### 1NC - OFF

#### CP: States ought to:

#### -- Announce that the appropriation of outer space by private entities via Large Satellite Constellations in Lower Earth Orbit violates the Outer Space Treaty and that this is a settled matter of customary international law

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

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

#### Solves the Aff.

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

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

#### That competes –

#### 1 -- CX is binding

#### 2 -- Treaties are the foundation of space law.

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

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

#### We solve better:

#### 1 -- CIL is far superior to treaties for space AND causes follow-on.

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

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

Finally, the Article concludes with some policy recommendations, suggesting mechanisms for the world community to press forward with autonomous efforts to promote stability and security in outer space, even in the face of recalcitrance from the leading space powers. I would certainly support the negotiation and implementation of a comprehensive new treaty to prevent an arms race in outer space, and a carefully drafted, widely accepted accord could accomplish much, well beyond what customary law alone could create. But the treaty process, too, has costs and disadvantages, and the world need not pursue just one of these alternatives in isolation.

If the absence of global consensus currently inhibits agreements that countries could already sign, perhaps the world community can nevertheless get some "satisfaction" via the operation of CIL, constructing a similar (although not completely equivalent) edifice of international regulation of ASATs based simply on what countries do.

#### 2 -- Rollback---treaties can be withdrawn or refused---CIL is durable even in a world of say no

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

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

At the other end of the timeline, a CIL rule would also continue to apply to any State that initially joined a treaty, but later changed its mind and decided to withdraw from it.257 Treaty withdrawals are rare, but the United States' 2002 pullout from the 1972 Anti-Ballistic Missile Treaty and North Korea's 2003 withdrawal from the 1968 Non-Proliferation Treaty suggest that this is no longer a trivial consideration. Similarly, if a treaty party exercises its right to "suspend" temporarily the operation of a treaty (as, for example, in response to another party's material breach of the obligations), any underlying CIL obligations could still be applicable.

#### 3 -- Scope---CIL doesn’t rely on countries saying yes

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

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

D. Customary International Law and Treaties

Although treaties and customary international law norms are of equivalent legal weight, there is one sense in which CIL is even more assertive and far-reaching than the written instruments. That is, once a CIL norm is established (through the above-described arcane objective and subjective criteria), it becomes automatically binding on all States even those that did not participate in the emerging pattern, that may not have been fully cognizant that a trend was developing, and that may not be fully supportive of the rule, if they took the occasion to think about it seriously. In fact, new countries (e.g., former colonies) that were not even in existence at the time a prior CIL norm had emerged are nonetheless bound by it-a new State may have some ability to pick and choose which treaty obligations of its former regime should continue to apply to the new entity, but it is generally deemed to have consented automatically to the entire corpus of CIL that exists on the date of its independence.38

The only exemption from CIL is available to a "persistent objector." That is, a State that publicly and consistently repudiates a newly arising norm of CIL, from the time that it emerges through its effectuation as law, is not bound by it. There are, however, few examples of successful invocation of this exception; it is rare for a State to be sufficiently prescient and conscientious to preserve its autonomy as a new CIL rule advances.'39

In contrast, of course, any State may avoid any treaty obligation simply by deciding not to sign or ratify it. Treaties rarely directly implicate the rights and responsibilities of non-parties, and passivity or inaction therefore results in the absence of legal responsibility. With CIL, on the other hand, the "default position" is reversed.

#### Reasonability- persuasive defense on theory means you ignore it- theory requires abandoning substance to set a norm, which means the benefit of that norm must outweigh voting on theory instead of substance.

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#### The plan requires clarifying international space law---causes strategic bargaining to extract concessions

Alexander William Salter 16, Assistant Professor of Economics, Rawls College of Business, Texas Tech University, "SPACE DEBRIS: A LAW AND ECONOMICS ANALYSIS OF THE ORBITAL COMMONS", 19 STAN. TECH. L. REV. 221 (2016), https://law.stanford.edu/wp-content/uploads/2017/11/19-2-2-salter-final\_0.pdf

V. MITIGATION VS. REMOVAL

Relying on international law to create an environment conducive to space debris removal initially seems promising. The Virginia school of political economy has convincingly shown the importance of political-legal institutions in creating the incentives that determine whether those who act within those institutions behave cooperatively or predatorily.47 In the context of space debris, the role of nation-states, or their space agencies, would be to create an international legal framework that clearly specifies the rules that will govern space debris removal and the interactions in space more generally. The certainty afforded by clear and nondiscriminatory48 rules would enable the parties of the space debris “social contract” to use efficient strategies for coping with space debris. However, this ideal result is, in practice, far from certain. To borrow a concept from Buchanan and Tullock’s framework,49 the costs of amending the rules in the case of international space law are exceptionally high. Although a social contract is beneficial in that it prevents stronger nation-states from imposing their will on weaker nation-states, it also creates incentives for the main spacefaring nations to block reforms that are overall welfare-enhancing but that do not sufficiently or directly benefit the stronger nations.

The 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (more commonly known as the Outer Space Treaty) is the foundation for current international space law.50 All major spacefaring nations are signatories. Article VIII of this treaty is the largest legal barrier to space debris removal efforts. This article stipulates that parties to the treaty retain jurisdiction over objects they launch into space, whether in orbit or on a celestial body such as the Moon. This article means that American organizations, whether private firms or the government, cannot remove pieces of Chinese or Russian debris without the permission of their respective governments. Perhaps contrary to intuition, consent will probably not be easy to secure.

A major difficulty lies in the realization that much debris is valuable scrap material that is already in orbit. A significant fraction of the costs associated with putting spacecraft in orbit comes from escaping Earth’s gravity well. The presence of valuable material already in space can justifiably be claimed as a valuable resource for repairs to current spacecraft and eventual manufacturing in space. As an example, approximately 1,000 tons of aluminum orbit as debris from the upper stages of launch vehicles alone. Launching those materials into orbit could cost between $5 billion and $10 billion and would take several years.51 Another difficulty lies in the fact that no definition of space debris is currently accepted internationally. This could prove problematic for removal efforts, if there is disagreement as to whether a given object is useless space junk, or a potentially useful space asset. Although this ambiguity may appear purely semantic, resolving it does pose some legal difficulties. Doing so would require consensus among the spacefaring nations. The negotiation process for obtaining consent would be costly.

