as well as boreal forests, and collapse of the West African monsoon, among others. While natural scientists refer to these as **abrupt and irreversible climate changes**, economists refer to them as catastrophic events (49). Warming of such magnitudes also has **catastrophic human health effects**. Many recent studies (50, 51) have focused on the direct influence of extreme events such as heat waves on public health by evaluating exposure to heat stress and hyperthermia. It has been estimated that the likelihood of extreme events (defined as 3-sigma events), including heat waves, has increased 10-fold in the recent decades (52). Human beings are extremely sensitive to heat stress. For example, the 2013 European heat wave led to about 70,000 premature mortalities (53). The major finding of a recent study (51) is that, currently, about 13.6% of land area with a population of 30.6% is exposed to deadly heat. The authors of that study defined deadly heat as exceeding a threshold of temperature as well as humidity. The thresholds were determined from numerous heat wave events and data for mortalities attributed to heat waves. According to this study, a 2 °C warming would double the land area subject to deadly heat and expose 48% of the population. A 4 °C warming by 2100 would subject 47% of the land area and almost 74% of the world population to deadly heat, which could pose **existential risks to humans** and mammals alike unless massive adaptation measures are implemented, such as providing air conditioning to the entire population or a massive relocation of most of the population to safer climates. Climate risks can vary markedly depending on the socioeconomic status and culture of the population, and so we must take up the question of “dangerous to whom?” (54). Our discussion in this study is focused more on people and not on the ecosystem, and even with this limited scope, there are multitudes of categories of people. We will focus on the poorest 3 billion people living mostly in tropical rural areas, who are still relying on 18th-century technologies for meeting basic needs such as cooking and heating. Their contribution to CO2 pollution is roughly 5% compared with the 50% contribution by the wealthiest 1 billion (55). This bottom 3 billion population comprises mostly subsistent farmers, whose livelihood will be severely impacted, if not destroyed, with a one- to five-year megadrought, heat waves, or heavy floods; for those among the bottom 3 billion of the world’s population who are living in coastal areas, a 1- to 2-m rise in sea level (likely with a warming in excess of 3 °C) poses **existential threat** if they do not relocate or migrate. It has been estimated that several hundred million people would be subject to famine with warming in excess of 4 °C (54). However, there has essentially been no discussion on warming beyond 5 °C. Climate change-induced species extinction is one major concern with warming of such large magnitudes (>5 °C). The current rate of loss of species is ∼1,000-fold the historical rate, due largely to habitat destruction. At this rate, about 25% of species are in danger of extinction in the coming decades (56). Global warming of 6 °C or more (accompanied by increase in ocean acidity due to increased CO2) can act as a major force multiplier and **expose** as much as **90% of species to** the dangers of **extinction** (57). The bodily harms combined with climate change-forced species destruction, biodiversity loss, and threats to water and food security, as summarized recently (58), motivated us to categorize warming beyond 5 °C as unknown??, implying the possibility of **existential threats**. Fig. 2 displays these three risk categorizations (vertical dashed lines).

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#### SpaceX’s Starlink satellites, which are megaconstellations, have already seen a beta rollout and are on path for delivery by 2022 – Supan 21:

Supan, Joe. “Starlink Wait Times Extended to Late 2022 to Early 2023.” Allconnect, 8 Nov. 2021, https://www.allconnect.com/blog/starlink-delays-service-expansion-to-2022. // LHP GB + LHP PS

