# Emory R3

#### Unjust means dialectically contrary to law – only a legal mechanism can do that.

The Law Dictionary, ND, Def of Unjust, URL: <https://thelawdictionary.org/unjust/#:~:text=Contrary%20to%20right%20and%20justice,conduct%20furnished%20by%20the%20laws>, KR

Contrary to right and justice, or to the enjoyment of his rights by another, or to the standards of conduct furnished by the laws.

## 1NC – OFF

#### CP: States ought to engage in a prior and binding consultation with indigenous nations to ban private actor appropriation of outer space.

Hilding **Neilson &** Elena **Cirkovic** Consulting Canadians on a Framework for Future Space Exploration Activities: A Response to the Canadian Space Agency (CSA) - Part I, Völkerrechtsblog, 28.07.**2021**, doi: 10.17176/20210728-135814-0. //SR

Canada’s position of support and leadership in space exploration has a positive and impressive history. From the development of the CanadaArm and the participation in work on the International Space Station (ISS) to the new scientific contributions with respect to lunar and Martian exploration, Canada has many reasons to be proud. However, it is worth noting that Canada’s role in space exploration has traditionally neglected to include Indigenous peoples, Indigenous knowledges, and Indigenous rights. In general, the history of Canadian participation in space exploration did not have a substantial and direct impact on Indigenous peoples’ rights in Canada. With accelerating technological developments in the past twenty years, space has become more accessible for humans. With these transformations, the current and proposed future of space exploration has the potential to negatively impact Indigenous peoples across Canada. One of the emerging issues for astronomers and various traditions including traditions of Indigenous peoples in Canada and elsewhere, is the launching of so-called satellite mega constellations, such as the SpaceX’s Starlink. Increasing the number of satellites in the Lower Earth’s Orbit (LEO), impacts further research. For various human cultures, Dark Skies have, among others, navigational and spiritual significance. Finally, the objective of our post is to emphasize the need for greater scientific understanding of the universe, which is achieved through research, education and outreach, and inclusion of multiple knowledges and ontologies. Without consultation with multiple knowledges of multicultural and multinational Canada, future space activities might contribute to the ongoing culture of colonization. We present arguments for the ethical and legal requirements for the CSA to consult with and to be inclusive of Indigenous rights and concerns as Canada moves to support the Artemis Accords. The Accords trigger a variety of issues in the outer space sector, which are beyond the scope of this brief post. The authors come to this work from two perspectives: the first being a Mi’kmaw astronomer who grew up in Newfoundland and is a status member of the Qalipu Nation, and co-author, a Bosnian-Canadian legal scholar. Thereby we stress that our contribution is an opinion and has no intent to speak for Indigenous peoples in general and/or any Indigenous-led organization in Canada, or any particular group or community in Canada. Please note that we will be using the terms Indigenous, and Aboriginal interchangeably as we engage with the language of domestic (Canadian) and international documents, publications, institutions, and relevant regulatory and/or administrative bodies. The terms Indigenous and Aboriginal refers to the three different categories of Indigenous peoples in Canada – First Nation, Inuit, and Métis. We reflect upon the CSA’s obligation to consult Indigenous peoples in Canada via two lenses: Firstly, where does Outer Space Law intersect with the modern and historic treaties between the First Nations and Canada (Crown)? Do these treaties include the skies and outer space? Secondly, considering its status as an international (and bilateral) agreement, where the Artemis Accords trigger the application of the United Nations Declaration on the Rights of Indigenous Peoples. Assuming that the Artemis Accords might, and in the situations where they do, trigger any responsibilities and obligations of Canada under the UNDRIP and its domestic laws to consult the First Nations, what are the CSA’s and Canada’s obligations to First Nation, Inuit, and Métis communities and Nations? We engage with these two points considering the following: That the questions of Indigenous rights and title in Canada, including the treaty rights, have significant impacts on how Canada consults with the First Nations and other communities and nations in Canada and pursues the ongoing and future space exploration accordingly; That these questions also require a revisiting of the allegedly prevailing narrative as proposed by some scholars and members of the global outer space sector, generally speaking, which treats space exploration as an analogy of the colonization of the Americas. The legal framework of our argument is that of Canadian Constitutional obligations towards indigenous peoples. The relevant cases are discussed and listed in the rest the following sections. Brief Consideration of Indigenous Rights in Canada Canada’s obligations to Indigenous peoples under the Canadian Constitution cannot be superseded or undermined by commitments under a bilateral agreement such as the Artemis Accords. These legal obligations include those recognized and affirmed by Section 35 of the Constitution Act, 1982, and those set out in self-government agreements. We recognize that, in 1985, the Supreme Court of Canada (SCC) concluded that treaties between Indigenous peoples and the Crown were not international treaties but were sui generis treaties (Simon v The Queen, [1985] 2 SCR 387 at para 33). However, it is worth considering that ‘[f]or many Indigenous peoples, treaties concluded with European powers…are, above all, treaties of peace and friendship, destined to organize coexistence in – not their exclusion from – the same territory and not to regulate restrictively their lives…under the overall jurisdiction of non-Indigenous authorities’ (para 117). While the United Nations, in documents including the UNDRIP, has recognized the potentially international character of Indigenous Crown treaties (UNDRIP Preamble, art 37(1)), we recognize that Canadian law has yet to consider this international recognition in domestic law. Nevertheless, as Henderson argues ‘any Crown authority over First Nations is limited to the actual scope of their treaty delegations. If no authority or power is delegated to the Crown, this power must be interpreted as reserved to First Nations, respectively, and is protected by prerogative rights and the common law since neither can extinguish a foreign legal system.’. There are plural and ongoing discussions on the status of Aboriginal title in Canada, as well as treaty obligations. It is beyond the scope of our comment to address the extensive international and domestic jurisprudence on the topic. However, we stress the existence of the Crown’s fiduciary duty to Aboriginal People as an aspect of various activities, including Canada’s activities in outer space (See, Annex I). Indeed, ‘The doctrine of Aboriginal rights exists… because of one simple fact: when Europeans arrived in North America, Aboriginal peoples were already here, living in communities on the land, and participating in distinctive cultures, as they had done for centuries. It is this fact, and this fact above all others, which separates Aboriginal peoples from all other minority groups in Canadian society and which mandates their special legal status.’ (Chief Justice Lamer in R. v. Van der Peet, para 30).

