# Affirmative

**Resolved: The appropriation of outer space by private entities is unjust.**

## FWK

The value of **Justice** (defined by giving each their due), will be achieved by **maximizing human well-being**.

**Only pleasure and pain are intrinsically valuable. Utilitarianism is a prerequisite to all other frameworks.**

**Moen 16** [Ole Martin Moen, Research Fellow in Philosophy at University of Oslo “An Argument for Hedonism” Journal of Value Inquiry (Springer), 50 (2) 2016: 267–281] SJDI

**Pleasure is intrinsically valuable and pain is intrinsically disvaluable**. On virtually any proposed list of intrinsic values and disvalues (we will look at some of them below), pleasure is included among the intrinsic values and pain among the intrinsic disvalues. This inclusion makes intuitive sense, moreover, for **There is something undeniably good about**the way**pleasure**feels**and**something undeniably **bad about**the way**pain**feels, and neither the goodness of pleasure nor the badness of pain seems to be exhausted by the further effects that these experiences might have. “Pleasure” and “pain” are here understood inclusively, as encompassing anything hedonically positive and anything hedonically negative.2

The special Value statuses of pleasure and pain are manifested in how we treat these experiences in our everyday reasoning about values. If you tell me that you are heading for the convenience store, I might ask: “What for?” This is a reasonable question, for when you go to the convenience store you usually do so, not merely for the sake of going to the convenience store, but for the sake of achieving something further that you deem to be valuable. You might answer, for example: “To buy soda.” This answer makes sense, for soda is a nice thing and you can get it at the convenience store. I might further inquire, however: “What is buying the soda good for?” This further question can also be a reasonable one, for it need not be obvious why you want the soda. You might answer: “Well, I want it for the pleasure of drinking it.” If I then proceed by asking “But what is the pleasure of drinking the soda good for?” the discussion is likely to reach an awkward end. The reason is that the Pleasure is not good for anything further; it is simply that for which going to the convenience store and buying the soda is good.3 As Aristotle observes: “We never ask [a man] what his end is in being pleased, because we assume that pleasure is choice worthy in itself.”4 Presumably, a similar story can be told in the case of pains, for if someone says “This is painful!” we never respond by asking: “And why is that a problem?” We take for granted that if something is painful, we have a sufficient explanation of why it is bad. If we are onto something in our everyday reasoning about values, it seems that **Pleasure and pain**are**both**places where we**reach the end**of the line in matters**of value.**

**Policies cannot cater to every single person’s desires, but what it can realistically do is maximize the people benefitted and minimize the people harmed.**

**Diepenbrock 14** <https://today.ku.edu/2014/06/02/professor-studies-how-utilitarianism-provides-framework-major-policy-decisions#:~:text=Professor%20studies%20how%20utilitarianism%20provides%20framework%20for%20major%20policy%20decisions,-Mon%2C%2006%2F16&text=All%20major%20policy%20decisions%20involve,the%20common%20good%20the%20most.%22>

"It doesn’t make sense to insist on 'do no harm' when the status quo presents us with problems that need to be addressed," said Ben Eggleston, associate professor of philosophy. "The status quo has real shortcomings, and it is worth looking into whether we can make improvements. All major policy decisions involve tradeoffs, and utilitarianism provides a framework for making those tradeoffs and trying to do so in the way that promotes the common good the most." Jeremy Bentham in the 18th century and John Stuart Mill in the 19th century pioneered utilitarianism, and it remains influential in contemporary moral philosophy. Eggleston, who co-edited the book with Dale E. Miller, a professor of philosophy at Old Dominion University, said one argument against using utilitarianism to justify policies, such as increasing the minimum wage or instituting mandatory health insurance coverage under the Affordable Care Act, centers on some unusual hypothetical cases instead of considering broader, more complex policy questions. N. Gregory Mankiw, a Harvard University economics professor, in a March New York Times column criticized both policies, saying they would have unintended consequences and do harm to business, for example. He argued against using utilitarianism as a public policy framework and mentioned the ethical dilemma of a doctor weighing harvesting the organs of one healthy patient to save four dying patients. "At this point, almost everyone balks," Mankiw wrote. "Sometimes, respecting natural rights trumps maximizing utility." Eggleston said While (the) scenario of “respecting natural rights trumps maximizing utility” is useful to discuss in introductory-level ethics courses when talking about utilitarianism, it's less applicable when trying to decide large-scale policy decisions. "You don't have to endorse forcibly removing some people’s organs, such as in that hypothetical example, in order to think that when it comes to large-scale economic planning, we ought to choose the policy that maximizes benefits and minimizes harms," he said. He said when Congress debates issues like the Affordable Care Act or raising the minimum wage, it's to address existing harm or problems with the status quo, such as people not being able to secure health insurance due to pre-existing conditions or still living below the poverty line despite working a full-time job. "At that scale it's much more plausible to think in terms of figuring out what's the policy that will maximize the balance of benefits minus harms," Eggleston said. "Acknowledging that any policy you choose is going to have some harm and some benefit, you try to pick the best one."

