### 1

#### Interpretation—the aff may not defend a subset of appropriation.

#### Appropriation is a generic indefinite singular. Cohen 01

Ariel Cohen (Ben-Gurion University of the Negev), “On the Generic Use of Indefinite Singulars,” Journal of Semantics 18:3, 2001 <https://core.ac.uk/download/pdf/188590876.pdf>

\*IS generic = Indefinite Singulars

French, then, expresses the two types of reading differently. In English, on¶ the other hand, generic BPs are ambiguous between inductivist and normative¶ readings. But even in English there is one type of generic that can express only¶ one of these readings, and this is the IS generic. While BPs are ambiguous¶ between the inductivist and the rules and regulations readings, ISs are not. In¶ the supermarket scenario discussed above, only (44.b) is true:¶ (44) a. A banana sells for $.49/lb.¶ b. A banana sells for $1.00/lb.¶ The normative force of the generic IS has been noted before. Burton-Roberts¶ (1977) considers the following minimal pair:¶ (45) a. Gentlemen open doors for ladies.¶ b. A gentleman opens doors for ladies.¶ He notes that (45.b), but not (45.a), expresses what he calls “moral necessity.”7¶ Burton-Roberts observes that if Emile does not as a rule open doors for ladies, his mother could utter [(45.b)] and thereby successfully imply that Emile was not, or was¶ not being, a gentleman. Notice that, if she were to utter. . . [(45.a)] she¶ might achieve the same effect (that of getting Emile to open doors for¶ ladies) but would do so by different means. . . For [(45.a)] merely makes a¶ generalisation about gentlemen (p. 188).¶ Sentence (45.b), then, unlike (45.a), does not have a reading where it makes¶ a generalization about gentlemen; it is, rather, a statement about some social¶ norm. It is true just in case this norm is in effect, i.e. it is a member of a set of¶ socially accepted rules and regulations.¶ An IS that, in the null context, cannot be read generically, may receive a¶ generic reading in a context that makes it clear that a rule or a regulation is¶ referred to. For example, Greenberg (1998) notes that, out of the blue, (46.a)¶ and (46.b) do not have a generic reading:¶ (46) a. A Norwegian student whose name ends with ‘s’ or ‘j’ wears green¶ thick socks.¶ b. A tall, left-handed, brown haired neurologist in Hadassa hospital¶ earns more than $50,000 a year.¶ However, Greenberg points out that in the context of (47.a) and (47.b),¶ respectively, the generic readings of the IS subject are quite natural:¶ (47) a. You know, there are very interesting traditions in Norway, concerning the connection between name, profession, and clothing. For¶ example, a Norwegian student. . .¶ b. The new Hadassa manager has some very funny paying criteria. For¶ example, a left-handed. . .¶ Even IS sentences that were claimed above to lack a generic reading, such¶ as (3.b) and (4.b), may, in the appropriate context, receive such a reading:¶ (48) a. Sire, please don’t send her to the axe. Remember, a king is generous!¶ b. How dare you build me such a room? Don’t you know a room is¶ square?

#### Their plan violates. Rules readings are always generalized – specific instances are not consistent. Cohen 01

Ariel Cohen (Ben-Gurion University of the Negev), “On the Generic Use of Indefinite Singulars,” Journal of Semantics 18:3, 2001 https://core.ac.uk/download/pdf/188590876.pdf

In general, as, again, already noted by Aristotle, rules and definitions are not relativized to particular individuals; it is rarely the case that a specific individual¶ forms part of the description of a general rule.¶ Even DPs of the form a certain X or a particular X, which usually receive¶ a wide scope interpretation, cannot, in general, receive such an interpretation in the context of a rule or a definition. This holds of definitions in general, not¶ only of definitions with an IS subject. The following examples from the Cobuild¶ dictionary illustrate this point:¶ (74) a. A fanatic is a person who is very enthusiastic about a particular¶ activity, sport, or way of life.¶ b. Something that is record-breaking is better than the previous¶ record for a particular performance or achievement.¶ c. When a computer outputs something it sorts and produces information as the result of a particular program or operation.¶ d. If something sheers in a particular direction, it suddenly changes¶ direction, for example to avoid hitting something.

#### That outweighs—only our evidence speaks to how indefinite singulars are interpreted in the context of normative statements like the resolution. This means throw out aff counter-interpretations that are purely descriptive

#### Vote neg:

#### 1] Precision –any deviation justifies the aff arbitrarily jettisoning words in the resolution at their whim which decks negative ground and preparation because the aff is no longer bounded by the resolution.

#### 2] Limits—specifying a type of appropriation offers huge explosion in the topic since space is, quite literally, infinite.

#### Drop the debater to preserve fairness and education – use competing interps –reasonability invites arbitrary judge intervention and a race to the bottom of questionable argumentation

#### Hypothetical neg abuse doesn’t justify aff abuse, and theory checks cheaty CPs

#### No RVIs—it’s their burden to be topical.

### 2

#### Counterplan: states ought to charge private entities orbital use fees for each satellite in a megaconstellation put into low-Earth Orbit.

#### Solves the case while also boosting the economy. Vergoth 20:

Karin Vergoth {CIRES-NOAA Science Writer}, 20 - ("Solving the space junk problem," CU Boulder Today, 5-26-2020, https://www.colorado.edu/today/2020/05/26/solving-space-junk-problem)//marlborough-wr/

