==Aff – Space Exploration==

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====Pleasure and pain are intrinsically valuable. People consistently regard pleasure and pain as good reasons for action, despite the fact that pleasure doesn't seem to be instrumentally valuable for anything.====

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, https://link.springer.com/article/10.1007/s10790-015-9506-9~~] TDI

Let us start by observing, empirically, that a widely shared judgment about intrinsic

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places where we reach the end of the line in matters of value.

====Moral uncertainty means preventing extinction should be our highest priority.====

Bostrom 12 ~~[(Nick Bostrom, Faculty of Philosophy & Oxford Martin School University of Oxford) "Existential Risk Prevention as Global Priority." Global Policy, 2012~~] TDI

These reflections on moral uncertainty suggest an alternative, complementary way of looking at existential

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of value. To do this, we must prevent any existential catastrophe.

====Consequentialism offers the best explanation of degrees of wrongness====

Sinnott-Armstrong 09 ~~[(Walter, Professor of Practical Ethics at Duke. Go Blue Devils!) "How strong is this obligation? An argument for consequentialism from concomitant variation" Oxford University Press Analysis Vol. 69 No. 3, July 2009~~] TDI

This conclusion extends as well to the existence of such moral obligations. There are

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the existence and the strength of the moral obligation not to break promises.

===AC – Exploration Advantage===

====Space exploration is essential to the survival of humanity. Two impacts— ====

====First, colonization— ====

====It solves a litany of existential threats – don't put all your eggs in one basket.====

Fitzgerald 3/9 ~~[(Shanon, Assistant Websites Editor at Liberty Fund), "Why Human Space Exploration Matters," March 9 2021, https://www.econlib.org/why-human-space-exploration-matters/~~] TDI

While the yields to space exploration and the development of spaceflight technology may appear minimal

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is becoming, if it is not already, one of pure choice.

====Space col key to innovation, ====

West 20 Darrell M. West, 8-18-2020, "Five reasons to explore Mars," Brookings, https://www.brookings.edu/blog/techtank/2020/08/18/five-reasons-to-explore-mars/ TDI

The recent launch of the Mars rover Perseverance is the latest U.S.

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humans to survive on other planets, and how planets evolve over time.

====Second, Russia— ====

====Deep space exploration is a shared goal that prevents escalation of US-Russia tensions. But privatization threatens it independent of our other internal links====

CSIS 18 ~~[(Center for Strategic and International Studies), "Why Human Space Exploration Matters," August 21, 2018 https://www.csis.org/blogs/post-soviet-post/space-cooperation~~] TDI

U.S.-Russian space cooperation continues to be a stated mutual goal.

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date of Russian RD-180 rocket engines by 2022.

countries."

====Space weapons heighten potential for escalation and make perceptions of US-Russia space conflict key. ====

Alexey Arbatov et al, head of the Center for International Security at the Primakov National Research Institute of World Economy and International Relations, Major General Vladimir Dvorkin, a principal researcher at the Center for International Security at the Primakov National Research Institute of World Economy and International Relations and Peter Topychkanov, fellow at the Carnegie Moscow Center's Nonproliferation Program, '17 "Russian And Chinese Perspectives On Non-Nuclear Weapons And Nuclear Risks" Carnegie Endowment for International Peace Publications, https://www.russiamatters.org/sites/default/files/media/files/Entanglement\_interior\_FNL.pdf

Against this background, Russian military and technical experts are currently engaged in efforts to

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discusses how new and emerging military technologies might contribute to such an escalation.

====Nuke war causes extinction – it won't stay limited====

Edwards 17 ~~[(Paul N. Edwards, CISAC's William J. Perry Fellow in International Security at Stanford's Freeman Spogli Institute for International Studies. Being interviewed by EarthSky/card is only parts of the interview directly from Paul Edwards.) "How nuclear war would affect Earth's climate," EarthSky, September 8, 2017, earthsky.org/human-world/how-nuclear-war-would-affect-earths-climate~~] TDI

We are not talking enough about the climatic effects of nuclear war. The "

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two nuclear powers would stay limited to these smaller, less destructive bombs.

====Privatization of space travel kills off public space exploration.====

====Two internal links—====

====First, tradeoff— ====

====Space exploration must be public-sector – entrepreneurs purposely understate the barriers to colonization, yet exploit its potential for financial gain. ====

Phillips 20 ~~[(Leigh, science writer and EU affairs journalist, author of Austerity Ecology & the Collapse-Porn Addicts.) "We Don't Need Elon Musk to Explore the Solar System," May 8, 2021, https://jacobinmag.com/2021/05/elon-musk-space-exploration-mars-colonization~~] TDI

He opens the paper with a recognition that, at some point, if we

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profitability at all, but rather of our species' survival through the eons.

====Privatization of space travel makes it politically polarizing and drains public support.====

Phillips 20 ~~[(Leigh, science writer and EU affairs journalist, author of Austerity Ecology & the Collapse-Porn Addicts.) "We Don't Need Elon Musk to Explore the Solar System," May 8, 2021, https://jacobinmag.com/2021/05/elon-musk-space-exploration-mars-colonization~~] TDI

Elon Musk is right to dream of humanity's future as a multi-planet species

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to deliver more to STEM subjects, mothballing language courses and classics programs!

====Second, debris—====

====Commercial rocket launches produce space clutter—increased debris could reach a tipping point====

Thompson 20 ~~[(Clive, author of Coders: The Making of a New Tribe and the Remaking of the World, a columnist for Wired magazine, and a contributing writer to The New York Times Magazine) "Monetizing the Final Frontier The strange new push for space privatization," December 3, 2020 https://newrepublic.com/article/160303/monetizing-final-frontier~~] TDI

"Physics tells us that two things can't occupy the same space at the same

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-conference call, he conceded that it's a huge, unresolved issue.

====Space dust wrecks satellites and debris exponentially spirals ====

Intagliata 17 ~~[(Christopher Intagliata, MA Journalism from NYU, Editor for NPRs All Things Considered, Reporter/Host for Scientific American's 60 Second Science) "The Sneaky Danger of Space Dust," Scientific American, May 11, 2017, https://www.scientificamerican.com/podcast/episode/the-sneaky-danger-of-space-dust/~~] TDI

