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#### Counterplan: States should establish a treaty to:

#### Remove the most volatile and largest Debris pieces from the most congested orbits

#### Mandate UN guidelines on space debris mitigation

#### Collaborate on techniques to track and display the location of objects in real time and AI to automate debris-avoidance maneuvers

#### - Indefinitely stall deployment of low earth orbit ASAT’s.

#### That solves satellites, miscalculation and debris collisions

NEB 21 [(Nature Editorial Board, peer-reviewed, comprises experimental scientists and data-standards experts from across different fields of science) “The world must cooperate to avoid a catastrophic space collision,” Nature, 8/11/2021] JL

But there are no traffic cops in space, nor international borders with clearly delineated areas of responsibility. To avoid further damage, it’s crucial that satellite operators have an accurate and up-to-date list of where objects are in space. At present, the main global catalogue of space objects is published at Space-Track.org by the US Space Command, a branch of the military. The catalogue is the most widely used public listing available, but it lacks some satellites that countries — including the United States, China and Russia — have not acknowledged publicly. In part because of this lack of transparency, other nations also track space objects, and some private companies maintain commercially available catalogues.

Rather than this patchwork of incomplete sources, what the world needs is a unified system of space traffic management. Through this, spacefaring nations and companies could agree to share more of their tracking data and cooperate to make space safer. This might require the creation of a new global regime, such as an international convention, through which rules and technical standards could be organized. One analogy is the International Telecommunication Union, the United Nations agency that coordinates global telecommunications issues such as who can transmit in which parts of the radio spectrum.

It won’t be easy to create such a system for space traffic. For it to succeed, questions of safety (such as avoiding smashing up a satellite) will need to be disentangled from questions of security (such as whether that satellite is spying on another nation) so that countries can be assured that participating in such an effort would not compromise national security. Countries could, for instance, share information about the location of a satellite without sharing details of its capabilities or purpose for being in space.

One near-term move that would help would be for the United States to complete a planned shift of responsibility for the Space-Track.org catalogue from the military to the civilian Department of Commerce. Because this catalogue has historically been the most widely used around the world, shifting it to a civilian agency could start to defuse geopolitical tensions and so improve global efforts to manage space debris. It might one day feed into a global space-traffic agreement between nations; even the nascent space superpower China would have a big incentive to participate, despite rivalries with the United States. The transition was called for in a 2018 US presidential directive that recognizes that companies are taking over from national governments as the dominant players in space, but it has yet to occur, in part because Congress has not allocated the necessary funds.

On 25 August, the UN Committee on the Peaceful Uses of Outer Space will meet to discuss a range of topics related to international cooperation in space. The UN is the right forum through which spacefaring nations can work together to establish norms for responsible space behaviour, and that should include how the world can track objects to make space safer. It should continue recent work it has been doing emphasizing space as a secure and sustainable environment, which at least brings countries such as the United States and China into the same conversation.

Basic research has a role, too: innovations such as techniques to track and display the locations of orbiting objects in real time, and artificial intelligence to help automate debris-avoidance manoeuvres, could bolster any global effort to monitor and regulate space.

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#### Strong commercial space catalyzes tech innovation – progress at the margins and spinoff tech change global information networks

Joshua Hampson 2017, Security Studies Fellow at the Niskanen Center, 1-25-2017, “The Future of Space Commercialization”, Niskanen Center, https://republicans-science.house.gov/sites/republicans.science.house.gov/files/documents/TheFutureofSpaceCommercializationFinal.pdf

Innovation is generally hard to predict; some new technologies seem to come out of nowhere and others only take off when paired with a new application. It is difficult to predict the future, but it is reasonable to expect that a growing space economy would open opportunities for technological and organizational innovation. In terms of technology, the difficult environment of outer space helps incentivize progress along the margins. Because each object launched into orbit costs a significant amount of money—at the moment between $27,000 and $43,000 per pound, though that will likely drop in the future —each 19 reduction in payload size saves money or means more can be launched. At the same time, the ability to fit more capability into a smaller satellite opens outer space to actors that previously were priced out of the market. This is one of the reasons why small, affordable satellites are increasingly pursued by companies or organizations that cannot afford to launch larger traditional satellites. These small 20 satellites also provide non-traditional launchers, such as engineering students or prototypers, the opportunity to learn about satellite production and test new technologies before working on a full-sized satellite. That expansion of developers, experimenters, and testers cannot but help increase innovation opportunities. Technological developments from outer space have been applied to terrestrial life since the earliest days of space exploration. The National Aeronautics and Space Administration (NASA) maintains a website that lists technologies that have spun off from such research projects. Lightweight 21 nanotubes, useful in protecting astronauts during space exploration, are now being tested for applications in emergency response gear and electrical insulation. The need for certainty about the resiliency of materials used in space led to the development of an analytics tool useful across a range of industries. Temper foam, the material used in memory-foam pillows, was developed for NASA for seat covers. As more companies pursue their own space goals, more innovations will likely come from the commercial sector. Outer space is not just a catalyst for technological development. Satellite constellations and their unique line-of-sight vantage point can provide new perspectives to old industries. Deploying satellites into low-Earth orbit, as Facebook wants to do, can connect large, previously-unreached swathes of 22 humanity to the Internet. Remote sensing technology could change how whole industries operate, such as crop monitoring, herd management, crisis response, and land evaluation, among others. 23 While satellites cannot provide all essential information for some of these industries, they can fill in some useful gaps and work as part of a wider system of tools. Space infrastructure, in helping to change how people connect and perceive Earth, could help spark innovations on the ground as well. These innovations, changes to global networks, and new opportunities could lead to wider economic growth.

#### Tech innovation solves every existential threat – cumulative extinction events outweigh the aff

Dylan **Matthews 18**. Co-founder of Vox, citing Nick Beckstead @ Rutgers University. 10-26-2018. "How to help people millions of years from now." Vox. https://www.vox.com/future-perfect/2018/10/26/18023366/far-future-effective-altruism-existential-risk-doing-good

If you care about improving human lives, you should overwhelmingly care about those quadrillions of lives rather than the comparatively small number of people alive today. The 7.6 billion people now living, after all, amount to less than 0.003 percent of the population that will live in the future. It’s reasonable to suggest that those quadrillions of future people have, accordingly, hundreds of thousands of times more moral weight than those of us living here today do. That’s the basic argument behind Nick Beckstead’s 2013 Rutgers philosophy dissertation, “On the overwhelming importance of shaping the far future.” It’s a glorious mindfuck of a thesis, not least because Beckstead shows very convincingly that this is a conclusion any plausible moral view would reach. It’s not just something that weird utilitarians have to deal with. And Beckstead, to his considerable credit, walks the walk on this. He works at the Open Philanthropy Project on grants relating to the far future and runs a charitable fund for donors who want to prioritize the far future. And arguments from him and others have turned “long-termism” into a very vibrant, important strand of the effective altruism community. But what does prioritizing the far future even mean? The most literal thing it could mean is preventing human extinction, to ensure that the species persists as long as possible. For the long-term-focused effective altruists I know, that typically means identifying concrete threats to humanity’s continued existence — like unfriendly artificial intelligence, or a pandemic, or global warming/out of control geoengineering — and engaging in activities to prevent that specific eventuality. But in a set of slides he made in 2013, Beckstead makes a compelling case that while that’s certainly part of what caring about the far future entails, approaches that address specific threats to humanity (which he calls “targeted” approaches to the far future) have to complement “broad” approaches, where instead of trying to predict what’s going to kill us all, you just generally try to keep civilization running as best it can, so that it is, as a whole, well-equipped to deal with potential extinction events in the future, not just in 2030 or 2040 but in 3500 or 95000 or even 37 million. In other words, caring about the far future doesn’t mean just paying attention to low-probability risks of total annihilation; it also means acting on pressing needs now. For example: We’re going to be better prepared to prevent extinction from AI or a supervirus or global warming if society as a whole makes a lot of scientific progress. And a significant bottleneck there is that the vast majority of humanity doesn’t get high-enough-quality education to engage in scientific research, if they want to, which reduces the odds that we have enough trained scientists to come up with the breakthroughs we need as a civilization to survive and thrive. So maybe one of the best things we can do for the far future is to improve school systems — here and now — to harness the group economist Raj Chetty calls “lost Einsteins” (potential innovators who are thwarted by poverty and inequality in rich countries) and, more importantly, the hundreds of millions of kids in developing countries dealing with even worse education systems than those in depressed communities in the rich world. What if living ethically for the far future means living ethically now? Beckstead mentions some other broad, or very broad, ideas (these are all his descriptions): Help make computers faster so that people everywhere can work more efficiently Change intellectual property law so that technological innovation can happen more quickly Advocate for open borders so that people from poorly governed countries can move to better-governed countries and be more productive Meta-research: improve incentives and norms in academic work to better advance human knowledge Improve education Advocate for political party X to make future people have values more like political party X ”If you look at these areas (economic growth and technological progress, access to information, individual capability, social coordination, motives) a lot of everyday good works contribute,” Beckstead writes. “An implication of this is that a lot of everyday good works are good from a broad perspective, even though hardly anyone thinks explicitly in terms of far future standards.” Look at those examples again: It’s just a list of what normal altruistically motivated people, not effective altruism folks, generally do. Charities in the US love talking about the lost opportunities for innovation that poverty creates. Lots of smart people who want to make a difference become scientists, or try to work as teachers or on improving education policy, and lord knows there are plenty of people who become political party operatives out of a conviction that the moral consequences of the party’s platform are good. All of which is to say: Maybe effective altruists aren’t that special, or at least maybe we don’t have access to that many specific and weird conclusions about how best to help the world. If the far future is what matters, and generally trying to make the world work better is among the best ways to help the far future, then effective altruism just becomes plain ol’ do-goodery.\*

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#### Russia’s international ambitions are low now due to space sector failures.