Space is getting crowded. Aging satellites and space debris crowd low-Earth orbit, and launching new satellites adds to the collision risk. The most effective way to solve the space junk problem, according to a new study, is not to capture debris or deorbit old satellites: it’s an international agreement to charge operators “orbital-use fees” for every satellite put into orbit. Orbital use fees would also increase the long-run value of the space industry, said economist Matthew Burgess, a [CIRES Fellow and co-author of the new paper](https://cires.colorado.edu/news/solving-space-junk-problem). By reducing future satellite and debris collision risk, an annual fee rising to about $235,000 per satellite would quadruple the value of the satellite industry by 2040, he and his colleagues concluded in a paper published today in the [Proceedings of the National Academy of Sciences](https://www.pnas.org/content/early/2020/05/20/1921260117). “Space is a common resource, but companies aren’t accounting for the cost their satellites impose on other operators when they decide whether or not to launch,” said Burgess, who is also an assistant professor in environmental studies and an affiliated faculty member in economics at CU Boulder. “We need a policy that lets satellite operators directly factor in the costs their launches impose on other operators.” Currently, an estimated 20,000 objects—including satellites and space debris—are crowding low-Earth orbit. It’s the latest tragedy of the commons, the researchers said: Each operator launches more and more satellites until their private collision risk equals the value of the orbiting satellite. So far, proposed solutions have been primarily technological or managerial, said Akhil Rao, assistant professor of economics at Middlebury College and the paper’s lead author. Technological fixes include removing space debris from orbit with nets, harpoons, or lasers. Deorbiting a satellite at the end of its life is a managerial fix. Ultimately, engineering or managerial solutions like these won’t solve the debris problem because they don’t change the incentives for operators. For example, removing space debris might motivate operators to launch more satellites—further crowding low-Earth orbit, increasing collision risk, and raising costs. “This is an incentive problem more than an engineering problem. What’s key is getting the incentives right,” Rao said. A better approach to the space debris problem, Rao and his colleagues found, is to implement an orbital-use fee—a tax on orbiting satellites. “That’s not the same as a launch fee,” Rao said, “Launch fees by themselves can’t induce operators to deorbit their satellites when necessary, and it's not the launch but the orbiting satellite that causes the damage.” Orbital-use fees could be straight-up fees or tradeable permits, and they could also be orbit-specific, since satellites in different orbits produce varying collision risks. Most important, the fee for each satellite would be calculated to reflect the cost to the industry of putting another satellite into orbit, including projected current and future costs of additional collision risk and space debris production—costs operators don’t currently factor into their launches. “In our model, what matters is that satellite operators are paying the cost of the collision risk imposed on other operators,” said Daniel Kaffine, professor of economics and RASEI Fellow at CU Boulder and co-author on the paper. And those fees would increase over time, to account for the rising value of cleaner orbits. In the researchers’ model, the optimal fee would rise at a rate of 14 percent per year, reaching roughly $235,000 per satellite-year by 2040. For an orbital-use fee approach to work, the researchers found, all countries launching satellites would need to participate—that's about a dozen that launch satellites on their own launch vehicles and more than 30 that own satellites. In addition, each country would need to charge the same fee per unit of collision risk for each satellite that goes into orbit, although each country could collect revenue separately. Countries use similar approaches already in carbon taxes and fisheries management. In this study, Rao and his colleagues compared orbital-use fees to business as usual (that is, open access to space) and to technological fixes such as removing space debris. They found that orbital use fees forced operators to directly weigh the expected lifetime value of their satellites against the cost to industry of putting another satellite into orbit and creating additional risk. In other scenarios, operators still had incentive to race into space, hoping to extract some value before it got too crowded. With orbital-use fees, the long-run value of the satellite industry would increase from around $600 billion under the business-as-usual scenario to around $3 trillion, researchers found. The increase in value comes from reducing collisions and collision-related costs, such as launching replacement satellites. Orbital-use fees could also help satellite operators get ahead of the space junk problem. “In other sectors, addressing the tragedy of the commons has often been a game of catch-up with substantial social costs. But the relatively young space industry can avoid these costs before they escalate,” Burgess said.

### 3

#### Russia hates StarLink. Smith 21:

Rich Smith, 21 - ("Why Russia Is Terrified of SpaceX," Motley Fool, 2-15-2021, https://www.fool.com/investing/2021/02/15/why-russia-is-terrified-of-spacex-and-starlink/)//marlborough-wr/

SpaceX wants to bring [fast satellite broadband internet](https://www.fool.com/investing/2020/08/23/fast-broadband-from-orbit-new-data-says-spacex-can/) to the world -- and in particular, to internet users in far-flung, rural locations, where download speeds are low and prices are high. One of the first places in America to get SpaceX Starlink service was Alaska, the state with the lowest population density in the country -- just one person per square mile. The company next extended service into Canada (population density: three people per square mile), followed last month by [service in the UK](https://www.fool.com/investing/2021/02/09/spacex-starlink-wins-another-big-customer/) -- a big jump in concentration, with 650 people per square mile. (Even in the UK, there are plenty of isolated locations where internet service is expensive, slow -- or both). SpaceX's globe-spanning satellite constellation should be capable of providing 100 megabit-per-second internet service to anywhere by the end of this year. You can expect that a lot of countries, no matter how urbanized they are (or not), will be lining up to sign up for Starlink service. And the more countries Starlink signs up as customers, the better the prospects for the SpaceX subsidiary's [promised IPO](https://www.fool.com/investing/2020/02/07/spacex-will-likely-ipo-its-starlink-internet-satel.aspx). One country that most definitely does not want Starlink, however, is Russia. Just say "nyet" to fast internet As ArsTechnica.com reported last month, the Russian State Duma (Russia's congress) is currently considering legislation to impose fines upon any individual or company that signs up for Starlink -- or indeed, for any foreign-operated satellite internet system, [OneWeb or Project Kuiper](https://www.fool.com/investing/2019/06/11/could-amazon-beat-spacex-in-satellite-broadband-in.aspx) included. According to ArsTechnica, the Russian Duma may fine individual customers of Starlink up to $405 for use of the satellite internet service, and fine corporate users as much as $13,500. What does Russia have against cheap, fast, reliable internet from space? For one thing, Russian security services object that internet operated by a foreign satellite network would be immune from surveillance under Russia's System of Operational Search Measures legislation ("SORM"). For another, they suspect that Starlink is part of a U.S. government plot to deploy "predatory, clever, powerful, high-technology ... shock and awe ... to advance, above all, [American] military interests." Yes, seriously.

#### We stopped appeasing Russia – they’ll pocket concessions from coop and increase aggression – tensions aren’t the result of understandings but hardened differences

Haddad and Polakova 18 [Benjamin Haddad Director, Future Europe Initiative - Atlantic Council. Alina Polyakova Director, Project on Global Democracy and Emerging Technology Fellow - Foreign Policy, Center on the United States and Europe. Don’t rehabilitate Obama on Russia. March 5, 2018. https://www.brookings.edu/blog/order-from-chaos/2018/03/05/dont-rehabilitate-obama-on-russia/]

Obama’s much-ballyhooed “Reset” with Russia, launched in 2009, was in keeping with optimistic attempts by every post-Cold War American administration to improve relations with Moscow out of the gate. Seizing on the supposed change of leadership in Russia, with Dmitry Medvedev temporarily taking over the presidency from Vladimir Putin, Obama’s team quickly turned a blind eye to Russia’s 2008 war with Georgia, which in retrospect was Putin’s opening move in destabilizing the European order. Like George W. Bush before him, Obama vastly overestimated the extent to which a personal relationship with a Russian leader could affect the bilateral relationship. U.S.-Russia disagreements were not the result of misunderstandings, but rather the product of long-festering grievances. Russia saw itself as a great power that deserved equal standing with the U.S. What Obama saw as gestures of good will—such as the 2009 decision to scrap missile defense plans for Poland and the Czech Republic—Russia interpreted as a U.S. retreat from the European continent. Moscow pocketed the concessions and increasingly inserted itself in European affairs. The Kremlin was both exploiting an easy opportunity and reasserting what it thought was its historic prerogative.