## C1: Space Debris

#### Private companies overpopulate space causing debris cascades

Impey 21 [Chris Impey, professor of astronomy at the University of Arizona, 10-8-2021, "Is conflict in space inevitable?," TheHill, https://thehill.com/opinion/international/575903-is-conflict-in-space-inevitable?rl=1]/Kankee

The treaty prohibits weapons of mass destruction, but it says nothing about conventional weapons. Ownership is addressed by the U.N. Moon Treaty of 1979. It declares the Moon to be part of the common heritage of mankind and says lunar and other off-Earth resources are “not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.” Unfortunately, the treaty is moot since none of the major space-faring powers signed it. Lawlessness and lack of regulation are showing an effect in the dramatic increase in space junk — the detritus of our activity in space. Chunks of metal that no longer serve a useful purpose include non-functional spacecraft, abandoned launch vehicles, cast-off materials from space missions and fragmentation debris. There are 23,000 pieces of debris larger than a softball orbiting the Earth, tracked by the Defense Department’s space surveillance network. Estimates of smaller sizes are half a million the size of a marble or larger and 100 million a millimeter or larger. The problem is that they are all moving at extremely high speeds, up to 17,500 mph — and even a tiny fleck of paint can damage a spacecraft at that speed. The situation is getting worse. As more satellites and spacecraft are launched and more obsolete hardware accumulates in orbit, the odds of collisions increase. Commercial space companies like SpaceX are planning to launch tens of thousands of satellites in the next decade to facilitate wireless Internet in parts of the world that currently have no coverage. Even before these plans, it was predicted that large collisions could cause cascading collisions, exponentially increasing the number and density of small pieces, and potentially rendering low Earth orbit completely unusable. This dire scenario is called the Kessler syndrome. The problem has an ominous overtone because world powers are arming themselves to take out each other’s satellites, offensively or defensively. It is going to get increasingly difficult for a country to tell why their satellite went down or fell silent. Was it a collision with debris, space “weather,” or a hostile action? No international treaty governs space debris. Mitigation strategies exist, but governments have been dragging their feet. Earth orbit is a new “tragedy of the commons,” where we ruin something because we profit by exploiting it and cannot exclude others from doing the same. Space junk is a headache, but space weapons are a nightmare. China is a rapidly rising space power, with ambitious plans for a space station, a Moon base and a Mars base. Unlike the United States, where NASA is a civilian agency with plans available for scrutiny, China’s space program is blended with its military and operates under a veil of secrecy. A recent report from the Office of the Director of National Intelligence said China is working on an array of capabilities to weaponize space, and it plans to “match or exceed U.S. capabilities in space to gain the military, economic, and prestige benefits that Washington has accrued from space leadership.”

#### Private companies increase chances of collision

**Ramanathan 21** <https://news.yahoo.com/starlinks-megaconstellation-12-000-satellites-161610349.html?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAGbXBZNFMOhHvri0WdtPjDnuXKopW_I-fNJgnN1tTU51UYjv37jNn9qWgUr7zm6j0_0ZL8w2ZXIAkK6L09w0vIBfzrcGtVrD15p6Oi6OC5_rBugPI_G6kctjipvCuG-FX7D_fHiH4OmoWSXbHKWTnFXqvra8mtQQh0m_BWLrOtxB>

Starlink satellites will ultimately be responsible for 90% of near misses in Earth orbit, a scientist predicts. Hugh Lewis told Space.com that Starlink satellites were already involved in about 50% of near misses. Near misses occur when two spacecraft pass within 1 kilometer (0.6 miles) of each other. See more stories on Insider's business page. Starlink satellites will ultimately be involved in 9 in 10 near misses between spacecraft that are orbiting Earth, a scientist and space debris expert has predicted. Once the "megaconstellation" of Starlink satellites has reached its intended size of **12,000**, it will be responsible for **90%** of these close encounters, research by Hugh Lewis, of the University of Southampton, published by Space.com, suggests. Starlink, which is owned by Elon Musk's SpaceX, aims to create "the world's most advanced broadband internet system." It has already launched around **17 00** satellites into Earth orbit, which are responsible for about **half of all** near misses presently, Professor Lewis' research suggests. Near misses in Earth orbit occur when two spacecraft pass within 1 kilometer (0.6 miles) of each other. With a rapidly growing number of satellites being sent into orbit, scientists are concerned about the increased likelihood of collisions, and the potential for a chain reaction that leads to multiple collisions. Lewis examined data from the Satellite Orbital Conjunction Reports Assessing Threatening Encounters in Space (Socrates) database, which tracks satellite orbits and models their trajectory to assess collision risk. He looked at data back to May 2019, when Starlink launched its first batch of satellites. Lewis said that Starlink satellites were responsible for 1,600 close encounters between two spacecraft a week. Excluding near misses involving two Starlink satellites, the figure was 500, he said. He told Space.com that the number of encounters picked up by the Socrates database "has more than doubled and now we are in a situation where Starlink accounts for half of all encounters." OneWeb, a Starlink competitor, has 250 satellites in orbit, which are [is] involved in 80 near misses with other operators' satellites each week

#### Large constellations cause debris cascades

Murtaza et al. 20 [Abid Murtaza, educator at the School of Electronic and Information Engineering at Beihang University pursuing a Ph.D. in space technology applications with Beihang University, Syed Jahanzeb Hussain Pirzada, educator at the School of Cyber Science and Technology at Beihang University pursuing a Ph.D. in space technology applications with Beihang University, Tongge Xu, Associate Professor with the School of Cyber Science and Technology at Beihang University, and Liu Jianwei, educator at the School of Electronic and Information Engineering at Beihang University, 03-09-2020, “Orbital Debris Threat for Space Sustainability and Way Forward (Review Article),” IEEE, https://ieeexplore.ieee.org/abstract/document/9028136]/Kankee

