# 1NC

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#### Interpretation – Affirmatives must only defend the topic. To clarify, they may not fiat an action that does more than the resolution.

#### Violation – space governance, consensus, space traffic management, debris liability regimes and more – pen reads blue

Silverstein & Panda ‘3/9 - Benjamin Silverstein [research analyst for the Space Project at the Carnegie Endowment for International Peace. MA, International Relations, Syracuse University Maxwell School of Citizenship and Public Affairs BA, International Affairs, George Washington University] and Ankit Panda [Stanton Senior Fellow in the Nuclear Policy Program at the Carnegie Endowment for International Peace. AB, Princeton University], “Space Is a Great Commons. It’s Time to Treat It as Such.” *Carnegie Endowment for International Peace* (Web). March 9, 2021. Accessed Dec. 13, 2021. <<https://carnegieendowment.org/2021/03/09/space-is-great-commons.-it-s-time-to-treat-it-as-such-pub-84018>> AT

The failure to manage Earth orbits as a commons undermines safety and predictability, exposing space operators to growing risks such as collisions with other satellites and debris. The long-standing debris problem has been building for decades and demands an international solution.¶ Competing states need to coalesce behind a commons-based understanding of Earth orbits to set the table for a governance system to organize space traffic and address rampant debris. New leadership in the United States can spur progress on space governance by affirming that Earth orbits are a great commons. So far, President Joe Biden and his administration have focused on major space projects, but a relatively simple policy declaration that frames Earth orbits as a great commons can support efforts to negotiate space governance models for issues like debris mitigation and remediation. The Biden administration can set the stage to pursue broad space policy goals by establishing a consensus among states, particularly those with the most invested in Earth orbits, that space is a great commons.¶ THE PRESSING NEED FOR SPACE GOVERNANCE¶ The Earth orbits that provide the majority of benefits to states and commercial ventures represent only a tiny fraction of outer space as a whole. Competition for the limited volume of these Earth orbits is especially fierce since two satellites cannot be in the same place at the same time and not all orbits are equally useful for all missions. The number of objects residing in Earth orbits is now at an all-time high, with most new objects introduced into orbits at altitudes of between 400 and 700 kilometers above sea level. Millions of pieces of debris in Earth orbits pose a threat to continuing space operations. For instance, the final U.S. space shuttle missions faced 1-in-300 odds of losing a space vehicle or crew member to orbital debris or micrometeoroid impacts.¶ Collisions with fragments of orbital litter as small as a few millimeters across can ruin satellites and end missions. Current technologies cannot track all of these tiny pieces of debris, leaving space assets at the mercy of undetectable, untraceable, and unpredictable pieces of space junk. Some researchers have determined that the debris population in low Earth orbit is already self-sustaining, meaning that collisions between space objects will produce debris more rapidly than natural forces, like atmospheric drag, can remove it from orbit.¶ States—namely the United States, Russia, China, and India—have exacerbated this debris accumulation trend by testing kinetic anti-satellite capabilities or otherwise purposefully fragmenting their satellites in orbit. These states, along with the rest of the multilateral disarmament community, are currently at an impasse on establishing future space governance mechanisms that can address the debris issue. A portion of this impasse may be attributable to disparate views of the nature of outer space in the international context. Establishing a clear view among negotiating parties that Earth orbits should be treated as a great commons would establish a basis for future agreements that reduce debris-related risks.¶ Beyond debris-generating, kinetic anti-satellite weapons tests, revolutionary operating concepts challenge existing space traffic management practices. For instance, commercial ventures are planning networks of thousands of satellites to provide low-latency connectivity on Earth and deploying them by the dozens. States are following this trend. Some are considering transitioning away from using single (or few) exquisite assets in higher orbits and toward using many satellites in low Earth orbits. These new operational concepts could lead to an increase in collision risks.¶ Without new governance agreements, problems related to debris, heavy orbital traffic, and harmful interference will only intensify. Debris in higher orbits can persist for a century or more. The costs of adapting to increasingly polluted orbits would be immense, and the opportunity costs would be even higher. For instance, all else being equal, hardening satellites against collisions increases their mass and volume, in turn raising launch costs per satellite. These costs, rooted in a failure to govern space as a commons, will be borne by all space actors, including emerging states and commercial entities.¶ EXISTING FORMS OF SPACE GOVERNANCE¶ A well-designed governance system, founded on a widespread understanding of Earth orbits as a great commons, could temper these risks. Currently, space is not wholly unregulated, but existing regulations are limited both in scope and implementation. Many operators pledge to follow national regulations and international guidelines, but decentralized accountability mechanisms limit enforcement. These guidelines also do not cover the full range of potentially risky behaviors in space. For example, while some space operators can maneuver satellites to avoid collisions, there are no compulsory rules or standards on who has the right of way.¶ At the interstate level, seminal multilateral agreements provide some more narrow guidance on what is and is not acceptable in space. Most famously, the Outer Space Treaty affirms that outer space “shall be free for exploration and use by all states without discrimination of any kind” and that “there shall be free access to all areas of celestial bodies.” Similar concepts of Earth orbits being a great commons arise in subsequent international texts. Agreements like the Liability Convention impose fault-based liability for debris-related collisions in space, but it is difficult to prove fault in this regime in part because satellite owners and operators have yet to codify a standard of care in space, and thus the regime does not clearly disincentivize debris creation in orbit. Other rules of behavior in Earth orbits have been more successful in reducing harmful interference between satellite operations, but even these efforts are limited in scope.¶ States have acceded to supranational regulations of the most limited (and thus most valuable) Earth orbits. The International Telecommunication Union (ITU) coordinates, but does not authorize, satellite deployments and operations in geosynchronous orbits and manages radiofrequency spectrum assignments in other regions of space to reduce interference between satellites. These coordination activities are underpinned by the ITU’s constitution, which reminds states “that radio frequencies and any associate orbits . . . are limited natural resources,” indicating a commons-based approach to governing the radiofrequency spectrum. However, the union’s processes are still adapting to new operational realities in low Earth orbit, and these rules were never designed to address issues like debris.