Though Russia’s invasion of Ukraine in 2014 was the final nail in the coffin of the Reset, President Obama remained reluctant to view Moscow as anything more than a local spoiler, and thought the whole mess was best handled by Europeans. France and Germany spearheaded the Minsk ceasefire process in 2014-2015, with U.S. support but without Washington at the table. The Obama administration did coordinate a far-ranging sanctions policy with the European Union—an important diplomatic achievement, to be sure. But to date, the sanctions have only had a middling effect on the Russian economy as a whole (oil and gas prices have hurt much more). And given that sanctions cut both ways—potential value is destroyed on both sides when economic activity is systematically prohibited—most of the sacrifice was (and continues to be) born by European economies, which have longstanding ties to Russia. In contrast, the costs of a robust sanctions policy have been comparatively minor in the United States; Obama spent little political capital to push them through at home. The Obama administration also sought to shore up NATO’s eastern flank through the European Reassurance Initiative (ERI), which stationed rotating troops in Poland and the Baltics while increasing the budget for U.S. support. Nevertheless, the president resisted calls from Congress, foreign policy experts, and his own cabinet to provide lethal weapons to Ukraine that would have raised the costs on Russia and helped Kyiv defend itself against Russian military incursion into the Donbas. As Obama told Jeffrey Goldberg, he viewed any deterrent moves by the United States as fundamentally not credible, because Russia’s interests clearly trumped our own; it was clear to him they would go to war much more readily that the United States ever would, and thus they had escalatory dominance. Doing more simply made no sense to Obama. This timid realpolitik was mixed up with a healthy dose of disdain. Obama dismissed Russia as a “regional power” that was acting out of weakness in Ukraine. “The fact that Russia felt it had to go in militarily and lay bare these violations of international law indicates less influence, not more,” Obama said at the G7 meeting in 2014. This line has not aged well. Obama’s attitudes on Russia reflected his administration’s broadly teleological, progressive outlook on history. Russia’s territorial conquest “belonged in the 19th century.” The advance of globalization, technological innovation, and trade rendered such aggression both self-defeating and anachronistic. The biggest mistake for America would be to overreact to such petty, parochial challenges. The 2015 National Security Strategy favored “strategic patience”. But was it patience… or passivity? As its actions in 2016 proved, Russia is very much a 21st century power that understands how to avail itself of the modern tools available to it, often much better than we do ourselves. The same intellectual tendencies that shaped Obama’s timid approach to Ukraine were reflected in his administration’s restrained response as evidence of Russian electoral interference began to emerge in the summer of 2016. Starting in June, intelligence agencies began reporting that Russian-linked groups hacked into DNC servers, gained access to emails from senior Clinton campaign operatives, and were working in coordination with WikiLeaks and a front site called DCLeaks to strategically release this information throughout the campaign cycle. By August, Obama had received a highly classified file from the CIA detailing Putin’s personal involvement in covert influence operations to discredit the Clinton campaign and disrupt the U.S. presidential elections in favor of her opponent, Donald Trump. That fall through to his departure from the White House, the president and his key advisers struggled to find an appropriate response to the crime of the century. But out of all the possible options, which included a cyber offensive on Russia and ratcheted up sanctions, the policy that was adopted in the final months of Obama’s term was, characteristically, cautious. Obama approved additional narrow sanctions against Russian targets, expelled 35 Russian diplomats, and shut down two Russian government compounds. It’s true that Obama faced a difficult political environment that constrained his ability to take tougher measures. Republican opponents would have surely decried any loud protests as a form of election meddling on Hillary Clinton’s behalf. Donald Trump was already flogging the narrative that the elections were rigged against him. And anyway, Clinton seemed destined to win; she would tend to the Russians in her own time, the thinking went. But just as with the decision to not provide weapons to Ukraine, the Obama administration also fretted about provoking Russia into taking even more drastic steps, such as hacking the voting systems or a cyber attack on critical infrastructure. In the end, the administration’s worries proved to be paralyzing. “I feel like we sort of choked,” one Obama administration official told the Washington Post. Much ink has been spilled over President Trump’s effusive praise for Putin and his brutal regime. “You think our country’s so innocent?” candidate Trump famously replied to an interviewer listing the many human rights abuses of Putin’s Russia, including the harassment and murder of journalists. Obama, on the other hand, never had any ideological or psychological sympathy for Putin or Putinism. By the end of his second term, the two men were barely on speaking terms, the iciness of their encounters in full public view. For most of Obama’s two terms, however, this personal animosity did not translate into tougher policies. Has the Trump administration been tougher on Russia than Obama, as the president claims? Trump’s own boasting feels like a stretch, especially given how he seems to have gone out of his way to both disparage NATO and praise Putin during the course of his first year in office. Still, many of his administration’s good policies have been obscured by the politics of the Mueller investigation and the incessant furor kicked up by the president’s tweets. As Tom Wright has noted, the Trump administration seems to pursue two policy tracks at the same time: the narrow nationalism of the president’s inflammatory rhetoric openly clashing with the seriousness of his administration’s official policy decisions.

These tensions are real, but all too often they become the story. Glossed over is the fact that President Trump has appointed a string of competent and widely respected figures to manage Russia policy—from National Security Council Senior Director Fiona Hill to Assistant Secretary of State for European affairs Wess Mitchell to the Special Envoy for Ukraine Kurt Volker. The Trump administration is, in fact, pursuing concrete policies pushing back on Russian aggression that the Obama administration had fervently opposed. The National Security Strategy of 2017, bringing a much-needed dose of realism to a conversation too often dominated by abstractions like the “liberal world order”, singles out both China and Russia as key geopolitical rivals. During Trump’s first year, the administration approved the provision of lethal weapons to Ukraine, shut down Russia’s consulate in San Francisco as well as two additional diplomatic annexes, and rather than rolling back sanctions, Trump signed into law additional sanctions on Russia, expanded LNG sales to a Europe dependent in Russian gas imports, and increased the Pentagon’s European Reassurance Initiative budget by 40 percent. (A president who berated U.S. investments for European defense has actually dramatically increased American military presence on Europe’s threatened borders.) While many of these policies may have been implemented despite rather than because of the president—on the expansion of sanctions in particular, Trump faced a veto-proof majority in Congress—credit should be given where credit is due.

The Trump administration’s sober policy decisions should not excuse the president’s praise for Vladimir Putin, nor his reckless undermining of America’s stated commitment to enforcing Article 5 during his first speech in front of NATO. But the fact remains that the U.S. is taking concrete steps to strengthen Europe against Russian aggression. And let’s not be coy about it: if the president’s strident complaining about unequal burden-sharing in NATO finally snaps European allies out of their complacency and helps spur military investment on the continent, this won’t be good news for Russia either. Indeed, he will have succeeded in moving the needle on an issue that has frustrated every one of his predecessors since 1989. Has Trump’s bluster, especially on Article 5, been cost-free? Hardly. Nevertheless, talking to diplomats around town suggests that after initial months of uneasiness, most Europeans have learned to deal with the Trump administration in a dispassionate and pragmatic manner that stands in stark relief with much of the hysteria that passes for commentary in the U.S.

Each administration should be judged on what it has achieved. At the end of the Obama’s two terms, Putin had elevated Russia to a credible revisionist power on the international stage. Russia annexed Crimea and occupied much of Eastern Ukraine; by successfully propping up the degenerate Assad regime, the Kremlin gained a veto on any possible political solution to Syria, and got a meaningful foothold in the broader region for the first time since Sadat threw Soviet advisors out; and its populist allies and fellow-travelers were on the rise in Europe, fueling both anti-Americanism and illiberalism; and most damning of all, it managed to meddle, almost unopposed, in U.S. politics—all on Obama’s watch.