When tiny particles of space debris slam into satellites, the collision could cause the emission of hardware-frying radiation, Christopher Intagliata reports. Aside from all the satellites, and the space station orbiting the Earth, there's a lot of trash circling the planet, too. Twenty-one thousand baseball-sized chunks of debris, according to NASA. But that number's dwarfed by the number of small particles. There's hundreds of millions of those. "And those smaller particles tend to be going fast. Think of picking up a grain of sand at the beach, and that would be on the large side. But they're going 60 kilometers per second." Sigrid Close, an applied physicist and astronautical engineer at Stanford University. Close says that whereas mechanical damage—like punctures—is the worry with the bigger chunks, the dust-sized stuff might leave more insidious, invisible marks on satellites—by causing electrical damage. "We also think this phenomenon can be attributed to some of the failures and anomalies we see on orbit, that right now are basically tagged as 'unknown cause.'" Close and her colleague Alex Fletcher modeled this phenomenon mathematically, based on plasma physics behavior. And here's what they think happens. First, the dust slams into the spacecraft. Incredibly fast. It vaporizes and ionizes a bit of the ship—and itself. Which generates a cloud of ions and electrons, traveling at different speeds. And then: "It's like a spring action, the electrons are pulled back to the ions, ions are being pushed ahead a little bit. And then the electrons overshoot the ions, so they oscillate, and then they go back out again." That movement of electrons creates a pulse of electromagnetic radiation, which Close says could be the culprit for some of that electrical damage to satellites. The study is in the journal Physics of Plasmas. ~~[Alex C. Fletcher and Sigrid Close, Particle-in-cell simulations of an RF emission mechanism associated with hypervelocity impact plasmas~~]

====Privatized space tourism increases collision risks due to orbital debris.====

Tehrani 4/1 ~~[(James, Editor in Chief of Spark Magazine) "Space Junk: A Safety and Sustainability Problem Moving at 18,000 MPH," April 1, 2021, https://sphera.com/spark/space-junk-a-safety-and-sustainability-problem-moving-at-18000-mph/~~] TDI

Most of the current debris is found in the low Earth orbit (LEO), which is about 600 to 1,200 miles (1,000 to 2,000 kilometers) above the planet. NASA calls LEO an "orbital space junkyard." The junk isn't sitting idly in a landfill; it is moving around at speeds up to 18,000 mph (29,000 kph), or 23 times the speed of sound. While the Inter-Agency Space Debris Coordination Committee was designed to coordinate space debris efforts, there are currently no international laws in place regarding removing space debris. Since a single satellite can cost between $50 million and $400 million, the risk of damage from space debris to a satellite is clearly significant. And as more debris is left behind, there is obviously more risk of collisions, especially when space tourism picks up. The orbiting junk was explored in the 2013 film "Gravity," starring George Clooney and Sandra Bullock; it's known as the Kessler Effect. Don Kessler, the former NASA scientist who studied space debris even told the Guardian back in 2011 in regard to formulating a plan to deal with space junk: "The longer you wait to do this, the more expensive it's going to be. … This scenario of increasing space debris will play out even if we don't put anything else in orbit," he said. On that point, the European Space Agency has contracted with a Swiss startup called ClearSpace that plans to launch its first mission to remove space debris in 2025. The Gravity of the Situation Without a doubt, space debris is an Operational Risk; even the International Space Station has to dodge space junk at times. Former NASA Administrator Jim Bridenstine even tweeted last September that the "Space Station has maneuvered 3 times in 2020 to avoid debris. In the last 2 weeks, there have been 3 high concern potential conjunctions. Debris is getting worse!" Some of the larger debris that doesn't burn up re-entering the atmosphere (about one object per day) even crashes back on Earth. Since most of the Earth's surface is covered in water, it's not surprisingly that most of the junk winds up in oceans, so the risk to humans is statistically very low. That doesn't mean nil though. For example, there is debris from Russian Proton rockets that has been found in Siberia, including that of old fuel tanks containing toxic fuel residue, which can be harmful to plants, animals and humans. The environmental risks of space junk need to be explored further. A piece of space junk floating through the ocean is certainly not nearly as concerning as our plastic problem, but it's nothing to ignore either. LCA Leads the Way Just as more and more companies are assessing the Life Cycle Assessment (LCA) of their products and services from cradle to grave on Planet Earth, it stands to reason that LCA could be just as important in outer space. That's especially true when you consider space tourism is poised to blast off to become a potential $1.5 billion industry by 2028. The more activity, the more debris.

====Increased space debris makes future space exploration impossible====

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

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

====Early warning satellites going dark signals attacks – causes miscalc and goes nuclear====

Orwig 16 ~~[(Jessica, MS in science and tech journalism from Texas A&M, BS in astronomy and physics from Ohio State) "Russia says a growing problem in space could be enough to spark a war," Insider,' January 26, 2016, https://www.businessinsider.com/russia-says-space-junk-could-spark-war-2016-1~~] TDI

NASA has already warned that the large amount of space junk around our planet is growing beyond our control, but now a team of Russian scientists has cited another potentially unforeseen consequence of that debris: War. Scientists estimate that anywhere from 500,000 to 600,000 pieces of human-made space debris between 0.4 and 4 inches in size are currently orbiting the Earth and traveling at speeds over 17,000 miles per hour. If one of those pieces smashed into a military satellite it "may provoke political or even armed conflict between space-faring nations," Vitaly Adushkin, a researcher for the Institute of Geosphere Dynamics at the Russian Academy of Sciences, reported in a paper set to be published in the peer-reviewed journal Acta Astronautica, which is sponsored by the International Academy of Astronautics. Say, for example, that a satellite was destroyed or significantly damaged in orbit — something that a 4-inch hunk of space junk could easily do traveling at speeds of 17,500 miles per hour, Adushkin reported. (Even smaller pieces no bigger than size of a pea could cause enough damage to the satellite that it would no longer operate correctly, he notes.) It would be difficult for anyone to determine whether the event was accidental or deliberate. This lack of immediate proof could lead to false accusations, heated arguments and, eventually, war, according to Adushkin and his colleagues. A politically dangerous dilemma In the report, the Adushkin said that there have already been repeated "sudden failures" of military spacecraft in te last two decades that cannot be explained. "So, there are two possible explanations," he wrote. The first is "unregistered collisions with space objects." The second is "machinations" ~~[deliberate action~~] of the space adversary. "This is a politically dangerous dilemma," he added. But these mysterious failures in the past aren't what concerns Adushkin most. It's a future threat of what experts call the cascade effect that has Adushkin and other scientists around the world extremely concerned. The Kessler Syndrome In 1978, American astrophysicist Donald Kessler predicted that the amount of space debris around Earth would begin to grow exponentially after the turn of the millennium. Kessler 's predictions rely on the fact that over time, space junk accumulates. We leave most of our defunct satellites in space, and when meteors and other man-made space debris slam into them, you get a cascade of debris. The cascade effect — also known as the Kessler Syndrome — refers to a critical point wherein the density of space junk grows so large that a single collision could set off a domino effect of increasingly more collisions. For Kessler, this is a problem because it would "create small debris faster than it can be removed," Kessler said last year. And this cloud of junk could eventually make missions to space too dangerous. For Adushkin, this would exacerbate the issue of identifying what, or who, could be behind broken satellites. The future So far, the US and Russian Space Surveillance Systems have catalogued 170,000 pieces of large space debris (between 4 and 8 inches wide) and are currently tracking them to prevent anymore dilemmas like the ones Adushkin and his colleagues cite in their paper. But it's not just the large objects that concern Adushkin, who reported that even small objects (less than 1/3 of an inch) could damage satellites to the point they can't function properly. Using mathematical models, Adushkin and his colleagues calculated what the situtation will be like in 200 years if we continue to leave satellites in space and make no effort to clean up the mess. They estimate we'll have: 1.5 times more fragments greater than 8 inches across 3.2 times more fragments between 4 and 8 inches across 13-20 times more smaller-sized fragments less than 4 inches across "The number of small-size, non-catalogued objects will grow exponentially in mutual collisions," the researchers reported.