#### Violation – Extra-T – They fiat new space governance models, consensus among states under Biden, quotas, distribution, regulation, etc. which obviously isn’t the rez; That’s a voting issue – justifies infinite planks and additional actions eliminating neg Das and CPs and exploding predictable limits.

#### Use Competing Interps – 1] Topicality is a yes/no question, you can’t be reasonably topical and 2] Reasonability invites arbitrary judge intervention and a race to the bottom of questionable argumentation.

#### No RVI’s - you shouldn’t win for not being abusive.

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#### CP: States should remove the most volatile and largest Debris pieces from the most congested orbits

#### Solves Debris

Khlystov 18 [Nikolai Khlystov](https://www.weforum.org/agenda/authors/nikolai-khlystov) Lead, Space, and lead, Global Future Council on Space, World Economic Forum. 3 April, 2018 “We have a space debris problem Here’s how to solve it” [We have a space debris problem. Here’s how to solve it | World Economic Forum (weforum.org)](https://www.weforum.org/agenda/2018/04/we-have-a-space-debris-problem-heres-how-to-solve-it/) Accessed 12-19 // gord0

The first Chinese space station, Tiangong-1, crashed on 1 April over the Southern Pacific, after uncontrollably re-entering the Earth’s atmosphere.

In fact, the station most likely all but burned up on re-entry, ironically very close to the location called ‘spacecraft cemetery’, where space agencies purposefully guide their old spacecraft to crash as it is the most isolated location in the ocean.

The Chinese authorities lost contact with the station back in 2016 and could not guide it since then.

Tiangong-1 is one example of space debris that ended up coming back to Earth and burning up, just like most other debris that re-enters Earth’s atmosphere. That is not a bad thing.

But large quantities of space junk end up staying in various orbits around Earth, threatening satellites, the International Space Station (ISS), as well as future missions beyond Earth's vicinity – to asteroids, the Moon and Mars.

Somewhat similar to pieces of tyres that litter the highways on Earth, debris can be parts of old satellites, from paint chips, to bolts, larger sections, and entire defunct satellites; it can also include spent rocket bodies, the sections of rockets that don’t fall back to Earth after a rocket's launch. The total number of debris pieces larger than a marble counts more than half a million.

[photo omitted]

The key difference is that while it would be dangerous for your car to hit a piece of garbage on the highway at 100 km/h, in orbit, things are moving at the much faster speed of 28,000 km/h – the speed required by the laws of physics for objects to stay in orbit and not fall back to the ground.