There is plenty left to criticize in how the Trump administration has done things in its first year. The Trump administration’s apparent unwillingness to take steps to deter hostile foreign powers from meddling in American politics is inexcusably irresponsible. And in the Middle East, the Trump administration seems hell-bent on following Obama’s myopic policy of retreat and narrow preoccupation with fighting ISIS to the exclusion of all else. But despite the president’s campaign promises, his administration has been the first in the post-Cold War era to not try for a “Reset” with Moscow. If Vladimir Putin wanted to sow chaos and confusion in Washington, he has succeeded beyond his wildest dreams. If he wanted a pliant ally in America, he has abjectly failed.

#### Appeasing Russia shreds the NPT and causes nuke prolif – extinction

Umland 17 [Andreas Umland is a German political scientist, historian and Russian interpreter, specializing in contemporary Russian and Ukrainian history. He is a Member of the Institute for Central and East European Studies at the Catholic University, and a senior research fellow at the Institute for Euro-Atlantic Cooperation in Kyiv. The Price of Appeasing Russian Adventurism. January 16, 2017. https://carnegieeurope.eu/strategiceurope/67692]

A major foreign policy challenge for the incoming U.S. administration will be how to deal with Russia’s new international assertiveness and foreign military adventures. Some signs in recent weeks, especially regarding the ongoing confrontation between Russia and Ukraine, point to a friendlier U.S. approach toward Moscow. Such a shift would have very serious consequences for the rest of the world.

A new rapprochement between Washington and Moscow may go far beyond the attempt by the administration of outgoing U.S. President Barack Obama to reset Russian-U.S. relations after the Russian-Georgian War in 2008. Supposedly, a dovish American approach toward the Kremlin would put U.S. concerns before those of countries and peoples currently in conflict with Russia.

To be sure, a number of probable members of the new administration, like Rex Tillerson, Mike Pompeo, and James Mattis, have voiced hawkish views on Russian imperialism. Yet apparently, U.S. President-elect Donald Trump and some of those advising him specifically on Russia, like Michael Flynn, Paul Manafort, and Carter Page, hope that U.S. tolerance of Russian freedom of movement in the former Soviet space—in particular, in Ukraine—would make the Kremlin more cooperative in other fields, such as the fight against Islamist terrorism, and in other regions, such as Syria or the Arctic.

However, one wonders whether Trump and other so-called Putinversteher in the incoming administration fully understand the stakes. The risks do not only concern the fundamental national interests of such pro-American countries as Ukraine, Estonia, Georgia, or Poland. The U.S. administration’s tolerance of Russia’s violation of Ukrainian territorial integrity would have larger implications for the future of humanity.

In view of the security assurances that the United States gave Ukraine under the 1994 Budapest Memorandum, a move by Washington to appease Moscow would be another crack in the splintering international nuclear nonproliferation regime. Acquiescence to Russia’s territorial gains in Ukraine would further undermine the already-shattered 1968 Nuclear Non-Proliferation Treaty (NPT), one of the world’s most important multilateral agreements.

Under the Budapest Memorandum, three official nuclear-weapons states under the NPT—Russia, the UK, and the United States—assured the inviolability of Ukraine’s borders. In two simultaneous but separate declarations, the other two official nuclear-weapons states, China and France, also expressed their respect for Ukraine’s political sovereignty. This was the core of a shrewd deal between the five guarantor states of the NPT and Ukraine (as well as Belarus and Kazakhstan), which had inherited parts of the Soviet nuclear arsenal. In exchange for Kyiv’s readiness to give up its weapons of mass destruction and join the NPT, the world’s five major nuclear powers explicitly acknowledged their obligation to observe and protect Ukraine’s territorial integrity.

But since 2014, if not before, Moscow has manifestly violated the Budapest Memorandum. As the agreement forms an important annex to the NPT, its violation through continuing Russian occupation of Ukraine’s territory undermines the logic of the international mechanism to prevent the spread of atomic weapons. That not only harshly punishes a country that voluntarily agreed to give up its nuclear weapons in exchange for security assurances. It also demonstrates how an official nuclear-weapons state can use its nuclear deterrence potential to implement and secure territorial expansion with military means.

Worse, two other official nuclear powers, Beijing and Paris, have implicitly assisted Russia in its subversion of the nonproliferation regime. Despite having expressed its respect for Ukraine’s territorial integrity, China did not support a 2014 UN General Assembly resolution against Russia’s annexation of Crimea. And several prominent French center-right parliamentarians have visited Crimea since its annexation by Russia, even though the French government that in 1994 declared its respect for Ukraine’s sovereignty was also a center-right administration (albeit under Socialist president François Mitterrand).

U.S. appeasement of Russia regarding its annexation of Crimea and interference in Ukraine’s eastern Donbas region would compound the effects of these earlier aberrations. The United States would be disregarding its earlier statements about Ukraine’s accession to the NPT and voluntary nuclear disarmament. The UK would be the only guarantor state of the NPT left that behaves more or less in line with the logic of the world’s nonproliferation regime with regard to Ukraine.

### 4

#### Starlink is key to global internet access.

John Koetsier {journalist, analyst, author, and speaker}, 20 - ("Elon Musk’s 42,000 StarLink Satellites Could Just Save The World," Forbes, 1-9-2020, https://www.forbes.com/sites/johnkoetsier/2020/01/09/elon-musks-42000-starlink-satellites-could-just-save-the-world/?sh=85866264c2cd)//marlborough-wr/