Less obvious, but still important, is the 1972 Convention on International Liability for Damage Caused by Space Objects, normally referred to as the Liability Convention. The Liability Convention expanded on the issue of liability in Article VII of the Outer Space Treaty. Under the Liability Convention, any government “shall be absolutely liable to pay compensation for damage caused by its space objects on the surface of the Earth or to aircraft, and liable for damage due to its faults in space.”52 In other words, if a US party attempts to remove debris and accidentally damages another nation’s space objects, the US government would be liable for damages. More generally, because launching states would bear costs associated with accidents during debris removal, those states may be unwilling to participate in or permit such efforts. In theory, insurance can partly remediate the costs, but that remediation would still make debris removal engagement less appealing.

A global effort to remediate debris would, by necessity, involve the three major spacefaring nations: the United States, Russia, and China.53 However, any effort would also require—at a minimum—a significant clarification and—at most —a complete overhaul of existing space law.54 One cannot assume that parties to the necessary political bargains would limit parleying to space-related issues. Agreements between sovereign nation-states must be self-enforcing.55 To secure consent, various parties to the change in the international legal-institutional framework may bargain strategically and may hold out for unrelated concessions as a way of maximizing private surplus. The costs, especially the decision-making costs, of changing the legal framework to secure a global response to a global commons problem are potentially quite high.

#### The US will use that opportunity to push Artemis Accords and bilateralization – undermines multilateral space law.

Wall 20 – Senior Space Writer with Space.com, former herpetologist and wildlife biologist, Ph.D. in evolutionary biology from the University of Sydney, Australia; citing Boley (Department of Physics and Astronomy, University of British Columbia, Vancouver) and Byers (Department of Political Science, University of British Columbia, Vancouver)

Mike Wall, 10-8-2020, “US policy could thwart sustainable space development, researchers say,” Space.com, https://www.space.com/us-space-policy-mining-artemis-accords DD

The United States' space policy threatens the safe and sustainable development of the final frontier, two researchers argue. The U.S. is pushing national rather than multilateral regulation of space mining, an approach that could have serious negative consequences, astronomer Aaron Boley and political scientist Michael Byers, both of the University of British Columbia in Vancouver, write in a "Policy Forum" piece that was published online today (Oct. 8) in the journal Science. Boley and Byers cite the 2015 passage of the Commercial Space Launch Competitiveness Act, which explicitly granted American companies and citizens the right to mine and sell space resources. That right was affirmed this past April in an executive order signed by President Donald Trump, they note. The researchers also point to NASA's announcement last month that it intends to buy moon dirt and soil collected by private companies, and its plan to sign bilateral agreements with international partners that want to participate in the agency's Artemis program of crewed lunar exploration. Artemis, one of NASA's highest-profile projects, aims to return astronauts to the moon in 2024 and establish a long-term, sustainable human presence on and around Earth's nearest neighbor by the end of the decade. Making all of this happen will require the extensive use of lunar resources, such as the water ice that lurks on the permanently shadowed floors of polar craters, NASA officials have said. Boley and Byers take special aim at the planned bilateral agreements, known as the Artemis Accords. In promoting them, the U.S. "is overlooking best practice with regard to the sustainable development of space," the researchers write. "Instead of pressing ahead unilaterally and bilaterally, the United States should support negotiations on space mining within the UN [United Nations] Committee on the Peaceful Uses of Outer Space, the same multilateral body that drafted the five major space treaties of the 1960s and '70s," they write in the Science piece. (The most important of the five is the 1967 Outer Space Treaty, which forms the basis of international space law.) "Meanwhile, NASA’s actions must be seen for what they are — a concerted, strategic effort to redirect international space cooperation in favor of short-term U.S. commercial interests, with little regard for the risks involved," Boley and Byers add. The researchers worry that the U.S. is setting an unfortunate precedent for other countries to follow, and that space mining and other exploration activities may therefore proceed in a somewhat careless and chaotic fashion in the not-too-distant future.

#### That returns space to might-makes-right imperial conflict.

O’Brien 20 – member of the International Institute of Space Law and founder of The Space Treaty Project, retired attorney and former member of the NASA-Hastings Law Project

Dennis O’Brien, 6-29-2020, “The Artemis Accords: repeating the mistakes of the Age of Exploration,” *The Space Review*, https://www.thespacereview.com/article/3975/1 DD