**Indigenous people say yes–appropriation goes against their values**

**Young**, M. J. (**1987**). “Pity the Indians of Outer Space”: Native American Views of the Space Program. Western Folklore, 46(4), 269. doi:10.2307/1499889 //SR \*brackets for problematic language]

Because Native Americans [indigenous people] have a different perspective of the world, they can offer us alternative ways of seeing ourselves in relationship to the natural world and help us answer the question of what constitutes appropriate behavior-in outer space, as well as on earth. Furthermore, some non-Native Americans realize that, as they look to the traditions of the Native Americans, they see their own heritage with increased clarity. Although this appreciation of Native Americans comes too late in America's history and could be construed as appropriating their ideas as we did their land, a significant number of Native Americans are receptive to the potential that now exists for a dialogue between traditions, both non-Native and Native American, perhaps because they are experiencing a parallel concern, a need to come to terms with their own emerging identity.2 Both groups have begun to realize that it is only through such a dialogue that the mistakes of the past can be avoided in the future. For non-Native Americans the justification for this inquiry is that through an analysis of the difference between the two understandings of space-Anglo and Native American-we can better "see" the ideological dimensions of our own, taken-for-granted mythology that legitimizes space exploration. Native American [indigenous] attitudes towards "outer space" often conflict with the attitudes of the proponents of the U.S. space program. Rather than applying the metaphor of the "new frontier" or even the term "outer" to this aspect of the cosmos, many Native Americans regard it as encompassed in "Father Sky," part of their network of symbolic associations that integrates all elements of the cosmos. A recent commercial called "Earth Pictures," produced by TRW, a firm that specializes in "aerial views" of portions of the earth's globe from outer space, aptly illustrates these differing attitudes.3 In this commercial, TRW representatives give members of the Navajo tribe a guided tour of the TRW laboratories and conclude by showing them a satellite picture (Landsat) of the Navajo reservation from outer space. With evident humor, the Navajos respond by holding up a picture of outer space from their reservation-a dry painting of Father Sky who contains within his body the sun, moon, and constellations. The commercial thus serves to illustrate Navajo beliefs about "outer space." According to Navajo worldview, which emphasizes harmonious relations with all elements of the cosmos-a sacred kinship among all aspects of experience, natural and supernatural-Father Sky is a living being, intimately related to humans who should, therefore, treat him with appreciation and respect. This example from the Navajo is representative of the cosmology of most Native American groups, a cosmology that is shaped by a belief in the unity and sacred nature of all life, the above and the below. As Joseph Epes Brown suggests, the Native American quality of seeing is based on "a polysynthetic metaphysic of nature, immediately experienced rather than dangerously abstracted."4 He describes this vision as a "message of the sacred nature of the land, of place."5 Place in this sense extends, of course, to outer space, or Father Sky, as well as to Mother Earth. This perspective contrasts sharply with that of enthusiasts of space exploration who regard space as something "out there," beyond everyday experience, through which we should travel to reach planets and other objects that we will investigate, and, if possible, use to meet our own needs.

#### Give us disad snad cps – toherwise allwos for infinite shiftiness bc u can delink out of any disad and “what proves the res just” is extemely uncleear since you arent defending a psecific action -I’ll prove that private entity appropriation is unjust if they don’t consult natives

## 1NC – OFF

#### States ought to:

#### --Announce that appropriation of outer space by private actors violates the Outer Space Treaty and that this is a settled matter of customary international law

#### --Announce that this action is taken pursuant to *opinio juris* (the belief that the action is taken pursuant to a legal obligation) and that non-compliant actors are in violation of international law

#### --Fully comply, not appropriating outer space in a manner inconsistent with these proclamations

#### Solves the Aff.

[Fabio](https://kluwerlawonline.com/journalarticle/Air+and+Space+Law/33.3/AILA2008021) **Tronchetti 8**. Dr. Fabio Tronchetti works as a Co-Director of the Institute of Space Law and Strategy and as a Zhuoyue Associate Professor at Beihang University, “The Non–Appropriation Principle as a Structural Norm of International Law: A New Way of Interpreting Article II of the Outer Space Treaty,” Air and Space Law, Volume 33, No 3, 2008, <https://kluwerlawonline.com/journalarticle/Air+and+Space+Law/33.3/AILA2008021>, RJP, **DebateDrills**.

The non–appropriation principle represents the fundamental rule of the space law system. Since the beginning of the space era, it has allowed for the safe and orderly development of space activities. Nowadays, however, the principle is under attack. Some proposals, arguing the need for abolishing it in order to promote commercial use of outer space are undermining its relevance and threatening its role as a guiding principle for present and future space activities. This paper aims at safeguarding the non–appropriative nature of outer space by suggesting a new interpretation of the non–appropriation principle that is based on the view that this principle should be regarded as a customary rule of international law of a special character, namely ‘a structural norm’ of international law.

#### That competes ---

#### 1] Widespread support for OST overhaul means a new treaty is likely---top military leaders are pushing it.

Theresa **Hitchens 21**. Theresa Hitchens is the Space and Air Force reporter at Breaking Defense. The former Defense News editor was a senior research associate at the University of Maryland’s Center for International and Security Studies at Maryland (CISSM). Before that, she spent six years in Geneva, Switzerland as director of the United Nations Institute for Disarmament Research (UNIDIR). “US Should Push New Space Treaty: Atlantic Council,” Breaking Defense, April 12, 2021, <https://breakingdefense.com/2021/04/us-should-push-new-space-treaty-atlantic-council/>, RJP, **DebateDrills**

WASHINGTON: The US should push hard to overhaul the entire international legal framework for outer space — including replacing the foundational [1967 Outer Space Treaty (OST),](https://breakingdefense.com/tag/outer-space-treaty/) a new report from the Atlantic Council says. As it moves to do so, the US also should more aggressively court allies with an eye to establishing a “collective security alliance for space” among likeminded countries to “deter aggression” and defend “key resources and access.” “The 1967 Treaty is dated. It was written, literally, in a different era,” said former Air Force Secretary Deborah Lee James in an Atlantic Council briefing today. “At present it is too broad, and in some cases it’s probably overly specific.” The year-long study, [“The Future of Security In Space: A Thirty-Years US Strategy”](https://www.atlanticcouncil.org/wp-content/uploads/2021/04/TheFutureofSecurityinSpace.pdf) was co-chaired by James and retired Marine Corps Gen. Hoss Cartwright, former vice chair of the Joint Chiefs of Staff. In essence, it argues that the US needs to lead international efforts to craft a new rules-based regime to govern all space activities — from exploration to commercial ventures to military interactions. As the two argued in a recent [op-ed in Breaking D,](https://breakingdefense.com/2021/03/the-space-rush-new-us-strategy-must-bring-order-regulation/) “Great-power competition among the United States, China, and Russia has launched into outer space without rules governing the game.” “The international law of space, centered on the 1967 Outer Space Treaty, is outdated and insufficient for a future of space in which economic activity is primary. The international community needs a new foundational space treaty, and the United States should precipitate its negotiation,” the study argues. James elaborated that the idea would be to craft a more expansive treaty that covers emerging issues like debris mitigation and removal and [commercial extraction of resources](https://breakingdefense.com/tag/space-resource-extraction/) from the Moon and/or asteroids. That said, she stressed that the US should not abandon the OST — which has been signed by 193 nations — unless and until something new is there to replace it.