At that speed, even a small bolt could destroy an entire satellite, or even endanger the entire Space Station. That is the reason why astronauts or cosmonauts on board the ISS have to huddle into the escape capsules several times a year, when a piece of debris is being tracked close to the Space Station. Currently only the Russian Soyuz offers a way of getting to and from the ISS for humans.

The most polluted orbits in general are considered to be those between 200-2000 km above Earth (Lower Earth Orbits or LEO), and the 36,000 km orbit (Geosynchronous).

This is a growing issue, which has become more widely known to the public through the movie ‘Gravity’.

Out-of-control space junk in LEO orbit – the so-called Kessler Syndrome – in real life would not be quite as dramatic as in the movie; however, it does pose a serious and an ever-growing threat, nonetheless.

There are two key elements to addressing this global risk.

First, we need to start removing the most volatile and biggest pieces from the most congested orbits.

A number of companies, such as Astroscale and Saber Astronautics, are looking at this very complicated and technical solution already. The idea is essentially to grab a piece of debris with a special satellite and de-orbit both of them, in the process burning up both objects above the aforementioned ‘spacecraft cemetery’.

Other technologies include moving objects with a powerful laser beam. It is important to start doing that soon – current scientific estimates predict that without active debris removal, certain orbits will become unusable over the coming decades.

Though it is hard to capture objects that are moving as fast as this debris, it is certainly possible. After all, spacecraft dock with the ISS all the time.

The bigger issues are financing and international cooperation. The question of who pays for these ‘garbage collection’ missions is a tricky one. Perhaps even trickier, is negotiating the international diplomatic space and persuading, for example Russia, that their old military satellite needs to be de-orbited by a technology company.

[photo omitted]

The second part of the puzzle to ensure the long-term accessibility of orbits is to adjust our current behaviour in space in order to minimize the creation of new debris. We need to be more careful with existing operational satellites and new missions.

The UN guidelines on space debris mitigation are among the key international efforts to get different actors to follow proper rules of the road, but they are voluntary.

There are over 1,500 active satellites in various orbits, but this figure is set to grow dramatically over the coming years.

Large constellations that number hundreds and thousands of satellites, such as OneWeb and SpaceX, are being developed currently (mostly for LEO orbits), and promise to provide affordable connectivity to all parts of the world.

New governments are also entering the race to get access to space. The question is, with such an increase in traffic, how do we get all the private and public actors to think more sustainably?

The [Global Future Council on Space Technologies](https://www.weforum.org/communities/the-future-of-space-technologies) is working on an industry framework to incentivize private actors to step up their act. Other efforts are needed.

Orbits are a critical part of the Earth environment, a global commons just like the oceans, and we need to protect this resource for future generations.

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#### Space tech advancements and control have produced a qualitative military advantage. US space privatization maintains a shaky but tenable US lead.

Sergeant **Duke 20** served as a US Army intelligence analyst, holds a BA in intelligence studies with a concentration in counterintelligence from American Military University and research national security autonomous weaponry armed conflict, and the space domain, , 9-25-2020, "Conflict and Controversy in the Space Domain: Legalities, Lethalities, and Celestial Secur," Air University (AU), <https://www.airuniversity.af.edu/Wild-Blue-Yonder/Article-Display/Article/2362296/conflict-and-controversy-in-the-space-domain-legalities-lethalities-and-celesti/>

Advancements in space technology are quickly leading to an inevitable conflict over control in space, which includes control over the Moon through lunar bases and potentially control over the colonization of Mars. The PRC has added the capability to "physically attack satellites using antisatellite [ASAT] interceptors, miniature space mines, and ground-based lasers" into its military space program.1 These capabilities fall under the guise of the Outer Space Treaty’s permission to destroy militarized satellites.2 These technologies could easily be used offensively to create a decision advantage in combat. Some analysts believe that the deliberate collision of PRC satellites with older satellites shows that the PRC has experimented with "parasitic satellites" designed to lie dormant in the vicinity of a target until activated, potentially for hacking purposes.3 The PRC even "reportedly launched a hypersonic 'prototype space fighter' " in 2010. It continues to be locked in an intense space race with the rest of the space-savvy international community—particularly Russia, the United States, and India—with a short-term goal of controlling the Moon with a lunar base and a longer-term goal of populating Mars under the rule of the PRC.4