====Earth observation satellites key to warming adaptation====

Alonso 18 ~~[(Elisa Jiménez Alonso, communications consultant with Acclimatise, climate resilience organization) "Earth Observation of Increasing Importance for Climate Change Adaptation," Acclimatise, May 2, 2018, https://www.acclimatise.uk.com/2018/05/02/earth-observation-of-increasing-importance-for-climate-change-adaptation/~~] TDI

Earth observation (EO) satellites are playing an increasingly important role in assessing climate change. By providing a constant and consistent stream of data about the state of the climate, EO is not just improving scientific outcomes but can also inform climate policy. Managing climate-related risks effectively requires accurate, robust, sustained, and wide-ranging climate information. Reliable observational climate data can help scientists test the accuracy of their models and improve the science of attributing certain events to climate change. Information based on projections from models and historic data can help decision makers plan and implement adaptation actions. Providing information in data-sparse regions Ground-based weather and climate monitoring systems only cover about 30% of the Earth's surface. In many parts of the world such data is incomplete and patchy due to poorly maintained weather stations and a general lack of such facilities. EO satellites and rapidly improving satellite technology, especially data from open access programmes, offer a valuable source information for such data-sparse regions. This is especially important since countries and regions with a lack of climate data are often particularly vulnerable to climate change impacts. International efforts for systematic observation The importance of satellite-based observations is also recognised by the international community. Following the recommendations of the World Meteorological Organization's (WMO) Global Climate Observing System (GCOS) programme, the UNFCCC strongly encourages countries that support space agencies with EO programmes to get involved in GCOS and support the programme's implementation. The Paris Agreement highlights the need for and importance of effective and progressive responses to the threat of climate change based on the best available scientific knowledge. This implies that climate knowledge needs to be strengthened, which includes continuously improving systematic observations of the Earth's climate. To meet the need of such systematic climate observations, GCOS developed the concept of the Essential Climate Variable, or ECV. According to WMO, an ECV "is a physical, chemical or biological variable or a group of linked variables that critically contributes to the characterization of Earth' s climate." In 2010, 50 ECVs which would help the work of the UNFCCC and IPCC were defined by GCOS. The ECVs, which can be seen below, were identified due to their relevance for characterising the climate system and its changes, the technical feasibility of observing or deriving them on a global scale, and their cost effectiveness. The 50 Essential Climate Variables as defined by GCOS. One effort supporting the systemic observation of the climate is the European Space Agency's (ESA) Climate Change Initiative (CCI). The programme taps into its own and its member countries' EO archives that have been established in the last three decades in order to provide a timely and adequate contribution to the ECV databases required by the UNFCCC. Robust evidence supporting climate risk management Earth observation satellites can observe the entire Earth on a daily basis (polar orbiting satellites) or continuously monitor the disk of Earth below them (geostationary satellites) maintaining a constant watch of the entire globe. Sensors can target any point on Earth even the most remote and inhospitable areas which helps monitor deforestation in vast tropical forests and the melting of the ice caps. Without insights offered by EO satellites there would not be enough evidence for decision makers to base their climate policies on, increasing the risk of maladaptation. Robust EO data is an invaluable resource for collecting climate information that can inform climate risk management and make it more effective.

====Warming causes extinction====

Klein 14~~[(Naomi Klein, award-winning journalist, syndicated columnist, former Miliband Fellow at the London School of Economics, member of the board of directors of 350.org), This Changes Everything: Capitalism vs. the Climate, pp. 12-14~~]

In a 2012 report, the World Bank laid out the gamble implied by that target. "As global warming approaches and exceeds 2-degrees Celsius, there is a risk of triggering nonlinear tipping elements. Examples include the disintegration of the West Antarctic ice sheet leading to more rapid sea-level rise, or large-scale Amazon dieback drastically affecting ecosystems, rivers, agriculture, energy production, and livelihoods. This would further add to 21^^st^^-century global warming and impact entire continents." In other words, once we allow temperatures to climb past a certain point, where the mercury stops is not in our control. But the bigger problem—and the reason Copenhagen caused such great despair—is that because governments did not agree to binding targets, they are free to pretty much ignore their commitments. Which is precisely what is happening. Indeed, emissions are rising so rapidly that unless something radical changes within our economic structure, 2 degrees now looks like a utopian dream. And it's not just environmentalists who are raising the alarm. The World Bank also warned when it released its report that "we're on track to a 4-C warmer world ~~[by century's end~~] marked by extreme heat waves, declining global food stocks, loss of ecosystems and biodiversity, and life-threatening sea level rise." And the report cautioned that, "there is also no certainty that adaptation to a 4-C world is possible." Kevin Anderson, former director (now deputy director) of the Tyndall Centre for Climate Change, which has quickly established itself as one of the U.K's premier climate research institutions, is even blunter; he says 4 degrees Celsius warming—7.2 degrees Fahrenheit—is "incompatible with an organized, equitable, and civilized global community." We don't know exactly what a 4 degree Celsius world would look like, but even the best-case scenario is likely to be calamitous. Four degrees of warming could raise global sea levels by 1 or possibly even 2 meters by 2100 (and would lock in at least a few additional meters over future centuries). This would drown some island nations such as the Maldives and Tuvalu, and inundate many coastal areas from Ecuador and Brazil to the Netherlands to much of California and the northeastern United States as well as huge swaths of South and Southeast Asia. Major cities likely in jeopardy include Boston, New York, greater Los Angeles, Vancouver, London, Mumbai, Hong Kong, and Shanghai. Meanwhile, brutal heat waves that can kill tens of thousands of people, even in wealthy countries, would become entirely unremarkable summer events on every continent but Antarctica. The heat would also cause staple crops to suffer dramatic yield losses across the globe (it is possible that Indian wheat and U.S. could plummet by as much as 60 percent), this at a time when demand will be surging due to population growth and a growing demand for meat. And since crops will be facing not just heat stress but also extreme events such as wide-ranging droughts, flooding, or pest outbreaks, the losses could easily turn out to be more severe than the models have predicted. When you add ruinous hurricanes, raging wildfires, fisheries collapses, widespread disruptions to water supplies, extinctions, and globe-trotting diseases to the mix, it indeed becomes difficult to imagine that a peaceful, ordered society could be sustained (that is, where such a thing exists in the first place). And keep in mind that these are the optimistic scenarios in which warming is more or less stabilized at 4 degrees Celsius and does not trigger tipping points beyond which runaway warming would occur. Based on the latest modeling, it is becoming safer to assume that 4 degrees could bring about a number of extremely dangerous feedback loops—an Arctic that is regularly ice-free in September, for instance, or, according to one recent study, global vegetation that is too saturated to act as a reliable "sink", leading to more carbon being emitted rather than stored. Once this happens, any hope of predicting impacts pretty much goes out the window. And this process may be starting sooner than anyone predicted. In May 2014, NASA and the University of California, Irvine scientists revealed that glacier melt in a section of West Antarctica roughly the size of France now "appears unstoppable." This likely spells down for the entire West Antarctic ice sheet, which according to lead study author Eric Rignot "comes with a sea level rise between three and five metres. Such an event will displace millions of people worldwide." The disintegration, however, could unfold over centuries and there is still time for emission reductions to slow down the process and prevent the worst. Much more frightening than any of this is the fact that plenty of mainstream analysts think that on our current emissions trajectory, we are headed for even more than 4 degrees of warming. In 2011, the usually staid International Energy Agency (IEA) issued a report predicting that we are actually on track for 6 degrees Celsius—10.8 degrees Fahrenheit—of warming. And as the IEA's chief economist put it: "Everybody, even the school children, knows that this will have catastrophic implications for all of us." (The evidence indicates that 6 degrees of warming is likely to set in motion several major tipping points—not only slower ones such as the aforementioned breakdown of the West Antarctic ice sheet, but possibly more abrupt ones, like massive releases of methane from Arctic permafrost.) The accounting giant PricewaterhouseCoopers as also published a report warning businesses that we are headed for "4-C , or even 6-C" of warming. These various projections are the equivalent of every alarm in your house going off simultaneously. And then every alarm on your street going off as well, one by one by one. They mean, quite simply, that climate change has become an existential crisis for the human species. The only historical precedent for a crisis of this depth and scale was the Cold War fear that we were headed toward nuclear holocaust, which would have made much of the planet uninhabitable. But that was (and remains) a threat; a slim possibility, should geopolitics spiral out of control. The vast majority of nuclear scientists never told us that we were almost certainly going to put our civilization in peril if we kept going about our daily lives as usual, doing exactly what we were already going, which is what climate scientists have been telling us for years. As the Ohio State University climatologist Lonnie G. Thompson, a world-renowned specialist on glacier melt, explained in 2010, "Climatologists, like other scientists, tend to be a stolid group. We are not given to theatrical rantings about falling skies. Most of us are far more comfortable in our laboratories or gathering data in the field than we are giving interviews to journalists or speaking before Congressional committees. When then are climatologists speaking out about the dangers of global warming? The answer is that virtually all of us are now convinced that global warming poses a clear and present danger to civilization."