There is substantial uncertainty in the prediction of the reliability of mega constellation satellites, with considerable risk to the space environment. This is because much of the information about mega constellation satellites, including the detailed designs, is not available [10]. Another recent study shows that a high probability exists for the occurrence of at least one catastrophic collision:, i.e., 5% for OneWeb and **45.8% for SpaceX constellations, during an operational phase of 5 years** [97]. The study [98] showed that it was estimated that an impact of approximately 3 cm in diameter would lead to a catastrophic collision of a OneWeb sized satellite, while the proposed size of a SpaceX constellation satellite is larger than a OneWeb satellite. The study also shows that the Satellites in the constellation would have a 35% probability of fragmenting during the described mission lifecycle catastrophically. Thus, what we can confidently say is that despite the claims of mega constellation proposers, there are serious concerns, doubts, and uncertainty about the interaction of debris and satellites in mega constellations that exist. NASA has recently completed a parametric study to understand how significantly proposed large satellite constellation can contribute to the existing orbital debris problem. The objective was to quantify the potential negative debris-generation effects from mega constellation to the LEO environment and provide recommendations for mitigation measures [99]. The results show that for the 25-year decay rule at the end of their missions, with a 90% reliability of post-mission disposal, the additional debris population increase with respect to that without these big constellations is approximately 290% in 200 years. Even with 95% post-mission disposal reliability for the mega constellation spacecraft, the additional population increase is still close to 100% as shown in Fig. 12. While with 99% post-mission disposal, the additional population increase is reduced to 22%. The cumulative numbers of catastrophic collisions are shown in Fig. 13, which shows that in 90% scenario a non-linear increase from 27 to a total of 260 catastrophic collisions in 200 years. In 95% scenario, the total number of catastrophic collisions is 90 in 200 years. Based on results from this study NASA recommended that 99% spacecraft PMD reliability is needed to mitigate the serious long-term debris generation potential from mega constellation similar in scope to the study scenarios. Besides this, there are many aspects which are nevertheless not under the control of anyone, such as a collision of two large retired satellites or rocket bodies. Additionally, there could be many hypothetical scenarios that could lead to a catastrophic collision. For example, the accuracy error in tracking the debris data thorough SSN, the human or technical errors in estimated the timing of the collision threats, failure in a collision avoidance maneuver by satellites due to onboard control problems or anomalies in the propulsion system, and any deliberate political reasons and so on. Additionally, so far there is no legal restriction of using ASAT. So, what if the use of ASAT continues in future just like India did recently? Also what if the war between two advanced nations extends from ground to space that could result in the use of ASAT weapons to destroy the satellites of enemies? Thus, the argument is that there could be any reason for a catastrophic collision, and one or more such accident could make the situation worse, which would have severe consequences for everyone especially such as Kessler syndrome. Hence, we can say that mega constellation projects, despite their potential benefits are not going to help in improving debris and space environment in any way; instead, fair chances of worsening of debris and space environment can be envisioned from the above discussion. It might be negligence if we deliberately continue to underestimate debris challenge and its potential threat to the space environment in the future. SECTION VII.Legal and Regulatory Issues

[**Pultarova 21**](https://www.space.com/spacex-starlink-satellite-collision-alerts-on-the-rise)<https://www.space.com/spacex-starlink-satellite-collision-alerts-on-the-rise>  
SpaceX's [Starlink](https://www.space.com/spacex-starlink-satellites.html) satellites alone are involved in 1,600 close encounters between two spacecraft every week, that's about 50% of all such incidents. according to Hugh Lewis, the head of the Astronautics Research Group at the University of Southampton, U.K.

#### The timeframe is too soon and irreversible – it’s now or never

Phys Org 17 Phys Org, 5-31-2017, Space junk could destroy satellites, hurt economies, https://phys.org/news/2017-05-space-junk-satellites-economies.html, 1-16-2022

"The space junk problem has been getting worse every year," Ben Greene, head of Australia's Space Environment Research Centre which is hosting the two-day conference of international space environment scientists in Canberra, told AFP. "We're losing three or four satellites a year now to space debris collision. We're very close, NASA estimates, of within five to 10 years of losing everything." Greene added in a statement that "a catastrophic avalanche of collisions which could quickly destroy all orbiting satellites is now possible", noting that more collisions were creating extra debris. With society heavily dependent on satellites for communication and navigation, and powering key industries such as transport, finance and energy, the growing cosmic junkyard could threaten economies.

### !Impacts of Debris

#### 1) We will be blocked from exiting orbit: This means that any possibility of exploring space in the future will not happen before we address space debris.

**O’Callaghan 21** https://www.nytimes.com/2021/05/12/science/space-junk-climate-change.html  
It’s easy to compare the space junk problem to climate change. Human activities leave too many dead satellites and fragments of machinery discarded in Earth orbit. If left unchecked, space junk could pose(s) significant problems for future generations — rendering access to space increasingly difficult, or at worst, [impossible](https://www.nytimes.com/2007/02/06/science/space/06orbi.html). Yet the two may come to be linked. Our planet’s atmosphere naturally pulls orbiting debris downward and incinerates it in the thicker lower atmosphere, but increasing carbon dioxide levels are [lowering the density](https://www.nsf.gov/news/news_summ.jsp?cntn_id=108187) of the upper atmosphere, which may diminish this effect. A study [presented last month](https://space-debris-conference.sdo.esoc.esa.int/page/programme) at the European Conference on Space Debris says that the problem has been underestimated, and that the amount of space junk in orbit could, in a worst-case scenario, increase 50 times by 2100. “The numbers took us by surprise,” said Hugh Lewis, a space debris expert from the University of Southampton in England and a co-author on the paper, which will be submitted for peer review in the coming months. “There is genuine cause for alarm.”