The development of maneuverable space planes and lunar bases is not unique to the PRC. The National Aeronautical and Space Administration (NASA) developed the X-37 and X-37B space planes, and the Russian Federation is developing a maneuverable space plane using nuclear technology for power.5 All of these nations (as well as several others, including India and Japan) intend to establish lunar bases within the next 20 years.6 Despite the array of international treaties and agreements promoting peaceful global development of space resources in the name of science and humanity, it is unlikely that space will remain weapon free and likely that it will become the next frontier of global combat. Space weapons in development may use robotics, nanotechnology, and directed energy such as microwaves and lasers.7 With the establishment of a lunar base, a nation with advanced laser technology, advanced cyber weaponry, maneuverable space planes, satellite targeting capabilities, nano-science stealth technology, artificial intelligence, and self-guiding nanotechnology bullets would undoubtedly have the capacity to rule the Earth as it sees fit. All of these technologies already exist or are in development phases, and they are the future of intelligence and warfare.8

The US government and NASA, unlike the PRC and the RF, have been encouraging the commercialization of space cargo transportation to meet future American needs for access to the International Space Station (ISS) and to improve the research and development of spaceborne technologies and other developments.9 Private sector involvement has also opened the market for alternative rocket propulsion technologies that can achieve government and commercial goals for space at lower costs and faster than possible under the existing bureaucracy of NASA. Enhanced private sector involvement in space travel utilizes the free-market system to foster radical developments and investment for both government and private sector programs, incentivizing broader participation, which benefits both. Commercializing aspects of standard space operations, such as the recent partnership with SpaceX, will also pave the way for space tourism. This will free up resources for NASA and the newly minted US Space Force to pursue broader goals, such as manned deep space travel, a lunar base, and manned missions to Mars.

Part 2: Lunar Power

Rare earth metals and other minerals are quickly becoming scarce in the United States to the point where the international space race to claim the Moon and Mars has become a top priority, not just for control over them but for the resources available for exploitation. Uranium has even entered the economic radar as a good idea for boosting the American economy instead of remaining too dangerous to mine due to the associated health risks and environmental hazards. This resource is in abundance on the Moon.10 Estimates suggest there may be up to five million tons of Helium-3 (3He) contained within the lunar regolith.11 This has the potential to meet all of [hu]mankind's power needs for thousands of years when used with fusion power.12 On top of the resources potentially available, the Moon provides a unique launching position for future missions to Mars with a faster, more direct, and more efficient path to the Red Planet.13 Control over the Moon is an inherent factor in the future of the human race.