AFP **19** (Agence France-Presse - international news agency headquartered in Paris, “Moscow, we have a problem: theft plagues Russia’s space sector,” 5-28-2019, https://www.scmp.com/news/world/russia-central-asia/article/3012088/moscow-we-have-problem-theft-plagues-russias-space)

With millions of dollars missing and officials in prison or fleeing the country, Russia’s space sector is at the heart of a staggering embezzlement scheme that has dampened ambitions of recovering its Soviet-era greatness. For years, Moscow has tried to fix the industry that was a source of immense pride in the USSR. While it has bounced back from its post-Soviet collapse and once again become a major world player, the Russian space sector has recently suffered a series of humiliating failures. And now, massive corruption scandals at state space agency Roscosmos have eclipsed its plans to launch new rockets and lunar stations. “Billions (of roubles) are being stolen there, billions,” Alexander Bastrykin, the powerful head of Russia’s Investigative Committee – Russia’s equivalent of the FBI – said in mid-May. Investigations into corruption at Roscosmos have been ongoing “for around five years and there is no end in sight,” he added. In the latest controversy, a senior space official appears to have fled Russia during an audit of the research centre he headed. Yury Yaskin, the director of the Research Institute of Space Instrumentation, left Russia for a European country in April where he announced his resignation, the Kommersant paper reported. He feared the discovery of malpractice during an inspection of the institute, according to the newspaper’s sources. Roscosmos confirmed that Yaskin had resigned but did not clarify why. His Moscow institute is involved in developing the Russian satellite navigation system GLONASS designed to compete with the American GPS system. Corruption has particularly affected Russia’s two most important space projects of the decade: GLONASS and the construction of the country’s showpiece cosmodrome Vostochny, built to relieve Moscow’s dependence on Baikonur in ex-Soviet Kazakhstan. Almost all major companies in the sector, including rocket builders Khrunichev and Progress, have been hit by financial scandals that have sometimes led to prison sentences for large-scale fraud. Russia’s Audit Chamber, a parliamentary body of financial control, estimated that 760 billion roubles (around US$11.7 million) was misappropriated from Roscosmos in 2017, or nearly 40 per cent of the total misappropriated from the entire economy that year. Roscosmos said that “eradicating corruption” is one of its “primary goals”, adding that it regularly cooperates with investigations by the authorities. In mid-April, President Vladimir Putin stressed the need to “progressively resolve the obvious problems that slow down the development of the rocket-space sector.” “The time and financial frameworks to realise space projects are often unjustified,” the Russian leader Rebooting the space sector is a matter of prestige for the Kremlin. It symbolises its renewed pride and ability to be a major global power, especially in the context of increased tensions with the United States.

#### Space cooperation with the U.S. boosts Russia’s diplomatic leverage and international prestige

Juul 19 (Peter - senior policy analyst at the Center for American Progress, “Trump’s Space Force Gets the Final Frontier All Wrong,” 3/20/19, <https://foreignpolicy.com/2019/03/20/trumps-space-force-gets-the-final-frontier-all-wrong/>)

But funding isn’t everything, and in the new geopolitical context, democracy must be seen to work effectively. When it comes to space exploration, that means ratcheting back U.S. space cooperation with Russia as well as forgoing any equally intimate cooperation with China and its secretive space agency. The fact that the head of Russia’s space agency remains under U.S. sanctions for his role in Moscow’s military intervention in Ukraine illustrates the hazards involved in working with autocracies in space. Deep cooperation with autocratic powers in space gives autocracies a major point of diplomatic leverage over the United States, and more generally allows them to poach unearned international prestige by working on goals set and largely carried out by the United States. In today’s world, there’s no reason for the United States to give Russia or China this sort of standing by association.

#### Increased international prestige lays the foundation for Russian territorial expansion and foreign policy aggression

Gurganus 19 (Julia - nonresident scholar with the Russia and Eurasia Program at the Carnegie Endowment for International Peace & Eugene Rumer - senior fellow and the director of Carnegie’s Russia and Eurasia Program, “Russia’s Global Ambitions in Perspective,” 2/20/19, https://carnegieendowment.org/2019/02/20/russia-s-global-ambitions-in-perspective-pub-78067)

. Elsewhere, long-term conflicts, such as those in Afghanistan, Iraq, and Libya, or the unfinished business of post-conflict reconstruction, such as in the Balkans, have presented Russia with opportunities to insert itself and create new facts on the ground. In the United States and Europe, growing political divisions, the proliferation of information providers, and popular frustration with governing elites in the wake of the 2008 global financial crisis have exposed targets for Russian interference. Russian agents did not cause these long-term conflicts or cleavages inside Western societies, but they have used them to advance their goals, which vary depending on the circumstances. In many instances, the Kremlin has relied on a diverse toolkit that creates the appearance of operating one step removed from the Russian government (through a range of actors including state-owned corporations such as Rosatom and Rosneft, private security companies such as the Wagner Group, organized crime syndicates, hackers, and information operation organizations such as the Internet Research Agency). Western perceptions of post-Soviet Russia have been heavily affected by the country’s economic and political implosion and foreign policy retreat during the 1990s. Against that backdrop, the ambition and dynamism of Russian foreign policy since Putin’s 2012 return to the presidency appears to be a relatively new phenomenon. It isn’t. Moscow’s post-2012 foreign policy fits comfortably in the long-standing historical and intellectual tradition of Soviet and even pre-Soviet Russian foreign policy. THE TROIKA OF RUSSIAN FOREIGN POLICY Contemporary Russian foreign policy displays the unmistakable presence of three centuries-old drivers of Moscow’s posture on the world stage. Chief among these drivers is Russia’s quest for strategic depth and secure buffers against external threats, which, considering the country’s geography and absence of natural protective barriers between it and neighboring powers, has guided its geographic expansion. Along with physical insecurity and expansion, the second key driver of Russian foreign policy has been its ambition for recognition as a great power, which the Kremlin has long seen as necessary for legitimizing its geographic conquests and geopolitical ambitions. The third driver, related to the first two, is Russia’s complicated relationship with the West, which combines rivalry with the need for cooperation. These recurrent themes are important. They highlight the degree to which Russian foreign policy in the Putin era is a continuation of many pursuits that are, by turns, decades- and centuries-old and were embraced by previous Russian governments regardless of their political persuasion. The historical record also performs an important legitimizing function for the citizens of the Russian state, which is less than three decades old, cementing the state’s claim to be the heir to a long, illustrious tradition dating back centuries. References to this tradition thus legitimize the Putin government’s ambitious overseas pursuits and present them as a matter of historical continuity and as an integral part of what Russia is. GEOGRAPHY AND STRATEGIC DEPTH It is hard to overestimate the role of geography as a driver behind Russia’s foreign policy. The Russian state and its security policy have been shaped by the absence of natural geographic barriers—oceans, rivers, or mountains.2 Geography has shaped Russian identity and its rulers’ understanding of security throughout the entire existence of the Russian state. Throughout the centuries, contemporary Russia, the Soviet Union, imperial Russia, and the principality of Muscovy have all faced the challenge of securing a vast stretch of territory from neighbors perceived to be hostile to the west, south, and east. To secure its territory, the Russian state acquired more territory, which, in turn, had to be secured from ever-present external threats of one kind or another. In the words of historian Stephen Kotkin, “Whatever the original causes behind early Russian expansionism—much of which was unplanned—many in the country’s political class came to believe over time that only further expansion could secure the earlier acquisitions. Russian security has thus traditionally been partly predicated on moving outward, in the name of preempting external attack.”3 The loss of territory, as was the case after the two great dislocations Russia experienced in the twentieth century—first after the 1917 revolution and the 1918 Brest-Litovsk Treaty, and later after the 1991 breakup of the Soviet Union—resulted in a profound sense of Russian insecurity and a renewed quest to regain strategic depth. Regaining that depth was the key task of the Soviet government as soon as the country began to recover from the trauma of the revolution and the civil war, and again after Moscow regained a measure of strength after the collapse of the 1990s. GREAT POWER AMBITIONS The quest for recognition as a great power has been both the result of Russia’s geographic expansion and its driver. Geographic expanse was and is, in the eyes of Russian leaders, central to their claim to recognition as a great power. Such recognition, in turn, has been needed to lend a veneer of legitimacy to territorial conquests. Perhaps precisely because they have had to struggle repeatedly for such recognition, Russia’s rulers have been particularly sensitive to any suggestion that Russia does not belong in the ranks of major powers. In the mid-nineteenth century, Russian historian and writer Nikolay Danilevsky complained about Russia’s unfair treatment by Europe, which had turned a blind eye to Prussian and Austrian aggression against Denmark following the annexation of two Danish provinces yet criticized Russia’s efforts to protect the rights of its coreligionists in “barbaric” Turkey.4 Danilevsky’s complaint was, in effect, a precursor of Putin’s lament about the West’s double standards in dealing with Russia’s annexation of Crimea and the severing of Kosovo from Serbia.5 For the leaders of the independent Russia that emerged from the Soviet collapse, the Soviet and Russian imperial legacy appeared to serve as both an inspiration and a justification for their claim to great power status. They found ample philosophical rationales for their claim. In the words of noted Russian political philosopher Nikolai Berdyaev, empire and great power status constitute the essence of Russian identity even when the country is experiencing challenges and setbacks, in large part because of its spiritual and material wealth.6 As early as 1993, the official Foreign Policy Concept of the Russian Federation included, among other foreign policy priorities, the objectives of “furthering integration of the Commonwealth of Independent States” and ensuring Russia’s active role on the world stage as a “great power.”7 With Primakov’s rise to the helm of the Russian foreign policy establishment in 1996, great power ambitions again became the Kremlin’s driving force. In his first news conference as foreign minister, Primakov said, “Despite the present difficulties, Russia was and is a great power and its foreign policy should correspond with that.”8 Putin embraced this vision when he became president in 2000, and it has served as a cornerstone of his leadership ever since. Of particular importance to the Putin government has been the military record of the Russian state and its numerous conquests. Putin issued a presidential order in 2012 reconstituting the Russian Military-Historical Society.9 Long-serving Russian Culture Minister Vladimir Medinsky has been an active patron of the society as well. The expansion of the Russian state by force of arms—including numerous victories over Poland, Sweden, the Ottoman Empire, and Central Asia—make up an integral part of the foundational narrative of the contemporary Russian state. This narrative is reinforced by a sprawling state propaganda apparatus, official government activities, and educational curricula. Several historical events are featured prominently in this narrative. Russia’s defeat of Napoleon has been treated as a uniquely important event because of its significance to the European order in the nineteenth century, as well as for being an accomplishment that cemented Russia’s status as a great power. The victory over Nazi Germany in World War II is treated as the crowning achievement of the Soviet state, which saved not just the Soviet Union and Europe but the whole world from fascism. This triumph presently makes up the most important part of Russia’s national narrative. As a whole, this legacy provides both the justification and the motivation for Russia to pursue its ambitions not just around its vast periphery but well beyond its shores. UNEASY RELATIONS WITH THE WEST Moscow’s uneasy relationship with the West for centuries has been one of the most prominent features of its foreign policy. On the one hand—from Peter the Great’s founding of the new Russian capital on the Baltic shores to Catherine the Great’s engagement with leading European Enlightenment thinkers of the day, Czar Alexander I’s securing Russia’s place in the circle of major European powers to Joseph Stalin’s consolidation of the Soviet Union’s hold on Eastern Europe—Russia long has been an integral part of Europe and its political and security fabric. On the other hand, throughout Russian history since the time of Peter the Great, Russian elites, political thinkers, and cultural figures have questioned Russia’s European choice and relationship with Europe. In a more recent and very telling sign of that ambivalence, Foreign Minister Lavrov wrote in 2016 that, over the centuries, Russia has seen itself as part of Europe and the West, as better than the West, as different and unique from the West, and as representing a crucial link between the East and the West.10 The biggest obstacle that has kept Russia from having a closer and more stable relationship with Europe, according to Lavrov, has been Europe’s inability or unwillingness to simply let Russia be Russia, and its insistence on having Moscow conform to European norms—something that no Russian leader or the people of Russia would ever accept. Moscow’s claim to great power status has derived from its victories in the West, against Napoleon and Hitler. But Russia’s biggest setbacks too have been delivered by the West—in the Crimean War and in the Cold War—and these setbacks remain the biggest drivers of Moscow’s security and defense policy.11 As was the case during the Cold War, Russian policy toward the West has long had an important ideological dimension. During the Soviet era, the ideological competition was between Soviet communism and democratic capitalism. After a relatively brief period when Russia attempted to join the West, Moscow has embraced an overtly anti-Western ideology. Communism has been replaced by a mix of nationalist, authoritarian, and state-capitalist ideas as an alternative to the West’s notion of liberal democratic capitalism. The concept of Russia as a besieged fortress facing hostile Western designs and influences is a key tool the regime uses to mobilize the political support of Russian elites and ordinary citizens alike. OLD HABITS DON’T DIE In addition to a legacy of complicated geopolitics, great power ambitions, and a difficult relationship with the West, the new Russian state has inherited from its Soviet predecessor a time-tested foreign policy toolkit. While some elements of this toolkit fell into disuse early in the post-Soviet period when Russia was struggling with a series of domestic crises, these tools have been taken up again by the country’s foreign policy and national security establishment as Moscow has returned to the world stage as an increasingly assertive actor. George Kennan wrote in “The Sources of Soviet Conduct”: . . . the Kremlin is under no ideological compulsion to accomplish its purposes in a hurry . . . and it can afford to be patient. These precepts are fortified by the lessons of Russian history: of centuries of obscure battles between nomadic forces over the stretches of a vast unfortified plain. Here caution, circumspection, flexibility and deception are the valuable qualities . . . Its [the Soviet Union’s] political action is a fluid stream which moves constantly, wherever it is permitted to move, toward a given goal. . . . The main thing is that there should always be pressure, unceasing constant pressure, toward the desired goal. There is no trace of any feeling in Soviet psychology that that goal must be reached at any given time.12 Russian foreign policy in the Putin era fits Kennan’s description from more than half a century ago. The Kremlin’s approach has involved the relatively low-cost, limited use of military force in combination with other nonmilitary instruments of national power. Information operations, propaganda and disinformation, cyber operations, trade embargoes, and a vast array of other tools have been integrated into what has become commonly known as hybrid warfare. The current policy discussions in Western capitals often create the impression that Moscow has come up with a fundamentally new toolkit. In reality, an extensive reliance on such tools has long been a feature of Russian domestic politics and foreign policy.