#### 2) Loss of technology due to Kessler Effect.

Les Johnson 13, Deputy Manager for NASA's Advanced Concepts Office at the Marshall Space Flight Center, Co-Investigator for the JAXA T-Rex Space Tether Experiment and PI of NASA's ProSEDS Experiment, Master's Degree in Physics from Vanderbilt University, Popular Science Writer, and NASA Technologist, Frequent Contributor to the Journal of the British Interplanetary Sodety and Member of the American Institute of Aeronautics and Astronautics, National Space Society, the World Future Society, and MENSA, Sky Alert!: When Satellites Fail, p. 9-12 [language modified]

Whatever the initial cause, the result may be the same. A satellite destroyed in orbit will break apart into **thousands of pieces**, each traveling at over 8 km/sec. This virtual shotgun blast, with pellets traveling 20 times faster than a bullet, will quickly spread out, with each pellet now following its own orbit around the Earth. With over 300,000 other pieces of junk already there, the tipping point is crossed and a runaway series of collisions begins. A few orbits later, two of the new debris pieces strike other satellites, causing them to explode into thousands more pieces of debris. The rate of collisions increases, now with more spacecraft being destroyed. Called the "Kessler Effect", after the NASA scientist who first warned of its dangers, these debris objects, now numbering in the millions, cascade around the Earth, destroying every satellite in low Earth orbit. Without an atmosphere to slow them down, thus allowing debris pieces to bum up, most debris (perhaps numbering in the millions) will remain in space for hundreds or thousands of years. Any new satellite will be threatened by destruction as soon as it enters space, effectively rendering many Earth orbits unusable.

#### 3) Debris impacts cause US-Russia war, ends in nuclear extinction

Barrett 16 [Anthony Barrett, Cofounder and director of research of the Global Catastrophic Risk Institute and senior risk analyst at ABS Consulting, 2016, “False Alarms, True Dangers? Current and Future Risks of Inadvertent U.S.-Russian Nuclear War” https://www.semanticscholar.org/paper/False-Alarms%2C-True-Dangers-Current-and-Future-Risks-Barrett/dbc441aca0ddacb96598f78cfec7306ea85d1f71//]/Kankee

This scenario could take place over the next three years: Falling oil and gas prices make it difficult for Russia to maintain its early warning system components. One of the northern-facing Russian radars begins failing some of its reliability tests, and a month later the Russian early warning satellite constellation loses its only geostationary satellite. A combination of technical problems and budget pressures prevent either a radar overhaul or a launch of a replacement satellite for at least a year. Two months after the geostationary satellite loss, one of several remaining Russian early warning satellites in a highly elliptical Molniya orbit detects flares of some kind in the area of the ICBM fields in the northern United States. At that moment, the satellite is the only component of the Russian early warning satellite constellation that is in an orbital position allowing it to see the northern United States. The satellite cannot immediately determine whether the flares are due to launches at ICBM bases or to something else, such as fires at oil or gas facilities in the same region, or perhaps the reflection of sunlight off high-altitude clouds. The satellite is able to transmit its flare-detection signal to other parts of the Russian early warning system, alerting system operators in Russia. However, the Russian satellite is then struck, by orbital debris and it instantly ceases communication with Russian early warning system operators. Russian early warning system operators must quickly decide what to tell their leaders. Did the satellite detect a launch of U.S. ICBMs? Was the loss of communications capabilities caused by sabotage? Could Russian radar systems rule out the possibility of incoming ICBMs? These questions could be quite serious during a period of seeming calm between the United States and Russia, but they would be especially urgent during a period of heightened tension or crisis. This Perspective represents the various pathways for a false alarm scenario for both nations in one fault tree (Figure 1), given the assumption that both Russia and the United States have similar procedures to respond to early warning alarms and use roughly analogous categories of low-, mid-, and high-level alarm events. The outcome of concern here, of course, is the launch of nuclear missiles when one country mistakenly concludes that it is under attack by the other. As shown in the second level of the tree, a launch in response to a false alarm could occur either during a U.S.-Russian crisis or during a period of low tension. The next layer in the tree shows that a launch in response to a false alarm could occur if a midlevel false alarm is promoted to a high level and involves senior national leadership who choose a launch response. Each of those steps in the decision process for false alarms has an associated node in the fault tree that is a key risk factor in the model. That all applies to both crisis and noncrisis periods. However, as is shown farther down the tree, during crisis conditions, the effective total rate of false alarms includes both midlevel false alarm events and any low-level events whose resolution (identification as a false alarm) cannot be completed before the “use them or lose them” point where a launch response decision needs to be made by leaders.1

#### This scenario has happened in the past, but countries were better equipped. Early warning today is not in a good position to make accurate judgements if hit