Uranium has long been a part of the nuclear fission enterprise on Earth but comes with high costs, including radioactive waste and extreme health and environmental hazards due to the radiation produced in the fission process. Terrestrial reserves of other energy-producing resources, like oil and natural gas, have also been projected to be exhausted within 50–100 years under current and projected mining and usage rates.14 Alternatively, the element tritium (T), which has a half-life of 12.32 years, naturally decays into 3He,15 which can be used to create a new kind of power—fusion power. Fusion power can be generated by combining deuterium (D) with either more D, T, or 3He, using the following calculations shown in order of their ignition temperatures: D + T = 4He [Helium-4] + n [neutrons] + 17.6 MeV [Million electron Volts] D + D = T + H [Hydrogen] + 4.0 MeV (50%) = 3He + n + 3.3 MeV (50%) D + 3He = 4He + H + 18.4 MeV16 Fusion power can also be created by combining 3He with more 3He, creating Helium-4 (4He).17 The combination of 3He and 3He is the most energy efficient, producing the greatest net energy,18 but also requires the highest ignition temperature to achieve fusion.19 Unfortunately, 3He exists only in minute amounts on Earth.20 The nation that establishes a mining and transportation industry capable of bringing lunar 3He to Earth, and develops a fusion plant network that transforms 3He into power, could control a substantial portion of the planet’s energy industry for decades. Some scientific estimates discount both the estimates of the potential amount of extractable 3He in the lunar regolith and the potential to achieve industrial fusion reactors on Earth capable of processing it. Exemplifying this scientific stance are the calculations of Ian Crawford, who believes both prospects are greatly exaggerated and that there are only approximately 220,507 tons of 3He available in logical extraction areas, such as the titanium-rich lunar basalt flats.21 Despite his dissent, Crawford admits even lunar resources that seem impractical and economically inefficient to transport resources to Earth may provide substantial economic benefits for space-based uses, such as solar power systems and spacecraft fusion engines, for example,22 which would not require transport back to Earth. Earth's finite resources make lunar and space resource exploitation an inevitability. The most pertinent factor governing future human resource exploitation in space is the question of which nation will achieve a successful and effective industrial supply chain first. The most probable three nations to achieve this are the US, the PRC, and the RF, and the three areas that need to be navigated to succeed are facility establishment, production/refinement, and transportation. Establishing lunar facilities is the easiest of these goals, especially when lunar resources that can be used for building are taken into account, which decreases the amount of materials needed to be brought to the Moon and the time needed for construction. In 2008, a NASA experiment found that lunar regolith has potential construction properties. When scientists heated the regolith and used sulfur as a binding agent, they made "waterless concrete," which can be molded and is nearly as strong as concrete when it hardens.23 This process requires minimal effort and relies primarily on direct heat application and the ability to shape the regolith. Consequently, the entire process can be automated by robots with the appropriate tools on the lunar surface, such as the ones NASA began developing specifically for this purpose in 2009.24 The simplicity of the operational requirements means that these three nations already have the technical capability to begin construction using lunar soil after arriving on the Moon. They will also all be capable of bringing any other materials that would be necessary to construct facilities or bases on the lunar surface. Unlike the US, and contrary to existing international law, the PRC's stance on the Moon is that it is territory,25 despite the prohibition on "national appropriation" of celestial bodies outlined in Article II of the Outer Space Treaty.26 The PRC has also proposed mining 3He for future fusion power opportunities.27 The RF, while not openly pursuing a territorial ambition for the Moon, is certainly exploring and advancing prospects of economic development, including 3He extraction and tourism.28 Facility development and resource exploitation areas on the Moon are limited. This will exacerbate the race for prime locations and desirable resources, particularly at the poles, where water ice is believed to exist in large quantities (which can be used to sustain lunar human habitation), and in the titanium- and 3He-rich basalt flats of Mare Tranquillitatis and Oceanus Procellarum.29 Once established, facility operations can begin to extract and refine resources either for use on the lunar surface or for transportation to Earth. Transportation of materials from the Moon to Earth is a substantial financial and logistical undertaking. It will not be easy to show a profit after the considerable expenses associated with it. Nevertheless, extraction and transportation of 3He and other resources to Earth, specifically for fusion power production, have been expressed as long-term goals of the PRC and the RF within decades. Interestingly, the US has not stated this as a goal but has already shifted its space transportation industry sufficiently toward the private sector. The private sector will have the most viable opportunity to build the first industrial space transportation system, specifically because of advantages in the American free-market system.30 By encouraging private sector participation in the space industry and commercializing space transportation, the US has made production of space technologies competitive with proposals in the National Space Policy.31 A competitive industry makes substantial investments in research, development, and production of space transports; engine components for space travel; and tools for use in zero gravity. America cannot afford to fall behind in the race for lunar facility establishment and resource exploitation. This is for reasons of economic and national security and the future security of human expansion into space as the Moon offers the most efficient launching position for missions to Earth's red neighbor, Mars. Part 3: Mars Domination Mars is widely accepted by the scientific community to be the most plausible planet for the first human habitation on a celestial body and, consequently, the most likely location for the first space colony and eventually a second planet for humankind. Thus, Mars is a desirable goal for nations involved in space exploration for many reasons. The territory on Mars, for example, will most likely become marketable for economic value to civilians in the long term. The Outer Space Treaty prevents ownership of territory on celestial bodies but makes no mention of ownership or sale for profit of