#### Russian territorial expansion causes nuclear war with the U.S. and NATO

O’Hanlon 19 (Michael – PhD from Princeton in Public and International Affairs and currently a senior fellow at the Brookings Institute, “The Senkaku Paradox: Risking Great Power War Over Small Stakes,” p. 34-37, 4/30/19, Dartmouth Libraries)

As such, the United States and NATO partners would undoubtedly feel intense pressure, at the first sign of visible preparations for attack by Russia, to disable Russia’s surveillance and command and control capabilities and to preempt any missiles or aircraft or submarines before they could get within range of the target. That could, of course, entail direct attacks against airfields, ports, and other facilities on Russian soil, not just those that happened to be directly involved in the Baltic state occupation. In other words, NATO might strike first, rather than leave itself vulnerable to ambush. In light of the alliance’s consensus decision-making procedures, that possibility seems unlikely—but it must also be remembered that this scenario is premised on a situation in which Russian forces occupy at least a small swath of NATO territory, so certain thresholds would already have been crossed by enemy action. Regardless, the stage would be set for an extremely dangerous dynamic. If any initial conventional engagements went against its interests, Russia might also consider limited nuclear employment options. Indeed, some of its strategists currently entertain an “escalate to de-escalate” concept that would attempt to intimidate NATO allies into reversing their plans. Russia might detonate a nuclear weapon high in the atmosphere to create a powerful nuclear-induced electromagnetic pulse (EMP) that could prove lethal to air defense radars, military communications systems, and much civilian infrastructure over a region many hundreds of kilometers in radius. A Russian EMP burst using a high-altitude nuclear weapon would be an extremely provocative and risky move, to be sure.57 But some Russian leaders could argue that it was not strictly speaking a nuclear attack, since no humans would be killed by the direct explosive effects of such a weapon—and thus might delude themselves into thinking it was a relatively low-risk option. In fact, the risks could be very high. Some types of EMP attacks (or even cyberattacks) by Russia could disable large chunks of the U.S. or European electricity grids for many months.58 A severe attack of this type might even lead to a U.S. nuclear response, in light of the new nuclear doctrine of the Trump administration.59 Beyond the EMP option, Russia could use nuclear weapons directly against ships that carried military equipment, missile defense radars, or other capabilities. Indeed, it threatened to target nuclear missiles at any Danish ships joining the U.S.-led missile defense effort in 2015. Again, the provocation would be enormous—but the direct human stakes might be fairly limited, since only dozens of sailors, or at most a couple hundred, might be on a given naval vessel.60 Moscow might, perhaps delusionally, think the risks were acceptable. Of course, there would be enormous significance and risk to crossing the nuclear threshold in any way. But if weapons were used against isolated military targets (as both sides contemplated in various ways during the Cold War), Moscow again might convince itself, rightly or wrongly, that escalation risks could be tolerated and managed. That might be particularly true for attacks limited to the kinds of target sets that posed disproportionate vulnerability and dependence for NATO. These could include cargo ships at sea, rail marshaling yards where train tracks change gauge (necessitating unloading and reloading) at the Poland-Lithuania border, or particularly weak bridges without nearby alternative routes.61 If Russia could limit NATO fatalities to hundreds of sailors and not itself present any target sets that were characterized by a similar combination of relatively high military importance and relatively great separation from vulnerable civilian populations, NATO might not have a good recourse. Moscow might hope as much, at least—and so elect to roll the dice. Such a decision would be reckless and foolish, but perhaps not beyond the pale of how human beings have behaved historically in wars they felt they were otherwise likely to lose. The Outcome of the Scenario: Toward a Net Assessment With all these factors in motion, how would this kind of conflict likely play out? A NATO military response to the postulated Russian aggression seems very likely. Perhaps evidence of its preparations to move forces into position to defend its ally and liberate its territory from Russian occupation would be enough to catalyze a diplomatic resolution of the crisis. If not, however, the stage would be set for the possible eruption of World War III. Russia might try to impede a deployment through cyber-, space, and other such attacks, which would likely only slow the deployment, not stop it. Thus escalation could easily result.62 Once shots were fired, NATO would be unlikely to back down. Not every nation would necessarily send significant military forces, to be sure, but some key countries would probably remain resolute. Much more likely than acceptance of defeat would be a redoubled commitment to complete the mission—and, if Russian nuclear weapons had been used by that point, even in a limited attack, to respond in kind. Put differently, if Russia did choose to try to physically prevent the deployment of large forces into eastern NATO territory in likely preparation for a counterattack, there would be two possibilities. If that attempt failed, a showdown in the east on land would still loom. If it succeeded, NATO would then face a momentous decision: accept defeat, or reinforce dramatically with conventional forces (perhaps after a period of repairing damage and building more equipment and weaponry, depending on how many losses it had already suffered), or escalate to the nuclear level. In situations of this sort, the parties to the conflict might find themselves living scenarios like those that nuclear theorists pondered throughout the Cold War. They could be engaged in behavior that Thomas Schelling might have described as “the threat that leaves something to chance” or that Herman Kahn might have placed on the lower rungs of a nuclear escalation ladder that reached potentially to all-out war.63 American planners saw these kinds of escalatory ladders and options as ideas that might serve U.S. interests; thus it would not be too surprising to see Russian planners invoke them now.64 And whatever the dangers during the deployment phase, they would snowball during any actual maneuver warfare in eastern Europe. For example, it is entirely imaginable that an operation designed to liberate a Baltic state from a Russian occupation would trespass onto Russian territory to cut off supply lines and possible reinforcements.65 Moscow may or may not simply take NATO’s word that it has no designs on the country’s government. In other words, it might even fear that NATO’s counteroffensive could aspire to regime change in Russia. It may or may not have a clear picture of the kind of attack it is experiencing, as command and control systems would be compromised in the course of conventional battle, quite possibly including those systems commonly used for nuclear weapons.66 I conclude that, for a hypothetical conflict occurring sometime in the near future, enough uncertainties exist to make the outcome of the war somewhat unpredictable. One cannot simply assert that NATO’s numerous advantages guarantee a victory. The Baltics’ exposed geographic location, NATO’s limited means of deploying reinforcements to the region reliably, Russia’s options in domains ranging from cyberspace to outer space, and the possible use of nuclear weapons even in just a limited, tactical role make it uncertain that NATO could confidently expect victory despite collectively outspending Russia by more than ten to one in the military arena. For example, it is not clear that the United States could safely send most of its major ocean transport vessels to ports of debarkation and unload supplies there in the face of a conventional military threat. And if it lost a substantial fraction of its top-line supplies and ships to Russian attacks in its first attempt, the United States might need time to prepare for a second effort, which might then have to begin further west in Europe where disembarking and marshaling of forces could be carried out more safely, before those forces gradually made their way eastward. NATO would probably win such a conventional war, but it could take many months or even years. And even then, the deep uncertainties associated with possible nuclear escalation make it unclear whether victory could even be meaningful. Few would say that a few thousand square kilometers of Baltic territory logically warrant nuclear risks. But human beings are not always logical. Nuclear brinkmanship over a limited-war scenario in eastern Europe would not be unthinkable, based on what we know of history and human nature. And if nuclear weapons were ever used, even in small numbers at first, all bets are off as to where and how the conflict would end.