**Graham 05** https://www.armscontrol.org/act/2005-12/features/space-weapons-risk-accidental-nuclear-war

The United States and Russia maintain thousands of nuclear warheads on long-range ballistic missiles on 15-minute alert. Once launched, they cannot be recalled, and they will strike their targets in roughly **30 minutes**. Fifteen years after the end of the Cold War, the chance of an accidental nuclear exchange has far from decreased. Yet, the United States may be contemplating further exacerbating this threat by deploying missile interceptors in space. Both the United States and Russia **rel**[**ies**] on space-based systems to provide early warning of a nuclear attack. If deployed, however, U.S. space-based missile defense interceptors could eliminate the Russian early warning satellites quickly and without warning. So, just the existence of U.S. space weapons could make Russia’s strategic trigger fingers itchy. The potential protection space-based defenses might offer the United States is swamped therefore by their potential cost: a failure of or false signal from a component of the Russian early warning system could lead to a disastrous reaction and accidental nuclear war. There is no conceivable missile defense, space-based or not, that would offer protection in the event that the Russian nuclear arsenal was launched at the United States. Nor are the Russians or other countries likely to stand still and watch the United States construct space-based defenses. These states are likely to respond by developing advanced anti-satellite weapon systems.[1] These weapons, in turn, would endanger U.S. early warning systems, impair valuable U.S. weapons intelligence efforts, and increase the jitteriness of U.S. officials. The Dangers of Failed Early Warning Systems The Russian early warning system is in serious disrepair. This system consists of older radar systems nearing the end of their operational life and **just three** functioning **satellites**, although the Russian military has plans to deploy more. The United States has 15 such satellites. Ten years ago, on January 25, 1995, this aging early warning network picked up a rocket launch from Norway. The Russian military could not determine the nature of the missile or its destination. Fearing that it might be a submarine-launched missile aimed at Moscow with the purpose of decapitating the Russian command and control structure, the Russian military alerted President Boris Yeltsin, his defense minister, and the chief of the general staff. They immediately opened an emergency teleconference to determine whether they needed to order Russia’s strategic forces to launch a counterattack. The rocket that had been launched was actually an atmospheric sounding rocket conducting scientific observations of the aurora borealis. Norway had notified Russia of this launch several weeks earlier, but the message had not reached the relevant sections of the military. In little more than two minutes before the deadline to order nuclear retaliation, the Russians realized their mistake and stood down their strategic forces. Thus, 10 years ago, when the declining Russian **early warning system was stronger than today**, it read this single small missile test launch as a U.S. nuclear missile attack on Russia. The alarm went up the Russian chain of command all the way to the top. The briefcase containing the nuclear missile launch codes was brought to Yeltsin as he was told of the attack. Fortunately, Yeltsin and the Russian leadership made the correct decision that day and directed the Russian strategic nuclear forces to stand down. Obviously, nothing should be done in any way further to diminish the reliability of the space-based components of U.S. and Russian ballistic missile early warning systems. A decline in confidence in such early warning systems caused by the deployment of weapons in space would enhance the risk of an accidental nuclear weapons attack. Yet, as part of its plans for missile defense, the Pentagon is calling for the development of a test bed for space-based interceptors as well as examining a number of other exotic space weapons. In an interview published in Arms Control Today, Lt. Gen. Henry Obering, director of the Missile Defense Agency, touted what he said was “a very modest and moderate test-bed approach to launch some experiments.” Obering said the Pentagon would only deploy a handful of interceptors: “We are talking about onesies, twosies in terms of experimentation.”[2]

#### Even a small nuclear war leads to extinction of humankind (outweigh climate change b/c nuke war hastens clim change impx)