===AC – Solvency ===

====The United States federal government should end commercial space exploration and tourism by private entities, ruling that they violate its non-appropriation obligations under the Outer Space Treaty of 1967 and its succeeding treaties.====

====To clarify: This results in the banning of space colonization and exploration from private companies====

Cooper 8 ~~[Cooper, Nikhil D. "Circumventing Non-Appropriation: Law and Development of United States Space Commerce." Hastings Const. LQ 36 (2008): 457.~~] TDI

The latest piece of congressional legislation regulating the commercial space industry was the Commercial Space Launch Act (CSLA) 77 that was spurred on in part by the host of new technologies capable of commercially exploiting space. 78 The CSLA streamlined the earlier space-launch bureaucracy and mandated the DOT to issue licenses for all commercial space launch programs, 79 regulate forms of space tourism8 and space advertising, 8 ' impose minimum liability insurance and financial responsibility requirements, and82 provide for administrative and judicial review of DOT Secretariat decisions.83 Il. A Legal System? The CSLA represents the most recent and comprehensive United States space commerce legislation; but, in the years since its passage, no one has seriously questioned its consistency with United States international obligations of "non-appropriation." The issue is especially apt now, however, because the current and future capacities of commercially exploiting space seem primed to challenge non-appropriation as the guiding theme in space commerce. Therefore, the question we must ask now is whether or not the United States is circumventing the intent of non-appropriation by encouraging and protecting private commercial expansion into space. A. Treaties Versus Congressional Acts Whether the regulatory regime outlined in the CSLA conflicts with the national non-appropriation principle, as outlined in the Outer Space Treaty of 1967 and in its succeeding treaties, is an issue that could be reviewed by the federal judiciary under its constitutional grant of subject-matter jurisdiction over cases "arising under" treaties.8 4 The judiciary's power to interpret treaties is a power distinct from the treaty-making authority delegated to the executive and legislative branches. Article II of the United States Constitution authorizes the president to ratify treaties with the consent of two-thirds membership of the Senate. 5 Treaties entered into in this manner are the supreme law of the United States and bind state constitutions, legislatures, and judiciaries.8 6 Generally, courts employ distinct methods of interpretation when called on to perform the separate but related tasks of interpreting treaties and resolving treaty-statutory disputes. As to the former, courts generally will liberally construct a treaty "to give effect to the purpose which animates it" and will prefer that liberal construction "~~[e~~]ven where a provision of a treaty fairly admits of two constructions, one restricting, the other enlarging ~~[of~~] rights which may be claimed under it."87 A preference for broad construction, however, is not a license for courts to impose any interpretation they deem appropriate. For example, although courts have a greater ability to construct treaties more broadly than private contracts, they are still precluded from interpreting a treaty beyond the "apparent intent and purport" of its language.88 in this way, determining a treaty's "intent" delineates the boundaries of how broadly or narrowly the court may interpret a treaty's provision. Courts obviously have a much easier time determining a treaty's intent where the treaty language is unambiguous. In these instances, courts expressly forbid looking beyond the language of the treaty to supply the intent of the parties at the time the treaty was drawn.89 When the language of the treaty is ambiguous, however, the court will attempt to effectuate the drafter's intent through a broader inquiry into "the letter and spirit of the instrument," and may take into account "considerations deducible from the situation of the parties; and the reasonableness, justice, and nature of the thing, for which provision has been made." 90 The United States Supreme Court summarized its interpretive process in the case Eastern Airlines Inc., v. Floyd: When interpreting a treaty, ~~[begin~~] "with the text of the treaty and the context in which the written words are used." 91 ~~[When confronted with difficult or ambiguous passages, the Court provided that~~] ~~[o~~]ther general rules of construction may be brought to bear~~[.~~] ~~[And it finally noted that~~] treaties are construed more liberally than private agreements, and to ascertain their meaning we may look beyond the written words to the history of the treaty, the negotiations, and the practical construction adopted by the parties. 92 Treaty interpretation as described above is important when determining whether the treaty conflicts with an act of Congress. Each being the supreme law of the land, treaties and congressional acts are governed by the last-in-time rule: when they conflict, courts must privilege the last enacted treaty or congressional act over the other. 93 Still, federal courts often avoid finding such conflicts between congressional acts and treaty obligations. As Justice Marshall opined in 1804: ~~[A~~]n act of Congress ought never to be construed to violate the law of nations if any other possible construction remains, and consequently can never be construed to violate neutral rights, or to affect neutral commerce, further than is warranted by the law of nations as understood in this country. 94 Supreme Court jurisprudence since has largely followed the same presumption and, therefore, courts are inclined to harmonize treaties and congressional legislation that are seemingly antithetical to one another. 95 In the event that a congressional act were to supplant United States treaty obligations, courts would look for unambiguous evidence appearing "clearly and distinctly" in the text of the statute or treaty provision. 96 In other words, repeals of prior statutes or treaty provision must likely be made express. In contrast, "repeals by implication" are generally disfavored "unless the last statute is so broad in its terms and so clear and explicit in its words as to show that it was intended to cover the whole subject, and, therefore, to displace the prior statute. 97 B. CSLA Versus the Outer Space Treaty Both being duly enacted, the CSLA and the Outer Space Treaty are considered the supreme law of the land. If there is a conflict between the United States space commerce provisions as outlined in the CSLA and the Outer Space Treaty, a reviewing court would first be called upon to interpret the intent of the treaty itself. Recall that in the context of treaty interpretation, a court would be at liberty to give the treaty a broad construction to effectuate its intent. The key provision of the Outer Space Treaty at issue would be the language of Article II which forecloses "national appropriation" of space by claims of sovereignty, means of use, occupation, or any other means.98 Black's Law Dictionary defines "appropriation" as "the exercise of control over property, a taking of possession." 99 If defined broadly enough, the joint enterprise nature of the United States space commerce, as implemented in the CSLA, might violate the "spirit" of non-appropriation as outlined in the Outer Space Treaty of 1967. The best argument one could make against the CSLA's provisions is to advocate the court to broadly interpret the "appropriation" principle of the Outer Space Treaty. The proponent of this argument would urge that in so doing, a court should look beyond the words of the treaty and examine the history, negotiations, and practical considerations at the time of the treaty's negotiation to determine its true intent. 100 One would also want to argue that the space commerce industry violates perhaps not the "letter" of the treaty, but circumvents entirely its "spirit" if a court were taking into account "considerations deducible from the situation of the parties; and the reasonableness, justice, and nature of the thing, for which provision has been made."' 01 One who attacked the CSLA's general legitimacy in this way could argue that the United States is effectively "appropriating" space through its protection and encouragement of private industry. Such an appropriation would take place not by realizing a "sovereign" right to space property or the uses of space as expressly proscribed in the Outer Space Treaty, but, instead, through the effective use of government power, services, and contracts to encourage and support the rapid development of the private space commerce industry in the United States. In essence, the result of such government encouragement might not amount to wholesale sovereign appropriation, but, at the very least, a kind of sovereign and private space activity that would cast doubt on whether the non-appropriation principle is actually being respected. Therefore, one arguing that such activities were tantamount to sovereign appropriation would highlight the interrelatedness of government and private industry and argue for a broad interpretation of "appropriation" that encompassed the practical effects of such a relationship. In addition to the regulatory interaction between the CSLA and private space commerce industries, the interrelatedness between government and private industry is clearly illustrated by the interaction between CSLA and the 1972 Liability Convention. Recall that the Outer Space Treaty and its progeny envision a "state-oriented" system of responsibility 10 2 where each member state is responsible for all actions in outer space undertaken by the state and its nationals. 10 3 The Liability Convention further binds member states by holding each strictly liable for its actions or the actions of its nationals within outer space and permits only member states to petition for remuneration under the terms of the treaty. 1 04 In its text, the CSLA cites to such international obligations,'0 5 while also mitigating the United States' liability under the Liability Convention. 0 6 The CSLA licensing program ensures overall safety of private space ventures, 0 7 raises the funds necessary to pay "potential treaty claims through its liability insurance requirement,' 10 8 and limits the United States' joint and several liability exposure through restricting private use of foreign launch and reentry facilities.'09 These provisions effectively allow the United States to pass on the financial cost and recover from their private entities the amount of damages for which they are internationally liable. 110 In this way, the government is limiting its international liability exposure by passing on the cost to the private sector. When highlighting the further interrelatedness between government and private industry, one could also note that the United States government holds something of a monopoly in launch services and currently requires that decisions regarding commercial space-launch must be approved through the CSLA. 1' In addition, one making this argument would want to highlight the highly interdependent nature of investment flowing from government to private space commerce: in a February 4, 2008 press release, NASA Deputy Administrator Shana Dale justified the agency's 2009 budget request of $17.6 billion by claiming that "~~[t~~]he development of space simply cannot be 'all government all the time~~[~~]' . . . . NASA's budget for ~~[fiscal year~~] 2009 provides $173 million for entrepreneurs-from big companies or small ones-to develop commercial transport capabilities. . . ~~[and~~] NASA is designating $500 million toward the development of this commercial space capability." 2

====The aff solves orbital debris and decreases collision risks.====

Budhiraia 20 ~~[(Mili, LL.B. candidate 2022 at Faculty of Law, University of Delhi.) "The Menace of Space Debris," August 30, 2020, https://www.jurist.org/commentary/2020/08/mili-budhiraja-space-debris-india/~~] TDI