In the spring of 1493, the King and Queen of Spain sent an envoy to the Pope in Rome. Along with Portugal, Spain had just used its advanced sailing and navigation technology to reach “new worlds,” areas of the Earth that had not been previously discovered by Europeans. But they had a problem: they wanted to establish sovereign property rights in the lands they had discovered, but they weren’t sure they could do so under their own authority. So, they turned to the only international authority in Europe at that time, the Catholic Church, which held sway over governments from Portugal to Poland, from the Arctic to the Mediterranean. If the Church would establish a legal framework that granted them sovereignty, then those nations would be bound to recognize it.[2] This is the first lesson that the current governments of the world can learn from the Age of Exploration & Empire that began five centuries ago. Even then, the most powerful nation in Europe, with the largest army and most advanced technology, realized that it could not unilaterally establish property rights or any other kind of sovereignty without the approval of an international authority. After the Church granted that authority, Spain was able to create one of the greatest empires in history. Spain and Portugal formalized the arrangement with a binding international agreement, the Treaty of Tordesillas, whose purpose was to ensure peaceful cooperation between their nations, primarily by establishing a line of demarcation that separated their areas of activity.[3] Unfortunately, the legal framework so established was based on national dominance, not multilateral international cooperation. The grant of sovereignty was exclusive, made only to Spain and Portugal, and it required them to subjugate the “savages” in the lands they discovered by taking along Church missionaries. This exclusivity did not sit well with other nations as they also developed the technologies of exploration; it was one of the reasons many northern European nations joined the Protestant Reformation and rejected the authority of the Pope in Rome. Without a fair and equitable international agreement that honored the interests of emerging states, the Church lost its ability to act as an arbiter between nations. Even worse, the dominance model set up centuries of conflict among the major powers in Europe. Militant nationalism and economic colonialism became the principles guiding national policy. The result was centuries of war, suffering, and neglect among the major powers and the nations they subjugated. This pattern did not end until the 20th century, when the major powers fought two world wars and finally dismantled their colonial empires: sometimes peacefully, sometimes by force. By the mid-1960s, most countries on Earth were independent or on their way to becoming so. But a new conflict had started, one that threatened to repeat the mistakes of five centuries earlier. The great powers were once again using their advanced technology to explore new worlds, and the race was on to plant their flag on the Moon first. Under the ancient traditions, the country that did so would have a claim against all others for possession and use of the territory. The Cold War was about to expand into outer space. But then something wonderful happened. In 1967, the United Nations proposed, and the world’s space powers accepted, an international agreement known as the Outer Space Treaty.[4] The treaty was an intentional effort to avoid the mistakes of the Age of Exploration & Empire. Article I states, “The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.” Article II is even more specific: “Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.” Because of this treaty, the United States carried a plaque to the Moon that said, “We came in peace for all mankind.”[5] When the Apollo 11 astronauts planted the US flag, they did so out of pride, but did not establish any claim or national priority. This legal framework worked well initially, but people soon started wondering about what to do when countries or private entities wanted to start commercial activity on the Moon, or build settlements. The solution was the Moon Treaty, proposed by the United Nations and adopted by enough nations to come into force in 1984.[6] But it has not yet been adopted by any major spacefaring nation. The United States, by a recent executive order, has specifically renounced the treaty and stated its intentions to extract materials from the Moon without any international agreement.[7] The newly announced Artemis Accords go even further. Although the actual Accords have not been released pending consultation with possible partners, the summary provided by NASA[8] indicates that the United States will unilaterally interpret the Outer Space Treaty to allow “space resource extraction,” despite the prohibition against appropriation in Article II of the Treaty. There will also be “safety zones” to avoid “harmful interference” with such operations. The effect is to establish exclusive economic zones, especially if “harmful interference” is defined to include economic harm, not just safety. Will the new Space Force be used to protect such economic interests? Will other nations be excluded if they support the Moon Treaty?[9] Will private actors be required to follow the same rules as states, as recommended in the recently drafted Moon Village Principles?[10] This is the slippery slope of using unilateral action to establish economic rights rather than an international agreement. The Artemis Accords acknowledge many beneficial agreements and policies: The Outer Space Treaty, Rescue Agreement, and Registration Convention (though not the Liability Convention); peace, transparency, interoperability, protecting heritage sites and sharing scientific information. But its unilateral authorization of space mining is a continuation of the Trump Administration’s underlying foreign policy strategy: unilateral dominance over international cooperation. The United States has withdrawn from the Paris Accords, the Iranian nuclear deal, and, in the middle of a pandemic, the World Health Organization. Dominance has even become the theme of the administration’s domestic policy, with President Trump recently telling governors, “If you don't dominate, you're wasting your time… You have to dominate.”[11] That core philosophy is now being applied to outer space, as Vice President Mike Pence proudly announced in 2018. Despite the lessons of history, the United States is going full speed ahead with the “dominance” model of space development rather than working with the nations of the world to develop a “cooperation” model. Outer space, which so far has been preserved for peace and cooperation, is about to be spoiled, perhaps forever.

#### Goes nuclear – space conflict is uniquely escalatory.

Farley 22 – PhD, Senior Lecturer at the Patterson School at the University of Kentucky

Robert Farley, 1-9-2022, “Does A Space War Mean A Nuclear War?” 1945, https://www.19fortyfive.com/2022/01/does-a-space-war-mean-a-nuclear-war/ DD

The recent Russian anti-satellite test didn’t tell the world anything new, but it did reaffirm the peril posed by warfare in space. Debris from explosions could make some earth orbits remarkably risky to use for both civilian and military purposes. But the test also highlighted a less visible danger; attacks on nuclear command and control satellites could rapidly produce an extremely dangerous escalatory situation in a war between nuclear powers. James Acton and Thomas Macdonald drew attention to this problem in a recent article at Inside Defense. As Acton and MacDonald point out, nuclear command and control satellites are the connective tissue of nuclear deterrence, assuring countries that they’re not being attacked and that they’ll be able to respond quickly if they are. For a long time, these strategic early-warning satellites were akin to a center of gravity in ICBM warfare. Nuclear deterrence requires awareness that an attack is underway. Attacks on the monitoring system could easily be read as an attempt to blind an opponent in preparation for general war, and could themselves incur nuclear retaliation. Thus, the nuclear command and control satellites are critical to the maintenance of nuclear deterrence. They make it possible to distribute an order from the chief of government to the nuclear delivery systems themselves. Consequently, their destruction might lead to hesitation or delay in performing a nuclear launch order. It was only later that the relevance of satellites for conventional warfare became clear. Satellites could reconnoiter enemy positions and, more importantly, provide communications for friendly forces. Indeed, the expansion of the role of satellites in conventional warfare has complicated the prospect of space warfare. States have a clear reason for targeting enemy satellites which support conventional warfare, as those satellites enable the most lethal part of the kill chain, the communications and recon networks that link targets with shooters. Thus, we now have a situation in which space military assets have both nuclear and conventional roles. In a conflict confusion and misperception could rapidly become lethal. If one combatant views an attack against nuclear command and control as a prelude to a general nuclear attack, it might choose to pre-empt. Nuclear powers have dealt with problems in this general category for a good long while; would a conventional attack against tactical nuclear staging areas represent an escalation, for example? Would the use of ballistic missiles that can carry either conventional or nuclear weapons trigger a nuclear response? Do attacks against air defense networks that have both strategic and tactical responsibilities run the risk of triggering a nuclear response? There’s also the danger that damage to communications networks designated for conventional combat could force traffic onto the nuclear control systems, further confusing the issue. No one has ever fought a nuclear war, and no two nuclear powers have engaged in a prolonged, high-intensity conventional conflict. Now that conventional systems have become implicated in space technologies for reconnaissance, targeting, and communications, leaders will have to make very difficult, very careful decisions on what enemy capabilities they want to disrupt. Acton and MacDonald propose a straightforward ban on attacks against nuclear satellite infrastructure, which would also require agreement to keep nuclear and conventional communications networks separate. This is the little ask; countries should plan to fight more carefully. The big ask is for a multilateral ban to prevent future anti-satellite weapons tests in space. This would reduce the danger that debris could close off, temporarily or permanently, human access to certain locations in earth orbit. But given that countries use satellites for the conduct of conventional military operations, it’s a lot to ask for warfighters to consider critical military infrastructure off-limits in any particular conflict.