**Witze 20** https://www.nature.com/articles/d41586-020-00794-y

The goal was to analyse every step of nuclear winter — from the initial firestorm and the spread of its smoke, to agricultural and economic impacts. “We put all those pieces together for the first time,” says Robock. The group looked at several scenarios. Those range from a **US–Russia war** involving much of the world’s nuclear arsenal, which would **loft 150 million tonnes of soot** into the atmosphere, down to the 100-warhead India–Pakistan conflict, which would generate 5 million tonnes of soot6. The soot turns out to be a key factor in how bad a nuclear winter would get; three years after the bombs explode, Global temperatures would have **plummeted by more than 10 °C** in the first scenario — more than the cooling during the last ice age — but by a little more than 1 °C in the second. Toon, Robock and their colleagues have used observations from major wildfires in British Columbia, Canada, in 2017 to estimate how high smoke from burning cities would rise into the atmosphere7. During the wildfires, sunlight heated the smoke and caused it to soar higher, and persist in the atmosphere longer, than scientists might otherwise expect. The same phenomenon might happen after a nuclear war, Robock says. Raymond Jeanloz, a geophysicist and nuclear-weapons policy expert at the University of California, Berkeley, says that incorporating such estimates is a crucial step to understanding what would happen during a nuclear winter. “This is a great way of cross-checking the models,” he says. Comparisons with giant wildfires could also help in resolving a controversy about the scale of the potential impacts. A team at Los Alamos National Laboratory in New Mexico argues that Robock’s group has overestimated how much soot burning cities would produce and how high the smoke would go8. The Los Alamos group used its own models to simulate the climate impact of India and Pakistan setting off 100 Hiroshima-sized bombs. The scientists found that much less smoke would get into the upper atmosphere than Toon and Robock reported. With less soot to darken the skies, the Los Alamos team calculated a much milder change to the climate — and no nuclear winter. Pakistani spectators watch the Shaheen II long-range missile capable of carrying a nuclear warhead on its launcher at a parade. At a 2005 parade in Islamabad, Pakistan, a truck carries a Shaheen II long-range missile that can be armed with a nuclear warhead.Credit: Farooq Naeem/AFP via Getty The difference between the groups boils down to how they simulate the amount of fuel a firestorm consumes and how that fuel is converted into smoke. “After a nuclear weapon goes off, things are extremely complex,” says Jon Reisner, a physicist who leads the Los Alamos team. “We have the ability to model the source and we also understand the combustion process. I think we have a better feel about how much soot can potentially get produced.” Reisner is now also studying the Canadian wildfires, to see how well his models reproduce how much smoke gets into the atmosphere from an incinerating forest. Robock and his colleagues have fired back in tit-for-tat journal responses9. Among other things, they say the Los Alamos team simulated burning of greener spaces rather than a densely populated city. Dark seas While that debate rages, Robock’s group has published results showing a wide variety of impacts from nuclear blasts. That includes looking at ocean impacts, the first time this has been done, says team member Nicole Lovenduski, an oceanographer at the University of Colorado Boulder. When Toon first approached her to work on the project, she says, “I thought, ‘this sure seems like a bleak topic’.” But she was intrigued by how the research might unfold. She usually studies how oceans change in a gradually warming world, not the rapid cooling in a nuclear winter. Lovenduski and her colleagues used a leading climate model to test the US–Russia war scenario. “It’s the hammer case, in which you hammer the entire Earth system,” she says. In one to two years after the nuclear war, she found, Global cooling **(This) would affect the oceans’ ability to absorb carbon**, causing their pH to skyrocket. That’s the opposite to what is happening today, as the oceans soak up atmospheric carbon dioxide and waters become more acidic. She also studied what would happen to aragonite, a mineral in seawater that marine organisms need to build shells around themselves. In two to five years after the nuclear conflict, the cold dark oceans would start to contain less aragonite, putting the organisms at risk, the team has reported2. In the simulations, some of the biggest changes in aragonite happened in regions that are home to coral reefs, such as the southwestern Pacific Ocean and the Caribbean Sea. That suggests that coral-reef ecosystems, which are already under stress from warming and acidifying waters, could be particularly hard-hit during a nuclear winter. “These are changes in the ocean system that nobody really considered before,” says Lovenduski. And those aren’t the only ocean effects. Within a few years of a nuclear war, a “Nuclear Niño” would roil the Pacific Ocean, says Joshua Coupe, a graduate student at Rutgers. This is a turbo-charged version of the phenomenon known as El Niño. In the case of a US–Russia nuclear war, the dark skies would cause the trade winds to reverse direction and water to pool in the eastern Pacific Ocean. As during an El Niño, **Droughts and heavy rains** could plague many parts of the world for as long as seven years, Coupe reported last December at a meeting of the American Geophysical Union. Beyond the oceans, the research team has found big impacts on land crops and food supplies. Jonas Jägermeyr, a food-security researcher at NASA’s Goddard Institute for Space Studies in New York City, used six leading crop models to assess how agriculture would respond to nuclear winter. Even the relatively small India–Pakistan war would have catastrophic effects on the rest of the world, he and his colleagues report this week in the Proceedings of the National Academy of Sciences1. Over the course of five years, maize (corn) production would drop by 13%, wheat production by 11% and soya-bean production by 17% . The worst impact would come in the mid-latitudes, including breadbasket areas such as the US Midwest and Ukraine. **Grain reserves would be gone** in a year or two. Most countries would be unable to import food from other regions because they, too, would be experiencing crop failures, Jägermeyr says. It is the most detailed look ever at how the aftermath of a nuclear war would affect food supplies, he says. The researchers did not explicitly calculate how many people would starve, but say that The ensuing famine would be worse than any in documented history. Farmers might respond by planting maize, wheat and soya beans in parts of the globe likely to be less affected by a nuclear winter, says Deepak Ray, a food-security researcher at the University of Minnesota in St Paul. Such changes might help to buffer the food shock — but only partly. The bottom line remains that a war involving less than 1% of the world’s nuclear arsenal could shatter the planet’s food supplies.

## Aff Solvency

#### Private actors are uniquely key to avoid cleaning debris - The best solution to dealing with space debris is not to generate it in the first place

Yuan 21 [Alda Yuan, Public Health Analyst U.S. Department of Health and Human Services and visiting attorney at the Enivornmental Law Institute with a JD from Yale, 2021, “FILLING THE VACUUM: ADAPTING INTERNATIONAL SPACE LAW TO MEET THE PRESSURES CREATED BY PRIVATE SPACE ENTERPRISES,” Hein Online, https://heinonline.org/HOL/P?h=hein.journals/denilp49&i=27]/Kankee