**Elon Musk recently announced via Twitter that the beta testing for his low-orbit satellite program, Starlink, will be ending in October 2021.** Musk’s company, **SpaceX**, **launched Starlink in a beta** **phase** **and**, **as of** the end of **July** 2021, **reported it had customers in 12 countries**, **serving a total of 900,000 customers**. But if you didn’t sign up during the beta testing period, it might be a while before you can try out the new satellite internet service. **Until recently, Starlink’s website had been telling customers that they could expect to get coverage in 2021.** But as customers on Starlink’s Reddit page began noticing, **the arrival dates were being pushed back a full year to “late 2022 to early 2023.”** That said, **users who pre-ordered during the beta phase were still seeing an expected delivery date of late 2021.** Once those delays became apparent, **Starlink updated the FAQ section of its website** to include a question on when customers can expect to get coverage. “**Silicon shortages have delayed production which has impacted our ability to fulfill orders,”** it says. “Please visit your Account page for the most recent estimate on when you can expect your order to be fulfilled.”While **Musk initially expected a nationwide rollout by the end of October**, **these silicon shortages have apparently set Starlink back by a full year in many areas**. **You can still get in line for Starlink now** — the company says “orders will be fulfilled on a first-come, first-served basis in each area” — but you shouldn’t plan on using it for a while.

#### Starlink is coming now – but the aff bans it –

#### First, Starlink is crucial to the democratization of access to high quality and reliable internet connections worldwide – laundry list of impacts – Holden 21:

Holden, Andrew. “Are Starlink Satellites the Solution to Rural Internets Setbacks? .” Ohio Ag Manager, 9 Apr. 2021, https://u.osu.edu/ohioagmanager/2021/04/09/are-starlink-satellites-the-solution-to-rural-internets-setbacks/. // LHP GB + LHP PS

Slow internet can frustrate almost anyone, but if **you live in a rural area, slow internet, if any, can often be your only choice**. **The lack of highspeed internet access has been a concern for many years in rural America**. **While companies slowly improve service and governmental programs try to address these issues, many rural residents are left waiting for faster internet that can’t come soon enough**. **One company that is attempting to close this digital divide is SpaceX, with their high-speed satellite internet system called Starlink.** While Starlink is just beginning to roll out service, **the initial results appear to be promising. Rural communities and Tribal lands have far less access to high-speed internet compared to those in more populated areas**. **The Federal Communications Commission considers high-speed broadband internet as being able to provide 25 Mbps download speeds and 3 Mbps upload speeds. According to the FCC’s, 2020 Broadband Deployment Report, “22.3% of Americans in rural areas and 27.7% of Americans in Tribal lands lack coverage from fixed terrestrial 25/3 Mbps broadband, as compared to only 1.5% of Americans in urban areas”. Those without high-speed internet access can often be categorized under the phrase ‘last mile’ customers. The last mile problem can be described as the customers at the end of the communication line that are more expensive to reach and located farther apart**. As unfortunate as it is, in basic terms, **companies would rather run a mile of infrastructure in an area that will yield 25 customers than run a mile for just one customer.** **Diminishing returns leads to internet companies being unwilling to improve internet in rural areas, as well as less competition for existing providers. The impact of the digital divide can be felt across the US by those living in small and rural towns**. Many aspects of **modern life are affected by access to high-speed internet, including education, healthcare, entertainment, and employment**. In a report from Michigan State University’s Quello Center, **students with slow or limited internet access lacked digital skills and performed lower on standardized tests**. In addition to education, 2020 highlighted **the future of working remotely and virtual healthcare appointments which rely on faster internet.** **Rural businesses**, from farms to manufacturing, **benefit from better internet speeds as well, making it quicker to send and receive information**. As technology improves and expands, more people in rural areas are slowly receiving better internet services, but **one company that may have the ability to close the gap seemingly overnight is SpaceX.** SpaceX, short for the Space Exploration Technologies Corporation, is an aerospace manufacturer founded by Elon Musk. Musk is also the founder of the popular electric  vehicle company Tesla Motors. One of SpaceX’s business endeavors is providing satellite internet access via a satellite consolation called Starlink. This isn’t like the traditional satellite internet that has been offered over the years. **Starlink uses satellites in low Earth orbit that allow for shorter distances and speeds over 100 mbps for those in the beta testing program**. **Speeds like that would be a huge improvement for almost anyone in a rural area and can be offered remotely to the hardest to reach places**. In February, Starlink opened pre-orders to the public and has been slowly filling orders ever since. With the high demand for the service, many orders are slated to be filled by the end of 2021 depending on your location. The current advertised cost for the service is $99.00 per month with the hardware, including a small satellite dish and a router, for a $499.00 onetime payment. On their website Starlink states service will be offered on a first come, first served basis, and is currently taking $100 down payments to get in line for the service. If you are interested in seeing if service is available in your area, or signing up yourself, you can visit [www.Starlink.com](http://www.starlink.com/) to do so. Will Starlink satellites be the solution to our rural internet woes? When considering access to high-speed internet service in rural areas, one thing that has historically lacked were options to choose from. **Starlink will provide another option, or possibly the first option, to those living with poor to no access to internet and may solve the last mile problem for many rural communities**. Even those who do not use Starlink’s service could benefit from the competition that will encourage traditional internet providers to improve their infrastructure and speeds. Rural communities here in Ohio and across the United States could benefit greatly with better internet access and Starlink is on its way to providing it.