For most of the time India has participated in the space industry, it has played with one hand firmly tied behind its back. But with the introduction of the Self-Reliant India Movement (Aatma Nirbhar Bharat Abhiyaan), private companies hold the baton along with the government organizations to operate in the entire range of space activities. The Indian space industry now has unrivaled possibilities in the sectorial dimensions that constitute the field of space research and exploration. This raises the question of how privatization in the new space economy has increased the threshold of accountability for state actors involved in the operations. As of now, there are 375 private companies all across the globe engaged in the space industry. The privatization of the space industry relies upon the premise that it would lead to the expansion of opportunities to utilize the space. When in the mid-twentieth century the concept of privatization rose to the fore, it was faced with a bitter backlash. The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, popularly known as the 'Outer Space Treaty', was made when the concept of involving commercial entities into the multitude of space operations was not favored. The United States Communication Satellite Act of 1962 provided foundational support to the launch of communication satellites by commercial enterprises, thereby setting the stage for the entry of private players into the industry. But with increasing access to space operations and a growing level of satellite population, the problem of space debris, and the pollution caused due to the congestion of satellites, witnessed a simultaneous growth reaction. Space debris ranges from defunct spacecraft to paint flecks chipped off from wear and tear. A small debris particle of a mere 1 millimeter has the potential to cause catastrophic collisions. Privatization can act as an inducement in a hyper-dependent society banking upon satellite supported technology to launch more satellites into space. The estimate hints upon a possible 1100 satellites launched by the space industry each year by 2025. While satellites provide a broad, interdisciplinary use including human space exploration, meteorology, and climate change to name a few, the situation has the potential to significantly increase space traffic. It calls for a higher level of safety in the orbiting region from the floating debris, which can cause collisions. Astrophysicist Donald J. Kessler predicted that the debris in the Lower Earth Orbit (LEO) would reach a breaking point with an increase in satellite traffic and would start a collision chain reaction. This phenomenon is known as Kessler Syndrome. As a corollary to this phenomenon runs the concept of "Tragedy of the Commons" introduced by Garrett Hardins. The tragedy of commons occurs in a shared-resource system where independent operations motivated by self-interests deplete the shared-resource through their collective action. The increase in space traffic, which subsequently leads to an increase in space debris, can render LEO economically unviable for other participants. The legal framework dealing with the issue of space contamination is insufficient to provide any recourse. The Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space (2007) provides an international instrument of a persuasive nature and therefore, making it obligatory on the state parties is an onerous task. Article VI of the Outer Space Treaty imposes an international responsibility on the states, and Article VII renders a state party internationally liable to other states for any harm caused due to their operations. Though these provisions address the issues of responsibility in case of ruptures caused at an international level, they do not obligate states to take preventive actions or to remove the harmful agents from the outer space region. Moreover, Article IX of the Outer Space Treaty creates an obligation on the state parties to intimate with other members of the "potentially harmful activities", but because the release of pollution is a recurrent phenomenon, the law cannot be put to good use. Article I of the Convention on International Liability for Damage Caused by Space Objects (Liability Convention) does not even cover environmental harm under the definition of damage. It exhibits the temperament of organizations on addressing the issues of environmental safety. The academic debate over the tackling of this issue has steered into the arena of taxation. A study has suggested that the problem of space debris can be controlled by levying "Orbit Tax". The concept of Orbit Tax or Orbital Use Fees (OUF) stems from the Pigouvian Tax System proposed by the economist, Arthur Pigou. The Pigouvian tax was assessed on activities that adversely affect societal interests. The carbon tax which is assessed on the emission of greenhouse gasses illustrates the nature of this taxation system and the jurisprudence behind it. But as the question stands, is the employing of Orbit Tax an effective solution to curb the menace of space pollution? The answer cannot be in a binary nature. The implementation of the OUF requires global participation of the state actors who are involved in the space industry. Harmonious participation could only be ensured with the consensus reached among the state parties on the rate of taxation proposed, the criteria of assessing tax, etc. The Carbon Tax, a form of pollution tax, was implemented under the United Nations Framework Convention on Climate Change. It has witnessed significant participation and changes brought about in the municipal laws of many state members. But there has been a difference in the rate of taxation among the states which convolutes its implementation. Such disparities cannot be allowed to persist in the OUF model adopted for space debris taxation. Even if a presumption is accepted that Orbit Tax will be efficient in controlling the space debris release, the issue of the increased cost of operating satellites can result in a subsequent increase in the cost of providing satellite services. This can have an adverse impact on economically backward countries which are dependent on other state parties for launch and other satellite operations. Moreover, this does not provide an ultimate solution to eliminate the greater risk that debris causes. A better solution would be to motivate states to deploy efficient satellite infrastructure with a lower depletion rate. Instead of increasing the overall cost of a satellite through haphazard taxation measures, the satellite infrastructure shall be made more efficient. The goal should be of sustainable use of the resources. With the growing privatization of the Space Industry, the responsibility in outer space requires prompt actions. There is a need for international agreements of a binding nature to increase the threshold of accountability of member states to ensure a sustainable orbital domain. While increased participation of commercial enterprises is expounded as an economically growing feature of a country, the liability involved with the enlargement of the opportunity base cannot be side-lined. A legal framework has to be structured at both the international and national level to respond to the international responsibility laid down in Article VI of the Outer Space Treaty. Since the Outer Space Treaty is limited in its jurisdiction to state-sponsored activities, there is a need for an international instrument governing the operations of private players. The delay in employing environmental measures has significantly impacted the atmospheric make-up. The same temperament showcased for this issue could bring Kessler Syndrome to life.

====A public-private partnership solves none of the aff – market dynamics and hiring competition mean the two sectors are zero sum.====

Davenport 2/25 ~~[(Christian, Reporter covering NASA and the space industry, Colby College, B.A., American Studies), "As private companies erode government's hold on space travel, NASA looks to open a new frontier," February 25, 2021, https://www.washingtonpost.com/technology/2021/02/25/nasa-space-future-private/~~] TDI