C. Non-state Actors Introduce Practical Challenges that endanger the Future of Space Travel If companies are permitted to access space without a proper legal framework or sufficient coordination, the practical risks may doom the project of humanity in outer space for the near future. The opening anecdote dramatized the risks, but the fact that a chain of Cascading destruction might preclude the use of whole bands of outer space or make launches impossible is not farfetched. 99 Indeed, it is already happening.0 Because space missions always create debris and there is a correlation between the number of objects orbiting earth and the chances of collision, which thereby creates more debris, even no further activity in space will eventually result in a belt of debris encircling the earth.10 1 This cascade effect, called the Kessler Syndrome, 102 has the potential to speed up astronomically if activities in outer space expand without contingent regulation and mitigation measures.1 1 3 At current rates and in the absence of a catastrophic event, lower earth orbit, in particular, might reach a tipping point within the next ten to fifty years.1 4 If the space debris problem is permitted to reach this tipping point, access to space may well be cut off for the near future because it will be impossible to launch satellites.1 5 Given that we do not have the technology to clean up debris yet, space travel faces an existential threat. In light of this, most space-faring states cooperate, working together to develop guidelines and pool resources to track the debris already orbiting the earth to minimize the chances of a collision.106 Given the high speeds the debris travels at, approximately 10 km/second,107 and the amount of damage even tiny pieces can do, 108 the existing tracking systems are not an absolute fix. At these speeds, a piece of debris weighing a mere two grams can produce an impact force equivalent to a kilogram of TNT.109 More than three hundred thousand pieces of debris greater than one cm in diameter," and therefore capable of causing enormous damage, orbit the earth while the US Space Surveillance Network (SSN) system can only track objects over five cm in diameter." There are millions of fragments smaller than one cm, which are impossible to track and yet can still cause significant damage.11 2 Still, the tracking system is important. In the last twenty years, the International Space Station has carried out several avoidance maneuvers to avoid potential collision with pieces of space debris being tracked by the SSN system.113 Between April of 2011 and April of 2012, the ISS performed four evasive maneuvers." 4 On two additional occasions, the crew fell back to the Soyuz since there was no time to set up an evasive maneuver." 5 This sort of cooperation works given the limited number of actors involved and the aligned interests of the nation-state parties. Commercial space companies do not have the same incentives to cooperate to share data and new technologies. This is why many have called for the creation of a new convention on managing orbital debris. 16 However, escalation of the Kessler Syndrome is not the only problem that might arise by failing to accommodate for the rise of the commercial corporations, so such a convention would not eliminate the threat. For instance, many satellites use nuclear power sources (NPS), which can break up upon reentry." As early as 1978, the Cosmos-954 incident scattered radioactive debris over Canada.118 Other accidents of this type could raise fallout concerns, especially if they occur over more densely populated regions. In an attempt to alleviate this risk and decrease the chances of collisions, various nations have cooperated to design and standardize methods of decommissioning satellites. 119 One strategy is to supply spacecraft with additional fuel and nudge it out of orbit so it will burn up in the atmosphere over the ocean. 120 Another is to push the ailing satellite into a graveyard orbit. 121 These methods require additional research and design and incur additional costs. 12 2 Private companies may not spontaneously take the steps necessary to comport with the common practices of space-faring nations. Thus, the rise of private corporations, while opening up new possibilities, may also threaten space travel itself and the international legal order in which coordination currently occurs. The coordination necessary to prevent and manage the unique problems that arise in space requires a more pragmatic framework. Directly binding private non-state actors benefits the international community because it prevents abusive practices and permits the coordination of efforts that make space safer. However, it will also benefit the private sector by providing companies with a background legal structure, neutral dispute resolution, and common guidelines to even the playing field. More importantly, if companies not subject to regulation and oversight are permitted to operate in outer space, disasters cannot be effectively prevented. In that case, space exploration and the benefits stemming from it might be closed off for all. III. SPACE IS A GLOBAL COMMONS UNDER CUSTOMARY INTERNATIONAL LAW

#### SQ cleanup efforts will not be enough. Aff uniqueness allows the public sector to clean up debris while preventing further pollution by companies.

**Weiner 21** https://www.npr.org/2021/03/21/979815691/new-effort-to-clean-up-space-junk-prepares-to-launch

The development of other cleanup technologies has been underway for years. In 2016, **Japan's space agency** [sent a 700-meter tether into space](https://www.npr.org/sections/thetwo-way/2016/12/09/505020386/japan-sends-long-electric-whip-into-orbit-to-tame-space-junk) to try to slow down and redirect space junk. In 2018, [**A device called RemoveDebris**](https://www.cnn.com/2018/09/30/business/space-debris-capture/index.html) successfully cast a net around a dummy satellite. **The European Space Agency** also plans to send a self-destructing robot into orbit in 2025, which the organization's former director general has referred to as a [space "vacuum cleaner."](https://www.npr.org/2019/12/13/787720682/cleaning-up-space-junk) These efforts could prove increasingly important as **private space ventures like SpaceX continue to clutter low Earth orbit** with a ["mega-constellation" of satellites](https://www.npr.org/2020/01/23/798809252/can-space-traffic-control-handle-the-volume-of-private-launches).

## C2: Inequality and Abuses

#### In the meantime, before Kessler Effect creates a wall of debris around Earth, private initiatives will be central to space col

Weinzierl and Sarang 21   
<https://hbr.org/2021/02/the-commercial-space-age-is-here> [[Matt Weinzierl](https://hbr.org/search?term=matt%20weinzierl&search_type=search-all) is the Joseph and Jacqueline Elbling Professor of Business Administration at HBS and a Research Associate at the NBER. His research and teaching focus on the design of economic policy and the economics and business of space. [Mehak Sarang](https://hbr.org/search?term=mehak%20sarang&search_type=search-all) is a Research Associate at Harvard Business School and the Lunar Exploration Projects Lead for the MIT Space Exploration Initiative.] In contrast, the space-for-space economy — that is, goods and services produced in space for use in space, such as mining the Moon or asteroids for material with which to construct in-space habitats or supply refueling depots — has struggled to get off the ground. As far back as the 1970s, [research](https://ntrs.nasa.gov/citations/19780004167) commissioned by NASA predicted the rise of a space-based economy that would supply the demands of hundreds, thousands, even millions of humans living in space, dwarfing the space-for-earth economy (and, eventually, the entire terrestrial economy as well). The realization of such a vision would change how all of us do business, live our lives, and govern our societies — but to date, we’ve never even had more than [13 people](https://www.space.com/6503-population-space-historic-high-13.html) in space at one time, leaving that dream as little more than science fiction. **Today**, however, **there is reason to think that we may finally be reaching the first stages of a true space-for-space economy. SpaceX**’s[recent achievements](https://www.nasa.gov/press-release/nasa-s-spacex-crew-1-astronauts-headed-to-international-space-station/) (in cooperation with NASA), as well **as upcoming efforts by** [Boeing](https://www.nasa.gov/feature/boeing-s-starliner-makes-progress-ahead-of-flight-test-with-astronauts)**,** [Blue Origin](https://www.blueorigin.com/news/nasa-selects-blue-origin-national-team-to-return-humans-to-the-moon)**, and** [Virgin Galactic](https://spacenews.com/virgin-galactic-prepares-to-transition-to-operations) **to put people in space** sustainably and at scale, mark the opening of a **new chapter of** spaceflight led by private firms. These firms **have** both **the intention and capability to bring private citizens to space as** passengers, tourists, and — eventually — **settlers**, opening the door for businesses to start meeting the demand those people create over the next several decades with an array of space-for-space goods and services. In our [recent research](https://www.hbs.edu/faculty/Publication%20Files/jep.32.2.173_Space,%20the%20Final%20Economic%20Frontier_413bf24d-42e6-4cea-8cc5-a0d2f6fc6a70.pdf), we examined how **the model of centralized, government-directed human space activity born in the 1960s has, over the last two decades, made way for a new model, in which public initiatives in space increasingly share the stage with private priorities.** Centralized, government-led space programs will inevitably focus on space-for-earth activities that are in the public interest, such as national security, basic science, and national pride. This is only natural, as expenditures for these programs must be justified by demonstrating benefits for citizens — and the citizens these governments represent are (nearly) all on earth. **In contrast to governments, the private sector is eager to put people in space to pursue their own personal interests, not the state’s — and then supply the demand they create.** This is the vision driving **SpaceX**, which in its first twenty years **has entirely upended the rocket launch industry, secur[ed] 60% of the global commercial launch market and** building ever-larger spacecraft designed to ferry passengers not just to the International Space Station (ISS), but also to its own **promised** [settlement on Mars](https://www.spacex.com/media/making_life_multiplanetary_transcript_2017.pdf).