Elon Musk’s other company, SpaceX, is building Starlink, a global communications constellation that could approach a [staggering 42,000 satellites](https://www.forbes.com/sites/johnkoetsier/2019/12/20/apple-building-satellite-to-iphone-tech-spacex-launching-42000-satellites-2--2--/#5d1ee85668a7). And it could be all that stands between us and a fragmented world living in virtually — and actually — different realities. How? World War II can tell us the answer. In the early 1940s a tyrannical power using fake news, hate speech, military might and hegemonic power controlled most of Europe: the Nazis. They controlled public life, news and local economies. Resistance groups dotted the European mainland, with one lifeline for non-official communication from free countries: radio. As such, radios were [contraband](https://www.theholocaustexplained.org/life-in-nazi-occupied-europe/occupation-case-studies/) and confiscated. One of the activities the allies undertook to support resistance fighters was shipping in radios for communication and outside news. Today, radios aren’t at risk of being confiscated. And as a cloud-delivered service, hijacking the internet happens largely out of public sight, in servers and routers that enable services like Netflix and the BBC and Facebook and Google. It’s called [splinternet](https://en.wikipedia.org/wiki/Splinternet), and it’s the ongoing division of a worldwide interconnected internet into separate and isolatable fiefdoms, each of which can be controlled and managed so that governing powers can control what their populations see. The Great Firewall of China is the most well-known example, but Iran, Syria and Vietnam also control significant portions of the internet for their populations. Russia just [completed technology](https://www.pcmag.com/news/371347/russia-is-about-to-disconnect-from-the-internet-what-that-m) to wall off its internal networks, servers and internet users from the wider internet. And India, in its attempt to control unrest following its anti-Muslim citizenship law, has employed a particularly heavy-handed approach: simply [blocking](https://www.tellerreport.com/news/2019-12-27---india--new-internet-outages--protesters-back-on-the-street-.ryrh4IhQyI.html) the internet entirely. (One unintended result: contractors in India can’t reach their employers in the U.S.) Another country, United Arab Emirates, took a different approach: outlawing all messengers [except one that it built a digital backdoor into: Totok](https://www.forbes.com/sites/johnkoetsier/2019/12/23/top-50-social-app-in-usa-outed-as-spying-tool-for-united-arab-emirates-apple-and-google-delete-it/#5790934b7291). However it happens, it allows governments to control what people see, read and hear from outside sources — and censor what their own people say. Starlink can change all of that. Elon Musk recently revealed [details](https://twitter.com/elonmusk/status/1214548764054216704?ref_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1214548764054216704&ref_url=https%3A%2F%2Fwww.digitaltrends.com%2Fcool-tech%2Felon-musk-reveals-what-youll-need-to-connect-to-his-internet-satellites%2F) about how people will access StarLink. It will be incredibly simple, and it will enable access to the relatively free global internet from anywhere on the planet. What that means is that anyone can access the internet from anywhere. Chinese citizens will be able to access Google and information about Tiananmen Square. Russian citizens will be able to see external analysis of Putin’s financial dealings if even Russia blocks outside sources. Indian protesters can’t be cut off from the internet. Of course, governments will make the Starlink Terminal illegal. But that in itself will be a victory. Censorship works best when it is invisible: when people don’t even know that there is alternate information, other understandings of reality. (Chinese teenage exchange students at a relative’s house last year, for example, had never heard of Tiananmen Square, and refused to believe stories that, they felt, painted China in a negative light.) But when a device to connect to the outside world becomes contraband, the glass walls become opaque. People realize that walls have been erected to prevent them from seeing other opinions. And that is at least one step to maintaining a free, open and accessible internet globally, which should help combat fake news, propaganda and information deprivation aimed at controlling populations. And it’s a step towards making the splinternet harder to achieve. 1,000 satellites will be enough to enable basic service, Musk has said. SpaceX just [launched](https://www.digitaltrends.com/cool-tech/spacex-launches-60-more-starlink-satellites-amid-astronomer-concerns/) a third batch of 60 satellites, and is expected to continue launching that many [every two weeks](https://www.spaceitbridge.com/spacex-starlink-launch-targeted-for-november-11-will-questions-be-answered.htm) through the rest of 2020.

#### Free internet is crucial to the promotion of democracy. Pirannejad 17:

Ali Pirannejad {Department of Public Administration, University of Tehran, Tehran, Iran; Faculty of Technology, Policy and Management, Delft University of Technology, Delft, Netherlands, }, 17 - ("Can the internet promote democracy? A cross-country study based on dynamic panel data models," Taylor &amp; Francis, 4-1-2017, <https://www.tandfonline.com/doi/abs/10.1080/02681102.2017.1289889?journalCode=titd20)//marlborough-wr/>

In the age of information revolution, information and communication technologies are penetrating all levels of societies and are also influencing the political aspect of each country by providing some facilities such as the Internet and web technologies. Democracy, as a universal value and a political system, is also well known and has an important role in the sublimation of the human societies. This study attempts to examine the effect of Internet extension on democracy promotion by using a panel consisting of 122 countries covering the period from the year 2000 to 2014. In order to estimate the effect, and also to deal with the endogeneity and autocorrelation problems, the dynamic panel data models are employed in the study. The results of estimation models indicate that Internet extension has a significantly positive effect on democracy promotion during the period. In the end, some ideas for further research are presented.

#### Democracy Promotion is key to prevent great power war – we’re on the brink.

Gat 11 (Azar- the Ezer Weizman Professor of National Security at Tel Aviv University, 2011, “The Changing Character of War,” in The Changing Character of War, ed. Hew Strachan and Sibylle Scheipers, p. 30-32)

Since 1945, the decline of major great power war has deepened further. Nuclear weapons have concentrated the minds of all concerned wonderfully, but no less important have been the institutionalization of free trade and the closely related process of rapid and sustained economic growth throughout the capitalist world. The communist bloc did not participate in the system of free trade, but at least initially it too experienced substantial growth, and, unlike Germany and Japan, it was always sufﬁciently large and rich in natural resources to maintain an autarky of sorts. With the Soviet collapse and with the integration of the former communist powers into the global capitalist economy, the prospect of a major war within the developed world seems to have become very remote indeed. This is one of the main sources for the feeling that war has been transformed: its geopolitical centre of gravity has shifted radically. The modernized, economically developed parts of the world constitute a ‘zone of peace’. War now seems to be conﬁned to the less-developed parts of the globe, the world’s ‘zone of war’, where countries that have so far failed to embrace modernization and its pacifying spin-off effects continue to be engaged in wars among themselves, as well as with developed countries.¶ While the trend is very real, one wonders if the near disappearance of armed conﬂict within the developed world is likely to remain as stark as it has been since the collapse of communism. The post-Cold War moment may turn out to be a ﬂeeting one. The probability of major wars within the developed world remains low—because of the factors already mentioned: increasing wealth, economic openness and interdependence, and nuclear deterrence. But the deep sense of change prevailing since 1989 has been based on the far more radical notion that the triumph of capitalism also spelled the irresistible ultimate victory of democracy; and that in an afﬂuent and democratic world, major conﬂict no longer needs to be feared or seriously prepared for. This notion, however, is fast eroding with the return of capitalist non-democratic great powers that have been absent from the international system since 1945. Above all, there is the formerly communist and fast industrializing authoritarian-capitalist China, whose massive growth represents the greatest change in the global balance of power. Russia, too, is retreating from its postcommunist liberalism and assuming an increasingly authoritarian character.¶ Authoritarian capitalism may be more viable than people tend to assume. 8 The communist great powers failed even though they were potentially larger than the democracies, because their economic systems failed them. By contrast, the capitalist authoritarian/totalitarian powers during the ﬁrst half of the twentieth century, Germany and Japan, particularly the former, were as efﬁcient economically as, and if anything more successful militarily than, their democratic counterparts. They were defeated in war mainly because they were too small and ultimately succumbed to the exceptional continental size of the United States (in alliance with the communist Soviet Union during the Second World War). However, the new non-democratic powers are both large and capitalist. China in particular is the largest player in the international system in terms of population and is showing spectacular economic growth that within a generation or two is likely to make it a true non-democratic superpower.¶ Although the return of capitalist non-democratic great powers does not necessarily imply open conﬂict or war, it might indicate that the democratic hegemony since the Soviet Union’s collapse could be short-lived and that a universal ‘democratic peace’ may still be far off. The new capitalist authoritarian powers are deeply integrated into the world economy. They partake of the development-open-trade-capitalist cause of peace, but not of the liberal democratic cause. Thus, it is crucially important that any protectionist turn in the system is avoided so as to prevent a grab for markets and raw materials such as that which followed the disastrous slide into imperial protectionism and conﬂict during the ﬁrst part of the twentieth century. Of course, the openness of the world economy does not depend exclusively on the democracies. In time, China itself might become more protectionist, as it grows wealthier, its labour costs rise, and its current competitive edge diminishes.¶ With the possible exception of the sore Taiwan problem, China is likely to be less restless and revisionist than the territorially conﬁned Germany and Japan were. Russia, which is still reeling from having lost an empire, may be more problematic. However, as China grows in power, it is likely to become more assertive, ﬂex its muscles, and behave like a superpower, even if it does not become particularly aggressive. The democratic and non-democratic powers may coexist more or less peacefully, albeit warily, side by side, armed because of mutual fear and suspicion, as a result of the so-called ‘security dilemma’, and against worst-case scenarios. But there is also the prospect of more antagonistic relations, accentuated ideological rivalry, potential and actual conﬂict, intensiﬁed arms races, and even new cold wars, with spheres of inﬂuence and opposing coalitions. Although great power relations will probably vary from those that prevailed during any of the great twentieth-century conﬂicts, as conditions are never quite the same, they may vary less than seemed likely only a short while ago.