### 1NC – DA

#### Starlink Mega-Constellations generates next-level advanced Weather Forecasting.

Erwin 20 Sandra Erwin 10-14-2020 "SpaceX to explore ways to provide weather data to U.S. military" <https://spacenews.com/spacex-to-explore-ways-to-provide-weather-data-to-u-s-military/> (Sandra Erwin writes about military space programs, policy, technology and the industry that supports this sector. She has covered the military, the Pentagon, Congress and the defense industry for nearly two decades as editor of NDIA’s National Defense Magazine and Pentagon correspondent for Real Clear Defense.)//Elmer

The $2 million contract is to “assess the feasibility and long term viability of a ‘weather data as a service business model.” WASHINGTON — SpaceX is looking at ways it could provide weather data to the U.S. military. The company is working under a $2 million six-month study contract from the U.S. Space Force’s Space and Missile Systems Center. Charlotte Gerhart, chief of the Space and Missile Systems Center Production Corps Low Earth Orbit Division, said in a statement to SpaceNews that SpaceX received the contract in July from SMC’s Space Enterprise Consortium. The contract is to “assess the feasibility and long term viability of a ‘weather data as a service business model,’” said Gerhart. SpaceX did not respond to questions from SpaceNews on how the company would leverage the Starlink internet constellation to provide weather data. The contract awarded to SpaceX is part of a Space Force program called Electro Optical/Infrared Weather System (EO/IR EWS). The consortium in June awarded $309 million in contracts to Raytheon Technologies, General Atomics Electromagnetic Systems, and Atmospheric & Space Technology Research Associates to develop weather satellite prototypes and payloads. SpaceX won the portion of the EO/IR EWS program that is looking at how weather data could be purchased as a service from a commercial company. “The EWS program goal remains to provide a more resilient and higher refresh capability, enhancing global terrestrial weather capability,” said Gerhart. The SpEC consortium was created in 2017 to attract commercial space businesses to work with the military. The contracts awarded by SpEC are known as “other transaction authority” deals that are used for research projects and prototyping. The consortium on Oct. 8 informed its members that SpaceX had won the weather study contract. “The Air Force is pursuing a space-based environmental monitoring EO/IR system in a multi phased approach,” the SpEC said in an email to members. The EO/IR EWS program is looking at a future proliferated low-Earth orbit constellation to focus on cloud characterization and theater weather imagery that could be supplemented by commercial services. SpaceX’s contract is for the “weather data as a service system architecture exploration phase,” said SpEC. Industry sources speculated that SpaceX could provide weather data collected by sensors hosted on its own Starlink satellites, or it could team with a weather data services company and use Starlink to distribute the data to customers. One executive noted that both the U.S. military and the National Oceanic and Atmospheric Administration have growing demands for data that can be provided at relatively low cost from companies that operate proliferated LEO systems.

#### Advanced Weather Forecasting solves Climate Change.

Taylor-Smith 21 Kerry Taylor-Smith 3-25-2021 "What Role can Advanced Weather Forecasting have in Providing Climate Crisis Solutions?" <https://www.azocleantech.com/article.aspx?ArticleID=1193> (Pursuing a passion for science, Kerry completed a degree in Natural Sciences at the University of Bath; where she studied a range of topics, including chemistry, biology, and environmental sciences. Her passion for writing grew as she worked on the university newspaper as a contributor, feature editor, and editor.)//Elmer

Humankind is in the midst of a climate crisis, battling to prevent global temperatures from rising while also keeping up with the energy demands of a growing population. Weather-related disasters cost billions of dollars each year, but it is not just the financial cost that should be considered – there is the loss of life, homes, wildlife, and infrastructure. There are several ways weather monitoring can help solve the climate crisis, from lowing transportation emissions to pinpointing extreme weather events such as wildfires and extraordinary variations in temperature. Tackling Emissions Global travel and shipping contribute significantly to global warming. Aircraft, ships, cars – nearly all modes of transportation emit harmful greenhouse gases, notably carbon dioxide, but also nitrous and sulfur oxides as well as particulates. These greenhouse gases trap heat in the Earth’s atmosphere, causing an overall warming effect and a negative impact on our climate. Aviation accounts for 2.4% of all anthropogenic carbon dioxide emissions, with international flights in 2019 producing 915 million tons of the gas. Weather forecasting technology providing accurate, real-time data on meteorological conditions can help airlines adjust routes to avoid headwinds or take advantage of favorable winds, both of which can help reduce fuel consumption and emissions. Shipping is one of the most fuel-efficient means of transport, but also one of the most polluting, contributing 3% of all greenhouse gas emissions - a figure expected to almost double by 2050. “Burning bunker fuel accounts for almost 90% of global sulfur emissions and the 15 largest ships in the world produce more sulfur each year than all cars put together,” states Renny Vandewege, Vice President of Weather Operations at DTN, a company providing decision support tools and forecast insights across many sectors. Shipping discharges a large and growing source of noxious gas but the sector has the potential to drastically cut emissions through fuel-saving techniques. Among the most promising is weather routing. “Using weather information and analytics can help mitigate risks today caused by climate change and can also reduce emissions further reducing future impacts”, explains Vandewege, a former director of the Broadcast Meteorology Program at Mississippi State University. Weather analytics can optimize routes and “reduce emissions up to 4% and reduce fuel consumption up to 10%, depending on the type of vessel, the season, and the conditions,” states Vandewege. “If there’s bad weather ahead, sophisticated algorithms that use information about the ship and its capabilities and the weather effects on that specific ship can make numerous calculations and provide optimal route alternatives for the mariner.” Extreme Weather Events Advanced weather forecasting alerts us to the probability of extreme meteorological events occurring. While these events are largely unpredictable, accurate meteorological data can identify hotspots where they are likely to occur. The better the data, the better prepared the general public and authorities can be. Wildfires have ravaged the US state of California and huge swathes of land in Australia. Climate change is responsible for the increasing intensity and occurrence of blazes, not just here, but worldwide. It has created the optimal conditions for wildfires to start, including warmer weather, less precipitation, dryer vegetation, and stronger winds. Advanced weather forecasting, such as DTN’s live Geographic Information System (GIS) can monitor atmospheric conditions to evaluate wildfire risk and predict areas where conditions are just right for a wildfire to ignite. “Fire weather forecasting uses atmospheric conditions to evaluate wildfire risk,” explains Vendewege. “Meteorologists can also use their tools and experience to identify the specific location of wildfires. Sophisticated imaging systems can show fire locations in real time, allowing for a live look at the conditions using a GIS layer service containing the latest fire hotspot data and also showing the likelihood of a fire.” Machine learning, a means of artificial intelligence, can also be used in conjunction with current forecasting methods to predicts heat waves or cold snaps. These extreme weather events are the result of unusual atmospheric patterns that researchers from Rice University realized could be taught to a pattern recognition program. The technology, designed to work with current analog forecasting systems rather than replace them, could predict events with 80% accuracy, five days before the event occurred. Although only proof-of-concept, the technology could provide an early warning about when and where an extreme weather event might occur. Conclusion Humans are heavily reliant on the weather; it has a role in every aspect of our lives, from feeding us to providing power for our ever-growing needs. Climate change has warmed the planet and altered our weather, making extreme weather events such as droughts and floods more likely. High-tech weather forecasting technology can help in the fight against climate change by monitoring meteorological conditions to aid decision making, whether that be in the aviation or shipping industry, or by helping us understand and predict natural hazards and disasters, allowing us to reduce the risk of adverse events – and the costs, environmental, economic or otherwise.

#### Warming causes Extinction

Kareiva 18, Peter, and Valerie Carranza. "Existential risk due to ecosystem collapse: Nature strikes back." Futures 102 (2018): 39-50. (Ph.D. in ecology and applied mathematics from Cornell University, director of the Institute of the Environment and Sustainability at UCLA, Pritzker Distinguished Professor in Environment & Sustainability at UCLA)//Re-cut by Elmer