#### 2] Space law is typically treaty-based---Russian and Chinese proposals prove.

Stephanie **Nebehay 8**. Reporter, Reuters, “China, Russia to Offer Treaty to Ban Arms in Space,” Reuters, January 26, 2008, <https://www.reuters.com/article/us-arms-space/china-russia-to-offer-treaty-to-ban-arms-in-space-idUSL2578979020080125>, RJP, **DebateDrills**

GENEVA (Reuters) - China and Russia will submit a joint proposal next month for an international treaty to ban the deployment of weapons in outer space, a senior Russian arms negotiator said on Friday. Valery Loshchinin, Russia’s ambassador to the United Nations-sponsored Conference on Disarmament, said the draft treaty would be presented to the 65-member forum on February 12. Russian Foreign Minister Sergei Lavrov is due to address the Geneva forum, which constitutes the world’s main disarmament negotiating body, on that day. Loshchinin gave no details on the proposal which has been circulated to some senior diplomats. Tensions between Russia and the United States have deepened in recent years over U.S. plans to revive its stalled “Star Wars” program from the 1980s with a new generation of missile defense shields. Nuclear and other weapons of mass destruction are banned from space under a 1967 international treaty. But Washington’s plans have stirred concerns about non-nuclear arms in space.

#### 3] Treaties are the foundation of space law.

Sophie **Goguichvili et. al 21**. Program Associate, the Wilson Center, “The Global Legal Landscape of Space: Who Writes the Rules on the Final Frontier?” The Wilson Center, October 1, 2021, <https://www.wilsoncenter.org/article/global-legal-landscape-space-who-writes-rules-final-frontier>, RJP, **DebateDrills**

As previously mentioned, a series of treaties adopted by the U.N. General Assembly (UNGA) form the foundation of the global space governance system. The first and most significant of these treaties is the “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space including the Moon and Other Celestial Bodies,” more commonly known as the **Outer Space Treaty**or**OST** for short (1967). The Outer Space Treaty is considered the most comprehensive space treaty and provides the basic framework for international space law, namely: the exploration and use of outer space for peaceful purposes by all States for the benefit of mankind (Art. I); the outlaw of national appropriation or claims of sovereignty of outer space or celestial objects (Art. II); a ban on the placement of weapons of mass destruction in orbit or on celestial bodies (Art. IV); that astronauts should be regarded as the envoys of mankind (Art. V); and that States are required to supervise the activities of their national entities (Art. VI).

#### They never read a solvency advocate so don’t let the 1AR spin and stick them with normal means – otherwise presume they don’t solve since they have 0 mechanism for doing the aff.

#### We solve better, since CIL is far superior to treaties for space AND causes follow-on.

Koplow, 9 – Professor of Law, Georgetown University Law Center.

David A. Koplow, “ASAT-isfaction: Customary International Law and the Regulation of Anti-Satellite Weapons,” Michigan Journal of International Law. Volume 30, Summer 2009. <http://scholarship.law.georgetown.edu/cgi/viewcontent.cgi?article=1452&context=facpub>

Finally, the Article concludes with some policy recommendations, suggesting mechanisms for the world community to press forward with autonomous efforts to promote stability and security in outer space, even in the face of recalcitrance from the leading space powers. I would certainly support the negotiation and implementation of a comprehensive new treaty to prevent an arms race in outer space, and a carefully drafted, widely accepted accord could accomplish much, well beyond what customary law alone could create. But the treaty process, too, has costs and disadvantages, and the world need not pursue just one of these alternatives in isolation. If the absence of global consensus currently inhibits agreements that countries could already sign, perhaps the world community can nevertheless get some "satisfaction" via the operation of CIL, constructing a similar (although not completely equivalent) edifice of international regulation of ASATs based simply on what countries do.

## 1NC – OFF

#### FY 22 appropriations will pass now if Congress maintains bipartisanship—otherwise, yearlong CR ruins military modernization and defense startup funding

Gould 1/21 [Joe Gould is senior Pentagon reporter for Defense News, “Defense industry frets as funding talks crawl”, 1/21/2022, https://www.defensenews.com/congress/budget/2022/01/21/defense-industry-frets-as-funding-talks-crawl/]

Despite repeated warnings from uniformed Pentagon leaders and lawmakers of both parties that a full-year continuing resolution will hurt national security, some defense industry advocates are still worried about an impasse. On Thursday, both chambers of Congress left town on recess until the week of Jan. 31, after making scant progress on a deal for an omnibus federal spending package. Amid partisan divisions over funding levels and policy provisions, House Speaker Nancy Pelosi, D-N.Y., warned that a full-year CR would create a national security crisis ― in an effort to pressure Republicans. “It is a national security issue of the highest priority, with the threats that exist out there. To go to a continuing resolution instead of a decision-making omnibus bill is to weaken our security and our stability,” Pelosi told reporters Thursday. “The Republicans should know that, so we hope we will be able to bring that legislation to the floor before [the current CR] expires.” With fiscal 2022 spending bills four months overdue, lawmakers and the Pentagon have warned against a yearlong CR that would freeze defense spending at the level of 2021 appropriations. CRs continue funding at the previous year’s level, preventing the Pentagon from starting new acquisition programs and ramping up production quantities. And without a 2022 spending deal to set a new baseline, the president’s budget submission is in limbo and expected to come months late, which is sowing uncertainty for the military and its vendors. President Joe Biden signed a defense policy bill that boosts his $753 billion national defense budget request for FY22 to $778 billion, a 3% increase. But Republicans have said they want more for defense, less than the 16% increase proposed by Democrats and an agreement on some politically charged policy riders. By the reckoning of National Defense Industrial Association Chairman Arnold Punaro, lawmakers could meet somewhere in the middle with 8% increases for both defense and nondefense, but that’s far from a certainty. Democrats have raised fears some Republicans see budget gridlock as an advantage heading into midterm elections and don’t want a deal at all. “We’re still in budget chaos,” Punaro told Defense News this week. “China’s on the march, Russia’s on the move and North Korea’s on the advance, and yet Congress is sitting on their duff, not passing a spending bill. It’s disgraceful.” The lack of a 2022 deal as a baseline for defense amid escalating inflation presents a huge challenge for Pentagon planners crafting the FY23 budget request, Punaro said. He worried the administration could make a flat budget request, potentially costing the Pentagon billions of dollars in buying power. Meanwhile, a full-year CR would yield $11 billion of lost growth, while 7% inflation would mean another $50 billion in lost buying power, according to defense consultant Jim McAleese, the founder of McAleese & Associates. Though the current CR runs out on Feb. 18., recent negotiations in Congress have sparked some optimism. Lead appropriators in the Senate met Jan. 13 with Senate Majority Leader Chuck Schumer and Senate Minority Leader Mitch McConnell to set the guidelines for negotiations. From there, lead House and Senate appropriators met to kick off talks, and Pelosi has said she’s been in discussions with House Appropriations Committee Chairwoman Rosa DeLauro, D-Conn. Asked Thursday whether it’s realistic to get an agreement by Feb. 18, as Congress was about to leave town Senate Appropriations Committee Vice Chairman Richard Shelby, R-Ala., said: “That’s a good question. It’d be hard to get it by the 18th, but if we can make huge progress, we can probably get done soon.” It’s unclear whether looming international crises with Russia and Ukraine, China and Taiwan, and North Korean missile tests would add pressure to pass defense spending. When asked about Pelosi’s comments, Shelby seemed to dig in. “She’s right on that, but to underfund defense as some people would like to do, that would be a bigger challenge,” he said. At a House Appropriations Committee hearing Jan. 12 about the effects of a potential full-year CR, the top officers of the Army, Navy, Air Force, Marine Corps and Space Force warned such a move would sabotage the military’s efforts to compete with China by stalling new weapons like hypersonic missiles. “CRs effectively prevent modernization at speed,” said Marine Corps Commandant Gen. David Berger. “We actually stand to be outpaced by China — not because of their speed but because of our failure to comply with our own budgetary processes.” The president and CEO of the Aerospace Industries Association, Eric Fanning, has warned that budget unpredictability is inefficient for the defense industry, which has to idle while the Pentagon waits for its projects to be funded. Amid the Capitol Hill activity, Fanning said he is “hopeful that the momentum continues.” “The hearing painted a concerning picture of additional and unnecessary costs, as well risks to capabilities and to the industrial base in the short and long-terms. There was bipartisan agreement on how devastating a year-long CR could be,” Fanning said in a statement Thursday. “Over the last few days, there are positive signs that the message is getting through and the top appropriators from both parties are coming to the table.” Lead Pentagon officials have talked for years about the need to harness the innovation of small tech firms. But CRs stifle those efforts, an executive at one of those firms, Anduril Industries, wrote in an essay this week.