The four astronauts who will fly on a SpaceX mission by the end of the year will be a bunch of private citizens with no space experience. One's a billionaire funding the mission; another is a health care provider. The third will be selected at random through a sweepstakes, and the last seat will go to the winner of a competition. In the new Space Age, you can buy a ticket to orbit — no need to have been a fighter pilot in the military or to compete against thousands of other overachievers for a coveted spot in NASA's astronaut corps. In fact, for this mission, the first composed entirely of private citizens, NASA is little more than a bystander. It does not own or operate the rocket that will blast the astronauts into space or the capsule they will live in for the few days they are scheduled to circle Earth every 90 minutes. NASA has no say in selecting the astronauts, and it will not train or outfit them — that will all be done by Elon Musk's SpaceX. The money to pay for the flight also will not come from NASA — or any other government account. The cost of the project is being borne by a billionaire, Jared Isaacman, who has set it up as a fundraiser for St. Jude's Research Hospital and a promotional device for his business, Shift4Shop, which helps businesses set up websites and process payments. This is the new look of human space exploration as government's long-held monopoly on space travel continues to erode, redefining not only who owns the vehicles that carry people to space, but also the very nature of what an astronaut is and who gets to be one. And it comes as NASA confronts some of the largest changes it has faced since it was founded in 1958 when the United States' world standing was challenged by the Soviet Union's surprise launch of the first Sputnik into orbit. Now it is NASA's unrivaled primacy in human spaceflight that is under challenge. Thanks to NASA's investments and guidance, the private space sector has grown tremendously — no entity more than SpaceX, which according to CNBC is now worth $74 billion. The commercial space industry is taking on ever more roles and responsibilities — flying not just cargo and supplies to the International Space Station, but even NASA's astronauts there. The private sector will launch some of the major components of the space station NASA wants to build in orbit around the moon, and private companies are developing the spacecraft that will fly astronauts to and from the lunar surface. Space enthusiasts, including NASA, see enormous benefit in the shift — a new era of space exploration that will usher in a more capable and efficient space industry. But the changing dynamic also has left NASA, which for decades has set the pace for the American space project, with an uncertain role, a development NASA's Safety Aerospace Safety Advisory Panel warns could have consequences for years to come. The growth of companies like SpaceX has "tremendous upside potential — and are accompanied by equally tremendous challenges for managing the risk of human space exploration," it said in its annual report, released last month. "NASA leadership in human space exploration is still preeminent, but the agency's role is evolving with critical implications for how risk and safety will be managed." So far, NASA has done well "as it shifts from principally executing its programs and missions to commercially acquiring significant key elements and services," it said. But as the agency continues to evolve, "NASA must make some strategically critical decisions, based on deliberate and thorough consideration, that are necessary because of their momentous consequences for the future of human space exploration and, in particular, for the management of the attendant risks." In an interview, Steve Jurczyk, NASA's acting administrator, said the agency is well aware of how its identity and role are changing, and he likened the agency's role to how the U.S. government fostered the commercial aviation industry in the early 20th century. NASA's predecessor, NACA, or the National Advisory Committee for Aeronautics, "did research, technology development to initially support defense … but also later on supporting a burgeoning commercial aircraft industry and aviation industry," he said. "So that may be how we evolve, moving forward on the space side. We're going to do the research and the technology development and be the enablers for continuing to support the commercial space sector." NASA has not ceded all ground. It still leads major exploration and science programs that no company could match. Last week, for example, it landed a rover the size of a car on Mars, hitting a precise landing target after traveling nearly 300 million miles. Later this year, it is scheduled to launch the James Webb telescope, which is designed to look back in time to the origins of the universe. And it also recently snagged a sample of rocks and soil from an asteroid 200 million miles from Earth to return them to Earth for study. "NASA works," Rob Manning, the chief engineer at NASA's Jet Propulsion Laboratory, said after the Perseverance landed safely on Mars. "When we put our arms together and our hands together and our brains together, we can succeed. This is what NASA does." Those big, daring, push-the-envelope missions is where NASA's future lies, agency and industry officials agree. Not in looking for financial gain, but blazing the trail and opening new frontiers, and then allowing private industry to take over in the way homesteaders expanded into the West. Within NASA, there is still some resistance to that paradigm shift. "NASA feels like that's our domain," said Phil McAlister, NASA's director of commercial spaceflight. "And my response is, the solar system is a big place. We at NASA should always be doing the next thing, the thing where the profit motive is not as evident and where the barriers to entry are still too high for the private sector to really make a compelling business case." Jan Worner, the outgoing general director of the European Space Agency, agrees. "I believe space agencies have to change," he said in an interview. "If you are fixed permanently to the same thing that you did in the past, you will lose." But NASA officials are concerned that much of the future workforce is going to be attracted to a growing number of commercial companies doing amazing things. There is Planet, for example, which is putting up constellations of small satellites that take an image of Earth every day. Or Relativity Space, which is 3-D printing entire rockets. Or Axiom