In summary, six of the nine proposed planetary boundaries (phosphorous, nitrogen, biodiversity, land use, atmospheric aerosol loading, and chemical pollution) are unlikely to be associated with existential risks. They all correspond to a degraded environment, but in our assessment do not represent existential risks. However, the three remaining boundaries (**climate change**, global **freshwater** cycle, **and** ocean **acidification**) do **pose existential risks**. This is **because of** intrinsic **positive feedback loops**, substantial lag times between system change and experiencing the consequences of that change, and the fact these different boundaries interact with one another in ways that yield surprises. In addition, climate, freshwater, and ocean acidification are all **directly connected to** the provision of **food and water**, and **shortages** of food and water can **create conflict** and social unrest. Climate change has a long history of disrupting civilizations and sometimes precipitating the collapse of cultures or mass emigrations (McMichael, 2017). For example, the 12th century drought in the North American Southwest is held responsible for the collapse of the Anasazi pueblo culture. More recently, the infamous potato famine of 1846–1849 and the large migration of Irish to the U.S. can be traced to a combination of factors, one of which was climate. Specifically, 1846 was an unusually warm and moist year in Ireland, providing the climatic conditions favorable to the fungus that caused the potato blight. As is so often the case, poor government had a role as well—as the British government forbade the import of grains from outside Britain (imports that could have helped to redress the ravaged potato yields). Climate change intersects with freshwater resources because it is expected to exacerbate drought and water scarcity, as well as flooding. Climate change can even impair water quality because it is associated with heavy rains that overwhelm sewage treatment facilities, or because it results in higher concentrations of pollutants in groundwater as a result of enhanced evaporation and reduced groundwater recharge. **Ample clean water** is not a luxury—it **is essential for human survival**. Consequently, cities, regions and nations that lack clean freshwater are vulnerable to social disruption and disease. Finally, ocean acidification is linked to climate change because it is driven by CO2 emissions just as global warming is. With close to 20% of the world’s protein coming from oceans (FAO, 2016), the potential for severe impacts due to acidification is obvious. Less obvious, but perhaps more insidious, is the interaction between climate change and the loss of oyster and coral reefs due to acidification. Acidification is known to interfere with oyster reef building and coral reefs. Climate change also increases storm frequency and severity. Coral reefs and oyster reefs provide protection from storm surge because they reduce wave energy (Spalding et al., 2014). If these reefs are lost due to acidification at the same time as storms become more severe and sea level rises, coastal communities will be exposed to unprecedented storm surge—and may be ravaged by recurrent storms. A key feature of the risk associated with climate change is that mean annual temperature and mean annual rainfall are not the variables of interest. Rather it is extreme episodic events that place nations and entire regions of the world at risk. These extreme events are by definition “rare” (once every hundred years), and changes in their likelihood are challenging to detect because of their rarity, but are exactly the manifestations of climate change that we must get better at anticipating (Diffenbaugh et al., 2017). Society will have a hard time responding to shorter intervals between rare extreme events because in the lifespan of an individual human, a person might experience as few as two or three extreme events. How likely is it that you would notice a change in the interval between events that are separated by decades, especially given that the interval is not regular but varies stochastically? A concrete example of this dilemma can be found in the past and expected future changes in storm-related flooding of New York City. The highly disruptive flooding of New York City associated with Hurricane Sandy represented a flood height that occurred once every 500 years in the 18th century, and that occurs now once every 25 years, but is expected to occur once every 5 years by 2050 (Garner et al., 2017). This change in frequency of extreme floods has profound implications for the measures New York City should take to protect its infrastructure and its population, yet because of the stochastic nature of such events, this shift in flood frequency is an elevated risk that will go unnoticed by most people. 4. The combination of positive feedback loops and societal inertia is fertile ground for global environmental catastrophes **Humans** are remarkably ingenious, and **have adapted** to crises **throughout** their **history**. Our doom has been repeatedly predicted, only to be averted by innovation (Ridley, 2011). **However**, the many **stories** **of** human ingenuity **successfully** **addressing** **existential risks** such as global famine or extreme air pollution **represent** environmental c**hallenges that are** largely **linear**, have immediate consequences, **and operate without positive feedbacks**. For example, the fact that food is in short supply does not increase the rate at which humans consume food—thereby increasing the shortage. Similarly, massive air pollution episodes such as the London fog of 1952 that killed 12,000 people did not make future air pollution events more likely. In fact it was just the opposite—the London fog sent such a clear message that Britain quickly enacted pollution control measures (Stradling, 2016). Food shortages, air pollution, water pollution, etc. send immediate signals to society of harm, which then trigger a negative feedback of society seeking to reduce the harm. In contrast, today’s great environmental crisis of climate change may cause some harm but there are generally long time delays between rising CO2 concentrations and damage to humans. The consequence of these delays are an absence of urgency; thus although 70% of Americans believe global warming is happening, only 40% think it will harm them (http://climatecommunication.yale.edu/visualizations-data/ycom-us-2016/). Secondly, unlike past environmental challenges, **the Earth’s climate system is rife with positive feedback loops**. In particular, as CO2 increases and the climate warms, that **very warming can cause more CO2 release** which further increases global warming, and then more CO2, and so on. Table 2 summarizes the best documented positive feedback loops for the Earth’s climate system. These feedbacks can be neatly categorized into carbon cycle, biogeochemical, biogeophysical, cloud, ice-albedo, and water vapor feedbacks. As important as it is to understand these feedbacks individually, it is even more essential to study the interactive nature of these feedbacks. Modeling studies show that when interactions among feedback loops are included, uncertainty increases dramatically and there is a heightened potential for perturbations to be magnified (e.g., Cox, Betts, Jones, Spall, & Totterdell, 2000; Hajima, Tachiiri, Ito, & Kawamiya, 2014; Knutti & Rugenstein, 2015; Rosenfeld, Sherwood, Wood, & Donner, 2014). This produces a wide range of future scenarios. Positive feedbacks in the carbon cycle involves the enhancement of future carbon contributions to the atmosphere due to some initial increase in atmospheric CO2. This happens because as CO2 accumulates, it reduces the efficiency in which oceans and terrestrial ecosystems sequester carbon, which in return feeds back to exacerbate climate change (Friedlingstein et al., 2001). Warming can also increase the rate at which organic matter decays and carbon is released into the atmosphere, thereby causing more warming (Melillo et al., 2017). Increases in food shortages and lack of water is also of major concern when biogeophysical feedback mechanisms perpetuate drought conditions. The underlying mechanism here is that losses in vegetation increases the surface albedo, which suppresses rainfall, and thus enhances future vegetation loss and more suppression of rainfall—thereby initiating or prolonging a drought (Chamey, Stone, & Quirk, 1975). To top it off, overgrazing depletes the soil, leading to augmented vegetation loss (Anderies, Janssen, & Walker, 2002). Climate change often also increases the risk of forest fires, as a result of higher temperatures and persistent drought conditions. The expectation is that **forest fires will become more frequent** and severe with climate warming and drought (Scholze, Knorr, Arnell, & Prentice, 2006), a trend for which we have already seen evidence (Allen et al., 2010). Tragically, the increased severity and risk of Southern California wildfires recently predicted by climate scientists (Jin et al., 2015), was realized in December 2017, with the largest fire in the history of California (the “Thomas fire” that burned 282,000 acres, https://www.vox.com/2017/12/27/16822180/thomas-fire-california-largest-wildfire). This **catastrophic fire** embodies the sorts of positive feedbacks and interacting factors that **could catch humanity off-guard and produce a** true **apocalyptic event.** Record-breaking rains produced an extraordinary flush of new vegetation, that then dried out as record heat waves and dry conditions took hold, coupled with stronger than normal winds, and ignition. Of course the record-fire released CO2 into the atmosphere, thereby contributing to future warming. Out of all types of feedbacks, water vapor and the ice-albedo feedbacks are the most clearly understood mechanisms. Losses in reflective snow and ice cover drive up surface temperatures, leading to even more melting of snow and ice cover—this is known as the ice-albedo feedback (Curry, Schramm, & Ebert, 1995). As snow and ice continue to melt at a more rapid pace, millions of people may be displaced by flooding risks as a consequence of sea level rise near coastal communities (Biermann & Boas, 2010; Myers, 2002; Nicholls et al., 2011). The water vapor feedback operates when warmer atmospheric conditions strengthen the saturation vapor pressure, which creates a warming effect given water vapor’s strong greenhouse gas properties (Manabe & Wetherald, 1967). Global warming tends to increase cloud formation because warmer temperatures lead to more evaporation of water into the atmosphere, and warmer temperature also allows the atmosphere to hold more water. The key question is whether this increase in clouds associated with global warming will result in a positive feedback loop (more warming) or a negative feedback loop (less warming). For decades, scientists have sought to answer this question and understand the net role clouds play in future climate projections (Schneider et al., 2017). Clouds are complex because they both have a cooling (reflecting incoming solar radiation) and warming (absorbing incoming solar radiation) effect (Lashof, DeAngelo, Saleska, & Harte, 1997). The type of cloud, altitude, and optical properties combine to determine how these countervailing effects balance out. Although still under debate, it appears that in most circumstances the cloud feedback is likely positive (Boucher et al., 2013). For example, models and observations show that increasing greenhouse gas concentrations reduces the low-level cloud fraction in the Northeast Pacific at decadal time scales. This then has a positive feedback effect and enhances climate warming since less solar radiation is reflected by the atmosphere (Clement, Burgman, & Norris, 2009). The key lesson from the long list of potentially positive feedbacks and their interactions is that **runaway climate change,** and runaway perturbations have to be taken as a serious possibility. Table 2 is just a snapshot of the type of feedbacks that have been identified (see Supplementary material for a more thorough explanation of positive feedback loops). However, this list is not exhaustive and the possibility of undiscovered positive feedbacks **portends** even greater **existential risks**. The many environmental crises humankind has previously averted (famine, ozone depletion, London fog, water pollution, etc.) were averted because of political will based on solid scientific understanding. We cannot count on complete scientific understanding when it comes to positive feedback loops and climate change.

## Case

### 1NC – Framing

#### The standard is maximizing expected wellbeing.

#### Extinction outweighs---it’s the upmost moral evil and disavowal of the risk makes it more likely.

Burns 2017 (Elizabeth Finneron-Burns is a Teaching Fellow at the University of Warwick and an Affiliated Researcher at the Institute for Futures Studies in Stockholm, What’s wrong with human extinction?, <http://www.tandfonline.com/doi/pdf/10.1080/00455091.2016.1278150?needAccess=true>, Canadian Journal of Philosophy, 2017)