#### Large President-led national space policies incite immense partisan backlash that spills over to kill the entire political agenda

Dreier 16 [Casey Dreier, Chief Advocate & Senior Space Policy Adviser for The Planetary Society, April 13, 2016. “Does Presidential Intervention Undermine Consensus for NASA?” https://www.planetary.org/blogs/casey-dreier/2016/0413-does-a-strong-president-help-or-hurt-consensus-on-NASA.html]

To see how this happens, I recommend reading the book “[Beyond Ideology](http://smile.amazon.com/Beyond-Ideology-Politics-Principles-Partisanship/dp/0226470768/ref=smi_www_rco2_go_smi_g2243582042?_encoding=UTF8&*Version*=1&*entries*=0&ie=UTF8)” by Frances Lee. The author’s larger premise is that issues having no intrinsic relation to stated party ideology have become increasingly polarized in recent years. This is a function of the two party nature of our political system. If your party coalition wins, the other one loses. It’s [It is] zero-sum. Your party can win in one of two ways: you can make a better pitch to voters by demonstrating the superiority of your agenda; or you can undermine and stymie the agenda of the opposition party, making them unpopular with voters, and pick up the seats that they lose. Since you’re the only other political party, you gain in either scenario. I’m not sure if you’ve noticed, but the “undermine and stymie” approach has been popular for quite some time now in the U.S. Congress. Given this situation, the President and their policies naturally become the symbolic target of the opposition party. Anything promoted by the President effectively induces opposition by association. Lee demonstrates the magnitude of this induced polarization on various types of issues. For highly polarized issues like the role of government in the economy, or social issues, the impact is minimal—the opposition has already been clearly defined and generally falls into clearly defined ideologies of the Republican and Democratic parties. But for issues that do not fit readily into a predefined political ideology—like space—the induced polarization by the President can be significant. In fact, Lee showed that space, science, and technology issues incur the greatest increase in partisanship based on their inclusion in the Presidential agenda. One need only look to at the responses by political operatives of the opposing party to the strong human spaceflight proposals by [Barack Obama in 2010](http://www.shelby.senate.gov/public/index.cfm/mobile/newsreleases?ID=25F3AD2E-802A-23AD-4960-F512B9E205D2), [George W. Bush in 2004](http://www.nbcnews.com/id/3950099/ns/technology_and_science-space/t/bush-sets-new-course-moon-beyond/#.Vw3UMRMrKHo), and [George H.W. Bush in 1989](http://www.nytimes.com/1989/07/21/us/president-calls-for-mars-mission-and-a-moon-base.html) to see this reflected in recent history. This isn’t to say that Presidents can’t have a significant impact on the space program. Clearly they can. But the broad consensus needed for stability after their departure from office may be undermined by the very priority they gave it during their tenure. It what amounts to a mixed blessing for NASA, the U.S. space program does have an unusually strong bipartis an group of politicians who support the program due to NASA centers in a variety of states throughout the union. Berger notes this throughout his article, and it does, in a way, act as force that is resistant to change for good and bad. This mitigates somewhat the pure polarization seen on other science and technology issues. But for a Journey to Mars—a major effort that would, at best, require stability and significant funding over many Presidential administrations—that may not be enough. Perhaps the solution is for the next President to maintain a light touch on space. Maybe they should speak softly through the budget process, and avoid the Kennedyesque speeches and declarations to Congress that induce the types of partisanship we so dearly need to avoid.

#### Congress will backlash to unpopular decisions

Dr. Alicia Uribe 13, Lecturer in Political Science at University of Illinois, PhD University of Washington St. Louis, “The Influence of Congressional Preferences on Legislative Overrides of Supreme Court Decisions”, Law & Society Review, <http://faculty.ucmerced.edu/thansford/Articles/congress_reaction_to_court.pdf>

Conclusion Congress and the Supreme Court interact in a separation-of-powers framework as each attempts to shape policy. While the broader congressional politics literature provides convincing empirical evidence that legislative preferences have a significant effect on Members’ votes and the passage of legislation (e.g., Poole and Rosenthal 2007), no systematic evidence demonstrates legislative overrides of Supreme Court opinions result from congressional preferences. This lack of empirical support exists despite the widespread application of a spatial modeling approach to understand Congress-Court relations, which assumes overrides occur when Court decisions are ideologically distant from Congress. Our first goal was to show, consistent with existing spatial models in the literature, that Congress is more likely to pass laws overriding Supreme Court decisions the further ideologically removed a decision is from the legislative gridlock interval. Our statistical results, for the first time, demonstrate Congress overrides Court decisions the further ideologically removed it is from them. A two standard deviation shift around the mean of the ideological distance of Congress from a Court decision increases the likelihood of an override by 66.4%. This result indicates Congress takes notice of the policy import of a Court decision and is more likely to reject those it dislikes on ideological grounds. We therefore provide evidence in support of a core part of SOP models, showing Congress does indeed respond to Court decisions based on its preferences. This result is important because it confirms a fundamental component of nearly all SOP explanations of the relationship between Congress and the Court. Future studies can now be confident that their assertion that legislative preferences influence overrides is on a strong empirical footing. We further demonstrate Congress does not act strategically by avoiding legislative overrides when the Court is likely to reject them. The implication is that Congress is motivated by position-taking goals rather than the ultimate effect of its policy actions and the separation-ofpowers. That is, our data suggest Congress cares more about the short-term gains from overriding legislation (e.g., passing the legislation for electoral purposes) than the ultimate shape of the policies it chooses to override. This result suggests the Court may, at least when it concerns the ultimate effect of override legislation, have greater influence on the ultimate location of public policy. Of course, this conclusion is tempered by the fact that Congress and the Court rarely disagree about whether the status quo should be altered; Congress wishes to override a Court decision preferred by the Court only 2.5% of the time in our data. As Dahl (1957) famously declared, the Court is not often out-of-step with the elected branches, and as a result Congress and the Court tend to agree on the desirability of previously decided Court cases. Finally, we show the effect of ideological distance matters for all types of Court decisions, including constitutional ones. Thus, while the Court may, as some suggest (e.g., King 2007), attempt to insulate its decisions from congressional override by using constitutional interpretation, it appears this tactic does not work. When Congress is ideologically distant from a Court decision, regardless of whether the decision is based on constitutional, statutory or common law interpretation, it is more likely to override it. This result is new to the literature, and it means subsequent studies cannot exclusively focus on statutory cases.