### 1NC - OFF

#### Global shipping is recovering now, but it’s tenuous – disruptions could collapse a uniquely fragile global shipping system

Fullard 1/4/22 (Matt, Business Development Director Noatum Logistics UK, BRC, "Pandemic Supply Chain Problems Won't Be Easily Fixed and May Continue," <https://brc.org.uk/news/the-retailer/pandemic-supply-chain-problems-won-t-be-easily-fixed-and-may-continue/> DD)

The world’s economy depends on global supply chains, but the pandemic is undermining the global infrastructure that supports supply chains, and trouble looks likely to continue well into 2022, with some expectation that disruption could continue into 2023. The continued disruption of supply chains explains why eCommerce orders are taking longer to arrive, why there’s empty store shelves, and why purchases may take months instead of weeks to arrive. This unprecedented situation is causing prices to rise at one of the fastest rates in a decade, contributing to inflation on a global scale. THE CAUSES The disruption began with the economic upheaval of the pandemic. But it is now being made worse by the strength of the economic rebound, a shortage of workers, and a transportation system that is overstressed. Last year when consumers were locked down, no longer able to spend money on going out and services, they spent instead on clothing, products and electronic goods. Having laid up vessels when China first locked down last January, the shipping lines were unprepared to deal with the sudden (and sustained) consumer-driven demand for space that began in the 2nd quarter, especially with many of their empty containers out of position. The situation was exacerbated by the shortage of supply chain workers, owing to COVID and COVID-safe working practices, which is when ports, inland terminals and warehouses began to get congested. The global fleet of passenger aircraft were grounded at the beginning of the pandemic, removing over 50% of (belly-hold) cargo capacity at a stroke, crippling the time-sensitive mode and pushing even more demand to the ocean mode. DISRUPTION Usually interruptions to global shipping are overcome without lasting impact, but with supply chain operations so disrupted, since the beginning of 2020, even the slightest issue is having a disproportionate impact, with ripple effects, that spread disruption much wider than normal. In March, the EverGiven blocked the Suez Canal, disrupting trade flows between Asia and Europe, then COVID cases forced a partial shutdown of Shanghai, one of the world’s largest ports, followed by Ningbo, the second largest container port. Rolling lockdowns have shut down swathes of Asia, with parts of China entering lockdown, then opening, just to be shut down again and now factories in mainland China, are struggling with a series of power shortages. Laden container ships are idle, waiting for berth space at ports in North America, Asia and Europe, with schedule reliability at all-time lows and shipping lines skipping the busiest ports. The effect of this disruption is cumulative and it comes as volumes continue to rebound due to the strong recovery in Europe and North America. It is effectively reducing capacity across the container supply chain by substantially slowing the movement of vessels and containers around the world. With limited capacity and sustained high demand, supply and demand has pushed freight rates to levels never seen before, and as that additional cost is inevitably passed on, inflation increases. Shipping containers have become scarce. They may be sitting unopened for a week or two and thus cannot be put to work for another shipment, which is why lines have begun to restrict free time and enforce demurrage contracts. The problem is compounded by the HGV crisis and shortage of truck drivers available for container transport, with bookings made weeks in advance and containers still waiting to be picked up. Obtaining vessel space continues to be challenging, with delays along the supply chain and high-cost levels, that may be impacted further by peak season traffic. OUTLOOK New-build container vessels will start to come on stream from next year, though it should be noted that much of this new capacity could reignite the current global port disruption, because many ports do not have the infrastructure, cranes, equipment or capability to handle Ultra Large Container Ship (ULCS) vessels, that carry more than 20,000 containers. And with just 9 shipping lines, across 3 alliances, controlling over 90% of global trade, managing their capacity effectively means they will enter the post-pandemic era in a much stronger position and ensure they maintain healthy returns. With air passenger travel gradually reopening, more belly-hold capacity will become available on long-haul routes, including the critical trans-Atlantic and Asian routes. Sea and air freight will eventually come back into balance, but for now the pandemic’s consequences will be measured in shipping costs, prices, inflation and in delays. The pandemic supply chain challenges that have driven up prices for consumers and slowed the global economic recovery, will lessen in time. But recovery remain tenuous and easily set back by unseen events and weak links, like the shortage of HGV drivers in the UK and China’s drive for zero COVID cases. By 2023 (or even possibly late 2022) the COVID19 situation should be under control and consumer demand settled, providing stability in global shipping.

#### Megaconstellations create more autonomous communication systems globally which is key for accurate and immediate data transmission

Poole et al 21 (Carl, Captain USSF and orbital analyst and holds a master of science from the Air Force Institute of Technology, Robert Bettinger, Major USAF and assistant professor of astronautical engineering and curriculum chair for the astronautical engineering degree program at the Air Force Institute of Technology, Mark Reith, adjunct professor of systems engineering Air Force Institute of Technology, Air & Space Power Journal, "Shifting Satellite Control Paradigms: Operational Cybersecurity in the Age of Megaconstellations," <https://www.airuniversity.af.edu/Portals/10/ASPJ/journals/Volume-35_Issue-3/T-Poole.pdf> DD)