Many, though certainly not all, people might believe that it would be wrong to bring about the end of the human species, and the reasons given for this belief are various. I begin by considering four reasons that could be given against the moral permissibility of human extinction. I will argue that only those reasons that impact the people who exist at the time that the extinction or the knowledge of the upcoming extinction occurs, can explain its wrongness. I use this conclusion to then consider in which cases human extinction would be morally permissible or impermissible, arguing that there is only a small class of cases in which it would not be wrong to cause the extinction of the human race or allow it to happen. 2.1. It would prevent the existence of very many happy people One reason of human extinction might be considered to be wrong lies in the value of human life itself. The thought here might be that it is a good thing for people to exist and enjoy happy lives and extinction would deprive more people of enjoying this good. The ‘good’ in this case could be understood in at least two ways. According to the first, one might believe that you benefit a person by bringing them into existence, or at least, that it is good for that person that they come to exist. The second view might hold that if humans were to go extinct, the utility foregone by the billions (or more) of people who could have lived but will now never get that opportunity, renders allowing human extinction to take place an incidence of wrongdoing. An example of this view can be found in two quotes from an Effective Altruism blog post by Peter Singer, Nick Beckstead and Matt Wage: One very bad thing about human extinction would be that billions of people would likely die painful deaths. But in our view, this is by far not the worst thing about human extinction. The worst thing about human extinction is that there would be no future generations. Since there could be so many generations in our future, the value of all those generations together greatly exceeds the value of the current generation. (Beckstead, Singer, and Wage 2013) The authors are making two claims. The first is that there is value in human life and also something valuable about creating future people which gives us a reason to do so; furthermore, it would be a very bad thing if we did not do so. The second is that, not only would it be a bad thing for there to be no future people, but it would actually be the worst thing about extinction. Since happy human lives have value, and the number of potential people who could ever exist is far greater than the number of people who exist at any one time, even if the extinction were brought about through the painful deaths of currently existing people, the former’s loss would be greater than the latter’s. Both claims are assuming that there is an intrinsic value in the existence of potential human life. The second claim makes the further assumption that the forgone value of the potential lives that could be lived is greater than the disvalue that would be accrued by people existing at the time of the extinction through suffering from painful and/or premature deaths. The best-known author of the post, Peter Singer is a prominent utilitarian, so it is not surprising that he would lament the potential lack of future human lives per se. However, it is not just utilitarians who share this view, even if implicitly. Indeed, other philosophers also seem to imply that they share the intuition that there is just something wrong with causing or failing to prevent the extinction of the human species such that we prevent more ‘people’ from having the ‘opportunity to exist’. Stephen Gardiner (2009) and Martin O’Neill (personal correspondence), both sympathetic to contract theory, for example, also find it intuitive that we should want more generations to have the opportunity to exist, assuming that they have worth-living lives, and I find it plausible to think that many other people (philosophers and non-philosophers alike) probably share this intuition. When we talk about future lives being ‘prevented’, we are saying that a possible person or a set of possible people who could potentially have existed will now never actually come to exist. To say that it is wrong to prevent people from existing could either mean that a possible person could reasonably reject a principle that permitted us not to create them, or that the foregone value of their lives provides a reason for rejecting any principle that permits extinction. To make the first claim we would have to argue that a possible person could reasonably reject any principle that prevented their existence on the grounds that it prevented them in particular from existing. However, this is implausible for two reasons. First, we can only wrong someone who did, does or will actually exist because wronging involves failing to take a person’s interests into account. When considering the permissibility of a principle allowing us not to create Person X, we cannot take X’s interest in being created into account because X will not exist if we follow the principle. By considering the standpoint of a person in our deliberations we consider the burdens they will have to bear as a result of the principle. In this case, there is no one who will bear any burdens since if the principle is followed (that is, if we do not create X), X will not exist to bear any burdens. So, only people who do/will actually exist can bear the brunt of a principle, and therefore occupy a standpoint that is owed justification. Second, existence is not an interest at all and a possible person is not disadvantaged by not being caused to exist. Rather than being an interest, it is a necessary requirement in order to have interests. Rivka Weinberg describes it as ‘neutral’ because causing a person to exist is to create a subject who can have interests; existence is not an interest itself.3 In order to be disadvantaged, there must be some detrimental effect on your interests. However, without existence, a person does not have any interests so they cannot be disadvantaged by being kept out of existence. But, as Weinberg points out, ‘never having interests itself could not be contrary to people’s interests since without interest bearers, there can be no ‘they’ for it to be bad for’ (Weinberg 2008, 13). So, a principle that results in some possible people never becoming actual does not impose any costs on those ‘people’ because nobody is disadvantaged by not coming into existence.4 It therefore seems that it cannot be wrong to fail to bring particular people into existence. This would mean that no one acts wrongly when they fail to create another person. Writ large, it would also not be wrong if everybody decided to exercise their prerogative not to create new people and potentially, by consequence, allow human extinction. One might respond here by saying that although it may be permissible for one person to fail to create a new person, it is not permissible if everyone chooses to do so because human lives have value and allowing human extinction would be to forgo a huge amount of value in the world. This takes us to the second way of understanding the potential wrongness of preventing people from existing — the foregone value of a life provides a reason for rejecting any principle that prevents it. One possible reply to this claim turns on the fact that many philosophers acknowledge that the only, or at least the best, way to think about the value of (individual or groups of) possible people’s lives is in impersonal terms (Parfit 1984; Reiman 2007; McMahan 2009). Jeff McMahan, for example, writes ‘at the time of one’s choice there is no one who exists or will exist independently of that choice for whose sake one could be acting in causing him or her to exist … it seems therefore that any reason to cause or not to cause an individual to exist … is best considered an impersonal rather than individual-affecting reason’ (McMahan 2009, 52). Another reply along similar lines would be to appeal to the value that is lost or at least foregone when we fail to bring into existence a next (or several next) generations of people with worth-living lives. Since ex hypothesi worth-living lives have positive value, it is better to create more such lives and worse to create fewer. Human extinction by definition is the creation of no future lives and would ‘deprive’ billions of ‘people’ of the opportunity to live worth-living lives. This might reduce the amount of value in the world at the time of the extinction (by killing already existing people), but it would also prevent a much vaster amount of value in the future (by failing to create more people). Both replies depend on the impersonal value of human life. However, recall that in contractualism impersonal values are not on their own grounds for reasonably rejecting principles. Scanlon himself says that although we have a strong reason not to destroy existing human lives, this reason ‘does not flow from the thought that it is a good thing for there to be more human life rather than less’ (104). In contractualism, something cannot be wrong unless there is an impact on a person. Thus, neither the impersonal value of creating a particular person nor the impersonal value of human life writ large could on its own provide a reason for rejecting a principle permitting human extinction. It seems therefore that the fact that extinction would deprive future people of the opportunity to live worth-living lives (either by failing to create either particular future people or future people in general) cannot provide us with a reason to consider human extinction to be wrong. Although the lost value of these ‘lives’ itself cannot be the reason explaining the wrongness of extinction, it is possible the knowledge of this loss might create a personal reason for some existing people. I will consider this possibility later on in section (d). But first I move to the second reason human extinction might be wrong per se. 2.2. It would mean the loss of the only known form of intelligent life and all civilization and intellectual progress would be lost A second reason we might think it would be wrong to cause human extinction is the loss that would occur of the only (known) form of rational life and the knowledge and civilization that that form of life has created. One thought here could be that just as some might consider it wrong to destroy an individual human heritage monument like the Sphinx, it would also be wrong if the advances made by humans over the past few millennia were lost or prevented from progressing. A related argument is made by those who feel that there is something special about humans’ capacity for rationality which is valuable in itself. Since humans are the only intelligent life that we know of, it would be a loss, in itself, to the world for that to end. I admit that I struggle to fully appreciate this thought. It seems to me that Henry Sidgwick was correct in thinking that these things are only important insofar as they are important to humans (Sidgwick 1874, I.IX.4).5 If there is no form of intelligent life in the future, who would there be to lament its loss since intelligent life is the only form of life capable of appreciating intelligence? Similarly, if there is no one with the rational capacity to appreciate historic monuments and civil progress, who would there be to be negatively affected or even notice the loss?6 However, even if there is nothing special about human rationality, just as some people try to prevent the extinction of nonhuman animal species, we might think that we ought also to prevent human extinction for the sake of biodiversity. The thought in this, as well as the earlier examples, must be that it would somehow be bad for the world if there were no more humans even though there would be no one for whom it is bad. This may be so but the only way to understand this reason is impersonally. Since we are concerned with wrongness rather than badness, we must ask whether something that impacts no one’s well-being, status or claims can be wrong. As we saw earlier, in the contractualist framework reasons must be personal rather than impersonal in order to provide grounds for reasonable rejection (Scanlon 1998, 218–223). Since the loss of civilization, intelligent life or biodiversity are per se impersonal reasons, there is no standpoint from which these reasons could be used to reasonably reject a principle that permitted extinction. Therefore, causing human extinction on the grounds of the loss of civilization, rational life or biodiversity would not be wrong. 2.3. Existing people would endure physical pain and/or painful and/or premature deaths Thinking about the ways in which human extinction might come about brings to the fore two more reasons it might be wrong. It could, for example, occur if all humans (or at least the critical number needed to be unable to replenish the population, leading to eventual extinction) underwent a sterilization procedure. Or perhaps it could come about due to anthropogenic climate change or a massive asteroid hitting the Earth and wiping out the species in the same way it did the dinosaurs millions of years ago. Each of these scenarios would involve significant physical and/or non-physical harms to existing people and their interests. Physically, people might suffer premature and possibly also painful deaths, for example. It is not hard to imagine examples in which the process of extinction could cause premature death. A nuclear winter that killed everyone or even just every woman under the age of 50 is a clear example of such a case. Obviously, some types of premature death themselves cannot be reasons to reject a principle. Every person dies eventually, sometimes earlier than the standard expected lifespan due to accidents or causes like spontaneously occurring incurable cancers. A cause such as disease is not a moral agent and therefore it cannot be wrong if it unavoidably kills a person prematurely. Scanlon says that the fact that a principle would reduce a person’s well-being gives that person a reason to reject the principle: ‘components of well-being figure prominently as grounds for reasonable rejection’ (Scanlon 1998, 214). However, it is not settled yet whether premature death is a setback to well-being. Some philosophers hold that death is a harm to the person who dies, whilst others argue that it is not.7 I will argue, however, that regardless of who is correct in that debate, being caused to die prematurely can be reason to reject a principle when it fails to show respect to the person as a rational agent. Scanlon says that recognizing others as rational beings with interests involves seeing reason to preserve life and prevent death: ‘appreciating the value of human life is primarily a matter of seeing human lives as something to be respected, where this involves seeing reasons not to destroy them, reasons to protect them, and reasons to want them to go well’ (Scanlon 1998, 104). The ‘respect for life’ in this case is a respect for the person living, not respect for human life in the abstract. This means that we can sometimes fail to protect human life without acting wrongfully if we still respect the person living. Scanlon gives the example of a person who faces a life of unending and extreme pain such that she wishes to end it by committing suicide. Scanlon does not think that the suicidal person shows a lack of respect for her own life by seeking to end it because the person whose life it is has no reason to want it to go on. This is important to note because it emphasizes the fact that the respect for human life is person-affecting. It is not wrong to murder because of the impersonal disvalue of death in general, but because taking someone’s life without their permission shows disrespect to that person. This supports its inclusion as a reason in the contractualist formula, regardless of what side ends up winning the ‘is death a harm?’ debate because even if death turns out not to harm the person who died, ending their life without their consent shows disrespect to that person. A person who could reject a principle permitting another to cause his or her premature death presumably does not wish to die at that time, or in that manner. Thus, if they are killed without their consent, their interests have not been taken into account, and they have a reason to reject the principle that allowed their premature death.8 This is as true in the case of death due to extinction as it is for death due to murder. However, physical pain may also be caused to existing people without killing them, but still resulting in human extinction. Imagine, for example, surgically removing everyone’s reproductive organs in order to prevent the creation of any future people. Another example could be a nuclear bomb that did not kill anyone, but did painfully render them infertile through illness or injury. These would be cases in which physical pain (through surgery or bombs) was inflicted on existing people and the extinction came about as a result of the painful incident rather than through death. Furthermore, one could imagine a situation in which a bomb (for example) killed enough people to cause extinction, but some people remained alive, but in terrible pain from injuries. It seems uncontroversial that the infliction of physical pain could be a reason to reject a principle. Although Scanlon says that an impact on well-being is not the only reason to reject principles, it plays a significant role, and indeed, most principles are likely to be rejected due to a negative impact on a person’s well-being, physical or otherwise. It may be queried here whether it is actually the involuntariness of the pain that is grounds for reasonable rejection rather than the physical pain itself because not all pain that a person suffers is involuntary. One can imagine acts that can cause physical pain that are not rejectable — base jumping or life-saving or improving surgery, for example. On the other hand, pushing someone off a cliff or cutting him with a scalpel against his will are clearly rejectable acts. The difference between the two cases is that in the former, the person having the pain inflicted has consented to that pain or risk of pain. My view is that they cannot be separated in these cases and it is involuntary physical pain that is the grounds for reasonable rejection. Thus, the fact that a principle would allow unwanted physical harm gives a person who would be subjected to that harm a reason to reject the principle. Of course the mere fact that a principle causes involuntary physical harm or premature death is not sufficient to declare that the principle is rejectable — there might be countervailing reasons. In the case of extinction, what countervailing reasons might be offered in favour of the involuntary physical pain/ death-inducing harm? One such reason that might be offered is that humans are a harm to the natural environment and that the world might be a better place if there were no humans in it. It could be that humans might rightfully be considered an all-things-considered hindrance to the world rather than a benefit to it given the fact that we have been largely responsible for the extinction of many species, pollution and, most recently, climate change which have all negatively affected the natural environment in ways we are only just beginning to understand. Thus, the fact that human extinction would improve the natural environment (or at least prevent it from degrading further), is a countervailing reason in favour of extinction to be weighed against the reasons held by humans who would experience physical pain or premature death. However, the good of the environment as described above is by definition not a personal reason. Just like the loss of rational life and civilization, therefore, it cannot be a reason on its own when determining what is wrong and countervail the strong personal reasons to avoid pain/death that is held by the people who would suffer from it.9 Every person existing at the time of the extinction would have a reason to reject that principle on the grounds of the physical pain they are being forced to endure against their will that could not be countervailed by impersonal considerations such as the negative impact humans may have on the earth. Therefore, a principle that permitted extinction to be accomplished in a way that caused involuntary physical pain or premature death could quite clearly be rejectable by existing people with no relevant countervailing reasons. This means that human extinction that came about in this way would be wrong. There are of course also additional reasons they could reject a similar principle which I now turn to address in the next section. 2.4. Existing people could endure non-physical harms I said earlier than the fact in itself that there would not be any future people is an impersonal reason and can therefore not be a reason to reject a principle permitting extinction. However, this impersonal reason could give rise to a personal reason that is admissible. So, the final important reason people might think that human extinction would be wrong is that there could be various deleterious psychological effects that would be endured by existing people having the knowledge that there would be no future generations. There are two main sources of this trauma, both arising from the knowledge that there will be no more people. The first relates to individual people and the undesired negative effect on well-being that would be experienced by those who would have wanted to have children. Whilst this is by no means universal, it is fair to say that a good proportion of people feel a strong pull towards reproduction and having their lineage continue in some way. Samuel Scheffler describes the pull towards reproduction as a ‘desire for a personalized relationship with the future’ (Scheffler 2012, 31). Reproducing is a widely held desire and the joys of parenthood are ones that many people wish to experience. For these people knowing that they would not have descendants (or that their descendants will endure painful and/or premature deaths) could create a sense of despair and pointlessness of life. Furthermore, the inability to reproduce and have your own children because of a principle/policy that prevents you (either through bans or physical interventions) would be a significant infringement of what we consider to be a basic right to control what happens to your body. For these reasons, knowing that you will have no descendants could cause significant psychological traumas or harms even if there were no associated physical harm. The second is a more general, higher level sense of hopelessness or despair that there will be no more humans and that your projects will end with you. Even those who did not feel a strong desire to procreate themselves might feel a sense of hopelessness that any projects or goals they have for the future would not be fulfilled. Many of the projects and goals we work towards during our lifetime are also at least partly future-oriented. Why bother continuing the search for a cure for cancer if either it will not be found within humans’ lifetime, and/or there will be no future people to benefit from it once it is found? Similar projects and goals that might lose their meaning when confronted with extinction include politics, artistic pursuits and even the type of philosophical work with which this paper is concerned. Even more extreme, through the words of the character Theo Faron, P.D. James says in his novel The Children of Men that ‘without the hope of posterity for our race if not for ourselves, without the assurance that we being dead yet live, all pleasures of the mind and senses sometimes seem to me no more than pathetic and crumbling defences shored up against our ruins’ (James 2006, 9). Even if James’ claim is a bit hyperbolic and all pleasures would not actually be lost, I agree with Scheffler in finding it not implausible that the knowledge that extinction was coming and that there would be no more people would have at least a general depressive effect on people’s motivation and confidence in the value of and joy in their activities (Scheffler 2012, 43). Both sources of psychological harm are personal reasons to reject a principle that permitted human extinction. Existing people could therefore reasonably reject the principle for either of these reasons. Psychological pain and the inability to pursue your personal projects, goals, and aims, are all acceptable reasons for rejecting principles in the contractualist framework. So too are infringements of rights and entitlements that we accept as important for people’s lives. These psychological reasons, then, are also valid reasons to reject principles that permitted or required human extinction.