#### Falling behind on tech causes nuke war with Russia and China.

Kroenig & Gopalaswamy 18, \*Associate Professor of Government and Foreign Service at Georgetown University and Deputy Director for Strategy in the Scowcroft Center for Strategy and Security at the Atlantic Council. \*\*Director of the South Asia Center at the Atlantic Council. He holds a PhD in mechanical engineering with a specialization in numerical acoustics from Trinity College, Dublin. (Matthew & Bharath, 11-12-2018, "Will disruptive technology cause nuclear war?", *Bulletin of the Atomic Scientists*, https://thebulletin.org/2018/11/will-disruptive-technology-cause-nuclear-war/)

Rather, we should think more broadly about how new technology might affect global politics, and, for this, it is helpful to turn to scholarly international relations theory. The dominant theory of the causes of war in the academy is the “bargaining model of war.” This theory identifies rapid shifts in the balance of power as a primary cause of conflict. International politics often presents states with conflicts that they can settle through peaceful bargaining, but when bargaining breaks down, war results. Shifts in the balance of power are problematic because they undermine effective bargaining. After all, why agree to a deal today if your bargaining position will be stronger tomorrow? And, a clear understanding of the military balance of power can contribute to peace. (Why start a war you are likely to lose?) But shifts in the balance of power muddy understandings of which states have the advantage.You may see where this is going. New technologies threaten to create potentially destabilizing shifts in the balance of power. For decades, stability in Europe and Asia has been supported by US military power. In recent years, however, the balance of power in Asia has begun to shift, as China has increased its military capabilities. Already, Beijing has become more assertive in the region, claiming contested territory in the South China Sea. And the results of Russia’s military modernization have been on full display in its ongoing intervention in Ukraine. Moreover, China may have the lead over the United States in emerging technologies that could be decisive for the future of military acquisitions and warfare, including 3D printing, hypersonic missiles, quantum computing, 5G wireless connectivity, and artificial intelligence (AI). And Russian President Vladimir Putin is building new unmanned vehicles while ominously declaring, “Whoever leads in AI will rule the world.” If China or Russia are able to incorporate new technologies into their militaries before the United States, then this could lead to the kind of rapid shift in the balance of power that often causes war. If Beijing believes emerging technologies provide it with a newfound, local military advantage over the United States, for example, it may be more willing than previously to initiate conflict over Taiwan. And if Putin thinks new tech has strengthened his hand, he may be more tempted to launch a Ukraine-style invasion of a NATO member.Either scenario could bring these nuclear powers into direct conflict with the United States, and once nuclear armed states are at war, there is an inherent risk of nuclear conflict through limited nuclear war strategies, nuclear brinkmanship, or simple accident or inadvertent escalation. This framing of the problem leads to a different set of policy implications. The concern is not simply technologies that threaten to undermine nuclear second-strike capabilities directly, but, rather, any technologies that can result in a meaningful shift in the broader balance of power. And the solution is not to preserve second-strike capabilities, but to preserve prevailing power balances more broadly.

# Case

## Cap

No rev causal ev – evne if space preserves cap no reaosn why not going into space will solve cap – tons of alt cuases like billionaires, current investements, public companies, -- their massh luanch evidence is about rocket fuel so they can’t solve since it’s not a form of appropriation etc. prove cap is inevtiable

Their evinromental degradation card never says the word degradation – it just says cap epands ito other planets

Can oslv eof rpandemi s – island bunkers, natural immunity etc. means it’s highly unlikly

### Turn – Growth/Poverty

#### Capitalism is key to growth – and also reductions in poverty.

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Emily C. Skarbek, “Capitalism and Economic Growth,” Independent Institute. April 15, 2010. <https://www.independent.org/issues/article.asp?id=2769>

When the current administration talks of entrepreneurship, they speak of politically favored businesses and privileged recipients of the taxpayers’ dollars. To be clear, that is not entrepreneurship. It has become conventional to say that those who openly embrace capitalism, free markets and free trade are dogmatic, ideologues, idealistic, or market fundamentalists. And if you look to the media and our leaders, you get the impression that being in favor of free markets is somehow an unreasonable position.

Unless one is ashamed of unprecedented increases in income, rising life expectancy, greater education, and more political freedom, there is no reason to be a fair-weather fan of capitalism. Sprawling free markets in countries that became more capitalist over the last 25 years have meant many more people enjoy improvements in well being and opportunities to advance human capabilities.

There is no evidence that countries that eschewed freer markets and embraced substantially greater state control performed better on any of these major indicators. On the contrary, those countries that adopt increased taxation, increased regulation, fiscal mismanagement and enormous public debt have performed demonstrably worse.

From a global perspective, we have witnessed remarkable progress of mankind through the increased acceptance of free market policies in both rich and poor countries. Before the industrial revolution, 80% of the world’s population lived in abject poverty. By 1980, that number has fallen to 34.8% and by 2000, less than 20% of the population lives on less than $1 a day. In five years, the number is expected to fall to 10% if free trade is allowed to flourish.

In just the past 25 years increased private ownership, increased free trade, and lower taxes all came at the hands of politicians like Deng Xiaoping in China, Margaret Thatcher in England, and Ronald Reagan in United States. In the years following the adoption of these policies by these global leaders, per capita income nearly doubled from 1980 to 2005; Tariffs fell and trade increased; Schooling and life expectancy grew rapidly, while infant mortality and poverty fell just as fast.

In the average country that became more capitalist over the last 25 years, the average citizen gained a 43% increase in income, nearly half a decade in life expectancy, and a 2-year increase in the average years of schooling. In my lifetime alone, freer markets have improved the lives of billions of people from all walks of life.

When we look back at our own history, the tremendous economic growth that Americans experienced from the time of the original Tea Party up to 1914 was the result of economic freedom from government regulation, open boarders for free immigration, and very few trade restrictions on the global flow of goods, services, and capital. Anyone could get on a boat, land on Ellis Island and become an immigrant and this benefited both domestic Americans and the immigrant alike. Business and labor were free to be entrepreneurial—and entrepreneurship created wealth. But we don’t want wealth for wealth’s sake. Wealth allows for the improvement of the human condition.