structures built on, or items brought to, celestial bodies, just as there is no explicit language in the treaty preventing profit-based resource exploitation on celestial bodies by either governments, organizations, or private nationals.32 Additionally, the inevitability of Mars becoming a second planet inhabited by humanity must be considered, along with all of the implications of living spaces and ownership of property that will eventually follow. Denying this inevitability and claiming it as outlawed by international law due to the prohibition on appropriating territory on a celestial body would essentially equate owning property on Earth as also outlawed by international law. After all, Earth is also a celestial body. Language in the treaty encourages expansion into space and essentially says that if persons, governments, or organizations build something on a celestial body, they own that building33 and can do what they want with it, including selling it. They cannot, however, claim to own the planet's ground outside the building—yet. Resources on Mars, while still not mapped out as substantially as lunar resources have been, will likewise create new markets for economic prosperity and national wealth, including more 3He deposits from solar winds like those found in lunar regolith along with substantially high concentrations of iron.34 In addition to buildings constructed on celestial bodies, spacecraft and facilities constructed in space and on celestial bodies are also considered to be the territory of the owning nation, which means that the UN Charter applies to facilities and spacecraft in space and on celestial bodies. UN Charter Article 2(4), in particular, protects space explorers and potential future residents on Mars by prohibiting the "use of force against the territorial integrity" of another nation party to the treaty,35 which all space-faring nations are. Article 51 further dictates that if attacked, "the inherent right of . . . self-defense" shall not be impaired.36 Article V of the Outer Space Treaty prescribes that, in space, all humans are bound to "render all possible assistance to" each other as "envoys of Mankind."37 Essentially, a peaceful international course is possible—even mandated—for human expansion into space. Unfortunately, the PRC and the RF regard space and celestial bodies as territorial goals,38 leading to the assumption that attempts will be made to control and defend such territories as necessary to achieve space superiority, control over space resources, and managerial power over the future colonization of Mars. Control over Mars, in addition to affecting resource exploitation, transportation, and scientific advancements, also has implications for the direction of humanity in space. Establishment of a human colony, or human colonies, on Mars will eventually lead to territorial spaces, development of the land and air (potentially involving terraforming the planet for atmospheric enhancement), and security issues. While an established colony on the Red Planet is still likely decades away, trends within the PRC and RF governments suggest that any established colony on Mars under their jurisdiction would be authoritarian, weaponized, and secret. Given the nature of weather on Mars, fortified structures are easily justified, and the lack of a conventional weapons ban on celestial bodies makes weaponization of such a colony both legal and desirable, mainly because of the third inherently desired factor—secrecy. The inevitability of PRC and RF presence on Mars also suggests that any US developments will also include fortifications and weaponization. While the Outer Space Treaty mandates cooperation between nations on celestial bodies, the extreme distance between Earth and Mars means that a compliance verification system with effective monitoring and enforcement will be complicated, if not impossible, for the foreseeable future. For these reasons, a nation that effectively controls near-Earth space and establishes a security presence on the Moon will effectively be in a position to control Mars. Part 4: Space Control Celestial bodies are not the only potential fields of conflict in space, and in the short term, space itself has become a much more immediately relevant focus for spacefaring nations and the world. This is particularly the case in the vicinity of Earth, including orbital paths for communication technologies, weapon platforms, and sensors. Technological improvements and the proliferation of nation-state and private sector interest and capacity to enter space are causing the acceleration of an inevitability—usable orbital space around Earth is diminishing.39 Satellites and other spaceborne assets orbiting Earth are quickly filling up all of the most useful places to perform their assigned functions within Earth's various orbits, and space debris is complicating matters even further. Increasing numbers of space objects are causing difficulty in establishing safe orbital paths for newly launched spacecraft while increasing the risk to launches destined for deep space.40 Adding to these complications are international developments of ASAT weapons, many of which add to the more than 500,000 pieces of space debris traveling as fast as 17,500 mph41 already orbiting Earth.42 ASATs in use and under development include essentially two broad areas: kinetic energy (KE), such as missiles and rail guns, which impact targets in space; and directed energy (DE), which includes lasers, particle beams, and cyber weapons.43 The Outer Space Treaty, while prohibiting nuclear weapons from being used in any way in space including being stationed in space, "has no specific provision prohibiting the use of conventional weapons, [including lasers], in outer space,"44 which inherently authorizes them. The Outer Space Treaty also contains no prohibition of such weapons being stationed on space-based platforms, including on celestial bodies, or of them being used to target objects on Earth, in space, or on celestial bodies.45 In other words, these weapons are legal in every way, regardless of the potential damage they can cause to international stability and humanity. There are, however, multiple ongoing debates over the nature, definitions, and classifications of several kinds of ASATs currently in operation or in developmental phases. Nearly every KE ASAT results in a large amount of space debris, which causes an abundance of future and immediate problems for space activities, including endangerment of the basic military and commercial functions of satellites for the Global Positioning System (GPS), communications, and recreation. Space debris is therefore a highly undesirable side effect for any nation to risk and potentially dangerous to the integrity of a nation's armed forces. David Koplow addresses this issue in a substantially relevant and logical way in his article “An Inference about Interference: A Surprising Application of Existing International Law to Inhibit Anti-Satellite Weapons.” His stated thesis is as follows: “The [National Technical Means] NTM-protection provisions of arms control treaties already prohibit the testing and use of destructive, debris-creating ASATs, because it is foreseeable that the resulting cloud of space junk will, sooner or later, impermissibly interfere with the operation of another state's NTM satellite, such as by colliding with it or causing it to maneuver away from its preferred orbital parameters into a safer, but less useful, location.”46 By "interfering" with these NTM verifications mandated by multiple treaties, Koplow suggests that intentional actions creating space debris are already outlawed by international law, and that the development of debris creating KE ASATs should cease and be banned immediately.47 Laser weapons, particle beams, and weapons containing depleted uranium are also under debate due to their radioactivity as well as nuclear processes used for some of their operations. Some posit that nuclear activities or materials within a weapon system should constitute classifying them as nuclear weapons, thereby outlawing them in space per the Outer Space Treaty's nuclear weapons ban.48 Advocates for these weapons declare that the weapons are not nuclear. Of the three primary types debated, laser weapons use a nuclear or chemical reaction process to fire a radioactive beam, particle beams rapidly fire atomic charged particles at a target, and hypervelocity rod bundle weapons and railguns use depleted uranium as ammunition.49 Finally, the potential exists for the use of a nuclear explosion in space designed to generate an electromagnetic pulse (EMP) attack on an Earth target, which the RF "has worked on developing" in the form of an “EMP ASAT.”50 With the RF’s recent developments in ASATs and its stated intent “to station weapons in space,”51 the complete weaponization of space by the RF and other nations—including the US and the PRC—is inevitable. The RF and PRC are aggressively pursuing ASAT weapon advancements and preparing for space combat operations, including the RF recently fielding a "ground-based laser weapon" even as it publicly advocated for space not to be weaponized.52 Part 5: The Future of Space Space exploration converges on two of Sun Tzu's concepts of the strategic battlespace: “open ground” and the “ground of intersecting highways.” The former consists of areas where all sides have "liberty of movement" and the latter of areas where "contiguous states" converge.53 On open ground, Sun Tzu advises not "to block the enemy’s way," and on intersecting grounds he suggests to "join hands with your allies.54 Space is essentially a combination of these types of ground, where all nations are contiguously connected, and yet it consists of a legally recognized area of free movement for all persons and nations. Interestingly, Sun Tzu’s The Art of War, written over 2,000 years ago, advocates indirectly for peaceful human expansion into space, where allied nations proceed forth together while intentionally avoiding negative engagements with potential adversaries. This ancient concept of human cooperation and peaceful coexistence is also consistent with the Department of Defense's (DOD) and intelligence community's (IC) National Security Space Policy55 and the National Space Policy of the United States of America.56 Executive Order (EO) 13914, signed on 6 April 2020, clarifies the position of the US government that while international cooperation in space exploration is essentially mandatory, America "does not view [space] as a global commons,"57 reiterating that the Outer Space Treaty does in fact protect the individual interests of nations in space, including the right to self-defense. The policy further clarifies the intent of the United States to harvest materials from celestial bodies and strengthens the implied relationships with both the international community and the private sector concerning space exploration and related developments.58 By combining these principles, this renewed position on space developments further complements Sun Tzu’s ideas of the strategic battlespace in relation to the space domain moving into the future, regarding space as an area that can be used and exploited by everyone, but acknowledging that claims, defense, and security are also going to be essential factors in the way mankind moves forward in the space domain. In addressing the impact of space exploration, and the subsequent superiority gained by the PRC, the RF, or the US in the process, it is important to recognize the three principle issues of the strategic space environment outlined in these national policies: congestion, contestation, and competitiveness. The US IC is mandated by section 1.1 of EO 12333 to "provide . . . the necessary information on which to base decisions concerning the development and conduct of foreign, defense, and economic policies, and the protection of United States national interests from foreign security threats,"59 which now include threats from space and threats toward US space assets. Congestion, contestation, and competitiveness in space now directly impact the IC's ability to effectively pursue its mandate under EO 12333 and must be addressed collectively to ensure the future national security of the United States on Earth and in space. Enhancing the space industrial base’s ability to innovate and participate in the expansion of humankind into space fosters a unique opportunity to share with, and benefit from, research and development initiatives related to activities in space. Combining private sector and government resources together has the potential to greatly accelerate advancements across a wide range of space assets—including spacecraft developments, zero gravity research, energy production, and weapon applications—all of which will help minimize the risks of congestion, contestation, and competitiveness. Congestion in space refers to objects, including active devices and dangerous debris, filling up the usable orbital paths used for government and commercial purposes, primarily satellites. It also applies to finite amounts of bandwidth and frequencies used for transmissions that are currently being exhausted by demand threatening to exceed supply.60 Congestion will also inherently refer to space traffic once an industry exists that requires transportation between the Earth and the Moon, as well as to physical locations for lunar and Martian resource exploitation facilities and extraction points and places to build and operate on celestial bodies, including the Moon and Mars. This will eventually include a significant focus on the colonization of Mars since large portions of the planet are unsuitable for human habitation due to terrain, radiation, meteoroids, and weather. Short-term intelligence and counterintelligence impacts from the congestion of near-Earth space consist of primarily radio interference, protecting satellites from becoming compromised, effective deployment and concealment of collection platforms, and ensuring the integrity of protected information in transit.