### 1NC – Capitalism

#### They didn’t read an impact to cap

#### Independently, capitalism is sustainable and solves warming

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The past 30 years have seen immense progress in improving the quality of life for much of humanity. Extreme poverty — the number of people living on less than $1.90 per day — has fallen by nearly two-thirds, from 1.9 billion to around 650 million. Life expectancy has risen in most of the world, along with literacy and access to education, while infant mortality has fallen. Despite perceptions to the contrary, the average person born today is likely to have access to more opportunities and have a better quality of life than at any other point in human history. Much of this increase in human wellbeing has been propelled by rapid economic growth driven largely by state-led industrial policy, particularly in poor-to-middle income countries. However, this growth has come at a cost: between 1990 and 2019, global emissions of CO2 increased by 56%. Historically, economic growth has been closely linked to increased energy consumption — and increased CO2 emissions in particular — leading some to argue that a more prosperous world is one that necessarily has more impacts on our natural environment and climate. There is a lively academic debate about our ability to “absolutely decouple” emissions and growth — that is, the extent to which the adoption of clean energy technology can allow emissions to decline while economic growth continues. Over the past 15 years, however, something has begun to change. Rather than a 21st century dominated by coal that energy modelers foresaw, global coal use peaked in 2013 and is now in structural decline. We have succeeded in making clean energy cheap, with solar power and battery storage costs falling 10-fold since 2009. The world produced more electricity from clean energy — solar, wind, hydro, and nuclear — than from coal over the past two years. And, according to some major oil companies, peak oil is upon us — not because we have run out of cheap oil to produce, but because demand is falling and companies expect further decline as consumers increasingly shift to electric vehicles. The world has long been experiencing a relative decoupling between economic growth and CO2 emissions, with the emissions per unit of GDP falling for the past 60 years. This is the case even in countries like India and China that have been undergoing rapid economic growth. But relative decoupling alone is inadequate in a world where global CO2 emissions need to peak and decline in the next decade to give us any chance at limiting warming to well below 2℃, in line with Paris Agreement targets. Thankfully, there is increasing evidence that the world is on track to absolutely decouple CO2 emissions and economic growth — with global CO2 emissions potentially having peaked in 2019 and unlikely to increase substantially in the coming decade. While an emissions peak is just the first and easiest step towards eventually reaching the net-zero emissions required to stop the world from continuing to warm, it demonstrates that linkages between emissions and economic activity are not an immutable law, but rather simply a result of our current means of energy production. In recent years we have seen more and more examples of absolute decoupling — economic growth accompanied by falling CO2 emissions. Since 2005, 32 countries with a population of at least one million people have absolutely decoupled emissions from economic growth, both for terrestrial emissions (those within national borders) and consumption emissions (emissions embodied in the goods consumed in a country). This includes the United States, Japan, Mexico, Germany, United Kingdom, France, Spain, Poland, Romania, Netherlands, Belgium, Portugal, Sweden, Hungary, Belarus, Austria, Bulgaria, El Salvador, Singapore, Denmark, Finland, Slovakia, Norway, Ireland, New Zealand, Croatia, Jamaica, Lithuania, Slovenia, Latvia, Estonia, and Cyprus. Figure 1, below, shows the declines in territorial emissions (blue) and increases in GDP (red). To qualify as having experienced absolute decoupling, we require countries included in this analysis to pass four separate filters: a population of at least one million (to focus the analysis on more representative cases), declining territorial emissions over the 2005-2019 period (based on a linear regression), declining consumption emissions, and increasing real GDP (on a purchasing power parity basis, using constant 2017 international $USD). We chose not to include 2020 in this analysis because it is not particularly representative of longer-term trends, and consumption and territorial emissions estimates are not yet available for many countries. There is a wide range of rates of economic growth between 2005-2019 among countries experiencing absolute decoupling. Somewhat counterintuitively, there is no significant relationship between the rate of economic growth and the magnitude of emissions reductions within the group. While it is unlikely that there is not at least some linkage between the two factors, there are plenty of examples of countries (e.g., Singapore, Romania, and Ireland) experiencing both extremely rapid economic growth and large reductions in CO2 emissions. One of the primary criticisms of some prior analyses of absolute decoupling is that they ignore leakage. Specifically, the offshoring of manufacturing from high-income countries over the past three decades to countries like China has led to “illusory” drops in emissions, where the emissions associated with high-income country consumption are simply shipped overseas and no longer show up in territorial emissions accounting. There is some truth in this critique, as there was a large increase in emissions embodied in imports from developing countries between 1990 and 2005. After 2005, however, structural changes in China and a growing domestic market led to a reversal of these trends; the amount of emissions “exported” from developed countries to developing countries has actually declined over the past 15 years. This means that, for many countries, both territorial emissions and consumption emissions (which include any emissions “exported” to other countries) have jointly declined. In fact, on average, consumption emissions have been declining slightly faster than territorial emissions since 2005 in the 32 countries we identify as experiencing absolute decoupling. Figure 2, below, shows the change in consumption emissions (teal) and GDP (red) between 2005 and 2019. There is a pretty wide variation in the extent to which these countries have reduced their territorial and consumption emissions since 2005. Some countries — such as the UK, Denmark, Finland, and Singapore – have seen territorial emissions fall faster than consumption emissions, while the US, Japan, Germany, and Spain (among others) have seen consumption emissions fall faster. Figure 3 shows reductions in consumption and territorial emissions for each country, with the size of the dot representing the size of the population in 2019. Absolute decoupling is possible. There is no physical law requiring economic growth — and broader increases in human wellbeing — to necessarily be linked to CO2 emissions. All of the services that we rely on today that emit fossil fuels — electricity, transportation, heating, food — can in principle be replaced by near-zero carbon alternatives, though these are more mature in some sectors (electricity, transportation, buildings) than in others (industrial processes, agriculture).

### 1NC – Debris

#### It takes centuries and adaptation solves

Ted Muelhaupt 19, Associate Principal Director of the Systems Analysis and Simulation Subdivision (SASS) and Manager of the Center for Orbital and Reentry Debris Studies at The Aerospace Corporation, M.S., B.S. Aerospace and Aeronautical Engineering & Mechanics, University of Minnesota - Twin Cities, Senior Member of the American Institute of Aeronautics and Astronautics, “How Quickly Would It Take For the Kessler Syndrome To Destroy All The Satellites In LEO? And Could You See This Happening From Earth?”, Quora, 2/28/2019, https://www.quora.com/How-quickly-would-it-take-for-the-Kessler-Syndrome-to-destroy-all-the-satellites-in-LEO-And-could-you-see-this-happening-from-Earth

The dynamics of the Kessler Syndrome are real, and most people studying it agree on the concept: if there is sufficient density of objects and mass, a chain reaction of debris breaking up objects and creating more debris can occur. But the timescale of this process takes decades and centuries. There are many assumptions that go into these models. Though there is still argument about this, many people in the field think that the process is already underway in low earth orbit. But others, including myself, think we can stop it if we take action. This is a slow motion disaster that we can prevent.

But in spite of hype to the contrary, we will never “lose access to space”. Certain missions may become impractical or too expensive, and we may decide that some orbits are too risky for humans. Even that depends on the tolerance for the risk. But robots don’t have mothers, and if we feel it is worthwhile we will take the risk and fly the satellites where we need to.

To the specifics of the question, it will take many decades. It will not destroy all satellites in LEO. You won’t be able to see it from the ground unless you were extraordinarily lucky, and you happened to see a flash from a collision in the instant you were looking, with just the right lighting.