The development of constellations consisting of thousands of individual satellites controlled by one operator is no longer a wistful dream of science fiction or avant-garde technologists. With the introduction of LEO constellations such as “Starlink” or “OneWeb,” the concept of megaconstellations is becoming a reality, precipitating the rise of megaconstellations as a potential means to provide regional and global telecommunications services.3 In Asia, China Telecom reportedly plans to create a 10,000-satellite megaconstellation called “China StarNet” in the next 5−10 years.4 In late 2020, the European Union revealed plans to initiate a program to develop a telecommunications megaconstellation to establish “European digital sovereignty.”5 The proliferation of LEO with tens of thousands of satellites will require increasing levels of automation to handle intraconstellation operations and to enable future constellation growth and system safety in a given orbital altitude regime. The creation of megaconstellations is the result of two factors. First, the shift in the commercial space industry to create standardized, rapidly produced, and highvolume space-capable vehicles has caused both the size and cost of individual satellites to decrease drastically.6 The ability to buy commercial-off-the-shelf components instead of making proprietary hardware lowers the cost of research and development, thus accelerating system production. The second factor is a function of satellite size. As the satellite form factor decreases, more satellites can fit inside the payload fairing of a single launch vehicle, which, in turn, drives down the cost per satellite to reach orbit. Overall, the costs of satellite design, production, and space launch are decreasing, thus allowing for the nearly exponential proliferation of near-Earth orbital regimes. Consequently, the increase in satellites will lead to an escalation of costs associated with operations if the current satellite control paradigm does not evolve to meet the challenges of proliferated orbits. The evolution of satellite control from human-in-the-loop commands to automation will require the megaconstellation, in concert with the ground communications networks, to deconflict satellite pass times over receiver antennas at specified ground stations.7 By definition, a “pass time” is the time each satellite needs to downlink, or transmit, data to the ground antenna, as well as to uplink, or receive, commands from the ground station. Depending on the mission and amount of information transmitted, timing is critical. In addition, the orbital altitude of a given satellite determines the access durations to each ground antenna: the lower the satellite altitude, the faster the satellite passes over a given point on the ground. This planning will be increasingly important as the communication bandwidths become more crowded due to more satellites flying within the ground receiver’s view. Since the early twenty-first century, an increase in CPU power has enabled the addition of programmable capabilities to onboard satellite subsystems.8 A growing number of satellites are now being equipped with onboard systems that resemble a standard personal computer.9 This design architecture, in turn, increases reliability. A satellite’s onboard system can now identify and correct for faults and adapt to changing parameters much faster than a human-in-the-loop system.10 A human-in-the-loop system is comparatively slower due to data transmission and analysis delays and the need for an extra layer of review to verify the correctness and validity of planned operations before command uplink. One of the most common satellite-control tasks is that of station keeping or maintaining a satellite’s predetermined, mission-centric orbital attitude and position. For megaconstellations, an attitude determination and control system may control all station-keeping operations. Due to an increase in ground-station demand resulting from a vastly greater number of contacts, each satellite will have to determine correct orbital attitude and position deviations autonomously to ensure continued constellation stability and mission functionality and to reduce the likelihood of satellite collisions.11 Shifting such attitude and orbit maintenance tasks away from the ground segment, however, will require the introduction of a robust fault- and error-alert architecture to identify and notify the human satellite operators of any anomalous events. Ultimately, raising more house-keeping commands into the purview of control automation will shift the satellite maintenance workload from continuous hands-on, day-to-day human operations to an on-call, human-response control structure. Greater automation will also remove the likelihood of an incomplete command sent by human operators or the need to check for unsafe commands before data uplink.12

#### That is key to the maritime industry – avoids accidents and provides necessary logistical support

Heinrich et al 21 (David, Human Factors Ph.D. candidate at Capitol Technology University. His professional background spans over 19 years in the United States Air Force as a fighter avionics technician, instructor, and satellite operations professional, Ian McAndrew, Dean of Doctoral Programs at Capitol Technology University. He has taught in universities worldwide and is a frequent keynote speaker at many International Conferences. He is a Fellow of the Royal Aeronautical Society and Chartered Mechanical and Electrical Engineer in the U.K, and Jeremy Pretty, Senior Program Manager with the United States Air Force Civil Service. His professional background includes over 15 years in program/project/product management within the U.S. Department of Defence on Aircraft and Information Technology systems, International Journal of Managing Information Technology Vol 13 No 3 August 2021, "HUMAN FACTORS CONSIDERATIONS IN SATELLITE OPERATIONS HUMAN-COMPUTER INTERACTION TECHNOLOGIES: A REVIEW OF CURRENT APPLICATIONS AND THEORY," <https://arxiv.org/ftp/arxiv/papers/2110/2110.04880.pdf> DD)

According to Årstad and Aven, complacency is “unintentional unawareness [which can only be diagnosed] in hindsight, from a distanced perspective” [20, p. 115]. The National Aeronautics and Space Administration (NASA) defines complacency as “overconfidence from repeated experience on a specific activity, complacency has been implicated as a contributing factor in numerous aviation accidents and incidents” [21, p. para.1]. Parasuraman et al. [22] referenced the prevalence of complacency throughout multiple aviation accident investigations lending credence to the importance of Dupont’s “Dirty Dozen” [4]. Prinzel cited crew complacency as often being “a contributing factor in aviation accidents” [23, p. 4]. Merritt et al. referenced “complacency, or sub-optimal monitoring of automation performance, [as being] cited as a contributing factor in numerous major transportation and medical incidents” [24, p. 1]. Overconfidence in highly reliable automated systems often leads to complacency issues [22].Complacency is often cited alongside boredom and procrastination[21, 23] . Prinzel found that those with low self-efficacy “suffered automation-induced complacency” and operated significantly better when working in high workload environments[25, p. 13]. Furthermore, Prinzel [23] also found that pilot workload over-saturation can increase, leading to an overburdened cognitive load. Conversely, boredom has been shown to increase when the operator defers to the machine due to the repetitive nature of automated tasks in a cognitively low-demand environment [26]. Aviation human factors incidents involving pilot complacency have been attributed to a failure to adequately correct automation errors [22, 24, 27]. Merritt et al. [24] highlighted that complacency could manifest due to a person’s inability to comprehend the occurrence of an error or exhibit a prolonged response to an error or stimuli. Beyond prolonged reaction to an automation failure, failing to act may be attributed to both commission and omission errors [23, 24, 28].Errors of commission happen when the HITL makes a mistake or error due to incorrect decision-making. Errors of omission occur when the human does nothing when they should have[24, 29]. Complacency research pertaining to maritime shipping operations identifies similar outcomes, which serves to highlight Dupont’s “Dirty Dozen” [4, 30]. Attempting to fill gaps in maritime research, Bielic et al.[31]studied technology, leadership, management, and self-induced complacency during their study of complacency in maritime accidents. Bielic et al.[31]cite research by Turan et al.[30], who found that over 80% of maritime shipping incidents were attributable to human or organizational error, of which 6% could be attributed to complacency. The research referenced an overreliance on automation as a leading cause of technology complacency. Furthermore, leadership complacency may increase the risk of complacency in the same manner as poor team dynamics, toxic hierarchy, and steep authority gradient, as seen in aviation sources [31]. Leadership complacency occurs when the leader or manager possesses an inadequate leadership style. Workers may become apprehensive about going totheir leadership out of fear of being ignored or potential mistreatment[31]. Alternatively, leadership complacency may occur when leaders are not professionally challenged during critically sensitive moments. During the events leading up to the Chernobyl disaster, workers were discouraged from having a questioning attitude, and the overall lack of open communication resulted in increased loss of life due to the amount of time it took the workers to react to the situation[31, 32]. Satellite operations assets rely on a system-of-systems to provide autonomy due to the inherent complexity of satellite electronics and the inability to conduct on-orbit servicing. Due to this complexity, human satellite operators and the spacecraft, or autonomous agent, function as a team [33]. While not explicitly stated, the concept of human operators and autonomous agents working together points to the idea of crew resource management (CRM), where both entities operate as a crew working toward a common goal [34, 35, 36, 37]. Communication between the autonomous agent and humans exists within the environment, as seen in the human factors SHELL model where the liveware, hardware, and software work together [18].Complacency may occur due to automation bias when humans defer decision-making and authority to more complex autonomous agents [38]. Lyell and Coiera [38]found that task complexity and difficulty play a significant role in automation bias due to the level of difficulty present when monitoring and interpreting automated aids in the healthcare field.