#### Second, United States military readiness increasingly depends upon reliable internet and satellite connections in remote areas – the Army has already inked a deal with SpaceX.

Sandra Erwin, 05/26/2020

“U.S. Army signs deal with SpaceX to assess Starlink broadband.” Space News, <https://spacenews.com/u-s-army-signs-deal-with-spacex-to-assess-starlink-broadband/>.

**The U.S. Army will experiment using Starlink** broadband **to move data across military networks**. An agreement signed with SpaceX on May 20 gives the Army three years to try out the service. The Army and SpaceX signed a Cooperative Research and Development Agreement known as a CRADA, an Army source told SpaceNews. The project will be overseen by the Combat Capabilities Development Command’s C5ISR Center based at Aberdeen Proving Ground, Maryland. CRADAs are commonly used by the military to evaluate technologies and services from the private sector before it commits to buying them. **The Army in this case wants to be able to assess the performance of the Starlink low Earth orbit internet service when connected to military systems. The Army will seek answers to key questions such as what ground equipment it will need to use Starlink and how much systems integration work could be required.** According to the Army source, **the three-year agreement will “allow the Army to understand potential applications of state-of-the art advancements in commercial RF SATCOM such as the new Starlink LEO constellation and modern SATCOM terminal developments capable of tracking LEO satellites.”** The deal with SpaceX follows other CRADAs the Army has signed with companies like Kratos and SES to assess the use of commercial SATCOM. Joseph Welch, deputy program executive officer for command, control, communications tactical (C3T), said **the Army is trying to fill a growing demand for connectivity in the field.** “We have limited SATCOM today across our maneuver formations,” he said at a conference last fall. **One of the biggest challenges is integrating hardware and software apps into Army formations**, he said. The Army’s command operations centers access geostationary satellites via large dishes that are mounted on trailers and not very mobile. One of the problems is that satellite are over subscribed, provide limited throughput and have high latency. **“We liken that to a soda straw,” Welch said of the Army’s network capacity to support data flow.** To use LEO broadband like Starlink the Army will need flat panel antennas to track thousands of satellites. The cost of equipping Army units with new ground terminals will be one of the issues that the CRADA will investigate. Another concern is the security of the data piped down to ground stations. Starlink satellites currently are not connected in space via optical links so the data is sent to ground stations located around the world. The U.S. military prefers to use systems with inter-satellite links so data can be brought down to its desired point of entry.

#### Military readiness solves every threat---leadership ensures military overmatch but decline emboldens rivals and causes miscalc and arms races that escalate.

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

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

### CP

#### CP: Private entities appropriate space in the outer atmosphere through satellite launches must equip their technology with safety technologies in accordance with the Space Safety Coalition’s recommendations and best practices in order to avoid collisions.

Mike Wall, 11/15/21

“Kessler Syndrome and the space debris problem.” Wall has a Ph.D. in evolutionary biology from the University of Sydney, Australia. Space.com, <https://www.space.com/kessler-syndrome-space-debris>.