Space, which is building a commercial space station. Or Astrobotic, which intends to land a spacecraft on the moon later this year. The question NASA faces, then, is an urgent one: "How do you maintain that NASA technical expertise?" Jurczyk said. The agency does not know. "It may mean people are hiring more midcareer from industry or having people come to NASA, then go to industry, and come back. Or a different model where maybe you're not coming to NASA and staying for your 35-, 40-year career," he said. "We're still thinking through that." The workforce predicament was not on NASA's mind when it embarked on this road in 2006. That is when it awarded relatively small contracts to see whether the private sector could develop spacecraft capable of taking cargo to the International Space Station. At the time, SpaceX, which won an award, was largely unknown and on the verge of bankruptcy, with just one successful flight to orbit for its Falcon 1 rocket after three failures. Outside of what Musk once called "the weird rebels within NASA," few thought the program would work. It was not taken seriously by the mainstream aerospace industry or even by NASA's leadership. "Let's just give these annoying commercial people enough money so that they can fail, and we can say, 'That was dumb. We don't have to do that again,'" Musk once told The Washington Post. But it did work. And now NASA is relying on the private sector not only to deliver supplies and science experiments to the surface of the moon, but also its most precious cargo — its astronauts — there. Turning over human spaceflight to the private sector was a line many thought NASA would never cross. But last year, SpaceX successfully flew two crewed missions to the space station, and Boeing, the other company with the human spaceflight contract, is hoping to fly its first later this year. NASA has been eager to build on that success and hire private-sector companies to build and operate the spacecraft that would take astronauts to and from the surface of the moon. And while NASA's flagship rocket, the Space Launch System, would be used to fly astronauts to the moon and be the most powerful ever built, it has suffered all sorts of cost overruns and technical delays. A test of its engines that was supposed to last as long as eight minutes was cut short after just one because of a technical problem. And the redo of the test was recently postponed by NASA, which said it was looking into a problem with one of the valves. Recently, the NASA inspector general said the total cost of the rocket would reach $27 billion through 2025. That enormous cost has outraged critics of the space program, who have derided the effort as little more than a jobs program for select congressional districts and dubbed it the "Senate Launch System." Recently, the Bloomberg editorial board called for the Biden administration to "scrap the Space Launch System," asking, "Why is the U.S. government building a space rocket?" "No doubt, the era of government spacefaring had its glories," the editorial read. "But space is now a $424 billion business, with U.S. companies at its forefront. The new administration should embrace this revolution — and bring the power of private enterprise to bear in crossing the next cosmic frontier." Some high-level NASA officials, including former NASA Administrator Jim Bridenstine, have indicated that if the commercial sector can develop lower-cost alternatives, the space agency would have no choice but to consider those instead. NASA has already shifted one major mission from SLS — recently it announced that a commercial rocket, and not SLS, as Congress had mandated for years, would launch the Europa Clipper spacecraft that would study Jupiter's moon. That alone would save NASA "over $1.5 billion compared to using an SLS rocket," according to NASA's fiscal year 2021 budget request. NASA has always relied on contractors to build its hardware — from the Apollo lunar module built by Grumman to the space shuttle, built largely by North American Rockwell. But NASA defined the precise requirements, took ownership of the spacecraft and operated them. That is not the case with many of its programs today. It works alongside the companies to validate their rockets and spacecraft and ensure they meet the agency's safety standards. But the hardware and the launch procedures remain in private hands. The private astronaut mission, dubbed Inspiration4, marks the next iteration in this transition. Isaacman, the billionaire founder and chief executive of Shift4Shop, a payments technology company, paid an undisclosed sum for the SpaceX flight. Isaacman, an accomplished pilot, will occupy one of the four seats. Another will go to Hayley Arceneaux, a 29-year-old physician assistant at St. Jude Children's Research Hospital. The third is to be raffled off as part of a fundraising effort for the hospital. And the fourth seat will go to the winner of a competition among entrepreneurs who use Shift4Shop's platform. Isaacman has donated $100 million to St. Jude and hopes the fundraising effort will match that. "We will, of course, coordinate this with NASA," Musk said on a call with reporters earlier this month to discuss the mission. "NASA has been briefed on this and is supportive." But it will be SpaceX and the crew that will determine the flight parameters and training requirements, not NASA. "Wherever you want to go, we'll take you there," Musk said to Isaacman on the call. Meet the people paying $55 million each to fly to the space station That mission will be followed by a second flight made up entirely of civilians — three wealthy business executives, who are each paying $55 million, in addition to the commander, Michael Lopez-Alegria, a former NASA astronaut who now serves as a vice president at Axiom. Instead of spending a few days inside SpaceX's Dragon spacecraft, which has about as much interior room as a large SUV, they will fly to the International Space Station. They will spend eight days there before flying back. Ultimately, Axiom's goal is even bigger — to build a space station of its own. The ISS is getting old and will need to come down at some point. NASA has said that it would eventually get out of the space station business — and outsource that to the private sector as well. Axiom is one of the leading candidates to build the successor. If Axiom is successful, it could then proceed to its ultimate goal: charter missions of private citizens, flying on private rockets to a private space station with little to no involvement from NASA.