### 5

#### CP: NASA ought to build the Near-Object Surveyor.

#### Ground detection is not enough – space telescope needed to prevent asteroid collision. Marlborough reads yellow

AC Dreier 21, Casey Dreier is Senior Space Policy Adviser for The Planetary Society, an independent nonprofit organization based in California. “Why an Asteroid Strike Is Like a Pandemic”, July 25, 2021, <https://www.scientificamerican.com/article/why-an-asteroid-strike-is-like-a-pandemic/>, accessed 12/3/21, sb

Imagine the following scenario. Scientists identify a potential global threat, but initial data are spotty—not enough to spur drastic action. Rapidly, relentlessly, the threat grows. What once was preventable becomes inevitable. The world has no choice but to endure the disaster at the cost of trillions of dollars and millions of lives. This is the story of COVID pandemic—but it could equally well be the story of a catastrophic strike by a large asteroid. As we emerge from the worst of COVID-19, we should heed this lesson: low-probability, high-impact events do occur; but they can be mitigated if we prepare and act early enough. Asteroids are like viruses in a sense: they number in the tens of millions but only a few types pose a threat to humans. For asteroids, it’s the “near-Earth” variety—those with orbits that come close to our own—that we must worry about. Also as with viral outbreaks, the likelihood of a catastrophe is unlikely in any given year, but almost inevitable over time. And just as we can in principle develop vaccines against emerging viruses before they cause too much damage, creating immunity without making people sick, we can similarly use modern technology to develop a level of global immune response to asteroid collisions. But this requires ongoing investments in research and preparedness—and while the U.S. spent more than $6.5 billion dollars on pandemic preparedness over the past decade (with admittedly mixed results), the nation spent less than a tenth of that on the work of asteroid detection and deflection. This is far too low. In fact, impacts from space happen all the time, but they are generally small and harmless. The Earth is peppered with meteors throughout the year that are mere inches across or less, which burn up as shooting stars when they enter our atmosphere. The threat comes from the bigger ones, which are house-sized or larger. These strike less frequently, but they do happen. In 2013, a 60-foot-diameter meteor exploded over the city of Chelyabinsk, injuring thousands of people. The really big ones—miles across—are even rarer, occurring every few hundred million years or so. But the damage they do can be catastrophic. Think of the mass extinction 65 million years ago that wiped out most of the dinosaurs. The good news is that we’ve found most of those and, fortunately for us, Earth is not in their crosshairs. But there is a middle ground that demands our attention: “city killer” asteroids that are about around the size of a football field and could unleash 10,000 times the energy of the atomic bomb that leveled Hiroshima. They seem to hit us every few thousand years, on average. There are likely many tens of thousands of them with orbits near Earth’s, yet we’ve only found about one third of these. And finding them is hard. Even the big ones are tiny, cosmically speaking, and are camouflaged against the blackness of space by their charcoal-like dark surfaces. Ground-based telescopes, which measure reflected light, struggle to see these small, dim objects. Only a few hundred are discovered each year. To significantly improve the rate of detection we need to move off the Earth, to the realm of the asteroids. We need a telescope in space. The Near-Earth Object (NEO) Surveyor is a modest space telescope currently under consideration by NASA. Instead of looking at reflected light, it would seek out heat signatures of asteroids, which glow with infrared radiation against the cold background of space. And in space, where there’s no bad weather and daytime that limit observations, the NEO Surveyor could find more city-killer asteroids in the next 10 years than have been discovered by all the telescopes on Earth over the past three decades. The mathematics of orbital mechanics that characterizes asteroids can be as heartless as the exponential growth that goes with viral outbreaks. And as with broad testing regimes that have been used during COVID, a dedicated effort to discover potentially hazardous asteroids will be the key to preventing disaster. It’s possible to alter an incoming asteroid’s orbit to protect the Earth, but that becomes increasingly more difficult depending on how close we are to impact. It is far easier to act years (if not decades) in advance. After more than a decade in bureaucratic purgatory, where the NEO Surveyor has struggled to gain approval, the project appears ready to move forward. The Biden administration recently proposed to fund this mission in its latest NASA budget; Congress should support this request. It will take years to build and launch, but as early as 2026 we may see the start of the first dedicated effort to understand the scope of the asteroid threat. We also need to invest in deflection technology, the “vaccine” of the asteroid response. Fortunately, NASA is close to launching a mission called the Double Asteroid Redirection Test (DART). In 2022, the spacecraft will ram into the tiny “moon” that orbits the near-Earth asteroid Didymos, slightly changing its orbit. Scientists will compare the exact degree of change to their predictions, which will help them understand how to alter asteroid orbits more effectively in the future. This is only a test, but it could serve the same function as the years of basic research into the field of mRNA vaccines that ultimately paid off when applied to COVID. We must also continue to support sky surveys by ground telescopes, which can support the work of space-based missions. The Vera Rubin Observatory, for example, now under construction in Chile and especially good at finding fast-moving objects in the solar system, will greatly assist in asteroid detection. (The proposed “megaconstellations” of Earth-orbiting satellites by Amazon, SpaceX, OneWeb, and others threaten to overwhelm our view of these dim objects and make asteroid detections more difficult. There is no easy solution to this, beyond further confirming the need for space-based detectors located in quieter regions of the solar system.) The coronavirus pandemic has many humbling lessons for humanity. But let this be one of them: low-probability, high-impact disasters do occur; and there is no higher impact disaster than a large asteroid collision with the Earth. We know that early awareness enables early action. Big problems later on can be prevented by small investments now. Let’s not be caught off-guard again.