For example, in 1905, our average life expectancy in the U.S. was 47. Today it is 78. A hundred years ago only 14% of homes had a bathtub; 8% had a phone; 95% of all births took place at home; most women washed their hair once a month; and the average worker made about $300 per year.

As recent as 1984, it took the average American wage earner 456 hours of labor to earn enough to purchase a cellphone. Today, it takes the average American 4 hours. A computer has fallen from costing 435 hours of labor to less than 20. None of this accounts for the tremendous improvements in technological capacity. There are several reasons that the costs of goods have dropped so drastically, but perhaps the biggest is increased international trade.

Simply put, the free market means the poor are less poor. Globalization extends and deepens a capitalist system that has for generations been lifting American living standards—for high-income households, of course, but for low-income ones as well.

#### That outweighs---and turns sustainability.

Smith ’18 – assistant professor of finance at Stony Brook University

Noah. September 19. “Saving the Planet Doesn’t Mean Killing Economic Growth” <https://www.bloomberg.com/opinion/articles/2018-09-19/saving-the-planet-doesn-t-mean-killing-economic-growth>

In the 19th and 20th centuries, a few countries got fabulously rich. These included most of Europe, parts of East Asia, some small oil producing states and parts of the former British Empire. In recent decades, more of the world — large parts of China, portions of India, Southeast Asia and part of Latin America — have joined the rich world, thanks to an unprecedented explosion of global growth. But for large swathes of the world, life remains a grinding daily struggle. Women in poor countries spend hours every day carrying water. Hundreds of millions of people contract malaria every year. Almost a billion people still defecate outdoors.

The obvious solution to lifting these people out of poverty — without inflicting poverty on some of those who have already escaped it — is economic growth. But there is a small but vocal group of environmentalists telling us that growth is no longer possible — that unless growth ends, climate change and other environmental impacts will destroy civilization. Writing in Foreign Policy, anthropologist Jason Hickel declares:

Once we reach the limits of efficiency, pursuing any degree of economic growth drives resource use back up … Ultimately, bringing our civilization back within planetary boundaries is going to require that we liberate ourselves from our dependence on economic growth—starting with rich nations.

Hickel cites analyses by the United Nations Environment Program and others showing that even big improvements in resource efficiency, encouraged by very high carbon taxes, will be unable to halt overall resource use or global carbon emissions. But this evidence doesn’t support Hickel’s conclusions, which rely on several misconceptions about the nature and the importance of growth.

First, Hickel doesn’t seem to grapple with the fact that most economic growth now happens in countries that are relatively poor. The International Monetary Fund estimates that from 2010 to 2015, emerging markets and developing countries were responsible for about 70 percent of global output and consumption growth, while advanced economies were responsible for the rest. The World Bank’s forecasts for 2017-2019 are similar:

China’s contribution to global growth will be double that of the U.S., and India’s will be larger than that of the entire euro zone.

The same is true of greenhouse gas emissions. Since about 1990, emissions from the U.S. and EU have fallen, while emissions from developing countries, especially China and India, have exploded:

In 2017, the International Energy Agency estimated that the growth in energy-related carbon emissions in China and the rest of developing Asia was more than five times the growth in the European Union, while U.S. emissions declined.

In other words, if Hickel and others stop economic growth, it won’t be rich countries that bear the brunt of the change. It will be poor and middle-income countries like India and China. African countries that are still desperately poor will not even get their chance.

Hickel tries to avoid this outcome by declaring that “We can improve people’s lives right now simply by sharing what we already have more fairly,” but even total global redistribution — which is, of course, far outside of the realm of political and logistical possibility — would afford the average person a standard of living only slightly better than that now enjoyed in China. A realistic amount of redistribution would do far less for the global poor — meaning they’d be the ones on the hook in a zero-growth world.

The second thing that Hickel leaves out is the connection between growth and fertility. Once countries pass per-capita gross domestic product of $10,000, fertility rates rapidly drop to or below the replacement rate of 2.1 children per woman. Halting growth now would leave most African countries trapped well below that magic level, meaning their population growth — and thus, the world’s population growth — would continue without limit. That in turn would eventually overwhelm the world’s resources — if not in terms of the climate, then certainly in terms of fresh water and food.

Fortunately, Hickel and the zero-growth environmentalists ignore a third crucial factor — technology. In rich countries, growth has shifted somewhat from physical things to digital services, which require much less energy consumption. Even more importantly, green energy, especially solar power, has progressed by leaps and bounds:

In many regions, wind and solar are already cheaper than coal power, and electric vehicles are rapidly becoming more common. This incredible technological progress means that rich countries could see a renewable-powered electrical grid and fully electrified transportation before the century is out. More importantly, cheap renewable energy means that poor countries in Africa and South Asia will be able to follow a different, cleaner path to industrialization without sacrificing living standards. Ultimately, technological progress will be much more important for limiting global resource use than the energy-efficiency measures Hickel considers.

In the movie “Avengers: Infinity War,” the supervillain Thanos kills off half the universe in a misguided attempt to prevent resource overuse. The zero-growth environmentalists are embracing a solution only slightly less destructive. Thanos’s better course would have been to use his vast powers to provide the universe with renewable energy technology that would let them get rich — and lower their fertility rates — without destroying the environment. Environmentalists in the real world should take that approach as well.

### Turn – CCS

#### CCS. Markets are key.

Gregory F. Nemet et al. 16, Associate Professor, La Follette School of Public Affairs, University of Wisconsin–Madison, Martina Kraus, German Institute for Economic Research Vera Zipperer, German Institute for Economic Research, November, 2016, The Valley of Death, the Technology Pork Barrel, and Public Support for Large Demonstration Projects, La Follette School Working Paper No. 2016-007

Because the ultimate (but not immediate) goal of supporting demonstrations is to facilitate widespread adoption, demand a6nd thus markets are of course key (Kingsley et al., 1996). In climate change, policies are central to those markets (Taylor et al., 2003; Zhou et al., 2015), thus credibility in those policies is also central (Rai et al., 2010; Finon, 2012). But it is striking how many demonstration programs confronted markets that involved negative shocks around the time that projects came on-line—we see it in synfuels, biofuels, and solar thermal electricity (Figure 9), and CCS (Figure 10). The 1.9 year average lag from project initiation to time on-line is crucial. It would be a mistake to assume a Hotelling price path in which prices of an exhaustible resource (e.g. oil, atmospheric storage of CO2) rise at a constant pure rate of time preference. In this case the relevant price is the level at which avoided CO2 emissions are remunerated. Rather the experience of the past suggests we are more likely to see shocks and boom–bust cycles (Krautkraemer, 1998; Zaklan et al., 2011). We see it in our data in the prices related to each demonstration program (Figure 8). Lupion and Herzog (2013) attribute the failure of the NER300 program to stimulate the construction of any CCS projects to 4 factors: competition with renewables, project complexity, low carbon prices, and a combination of fiscal austerity and weak climate policy around the global financial crisis. Note that three of the four problems involved future demand, not the funding structure itself. Demonstrations need markets that pay off innovation investments not just under a steadily increasing Hotelling-style market, but under a broad range of market conditions. Features of robust demand pull include niche markets (Kemp et al., 1998), hedging across jurisdictions (Nemet, 2010), and flexible production (Sanchez and Kammen, 2016). Government price guarantees have played an important role as we have seen on synfuels, solar thermal electricity, and on a smaller scale, photovoltaics.