#### Squo tracking, shielding, and removal plans solve

Dr. Brian Koberlein 16, Professor of Physics at the Rochester Institute of Technology and PhD in Astrophysics from the University of Connecticut, “Cascade Effect”, 5-4, https://archive.briankoberlein.com/2016/05/04/cascade-effect/index.html

In the movie Gravity the driving force of the plot is a catastrophic cascade of space debris. An exploding satellite sends high speed debris into the path of other satellites, and the resulting collisions create more space debris until everything from a space shuttle to the International Space Station faces an eminent threat of destruction. Not unexpectedly, the movie portrayal of such a situation is not particularly accurate, but the risk of a debris cascade is very real.

It’s known as the Kessler syndrome, after Donald Kessler, who first imagined the scenario in the 1970s. The problem comes down to the fact that small objects in Earth orbit can stay in orbit for a very long time. If an astronaut drops a bolt, it can stay in orbit for decades or centuries. Because the relative speed of two objects in orbit can be quite large, it doesn’t take a big object to pose a real threat to your spacecraft. On the highway a small pebble can chip your car windshield. In space it can be done by a chip of paint traveling at thousands of kilometers per hour. In the history of the space shuttle missions, there were more than 1,600 debris strikes. Because of such strikes, more than 90 space shuttle windows had to be replaced over the lifetime of shuttle missions.

While that might sound alarming, it’s actually quite manageable. Upgrades and maintenance were quite common on the shuttle missions, and we tend to err on the side of caution when it comes to replacing parts. Modern spacecraft also have ways to mitigate the risk of small impacts, such as Whipple shields made of thin layers of material spaced apart so that objects disintegrate when hitting the shield rather than the spacecraft itself. We also have a tracking system that currently tracks more than 300,000 objects bigger than 1 cm, so we can make sure that most spacecraft avoid these objects.

But the risk of big collisions isn’t negligible. In 2009 the Iridium 33 and Kosmos-2251 satellites collided at high speed, destroying both spacecraft and creating more dangerous debris. It wouldn’t take many collisions like this for the debris numbers to rise dramatically, and more debris means a greater risk of collisions. In Gravity the cascade happens very quickly, triggered by a single event. The reality is not quite so grave. Instead of happening overnight, Kessler syndrome would occur gradually, raising collision risks to the point where certain orbits become logistically impractical. It could occur so gradually that we might not notice it early on, and there are some that argue it’s already underway.

The good news is that we’re aware of the threat. And, as the old saying goes, knowing is half the battle. Already we take steps to limit the amount of debris created. New spacecraft include end of life plans to remove them from orbit, either by sending them into Earths atmosphere to burn up, or sending them to a “graveyard orbit” that poses little risk to other spacecraft. There are also plans on the drawing board to clear orbits of debris, particularly in low-Earth orbit where the risk is greatest. The cascade effect is a real risk, but it’s also one we can likely manage with a bit of ingenuity.

### 1NC – Collisions

#### They don’t solve current debris – millions of debris particles already exist and the plan doesn’t remove those

#### Collision risk is infinitesimally small

Fange 17 Daniel Von Fange 17, Web Application Engineer, Founder and Owner of LeanCoder, Full Stack, Polyglot Web Developer, “Kessler Syndrome is Over Hyped”, 5/21/2017, http://braino.org/essays/kessler\_syndrome\_is\_over\_hyped/

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.

#### Low altitude orbits zeroes risk of collision and doesn’t contribute to overall debris in dense areas – even if satellites fail no impact

Grush 18 – [Loren, “SpaceX wants to fly some internet satellites closer to Earth to cut down on space trash,” 10/9/2018, <https://www.theverge.com/2018/11/9/18016962/spacex-internet-satellites-space-debris-trash-orbit-closer-earth-distance-atmosphere>]

SpaceX is revising its satellite internet initiative, Starlink, and it now hopes to operate some of its spacecraft at a lower altitude than originally planned. In a new filing to the Federal Communications Commission (FCC), SpaceX is asking the agency to modify its license so that more than 1,500 Starlink satellites can operate at an altitude 600 kilometers lower than the company originally requested.

SpaceX argues that this change will make the space environment safer, as it will be easier to get rid of these satellites at this new altitude when they run low on fuel or can no longer function properly in orbit. This update could also explain the unexpected behavior of two of SpaceX’s test satellites for Starlink, which have remained in lower orbits than expected.

Back in March, the FCC approved SpaceX’s license for the first phase of its ambitious Starlink initiative — the company’s long-term plan to launch nearly 12,000 satellites into orbit to beam internet coverage down to Earth. Initially, SpaceX asked the FCC for permission to launch 4,425 satellites into orbits ranging between 1,110 to 1,325 kilometers high. But with this new filing, SpaceX is requesting that 1,584 of those satellites, which were supposed to operate at 1,110 kilometers, be allowed to operate at 550 kilometers instead.

SpaceX says moving the satellites to a lower altitude means it can do more with less. Originally, the company said it needed 1,600 satellites to operate at the 1,110-kilometer altitude, but moving them lower means the company can get the same results with 16 fewer spacecraft. And the lower altitude makes it easy to dispose of these satellites once they’re done in space. At this height, particles from Earth’s atmosphere bombard the spacecraft more rapidly, pushing them out of orbit and dragging them down to the planet. And on the way down, they burn up in the atmosphere.

Making sure these spacecraft come out of orbit in a timely manner is crucial because of the vast number of vehicles that SpaceX wants to put into orbit. A constellation the size of Starlink could dramatically increase the number of operational satellites in space, raising the risk of in-space collisions. A recent NASA study argued that 99 percent of these satellites will need to be taken out of orbit, reliably, within five years of launch, or the risk of satellite collisions goes up quite a bit.

De-orbiting a satellite typically entails bringing the vehicle to a low enough altitude with thrusters where Earth’s air particles and gravity drag the probe down so that it burns up. Now, with this new filing, SpaceX won’t have to significantly move 1,584 of its satellites to get rid of them. The atmosphere at 550 kilometers should do the job within a few years. That’s also helpful in case the spacecraft fails in orbit. Satellites that fail in higher altitudes could turn into unoperational space debris that stay in orbit for long periods of time. At lower altitudes, they can still fail, and the atmosphere will still swallow them up in a timely manner.

#### Sat attacks don’t cause nuke war

Zarybnisky 18 [Eric J. Zarybnisky, MA in National Security Studies from the Naval War College, PhD in Operations Research from the MIT Sloan School of Management, Lt Col, USAF. Celestial Deterrence: Deterring Aggression in the Global Commons of Space. March 28, 2018. <https://apps.dtic.mil/dtic/tr/fulltext/u2/1062004.pdf>]

PREVENTING AGGRESSION IN SPACE

While deterrence and the Cold War are strongly linked in the public’s mind through the nuclear standoff between the United States and the Soviet Union, the fundamentals of deterrence date back millennia and deterrence remains relevant. Thucydides alludes to the concept of deterrence in his telling of the Peloponnesian War when he describes rivals seeking advantages, such as recruiting allies, to dissuade an adversary from starting or expanding a conflict.6F 6 Aggression in space was successfully avoided during the Cold War because both sides viewed an attack on military satellites as highly escalatory, and such an action would likely result in general nuclear war.7F 7 In today’s more nuanced world, attacking satellites, including military satellites, does not necessarily result in nuclear war. For instance, foreign countries have used highpowered lasers against American intelligence-gathering satellites8F 8 and the United States has been reluctant to respond, let alone retaliate with nuclear weapons. This shift in policy is a result of the broader use of gray zone operations, to which countries struggle to respond while limiting escalation. Beginning with the fundamentals of deterrence illuminates how it applies to prevention of aggression in space.

#### No one’s going to war over a downed satellite

Bowen 18 [Bleddyn Bowen, Lecturer in International Relations at the University of Leicester. The Art of Space Deterrence. February 20, 2018. https://www.europeanleadershipnetwork.org/commentary/the-art-of-space-deterrence/]

Space is often an afterthought or a miscellaneous ancillary in the grand strategic views of top-level decision-makers. A president may not care that one satellite may be lost or go dark; it may cause panic and Twitter-based hysteria for the space community, of course. But the terrestrial context and consequences, as well as the political stakes and symbolism of any exchange of hostilities in space matters more. The political and media dimension can magnify or minimise the perceived consequences of losing specific satellites out of all proportion to their actual strategic effect.

#### Won’t go nuclear – seen as a normal conventional attack because of integration with ground forces

Firth 7/1/19 [News Editor at MIT Technology Review, was Chief News Editor at New Scientist. How to fight a war in space (and get away with it). July 1, 2019. MIT Technology Review]

Space is so intrinsic to how advanced militaries fight on the ground that an attack on a satellite need no longer signal the opening shot in a nuclear apocalypse. As a result, “deterrence in space is less certain than it was during the Cold War,” says Todd Harrison, who heads the Aerospace Security Project at CSIS, a think tank in Washington, DC. Non-state actors, as well as more minor powers like North Korea and Iran, are also gaining access to weapons that can bloody the noses of much larger nations in space.

#### Solar flares will end satellites inevitably – no offense

Wild 15 (Jim Wild, Professor of Space Physics at Lancaster University, “With So Much Vested In Satellites, Solar Storms Could Bring Life To A Standstill,” July 30, 2015, https://theconversation.com/with-so-much-vested-in-satellites-solar-storms-could-bring-life-to-a-standstill-45204)

These can disrupt satellite operations by depositing electrical charge within the on-board electronics, triggering phantom commands or overloading and damaging sensitive components. The effects of space weather on the Earth’s upper atmosphere disrupts radio signals transmitted by navigation satellites, potentially introducing positioning errors or, in more severe cases, rendering them unusable. These are not theoretical hazards: in recent decades, solar storms have caused outages for a number of satellites services – and a handful of satellites have been lost altogether. These were costly events – satellite operator losses have run into hundreds of millions of dollars. The wider social and economic impact was relatively limited, but even so it’s unclear how our growing amount of space infrastructure would fare against the more extreme space weather that we might face. When Space Weather Becomes A Hurricane The largest solar storm on record was the Carrington event in September 1859, named after the British astronomer who observed it. Of course there were no Victorian satellites to suffer the consequences, but the telegraph systems of the time were crippled as electrical currents induced in the copper wires interfered with signals, electrocuted operators and set telegraph paper alight. The geomagnetic storm it triggered was so intense that the northern lights, usually a polar phenomenon, were observed as far south as the Bahamas. Statistical analysis of this and other severe solar storms suggests that we can expect an event of this magnitude once every few hundred years – it’s a question of “when” rather than “if”. A 2007 study estimated a Carrington event today would cause US$30 billion in losses for satellite operators and threaten vital infrastructure in space and here on the ground. It’s a risk taken sufficiently seriously that it appears on the UK National Risk Register and has led the government to draw up its preparedness programme.