### 6

#### Interpretation: Appropriation is permanently taking property for exclusive use. Gorove 69:

Stephen Gorove, Interpreting Article II of the Outer Space Treaty, 37 Fordham L. Rev. 349 (1969). Available at: https://ir.lawnet.fordham.edu/flr/vol37/iss3/2

With respect to the concept of appropriation the basic question is what constitutes "appropriation," as used in the Treaty, especially in contradistinction to casual or temporary use. The term "appropriation" is used most frequently to denote the taking of property for one's own or exclusive use with a sense of permanence. Under such interpretation the establishment of a permanent settlement or the carrying out of commercial activities by nationals of a country on a celestial body may constitute national appropriation if the activities take place under the supreme authority (sovereignty) of the state. Short of this, if the state wields no exclusive authority or jurisdiction in relation to the area in question, the answer would seem to be in the negative, unless, the nationals also use their individual appropriations as cover-ups for their state's activities.5 In this connection, it should be emphasized that the word "appropriation" indicates a taking which involves something more than just a casual use. Thus a temporary occupation of a landing site or other area, just like the temporary or nonexclusive use of property, would not constitute appropriation. By the same token, any use involving consumption or taking with intention of keeping for one's own exclusive use would amount to appropriation.

#### Violation: megaconstellations are not appropriation. Williams 95:

Christopher D. Williams, Space: The Cluttered Frontier, 60 J. Air L. & Com. 1139 (1995) https://scholar.smu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1384&context=jalc

Article II of the treaty allows for a more interesting argument. This article states, "[o] uter space.., is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means." 68 In a sense, space debris may constitute a form of appropriation of outer space. Because two objects cannot occupy the same space (orbit) at the same time, placing debris in space removes the possibility of another object using that location.69 This approach is related to the view of outer space as a commons. Some argue that Articles I and II of the Outer Space Treaty provide a structure for use of outer space similar to a terrestrial commons, thus encouraging spacefaring nations to take maximum advantage of the resource of space in the shortest time possible. 70 As with a terrestrial commons, the use or consumption of the resource by one party necessarily precludes that use by another member of the commons. Thus, the placement of debris in orbit may in fact constitute an appropriation. However, as in the case of accidental fragmentary debris, this appropriation may be entirely out of the control of any party. In addition, if the premise of the argument is valid, then any space object, not just space debris, would constitute an appropriation of outer space in violation of Article II. This clearly was not intended by the drafters of the treaty.

#### Vote neg – two impacts:

#### Limits. Expanding the topic to anything that involves merely launching something into the atmosphere expands the topic into numerous new tech areas which undermines core neg prep.

#### Topic literature. Our definition has intent to define and exclude in the context of the OST, which is the core of all topic research and the only predictable source.

#### Cross-apply the paradigm issues from the first shell

# CASE

1. **No solvency – they have no evidence that says being able to see an asteroid will allow us to drag the Earth out of its path**

#### Ground-based observatories already can’t see because of the sun, no impact to asteroid collision, and turn – satellites are key for asteroid detection. Blumberg 19:

Nick Blumberg { Public Insight Journalist Nick Blumberg (Phoenix) has served as an Associate Producer for KJZZ’s Here and Now, a news and public affairs talk show covering the Phoenix area. He grew up on the far North Side of Chicago, and has been a news junkie as long as he can remember. He moved to Arizona to attend the Walter Cronkite School of Journalism at Arizona State University, graduating magna cum laude. He was part of the Murrow and PRNDI-award winning team at KJZZ that covered Arizona’s controversial SB 1070 anti-immigration law throughout 2010.}, 19 - ("How Satellites Can Detect and Protect Earth From Asteroids," WTTW News, 9-10-2019, https://news.wttw.com/2019/09/10/how-satellites-can-detect-and-protect-earth-asteroids)//marlborough-wr/

This week, scientists from NASA, the European Space Agency and other institutions will gather at a conference in Italy, where they’ll be looking at a bold proposal to use two spacecraft to deflect an asteroid. That planetary defense plan is one of many worldwide efforts to ensure that Earth remains safe from collisions. While ground-based observatories have done great work in detecting asteroids, Adler Planetarium astronomer Mark Hammergren says they’re stymied by the bright light of the sun and that an infrared satellite orbiting Earth would be a more valuable sentry. “Out in space there’s no atmosphere, so you can look closer to the sun,” Hammergren said. “You can find what we think is an almost entirely unknown population of hazardous asteroids orbiting closer to the sun than us and every once in a while crossing our path.” Why infrared? Hammergren says it’s because darker asteroids are harder to detect visually. “If you have … a dark car sitting in the summer sun, it gets hotter than the white car next to you. The darker car – or darker asteroid – will emit more infrared light, so they appear brighter.” While Hammergren thinks a satellite to detect asteroids is valuable, he also advises people not to worry too much about Armageddon scenarios. “We have found virtually all of the large asteroids that could cause mass extinctions on Earth and not a single one of them is going to hit the Earth for at least a thousand years in the future,” Hammergren said. “It’s probably one of the greatest unsung victories that NASA and maybe even civilization has accomplished.”

1. **Ozone depletion non-unique – their Voosen card is all about how global warming is already tearing a hole**
2. **Probability – 0.1% chance of a collision.**

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

The probability of a collision is currently **low**. Bradley and Wein estimate that the **maximum probability** in LEO of a collision over the lifetime of a spacecraft remains **below one in one thousand**, conditional on continued compliance with NASA’s deorbiting guidelines.3 However, the possibility of a future “snowballing” effect, whereby debris collides with other objects, further congesting orbit space, remains a significant concern.4 Levin and Carroll estimate the average immediate destruction of wealth created by a collision to be approximately $30 million, with an additional $200 million in damages to all currently existing space assets from the debris created by the initial collision.5 The expected value of destroyed wealth because of collisions, currently small because of the low probability of a collision, can quickly become significant if future collisions result in runaway debris growth.

1. **Time frame – Kessler effect 200 years away.**

Peter **Stubbe**, PhD in law @ Johann Wolfgang Goethe University Frankfurt, **’17**, State Accountability for Space Debris: A Legal Study of Responsibility for Polluting the Space Environment and Liability for Damage Caused by Space Debris, Koninklijke Brill Publishing, ISBN 978-90-04-31407-8, p. 27-31

The prediction of possible scenarios of the future evolution of the debris p o p ulation involves many uncertainties. Long-term forecasting means the prediction of the evolution of the future debris environment in time periods of decades or even centuries. Predictions are based on models84 that work with certain assumptions, and altering these parameters significantly influences the outcomes of the predictions. Assumptions on the future space traffic and on the initial object environment are particularly critical to the results of modeling efforts.85 A well-known pattern for the evolution of the debris population is the so-called Kessler effect’, which assumes that there is a certain collision probability among space objects because many satellites operate in similar orbital regions. These collisions create fragments, and thus additional objects in the respective orbits, which in turn enhances the risk of further collisions. Consequently, the number of objects and collisions increases exponentially and eventually results in the formation of a self-sustaining debris belt around the Earth. While it has long been assumed that such a process of collisional cascading is likely to occur only in a very long-term perspective (meaning a time 1 n of several hundred years),87 a consensus has evolved in recent years that an uncontrolled growth of the debris population in certain altitudes could become reality much sooner.88 In fact, a recent cooperative study undertaken by various space agencies in the scope of i a d c shows that the current l e o debris population is unstable, even if current mitigation measures are applied. The study concludes:

Even with a 90% implementation of the commonly-adopted mitigation measures [...] the l e o debris population is expected to increase by an average of **30% in the next 200 years.** The population growth is primarily driven by catastrophic collisions between 700 and 1000 km altitudes and such collisions are likely to occur every 5 to 9 years.89

1. **Space debris is hype---there are thousands of satellites and only 15 debris collisions ever**

Mark **Albrecht 16**, Chairman of the board of USSpace LLC & fmr. head of the National Space Council, “Congested space is a serious problem solved by hard work, not hysteria, 5/9/16, https://spacenews.com/op-ed-congested-space-is-a-serious-problem-solved-by-hard-work-not-hysteria/

There are over a half million pieces of human-made material in orbit around our planet. Some are the size of school buses, some the size of BB gun pellets. They all had a function at some point, but now most are simply space debris littered from 100 to 22,000 miles above the Earth. Yet, all behave perfectly according to the laws of physics. Many in the space community have called the collision hazard caused by space debris a crisis.