## Celestial Bodies

No reverse causal evidence – just becauase private sector growth changes how US and Russia behave w each other, they don’t have ev syaing that getting rid of th private sector will sovle

Evidence is not specific to sapce – airspace is anything above a coutnry’s territroy which includes the atmostphere – if russia will esclalte then this is just eimpossible

Uq overwhelms the link – evne if relations suck that have 0 evidence saying they’re going to get better bc of the aff alone

Space weapons aren’t appropraition oproven by the fact that we’lve already tested them and no international backlash– they can’t solve for asat miltiarization even if they can marginally reduce tensions

Thumpers – russia and china tested their asats in space a couple months ago but no war and takes out percpetion

#### Alt mechanisms solve – Russia’s technical contributions and improvement of the space station solve—1AC CSIS 18

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. In April 2018, President Putin said of space, “Thank God, this field of activity is not being influenced by problems in politics. Therefore, I hope that everything will develop, since it is in the interests of everyone…This is a sphere that unites people. I hope it will continue to be this way.” During his statement at a recent event at CSIS, NASA Administrator Jim Bridenstine said, “[space] is our best opportunity to dialogue when everything else falls apart. We’ve got American astronauts and Russian cosmonauts dependent on each other on the International Space Station, which enables us to ultimately maintain that dialogue.” The U.S. and Russia both benefit from the ISS partnership. Russia provides transportation to the ISS for U.S. astronauts, from which Russia receives an average of $81 million per seat on the Soyuz (and recognition of its status as a space power). The U.S. also benefits from Russia’s technical contributions to the ISS while Russia benefits The U.S. and Russia signed a joint statement in 2017 in support of the idea of collaborating on deep space exploration, including the construction of the Lunar Orbital Platform-Gateway, a research-focused space station orbiting the moon. Through agreements on civilian space exploration, such as the Lunar Orbital Platform-Gateway or future Mars projects, that have clear benefits to both sides, some degree of cooperation will remain in both countries’ interest. The high price tag for pursuing space exploration alone and opportunities for sharing and receiving technical expertise encourages international partnerships like the ISS. However, at least three factors, apart from the overall deterioration of U.S.-Russia relations, threaten this cooperation. First, growth of the private sector space industry may alter the economic arrangement between the U.S. and Russia, and ultimately lower the benefits of cooperation to both countries. The development of advanced technologies by private companies will give NASA new options to choose from and reduce the need to depend on (and negotiate with) Russia. If NASA and its Russian counterpart, Roskosmos, have no need to talk with one another, they probably won’t in the face of tense political relations. The U.S. intends to use Boeing and SpaceX capsules for human spaceflight beginning in 2020, and a Congressional plan in 2016 set a phase out date of Russian RD-180 rocket engines by 2022.

## Debris/Mining

#### Alt cause – broad space privatization and existing debris.

Muelhapt et al 19 [(Theodore J., Center for Orbital and Reentry Debris Studies, Center for Space Policy and Strategy, The Aerospace Corporation, 30 year Space Systems Analyst and Operator, Marlon E. Sorge, Jamie Morin, Robert S. Wilson), “Space traffic management in the new space era,” Journal of Space Safety Engineering, 6/18/19, https://doi.org/10.1016/j.jsse.2019.05.007] TDI

The last decade has seen rapid growth and change in the space industry, and an explosion of commercial and private activity. Terms like NewSpace or democratized space are often used to describe this global trend to develop faster and cheaper access to space, distinct from more traditional government-driven activities focused on security, political, or scientific activities. The easier access to space has opened participation to many more participants than was historically possible. This new activity could profoundly worsen the space debris environment, particularly in low Earth orbit (LEO), but there are also signs of progress and the outlook is encouraging. Many NewSpace operators are actively working to mitigate their impact. Nevertheless, NewSpace represents a significant break with past experience and business as usual will not work in this changed environment. New standards, space policy, and licensing approaches are powerful levers that can shape the future of operations and the debris environment.

2. Characterizing NewSpace: a step change in the space environment

In just the last few years, commercial companies have proposed, funded, and in a few cases begun deployment of very large constellations of small to medium-sized satellites. These constellations will add much more complexity to space operations. Table 1 shows some of the constellations that have been announced for launch in the next decade. Two dozen companies, when taken together, have proposed placing well over ~~20,000~~ [twenty thousand] satellites in orbit in the next ~~10~~ [10]years. For perspective, fewer than ~~8100~~[eight thousand one hundred] payloads have been placed in Earth orbit in the entire history of the space age, only 4800 [1] remain in orbit and approximately 1950 [2] of those are still active. And it isn't simply numbers – the mass in orbit will increase substantially, and long-term debris generation is strongly correlated with mass.

[Table 1 Omitted]

This table is in constant flux. It is based largely on U.S. filings with the Federal Communications Commission (FCC) and various press releases, but many of the companies here have already altered or abandoned their original plans, and new systems are no doubt in work. Although many of these large constellations may never be launched as listed, the traffic created if just half are successful would be more than double the number of payloads launched in the last 60 years and more than 6 times the number of currently active satellites.

Current space safety, space surveillance, collision avoidance (COLA) and debris mitigation processes have been designed for and have evolved with the current population profile, launch rates and density of LEO space.

By almost any metric used to measure activity in space, whether it is payloads in orbit, the size of constellations, the rate of launches, the economic stakes, the potential for debris creation, the number of conjunctions, NewSpace represents a fundamental change.

3. Compounding effects of better SSA, more satellites, and new operational concepts

The changes in the space environment can be seen on this figurative map of low Earth orbit. Fig. 1 shows the LEO environment as a function of altitude. The number of objects found in each 10 km “bin” is plotted on the horizontal axis, while the altitude is plotted vertically. Objects in elliptical orbits are distributed between bins as partial objects proportional to the time spent in each bin. Some notable resident systems are indicated in blue text on the right to provide an altitude reference. The (dotted) red line shows the number of objects in the current catalog tracked by the U.S. Space Surveillance Network (SSN). All the COLA alerts and actions that must be taken by the residents are due to their neighbors in the nearby bins, so the currently visible risk is proportional to the red line.