#### Container shipping collapse triggers deglobalization

Economist 21 (Economist, “A perfect storm for container shipping Will prolonged disruptions shift the pattern of trade?”, <https://www.economist.com/finance-and-economics/a-perfect-storm-for-container-shipping/21804500>, September 18, 2021 DD)

A GIANT SHIP wedged across the Suez canal, record-breaking shipping rates, armadas of vessels waiting outside ports, covid-induced shutdowns: container shipping has rarely been as dramatic as it has in 2021. The average cost of shipping a standard large container (a 40-foot-equivalent unit, or FEU) has surpassed $10,000, some four times higher than a year ago (see chart). The spot price for sending such a box from Shanghai to New York, which in 2019 would have been around $2,500, is now nearer $15,000. Securing a late booking on the busiest route, from China to the west coast of America, could cost $20,000. Listen to this story Enjoy more audio and podcasts on iOS or Android. In response, some companies are resorting to desperate measures. Peloton, a maker of pricey exercise bikes, is switching to air freight. But costs are also sky-high as capacity, half of it usually provided in the holds of passenger jets, is constrained by curbs on international flights. Home Depot and Walmart, two American retailers, have chartered ships directly. Pressing inappropriate vessels into service has proved near-calamitous. An attempt in July to carry containers on a bulk carrier, which generally carts coal or iron ore, was hastily abandoned when the load shifted, forcing a return to port. More containers are travelling across Asia by train. Some are even reportedly being trucked from China to Europe then shipped across the Atlantic to avoid clogged Chinese ports. **Trains, planes and lorries can only do so much, especially when it comes to shifting goods halfway around the planet. Container ships lug around a quarter of the world’s traded goods by volume and three-fifths by value. The choice is often between paying up and suffering delays, or not importing at all. Globally 8m TEUS (20-foot-equivalent units) are in port or waiting to be unloaded, up by 10% year-on-year. At the end of August over 40 container ships were anchored off Los Angeles and Long Beach. These serve as car parks for containers, says Eleanor Hadland of Drewry, a shipping consultancy, in order to avoid clogging ports that in turn lack trains or lorries to shift goods to warehouses that are already full. The “pinch point”, she adds, “is the entire chain”. For years container shipping kept supply chains running and globalisation humming. Shipping was “so cheap that it was almost immaterial”, says David Kerstens of Jefferies, a bank. But disruption after disruption means that the metal boxes are losing their reputation for low prices and reliability. Few experts think things will get better before early next year. The dislocations could even hasten a reordering of global trade.** Shipping is so strained in part because the industry, which usually steams from short-lived boom to sustained bust, was enjoying a rare period of sanity in the run-up to the pandemic. Stephen Gordon of Clarksons, a shipbroker, notes that by 2019 it was showing self-discipline, with the level of capacity and the order book for new ships under control. Then came covid-19. Shipping firms, expecting a collapse in trade, idled 11% of the global fleet. In fact, trade held up and shipping rates started to climb. And, flush with stimulus cash, Americans started to spend. In the first seven months of 2021, cargo volumes between Asia and North America were up by 27% compared with pre-pandemic levels, according to BIMCO, a shipowners’ association. Port throughput in America was 14% higher in the second quarter of 2021 than in 2019. There has been little growth elsewhere: throughput in northern Europe is 1% lower. Yet rates on all routes have rocketed (see map), because ships have set sail to serve lucrative transpacific trade, starving others of capacity. A system stretched to its limits is subject to a “cascading effect”, says Eytan Buchman of Freightos, a digital-freight marketplace. Rerouting and rescheduling would once have mitigated the closure of part of Yantian, one of China’s biggest ports, in May and then Ningbo, another port, in August after covid-19 outbreaks. But without spare capacity, that is impossible. “All ships that can float are deployed,” remarks Soren Skou, boss of Maersk, the world’s biggest container-shipping firm. Empty containers are in all the wrong places. Port congestion puts ships out of service. The average door-to-door shipping time for ocean freight has gone from 41 days a year ago to 70 days, says Freightos. Some observers think normality may return after Chinese new year next February. Peter Sand of BIMCO says disruptions could even take a year to unwind. Lars Jensen of Vespucci Maritime, an advisory firm, notes that a dockers’ strike on America’s west coast in 2015 caused similar disruption, albeit only in the region. It still took six months to unwind the backlog. On the demand side much depends on whether the American consumer’s appetite for buying stuff continues. Although retail sales fell in July, they are still 18% above pre-pandemic levels, points out Oxford Economics, a consultancy. But even if American consumer demand slackens, firms are set to splurge as they restock inventories depleted by the buying spree and prepare for the holiday season at the end of the year. And there are signs that demand in Europe is picking up. In a sea of uncertainty, one bedrock remains. The industry, flush with profits, is reacting customarily, setting an annual record for new orders for container-ship capacity in less than eight months of this year, says Mr Sand. But with a two-to-three-year wait, this release valve will not start to operate until 2023. And the race to flood the market may not match torrents of the past. There are far fewer shipyards today: 120 compared with around 300 in 2008, when the previous record was set. And shipping, responsible for 2.7% of global carbon-dioxide emissions, is under pressure to clean up its act. Tougher regulations come into force in 2023. The upshot is that the industry “will remain cyclical”, but with rates normalising at a higher level, says Maersk’s Mr Skou. Discipline in both ordering and managing capacity may prove more permanent, aided by consolidation within the industry. The impact of higher shipping costs depends on the good being transported. Those hoping to import cheap and bulky things like garden furniture might be in for a long wait. Mr Buchman notes that current spot rates might add $1,000 to the price of a sofa travelling from China to America. The effects on product prices so far may have been dampened: around 60% of goods are subject to contractual arrangements with shipping rates agreed in advance and only 40% to soaring spot prices. Boxed in Nonetheless, for most products, shipping costs tend to be a small percentage of the overall cost. The boss of a large global manufacturer based in Europe says the extreme costs now are “bearable”. Nor might shipping rates rise much more even if disruptions continue. CMA CGM, the third-largest container-shipping firm in the world, stunned industry watchers on September 9th when it said that it would cap spot rates for ocean freight. Hapag-Lloyd, the fifth-largest, rapidly followed suit. Decarbonisation costs mean rates will eventually settle at higher levels than those before the pandemic. Yet research by Maersk suggests that this may not affect customers much. Even if sustainable fuel cost three times as much as the dirty stuff, increasing per-container fuel costs to $1,200 across the Pacific, for a container loaded with 8,000 pairs of trainers, the impact on each item would be minimal. Instead it is the problem of reliability that may change the way firms think. “Just in time” may give way to “just in case”, says Mr Sand, as firms guard against supply shortages by building inventories far above pre-pandemic levels. Reliability and efficiency might also be hastened by the use of technology in an industry that has long resisted its implementation. As Fraser Robinson of Beacon, another digital freight forwarder, points out, supply chains can be made sturdier by using data to provide better “visibility” such as over which suppliers and shipping companies do a better or worse job of keeping to timetables and ordering goods earlier. There is so far little evidence of “nearshoring”, except in the car industry, says Mr Skou. But the combination of trade war, geopolitics and covid-19 may together lead trade patterns to tilt away from China. Some Chinese firms and the companies they supply are relocating production to lower-cost countries to diversify supply chains and circumvent trade barriers. Mr Kerstens of Jefferies notes that after America under President Donald Trump imposed tariffs on China the volume of trade from China to America fell by 7% in 2019, but American imports remained stable overall as places like Vietnam and Malaysia took up the slack. Hedging against covid-19 shutdowns, particularly given China’s zero tolerance for infections, could provide another reason to move away. For their part, shipping firms may be preparing for more regionalised trade. The order book is bulging for ships of 13,000-15,000 TEU, smaller than the mega-vessels that can only be handled at the biggest ports. Vietnam opened a new deepwater terminal in January, which can handle all but those largest ships. **Finding new manufacturers is hard, however, especially for complex products. And building buffers into supply chains is costly. But conversations about deglobalising are said to be starting among some makers of low-cost clothing and commodity goods. If high costs and delays persist, some will judge that the benefits of proximity to suppliers outweigh the costs of bringing in goods made far away. With few alternatives to ships, the only choice will be to move the factories that make them.**