Popular culture has embraced the risks of collisions in space in films like Gravity. Some participants have dramatized the issue by producing graphics of Earth and its satellites, which make our planet look like a fuzzy marble, almost obscured by a dense cloud of white pellets meant to conceptualize space congestion.

Unfortunately, for the sake of a good visual, satellites are depicted as if they were hundreds of miles wide, like the state of Pennsylvania (for the record, there are no space objects the size of Pennsylvania in orbit). Unfortunately, this is the rule, not the exception, and almost all of these articles, movies, graphics, and simulations are **exaggerated and misleading**. Space debris and collision risk is real, but it **certainly** is **not a crisis.**

So what are the facts?

On the positive side, space is **empty** and it is **vast**. At the altitude of the International Space Station, **one half a degree** of Earth longitude is almost **40 miles long**. That same one half a degree at geostationary orbit, some 22,000 miles up is over 230 miles long. Generally, we don’t intentionally put satellites closer together than one-half degree. That means at geostationary orbit, they are no closer than 11 times as far as the eye can see on flat ground or on the sea: That’s the horizon over the horizon 10 times over. In addition, other than minute forces like solar winds and sparse bits of atmosphere that still exist 500 miles up, **nothing gets in the way of orbiting objects** and **they behave quite predictably**. The location of the smallest spacecraft can be predicated within a 1,000 feet, 24 hours in advance.

Since we first started placing objects into space there have been 11 known low Earth orbit collisions, and three known collisions at geostationary orbit. Think of it: 135 space shuttle flights, all of the Apollo, Gemini and Mercury flights, **hundreds** of telecommunications satellites, **1,300 functioning satellites** on orbit today, **half a million** total objects in space larger than a marble, and **fewer than 15 known collisions**. **Why** do people **worry?**

#### No debris cascades—This ev answers all aff warrants

Fange 2017 (Daniel Von Fange, 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/)

Kessler Syndrome is overhyped. A chorus of online commenters great any news of upcoming low earth orbit satellites with worry that humanity will to lose access to space. I now think they are wrong.

What is Kessler Syndrome?

Here’s the popular view on Kessler Syndrome. Every once in a while, a piece of junk in space hits a satellite. This single impact destroys the satellite, and breaks off several thousand additional pieces. These new pieces now fly around space looking for other satellites to hit, and so exponentially multiply themselves over time, like a nuclear reaction, until a sphere of man-made debris surrounds the earth, and humanity no longer has access to space nor the benefits of satellites.

It is a dark picture.

Is Kessler Syndrome likely to happen?

I had to stop everything and spend an afternoon doing back-of-the-napkin math to know how big the threat is. To estimate, we need to know where the stuff in space is, how much mass is there, and how long it would take to deorbit.

The orbital area around earth can be broken down into four regions.

Low LEO - Up to about 400km. Things that orbit here burn up in the earth’s atmosphere quickly - between a few months to two years. The space station operates at the high end of this range. It loses about a kilometer of altitude a month and if not pushed higher every few months, would soon burn up. For all practical purposes, Low LEO doesn’t matter for Kessler Syndrome. If Low LEO was ever full of space junk, we’d just wait a year and a half, and the problem would be over.

High LEO - 400km to 2000km. This where most heavy satellites and most space junk orbits. The air is thin enough here that satellites only go down slowly, and they have a much farther distance to fall. It can take 50 years for stuff here to get down. This is where Kessler Syndrome could be an issue.

Mid Orbit - GPS satellites and other navigation satellites travel here in lonely, long lives. The volume of space is so huge, and the number of satellites so few, that we don’t need to worry about Kessler here.

GEO - If you put a satellite far enough out from earth, the speed that the satellite travels around the earth will match the speed of the surface of the earth rotating under it. From the ground, the satellite will appear to hang motionless. Usually the geostationary orbit is used by big weather satellites and big TV broadcasting satellites. (This apparent motionlessness is why satellite TV dishes can be mounted pointing in a fixed direction. You can find approximate south just by looking around at the dishes in your northern hemisphere neighborhood.) For Kessler purposes, GEO orbit is roughly a ring 384,400 km around. However, all the satellites here are moving the same direction at the same speed - debris doesn’t get free velocity from the speed of the satellites. Also, it’s quite expensive to get a satellite here, and so there aren’t many, only about one satellite per 1000km of the ring. Kessler is not a problem here.

How bad could Kessler Syndrome in High LEO be?

Let’s imagine a worst case scenario.

An evil alien intelligence chops up everything in High LEO, turning it into 1cm cubes of death orbiting at 1000km, spread as evenly across the surface of this sphere as orbital mechanics would allow. Is humanity cut off from space?

I’m guessing the world has launched about 10,000 tons of satellites total. For guessing purposes, I’ll assume 2,500 tons of satellites and junk currently in High LEO. If satellites are made of aluminum, with a density of 2.70 g/cm3, then that’s 839,985,870 1cm cubes. A sphere for an orbit of 1,000km has a surface area of 682,752,000 square KM. So there would be one cube of junk per .81 square KM. If a rocket traveled through that, its odds of hitting that cube are tiny - less than 1 in 10,000.

So even in the worst case, we don’t lose access to space.

Now though you can travel through the debris, you couldn’t keep a satellite alive for long in this orbit of death. Kessler Syndrome at its worst just prevents us from putting satellites in certain orbits.

In real life, there’s a lot of factors that make Kessler syndrome even less of a problem than our worst case though experiment.

* Debris would be spread over a volume of space, not a single orbital surface, making collisions orders of magnitudes less likely.
* Most impact debris will have a slower orbital velocity than either of its original pieces - this makes it deorbit much sooner.
* Any collision will create large and small objects. Small objects are much more affected by atmospheric drag and deorbit faster, even in a few months from high LEO. Larger objects can be tracked by earth based radar and avoided.
* The planned big new constellations are not in High LEO, but in Low LEO for faster communications with the earth. They aren’t an issue for Kessler.
* Most importantly, all new satellite launches since the 1990’s are required to include a plan to get rid of the satellite at the end of its useful life (usually by deorbiting)

So the realistic worst case is that insurance premiums on satellites go up a bit. Given the current trend toward much smaller, cheaper micro satellites, this wouldn’t even have a huge effect.

I’m removing Kessler Syndrome from my list of things to worry about.