In 2019, for example, **the Space Safety Coalition (SSC**) **laid out a set of** [**proposed voluntary guidelines**](https://www.space.com/space-junk-threat-satellites-guidelines-reduce-orbital-debris.html) **designed to keep the Kessler Syndrome, and space junk in general, at bay over the coming years.** One recommendation is that **all satellites operating above 250 miles (400 km) be equipped with propulsion systems allowing them to maneuver away from possible collisions**. Drawing the line there makes sense for multiple reasons, according to the SSC: **It's the altitude at which the ISS flies, and satellites that circle below this boundary tend to encounter enough atmospheric drag to fall out of orbit relatively soon after their operational lives come to an end**. **The SSC** **also recommends that satellite designers consider building encryption systems into the command systems of their craft, so they'll be harder for chaos-seeking hackers to hijack**. And operators who control satellites in low Earth orbit should include in their launch contracts a requirement that rocket upper stages be disposed of in the atmosphere shortly after liftoff. More active debris-fighting strategies could also be part of the solution. **Removing just a handful of rocket bodies or big, dead satellites every year could help us keep our space-junk problem under control, according to some studies.** And researchers around the world are developing and testing ways to do just that, using nets, harpoons and other methods. Such activities would have to be carefully coordinated and thought out. Space objects, including junk such as spent rocket bodies, belong to the nation that launched them, so the U.S. government or a U.S. company couldn't just unilaterally de-orbit a bunch of spent Russian rocket bodies (or vice versa). Such action might spark an international incident, not least because debris-removing tech might also be viewed as a potential space weapon that could take out operational satellites. But the space-junk issue is a global one, **so governments around the world should already be having meaty conversations about how to deal with it. Let's hope the talks, the decisions and the tech end up outpacing the problem, for all of our sakes.**

### NC

#### In setting an end, every agent must recognize freedom as a necessary good, Gewirth 84 bracketed for grammar and gendered language

[Alan Gewirth, () "The Ontological Basis of Natural Law: A Critique and an Alternative" American Journal Of Jurisprudence: Vol. 29: Iss. 1 Article 5, 1984, https://scholarship.law.nd.edu/ajj/vol29/iss1/5/, DOA:9-10-2018 // WWBW Recut LHP AV]

Let me briefly sketch the main line of argument that leads to this conclusion. As I have said, the argument is based on the generic features of human action. To begin with, **every agent acts for purposes [t]he[y] regards as good.** Hence, **[t]he[y] must regard as necessary goods the freedom** and well being **that [is]** are the generic features and **necessary conditions of** his **action** and successful action in general. From this, it follows that **every agent logically must hold or accept** that he has **rights to these conditions**. For if he were **to deny** that he has **these rights**, then he **would** have to **admit that it is permissible** for other persons **to remove** from him the very **conditions** of freedom and well-being **that**, as **an agent**, he **must have**. But **it is contradictory** for him **to hold both that [t]he[y] must have these conditions and also that he may not have them.** Hence, on pain of self-contradiction, every agent must accept that he has rights to freedom and well-being. Moreover, **every agent must further admit that all other agents also have those rights, since all other actual or prospective agents have the same general characteristics of agency** on which he must ground his own right-claims. What I am saying, then, is that every agent, simply by virtue of being an agent, must regard his freedom and well being as necessary goods and must hold that he and all other actual or prospective agents have rights to these necessary goods. Hence, every agent, on pain of self-contradiction, must accept the following principle: Act in accord with the generic rights of your recipients as well as of yourself. The generic rights are rights to the generic features of action, freedom, and well-being. I call this the Principle of Generic Consistency (PGC), because it combines the formal consideration of consistency with the material consideration of the generic features and rights of action.

#### Prefer –

#### A] performativity – argumentation requires the assumption that freedom is good – else agents would be unable to make arguments

#### B] prerequisite – condoning any action requires condoning the freedom required to take that action – so my theory’s a prerequisite to theirs and my offense acts as a side-constraint to your framework.