#### Deglobalization shocks ensures great power conflict – empirics prove

WI 16 (DTN Washington Insider, DTN delivers accurate, objective, real-time, and actionable insights to increase our 2 million customers’ confidence and support their business decision, “Washington Insider: Implications of Deglobalization”, <https://www.dtnpf.com/agriculture/web/AG/columns/washington-insider/article/2016/11/14/implications-deglobalization>, November 14, 2016 DD)

While the trade confrontation has tended to focus on mechanics and politics in many urban dailies, an exception is an **OpEd by Ruchir Sharma, chief global strategist at Morgan Stanley. He writes in Sunday's New York Times that the world goes through long cycles of globalization and deglobalization, so the current turnaround is certainly not unique. But, the cycles are powerful.** **He thinks that globalization generates prosperity and benefits for millions--but that the elite gain the most and so inequality grows and this stirs "pockets of fierce resentment" and to "great shocks" in Democracies. The discontented often turn to nationalism and controls for trade, global banks and immigrants and "globalization stalls." Such a shock came in 1914, he says, when the outbreak of World War I ended an extraordinary four-decade period of rising migration and trade, a clear parallel to the globalization boom that gained momentum in the 1980s and stalled in 2008. Since then, globalization has been in retreat and "populism has been on the march" in the United States, Britain, Italy, France and Germany. He argues that the shock in 1914 continued for three decades and weakened the world economy enough to feed resentments that erupted into World War II. Now, the retreat that began in 2008 is still gaining strength, he says, but it is time to recognize the likely fallout, "which is slower growth, higher inflation and rising conflict." Both booms were driven by changing technology, including most recently, container ships, the internet and new global trade rules that opened the world's most populous country, China, to commerce.** Before 1914, there were steamships and the "Victorian internet," the telegraph along with novel rules that opened the 19th century's largest economy, Britain, to imports. By the eve of World War I, the world was in some ways as connected as now. There also were social tensions. In the early 20th century, the share of income going to the richest 1 percent of Americans rose steadily from 1870 to a peak of nearly 20 percent in the late 1920s, as global commerce created a "gilded age" plutocracy. Popular resentment pushed politicians to seal the borders, particularly after 1929 when the economy crashed. As America turned inward, Congress passed the sweeping Smoot-Hawley Tariff Act in 1930, prompting a global trade war, Sharma says. Measured as a share of the world economy, trade fell to a low of 10 percent in 1933. That year, Congress also passed the Glass-Steagall Act, which barred big banks from the investment business. After the war, it took decades for the flow of trade, money and people to regain momentum. Global trade did not recover to its 1914 peak until the 1970s; and capital mobility, the scale and ease of money flows, did not recover until the 1990s. Today, 2008 looks to Sharma to have been "as clear a turning point as 1914." With global demand weak, and many nations erecting import barriers, trade is slumping. Measured as a share of global gross domestic product, trade had doubled from 30% in 1973 to 60% in 2008—but, since has dropped to 55%. **Also, the world's major economies have imposed hundreds of protectionist measures since 2008, led by India, Russia, China and the United States. While there are many causes of job declines, he says the political reality remains that the tide has turned against immigrants and trade. It is time to recognize the implications of deglobalization.**