====Colonies in space are sustainable and rely on planetary resources, NASA has a plan====

Haynes 19, 5/17, Korey "O'Neill colonies: A decades-long dream for settling space," Astronomy, https://astronomy.com/news/2019/05/oneill-colonies-a-decades-long-dream-for-settling-space Top of Form

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Last week, Amazon founder Jeff Bezos revealed his spaceship company's new lunar lander, dubbed Blue Moon, and he spelled out a bold and broad vision for humanity's future in space. Faced with the limits of resources here on Earth, most fundamentally energy, he pointed to life in space as a solution. "If we move out into the solar system, for all practical purposes, we have unlimited resources," Bezos said. "We could have a trillion people out in the solar system." And while colonies on other planets would be plagued by low gravity, long distances to Earth (leading to communication delays), and further limits down the road, those weaknesses are avoided if the colonies remain truly in space. To that end, Bezos instead suggested people consider taking up residence in O'Neill colonies, a futuristic concept for space settlements first dreamed up decades ago. "These are very large structures, miles on end, and they hold a million people or more each." Gerard O'Neill was a physicist from Princeton University who teamed up with NASA in the 1970s on a series of workshops that explored efficient ways for humans to live off-world. Beyond influencing Bezos, his ideas have also deeply affected how many space experts and enthusiasts think about realistic ways of living in space. "What will space colonies be like?" O'Neill once asked the Space Science Institute he founded. "First of all, there's no point in going out into space if the future that we see there is a sterile future of living in tin cans. We have to be able to recreate, in space, habitats which are as beautiful, as Earth-like, as the loveliest parts of planet Earth — and we can do that." Of course, neither O'Neill nor anyone since has actually made such a habitat, but in many ways, the concepts he helped developed half a century ago remain some of the most practical options for large-scale and long-term space habitation. While NASA has mostly focused on exploring the moon and Mars in recent years, O'Neill colonies offer an option untethered to any planetary body. Instead, people would live in enormous circular structures in space that would be capable of hosting many thousands of people — or even millions according to Bezos — on a permanent basis. You may have seen these kinds of colonies in science fiction, from Star Trek, to the movie Interstellar. But in real life, researchers have thought up a a few variations: either a sphere, a cylinder, or a ring-shaped torus. All of these are designed to rotate and create a centrifugal force that mimics gravity for the inhabitants. While the sizes and specifications of the colonies vary, there are a few staples. In general, O'Neill colonies were designed to be permanent, self-sustaining structures. That means they would use solar power for electrical energy and for growing crops. The outer walls of an O'Neill colony are generally pictured as a transparent material, so that mirrors can aim sunlight through its walls as needed to provide light and energy – or to allow darkness, a feature humans also need, especially while we sleep. But building these colonies is a challenge beyond any humans have accomplished so far in space, and Bezos acknowledged that. He referred to two "gates" in his announcement, which he clarified as challenges that humans need to overcome. The first, which his company Blue Origin and other space entrepreneurs have been tackling, is to reduce the cost and difficulty of getting to space at all. But the second involves using resources from space, rather than hauling them from Earth. Bezos isn't alone in such thinking. Most of NASA's long-term plans for the Moon and Mars involve rely on harvesting materials and manufacturing products locally, using lunar and martian regolith to build and repair structures. And in the shorter term, three of the dozen experiments NASA selected as the first to fly as part of the new lunar program — possibly even by the end of the year — are what NASA terms "resource prospecting instruments." That pairs well with O'Neill's vision. These colonies are meant to use resources gathered from space, whether asteroids, the Moon, or even Mars. Doing so avoids the costly effort of heaving materials and goods out of Earth's deep gravity well. That means they would be built using materials available cheaply in space. The humans and their attendant plants and animals would need to be carried from Earth. But raw materials like oxygen, nitrogen and aluminum are plentiful in the solar system, and mining for resources in space is a common theme across space settlement discussions. Because of their size, the colonies should be able to act as fully independent ecosystems, with plants to cycle air and water and resource cycles not so dissimilar from Earth. Humans are a long way from being able to launch anything like an O'Neill colony in the near future. But it's somewhat telling that, after 50 years of space exploration and technological achievement, one of the modern leaders in private spaceflight is still espousing an idea from the first days of space exploration.

====Every adv CP fails – corporate incentives defang policy reforms and treaties. ====

Thompson 20 ~~[(Clive, author of Coders: The Making of a New Tribe and the Remaking of the World, a columnist for Wired magazine, and a contributing writer to The New York Times Magazine) "Monetizing the Final Frontier The strange new push for space privatization," December 3, 2020 https://newrepublic.com/article/160303/monetizing-final-frontier~~] TDI

But even assuming the wet new lunar frontier can be tamed—for all the space-booster rhetoric, it's still a very speculative prospect, both logistically and economically—there's a whole host of untested questions about property rights in the great beyond. Space law, it turns out, is very ambiguous about who's empowered to exploit space resources, and to what geopolitical-cum-commercial ends. There's an Outer Space Treaty, signed in 1967 by most major industrial countries, which seeks to establish space as a shared resource for humanity. It lets corporations engage in commercial activities on other celestial bodies—but neither they nor countries can claim property rights; and whatever a corporation does in space, its host country is on the hook for. There is also a Moon Treaty, created in 1979, that bans property rights on the moon and requires equitable use of lunar resources by all nations. But the Moon Treaty is mostly toothless; no country that has launched humans into space ever signed it. The force of those treaties was never certain. But now that there's possible money at hand, individual countries are openly defying the treaties—writing laws under their own steam to allow property rights in the heavens. In 2015, Obama signed the SPACE Act, which explicitly gives U.S. firms the rights to any resources they mine from a celestial body. The Trump administration is actively pushing for firms to mine the moon. Other countries courting New Space firms—hello, Luxembourg—are following suit. History, of course, would suggest that treaties crumble when serious money comes into play. Western settlers signed treaties with indigenous people in the Americas, then ignored them, as Lucianne Walkowicz, an astronomer at the Adler Planetarium and another cofounder of the JustSpace Alliance, noted. "In many cases," she told me, "treaties are good until somebody discovers something that they want." She's a fan of the Outer Space Treaty, finding it "a very, like, hopeful, peaceful, almost Star Trek-esque view of what space is." She hopes it proves stronger than it looks. Historically, however, law tends to follow the facts on the ground rather than shape them. When a new geography for commerce opens, whoever shows up first to exploit the resources sets the norm—and then law is written to validate the first movers. "'First come, first serve' is essentially what's going to happen when people start to do things on the moon," Peter Ward, author of The Consequential Frontier, said.