#### C] culpability – absent a conception of free will, people can just claim they were acting of desires they can’t control.

#### The universality of freedom justifies a libertarian state. Otteson 09

Otteson 09 brackets in original James R. Otteson (professor of philosophy and economics at Yeshiva University) “Kantian Individualism and Political Libertarianism” The Independent Review, v. 13, n. 3, Winter 2009

In a crucial passage in Metaphysics of Morals, Kant writes that the “Universal Principle of Right” is “‘[e]very action which by itself or by its maxim enables the freedom of each individual’s will to co-exist with the freedom of everyone else in accordance with a universal law is right.’” He concludes, “Thus the universal law of right is as follows: **let your external actions be such that the free application of your will can co-exist with the freedom of everyone in accordance with a universal law**” (1991, 133, emphasis in original).5 **This** stipulation **becomes** for Kant **the grounding justification for the existence of a state**, its raison d’être, and the reason we leave the state of nature is to secure this sphere of maximum freedom compatible with the same freedom of all others. Because this freedom must be complete, in the sense of being as full as possible given the existence of other persons who demand similar freedom, it entails that **the state may**—indeed, must—**secure this condition** of freedom, **but undertake to do nothing else because any other** state **activities** would **compromise** **the** very **autonomy the state seeks to defend**. **Kant’s position** thus outlines and implies a political philosophy that **is broadly libertarian**; that is, **it endorses a state constructed with the sole aim of protecting** its citizens **against invasions of** their **liberty**. For Kant, individuals create a state to protect their moral agency, and in doing so they consent to coercion only insofar as it is required to prevent themselves or others from impinging on their own or others’ agency. In his argument, **individuals cannot rationally consent to a state that instructs them in morals, coerces virtuous behavior, commands them to trade or not, directs their pursuit of happiness, or forcibly requires them to provide for** their own or **others**’ pursuits of happiness. And except in cases of punishment for wrongdoing,6 **this** severe limitation on the scope of the state’s authority **must always be respected**: “The rights of man must be held sacred, however great a sacrifice the ruling power may have to make. There can be no half measures here; it is no use devising hybrid solutions such as a pragmatically conditioned right halfway between right and utility. For all politics must bend the knee before right, although politics may hope in return to arrive, however slowly, at a stage of lasting brilliance” (Perpetual Peace, 1991, 125). The implication is that **a Kantian state protects** against invasions of **freedom and does nothing else**; in the absence of invasions or threats of invasions, it is inactive.

#### Thus, the standard is consistency with a libertarian state.

#### Negate –

#### 1] Injustice requires someone wronged, but initial acquisition doesn’t violate any entity’s rights– therefore, private appropriation of outer space cannot be unjust, Feser 05:

Edward Feser, [Associate Professor of Philosophy at Pasadena City College] “THERE IS NO SUCH THING AS AN UNJUST INITIAL ACQUISITION,” 2005 //LHP AV

The reason **there is no such thing as an unjust initial acquisition** of resources is that there is no such thing as either a just or an unjust initial acquisition of resources. The concept of **justice**, that is to say, simply **does not apply** to initial acquisition. **It applies only after initial acquisition has already taken place**. In particular, it applies only to transfers of property (and derivatively, to the rectification of injustices in transfer). This, it seems to me, is a clear implication of the assumption (rightly) made by Nozick that **external resources are initially unowned**. Consider the following example. **Suppose** **an individual** **A seeks to acquire some previously unowned resource R**. **For it to be** the case that A commits an **injustice** in acquiring R, it would also have to be the case that **there is some individual** **B** (or perhaps a group of individuals) **against whom A commits the injustice**. **But for B to have been wronged** by A’s acquisi- tion of R, **B would have to have had a rightful claim over R,** **a right to R**. By hypothesis, **however**, **B did not have a right to R, because no one had a right to it—it was unowned, after all**. So B was not wronged and could not have been. In fact, **the very first person who could conceivably be wronged by anyone’s use of R would be, not B, but A himself, since A is the first one to own R**. Such a wrong would in the nature of the case be an injustice in transfer—in unjustly taking from A what is rightfully his—not in initial acquisition. **The same thing, by extension, will be true of all unowned resources: it is only after some- one has initially acquired them that anyone could unjustly come to possess them, via unjust transfer**. It is impossible, then, for there to be any injustices in initial acquisition.7