# Case

#### Top-level – the aff is ridiculous - only satellites in the LEO are affected by the Kessler syndrome, not every satellite ever

#### Appropiation is a term of art that doesn’t mean occupation or usage. Satellites and objects in geosynchronous orbit do not constitute appropriation – it’s not permanent nor stationary

Gorove 84 Stephen Gorove, Major Legal Issues Arising from the Use of the Geostationary Orbit, 5 MICH. J. INT'L L. 3 (1984). Available at: <https://repository.law.umich.edu/mjil/vol5/iss1/1> //RD Debatedrills

Crucial to a proper analysis of this issue is an understanding of the concept of "appropriation." The term "appropriation" in law is used most frequently to signify "the taking of property for one's own or exclusive use with a sense of permanence." 12 The word" thus indicates something more than just casual use. The question then becomes whether the continued exclusive occupation by a geostationary satellite of the same physical area is a violation of the ban on national appropriation. While a state may certainly exercise exclusive control over a traditional object, such as a ship, or an aircraft, or a part of airspace, it is not clear that a satellite in geostationary orbit would be able to maintain its exact position and occupy the same area over a period of time. 13 Even if a position could be accurately maintained, and thus possibly constitute an "appropriation" within the meaning of article II, the satellite would have to be kept in that orbit with a "sense of permanence" and not on a temporary basis. It has been suggested that the keeping of a solar power satellite in geostationary orbit for a period of thirty years would not constitute appropriation. 14 In point of fact, thirty years would probably satisfy the "sense of permanence" requirement, unless the geostationary orbit were considered a natural resource as characterized by the International Telecommunication Convention of 1973 (ITC) 15 and as claimed by the equatorial countries. Authority exists to support the view that the ban on national appropriation of outer space does not relate to resources. 16 In view of this and the additional fact that solar energy is an inexhaustible and unlimited resource, its utilization for transmission to earth by satellites does not appear to fall under the prohibition of article II of the 1967 Treaty.

## C1 – Space Debris

#### Kessler Syndrome is hype - half-million objects in space now and only 15 collisions have ever happened

**Albrecht and Graziani 16** [Mark Albrecht and Paul Graziani, 5-9-2016, "Op-ed," SpaceNews, https://spacenews.com/op-ed-congested-space-is-a-serious-problem-solved-by-hard-work-not-hysteria/]//DDPT

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?

#### Military Precedent proves no escalation over sats

Zarybnisky 18, Eric J. Celestial Deterrence: Deterring Aggression in the Global Commons of Space. Naval War College Newport United States, 2018. (Senior Materiel Leader at United States Air Force)//Elmer

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 space war miscalc

Bragg et al, July 2018 - \*Dr. Allison Astorino-Courtois, NSI’s Chief Analytics Officer (CAO) and Executive Vice President, PhD in IR @ NYU \*\*Dr. Robert Elder, PhD @ Emory, BA @ Clemson, Assistant prof of History @ Baylor \*\*\*Dr. Belinda Bragg, principle research scientist at NSI, Inc. Lecturer in polisci @ Texas A&M.;“Contested Space Operations, Space Defense, Deterrence, and Warfighting: Summary Findings and Integration Report,” NSI, https://nsiteam.com/social/wp-content/uploads/2018/11/Space-SMA-Integration-Report-Space-FINAL.pdf

Everyone needs space

While the US may be relatively more dependent on space for national security than are other states, it is far from alone in relying on space. Nuclear armed states are dependent on space for important command and control functions, and major powers are increasingly using space for battlefield situational awareness and communications. China and Russia were identified as having significant (and fairly equal) levels of strategic risk in space (ViTTa Q16), although their regional security priorities and (to date) less spacedependent economies place them at an advantage to the US. They may, therefore, see the strategic risk of conflict is space as lower than does the US. Still, space capabilities remain a source of economic expansion and national pride for both, and their calculations of the cost of conflict involving space may include consideration of these factors. Even now, there is a general consensus that the US and other actors have more to gain from space than they have from the loss of space-based capabilities (ViTTa Q3). This suggests that, although the US is more vulnerable in the space domain than are other states, the likelihood that aggressive action against an adversary’s space assets would be reciprocated may provide a degree of security. It also creates another incentive for actors to use diplomacy and international law to reduce risk and increase transparency in the space domain.

#### Cleanup is working – multiple countries actively co-operate, treaties solve, and new tech is more careful

Paradise 15 (Lee A., writer for Science Clarified encyclopedia. 2001, accessed July 29 "Does the accumulation of "space debris" in Earth's orbit pose a significant threat to humans, in space and on the ground?" [www.scienceclarified.com/dispute/Vol-1/Does-the-accumulation-of-space-debris-in-Earth-s-orbit-pose-a-significant-threat-to-humans-in-space-and-on-the-ground.html](http://www.scienceclarified.com/dispute/Vol-1/Does-the-accumulation-of-space-debris-in-Earth-s-orbit-pose-a-significant-threat-to-humans-in-space-and-on-the-ground.html) DD)

In addition, space agencies around the world have taken steps to reduce space clutter. The United States, for example, has taken an official stand that is outlined in the 1996 National Space Policy that clearly states: "The United States will seek to minimize the creation of new orbital debris." For example, space mechanics are far more careful with regard to their tools. In the past, space mechanics sometimes let go of their tools and were unable to recover them. Strident efforts are now made to retain all objects used to repair satellites and conduct other missions. The Russians have also agreed to do their part. They used to purposely destroy their equipment in space to prevent it from falling into the wrong hands, but now refrain from that practice. Newly designed crafts and operating procedures also play a part in helping to keep space clean, while researchers continue to investigate safe ways to clean up the debris that currently exists. Everything from forcing the debris to reenter the atmosphere in a controlled manner to nudging it away from the Earth's orbit has been discussed. An activity such as collecting garbage from inside the space station and sending it back to Earth to burn up at reentry is one tangible way space explorers are helping to ensure the reduction of space clutter.¶ At this time there is no international treaty on how to deal with space debris; however, several nations have joined together to form the Inter-Agency Space Debris Coordination Committee (IADC). The IADC assesses the subject of space debris and how it should be handled in the future. Japan, like the United States, has developed a list of safety policies regarding space debris. Because this is ultimately a global issue, other countries such as France, The Netherlands, and Germany have jumped on the bandwagon with regard to addressing this issue.