#### Indentured servitude is the private sector’s way to settle the cosmos (public sector cannot solve indent. serv., e.g. colonial era and deaths of Natives + colonizers alike under Hudson’s Bay Company, Canada)

**Thorburn 21** https://www.highsnobiety.com/p/elon-musk-colonizing-mars-indentured-slavery/

Elon Musk, aka the newly anointed richest man in the world, has revealed more details of his plan to move people into space. However, before you get excited, everything he just detailed makes us want to stay firmly on earth. He's bringing indentured servitude to Mars. In a recent interview with Business Insider, Musk predicted that life as we know it "will be dramatically improved if we're a multiplanet species as a spacefaring civilization." But dramatically improved for who exactly? Musk's utopian project aims to see an estimated 1 million people relocate to Mars by 2050, many of whom will need to pay back their journey on arrival. T(He) tech billionaire intends for there to be “loans available for those who don’t have money,” and jobs on the Red Planet for settlers to pay off their debts. Sound familiar? That’s because his plan for colonizing Mars sounds a lot like OG colonialism. The idea of indentured servitude was born of a need for cheap labor in America in the decade following the settlement of Jamestown by the Virginia Company in 1607. Settlers soon realized that they had too much land to care for, but no one to care for it and so they developed the system of indentured servitude to attract workers. The life of an indentured servant was harsh and **restrictive**, but it wasn't slavery. There were laws that protected some of their rights. However, their contract could be extended as punishment for breaking a law, such as running away, or in the case of female servants, becoming pregnant. Now imagine that setup but in space. Over the last couple of years, Musk has demonstrated a less than impressive attitude to the rights and safety of his workers. In 2019 a judge found that he violated national labor laws when he implied via tweet that Tesla workers who unionized would have to give up their company stock options. Then, as the pandemic ravaged California last year, Tesla workers said they were fired after opting to stay home from the Fremont factory rather than risk being potentially exposed to the coronavirus. “The company, Elon included, they [doesn’t] really care about the health and well-being of the employees,” said ex-Tesla employee, Nayo Miller. “The manufacturing of the vehicles supersedes our safety.” Musk's Martian pay-away scheme sounds like the setup for an extremely stressful space-mutiny blockbuster or yet another reminder that we have yet to learn from or even acknowledge the failures of colonialism. In the wake of George Floyd’s death and the BLM protests, colonial monuments were torn down by protesters around the world who saw them as a constant reminder of racism and subjugation. Defenders of statues dedicated to slave traders and colonists argued that to deface and remove these monuments was to “erase history.” Musk’s plan to simply repackage colonial techniques is arguably a greater, not to mention deeply sinister, act of erasure.

#### Musk believes his Mars colonists are expendable: private appropriation of space only reinforces these ideas

**Tran 21** https://futurism.com/the-byte/elon-musk-jokes-mars-colonists-dying-horribly

Elon Musk’s hotly anticipated episode of Saturday Night Live was filled with surprises, awkward moments, and the occasional laugh — but one of the better sketches of the night had the SpaceX founder (him) **joking about Mars colonists dying a horrible and painful death**. The sketch, titled “Chad on Mars,” showcased Musk playing himself as he attempts to save a desperate colony on Mars from certain doom as their oxygen level runs out. Luckily, there’s a hero willing to sacrifice themselves for the colony: Chad, played by Pete Davidson. While the sketch was funny, it was a bit uncomfortable if you consider the broader implications of it. There was Musk, the head of a private space travel company, openly **joking about people who trust him with their lives dying horrific deaths on Mars**. It’s further punctuated with the ending kicker when the billionaire quickly heads for the exits following Chad’s death. “Well, I did say people were going to die,” the Tesla CEO said in the sketch. “I was never here.” On the one hand, it’s refreshing to see a CEO who can joke about his own business. But while there can be moments for levity, we should remember that there is an actual human cost of space travel. Plus, the clip might come back to haunt him if Mars astronauts ever die in the course of their mission. In any case, it was one of the better sketches for Musk and it allowed him to easily slip into a role he knows all too well: Himself.

## Conclusion

**You must affirm: Voting Aff will…**

1. **Solve for space debris and satellite destruction, hence nuke war and impacts of nuclear fallout**
2. **Prevent exploitation and the murdering of space settlers under private companies**