#### 2] Self-ownership justifies the appropriation of property – our freedom necessitates being able to set and pursue external things as our ends, including exercising our rights on property.

Feser 2, (Edward Feser, 1-1-2005, accessed on 12-15-2021, Cambridge University Press, "THERE IS NO SUCH THING AS AN UNJUST INITIAL ACQUISITION | Social Philosophy and Policy | Cambridge Core", Edward C. Feser is an American philosopher. He is an Associate Professor of Philosophy at Pasadena City College in Pasadena, California. [https://www.cambridge.org/core/journals/social-philosophy-and-policy/article/abs/there-is-no-such-thing-as-an-unjust-initial-acquisition/5C744D6D5C525E711EC75F75BF7109D1)[brackets](https://www.cambridge.org/core/journals/social-philosophy-and-policy/article/abs/there-is-no-such-thing-as-an-unjust-initial-acquisition/5C744D6D5C525E711EC75F75BF7109D1)%5bbrackets) for gen lang]//phs st

V. Some Implications If what I have argued so far is correct, then the way is opened to the following revised case for strongly libertarian Lockean-Nozickian prop-erty rights: We are self-owners, having full property rights to our body parts, powers, talents, energies, etc. As self-owners, we also have a right, given the SOP, not to have our self-owned powers nullified —we have the right, that is, to act within the extra-personal world and thus to acquire rights to extra-personal objects that the use of our self-owned powers requires.39 This might involve the buying or leasing of certain rights or bundles of rights and, correspondingly, the acquiring of lesser or greater degrees of ownership of parts of the external world, but as long as one is able to exercise one’s powers to some degree and is not rendered incapable of acting within that world, the SOP is satisfied. In any case, such rights can only be traded after they are first established by initial acquisition. In initially acquiring a resource, an agent does no one an injustice (it was unowned, after all). Furthermore, [they] has mixed [their] labor with the resource, significantly altering it and/or bringing it under his control, and is himself solely responsible for whatever value or utility the resource has come to have. Thus, [they] has a presumptive right to it, and, if his control and/or alteration (and thus acquisition) of it is (more or less) complete, his own- ership is accordingly (more or less) full. The system of strong private property rights that follows from the acts of initial acquisition performed by countless such agents results, as a matter of empirical fact, in a market economy that inevitably and dramatically increases the number of resources available for use by individuals, and these benefited individuals include those who come along long after initial acquisition has taken place. (Indeed, it especially includes these latecomers, given that they were able to avoid the hard work of being the first to “tame the land” and draw out the value of raw materials.)40 The SOP is thus, in fact, rarely, if ever, violated. The upshot is that a system of Lockean-Nozickian private property rights is morally justified, with a strong presumption against tampering with exist- ing property titles in general. In any case, there is a strong presumption against any general egalitarian redistribution of wealth, and no case what- soever to be made for such redistribution from the general theory of prop- erty just sketched, purged as it is of the Lockean proviso, with all the egalitarian mischief-making the proviso has made possible.

## Case

### Collisions

**Probability – 0.1% chance of a collision.**

**Salter 16** [(Alexander William, Economics Professor at Texas Tech) “SPACE DEBRIS: A LAW AND ECONOMICS ANALYSIS OF THE ORBITAL COMMONS” 19 STAN. TECH. L. REV. 221 \*numbers replaced with English words] TDI

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.

### Environment

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