The red line of the current catalog does not represent the complete risk; it indicates the risk we can track and perhaps avoid. A rule of thumb is that the current SSN LEO catalog contains objects about 10 cm or larger. It is generally accepted that an impact in LEO with an object 1 cm or larger will cause damage likely to be fatal to a satellite's mission. Therefore, there is a large latent risk from unobserved debris. While we cannot currently track and catalog much smaller than 10 cm, experiments have been performed to detect and sample much smaller objects and statistically model the population at this size [3]. The (solid) blue line represents the model of the 1 cm and larger debris that is likely mission-ending, usually called lethal but not trackable. If LEO operators avoid collisions with all the objects in the red line, they are nonetheless inherently accepting the risk from the blue line. This risk is already present.

The (dashed) orange line is an estimate of the population at 5 cm and larger and is thus an estimate of what the catalog might conservatively be a few years after the Space Fence, a new radar system being built by the Air Force, comes on line (currently planned for 2019) [4]. Commercial companies offering space surveillance services, such as LeoLabs, ExoAnalytics, Analytic Graphics Inc., Lockheed, and Boeing, might also add to the number of objects currently tracked. Space Policy Directive 3 (SPD-3) [13] specifically seeks to expand the use of commercial SSA services.

Existing operators can expect a sharp increase in the number of warnings and alerts they will receive because of the increase in the cataloged population. Almost all the increase will come from newly detected debris [5].

The pace of safety operations for each satellite on orbit will significantly change because of the increase in the catalog from the Space Fence. This effect is compounded because the NewSpace constellations described in Table 1 will drastically change the profile of satellites in LEO. The green bars in Fig. 1 represent the number of objects that will be added to the catalog (red or orange lines) from only the NewSpace large LEO constellations at their operational altitudes. This does not include the rocket stages that launch them, or satellites in the process of being phased into or removed from the operational orbits. Neighbors of one of these new constellations may face a radically different operations environment than their current practices were designed to address.

Satellites in these large LEO constellations typically have planned operational lifetimes of 5–10 years. Some companies have proposed to dispose of their satellites using low thrust electric propulsion systems, which would spiral satellites down over a period of months or years from operating altitudes as high as 1500 km through lower orbits where the Hubble Space Telescope, the International Space Station, and other critical LEO satellites operate [6]. Similar propulsive techniques would raise replacement satellites from lower launch injection orbits to higher operational orbits. These disposal and replenishment activities will add thousands of satellites each year transiting through lower altitudes and posing a risk to all resident satellites in those lower orbits. More importantly, failures will occur both among transiting satellites and operational constellations, potentially leaving hundreds more stranded along the transit path.

#### No debris cascades, but even a worst case is confined to low LEO with no impact

Fange 17 [Daniel Von Fange, Web Application Engineer, Founder and Owner of LeanCoder, Full Stack, Polyglot Web Developer, “Kessler Syndrome is Over Hyped”, 05/21/17, *Braino*, http://braino.org/essays/kessler\_syndrome\_is\_over\_hyped/]

Kessler Syndrome is overhyped. A chorus of online commenters great any news of upcoming low earth orbit satellites with worry that humanity will to lose access to space. I now think they are wrong. What is Kessler Syndrome? Here’s the popular view on Kessler Syndrome. Every once in a while, a piece of junk in space hits a satellite. This single impact destroys the satellite, and breaks off several thousand additional pieces. These new pieces now fly around space looking for other satellites to hit, and so exponentially multiply themselves over time, like a nuclear reaction, until a sphere of man-made debris surrounds the earth, and humanity no longer has access to space nor the benefits of satellites. It is a dark picture. Is Kessler Syndrome likely to happen? I had to stop everything and spend an afternoon doing back-of-the-napkin math to know how big the threat is. To estimate, we need to know where the stuff in space is, how much mass is there, and how long it would take to deorbit. The orbital area around earth can be broken down into four regions. Low LEO - Up to about 400km. Things that orbit here burn up in the earth’s atmosphere quickly - between a few months to two years. The space station operates at the high end of this range. It loses about a kilometer of altitude a month and if not pushed higher every few months, would soon burn up. For all practical purposes, Low LEO doesn’t matter for Kessler Syndrome. If Low LEO was ever full of space junk, we’d just wait a year and a half, and the problem would be over. High LEO - 400km to 2000km. This where most heavy satellites and most space junk orbits. The air is thin enough here that satellites only go down slowly, and they have a much farther distance to fall. It can take 50 years for stuff here to get down. This is where Kessler Syndrome could be an issue. Mid Orbit - GPS satellites and other navigation satellites travel here in lonely, long lives. The volume of space is so huge, and the number of satellites so few, that we don’t need to worry about Kessler here. GEO - If you put a satellite far enough out from earth, the speed that the satellite travels around the earth will match the speed of the surface of the earth rotating under it. From the ground, the satellite will appear to hang motionless. Usually the geostationary orbit is used by big weather satellites and big TV broadcasting satellites. (This apparent motionlessness is why satellite TV dishes can be mounted pointing in a fixed direction. You can find approximate south just by looking around at the dishes in your northern hemisphere neighborhood.) For Kessler purposes, GEO orbit is roughly a ring 384,400 km around. However, all the satellites here are moving the same direction at the same speed - debris doesn’t get free velocity from the speed of the satellites. Also, it’s quite expensive to get a satellite here, and so there aren’t many, only about one satellite per 1000km of the ring. Kessler is not a problem here. How bad could Kessler Syndrome in High LEO be? Let’s imagine a worst case scenario. An evil alien intelligence chops up everything in High LEO, turning it into 1cm cubes of death orbiting at 1000km, spread as evenly across the surface of this sphere as orbital mechanics would allow. Is humanity cut off from space? I’m guessing the world has launched about 10,000 tons of satellites total. For guessing purposes, I’ll assume 2,500 tons of satellites and junk currently in High LEO. If satellites are made of aluminum, with a density of 2.70 g/cm3, then that’s 839,985,870 1cm cubes. A sphere for an orbit of 1,000km has a surface area of 682,752,000 square KM. So there would be one cube of junk per .81 square KM. If a rocket traveled through that, its odds of hitting that cube are tiny - less than 1 in 10,000. So even in the worst case, we don’t lose access to space. Now though you can travel through the debris, you couldn’t keep a satellite alive for long in this orbit of death. Kessler Syndrome at its worst just prevents us from putting satellites in certain orbits. In real life, there’s a lot of factors that make Kessler syndrome even less of a problem than our worst case though experiment. Debris would be spread over a volume of space, not a single orbital surface, making collisions orders of magnitudes less likely. Most impact debris will have a slower orbital velocity than either of its original pieces - this makes it deorbit much sooner. Any collision will create large and small objects. Small objects are much more affected by atmospheric drag and deorbit faster, even in a few months from high LEO. Larger objects can be tracked by earth based radar and avoided. The planned big new constellations are not in High LEO, but in Low LEO for faster communications with the earth. They aren’t an issue for Kessler. Most importantly, all new satellite launches since the 1990’s are required to include a plan to get rid of the satellite at the end of its useful life (usually by deorbiting) So the realistic worst case is that insurance premiums on satellites go up a bit. Given the current trend toward much smaller, cheaper micro satellites, this wouldn’t even have a huge effect. I’m removing Kessler Syndrome from my list of things to worry about.