Sharing space in accordance with Sun Tzu’s ancient wisdom does not mean ceding it, and while space debris is the primary factor in congestion, contestation is becoming an issue due to potential adversarial ASATs. Contestation is an anticipated inevitability and one that will grow exponentially as more nations enter space and with further developments and potential use of ASATs, either in war, by accident, or for other reasons. Murphy’s Law applies, even in space. Currently, competitiveness is driving both the potential for contestation as well as the congestion in near-Earth space. Commercial and multi-governmental competition is increasing for space-related research and development, deployment of assets, and physical space for occupation by those assets. Intelligence agencies in many nations, including allies and adversaries of the US, are now advancing the deployment, use, and decision advantages of spaceborne intelligence assets, including space-based surveillance and weapons platforms. Reasserting US superiority over the space environment is vital to the continuation of American leadership on Earth and the effectiveness of IC assurance of national security through space superiority. American leadership in space exploration is the only way to ensure that humanity's expansion into the stars is undertaken with the ideologies of liberty and free-market economics leading the way.

America’s leadership in ingenuity and technological developments, combined with free-market capitalism, has transformed the face of the world for more than two centuries. Its leadership has created the environment necessary to explore game-changing space technologies. These technologies will revolutionize the entire space industry. For example, the Variable Specific Impulse Magnetoplasma Rocket (VASIMR) is an experimental electromagnetic thruster for spacecraft propulsion that will dramatically reduce travel time to Mars and other destinations.61 Commercial spacecraft like the Dream Chaser Cargo System will result in a private sector space travel industry, incentivizing space tourism and, potentially, a space cargo transportation industry. 62 In February 2020, the US Department of Energy announced a $50 million investment in fusion research and development projects across the country.63 One of these is the Plasma Science and Fusion Center at the Massachusetts Institute of Technology with the goal of keeping the United States at the forefront of fusion energy development.64 Another is the Fusion Technology Institute at the University of Wisconsin, which is focusing on advancing research in the field of helium-based fusion power production technologies on Earth.65 This technology will address finite terrestrial energy resources and production of 3He-based electricity from lunar regolith.

These are just a few examples of the future of space technology research and development, and such technologies were all made possible because of the structure of the American free-market system. The biggest challenge for the IC will be to balance President Dwight Eisenhower’s vision with Sun Tzu’s battlefield strategies. Eisenhower understood in 1958 that “through [space] exploration, man hopes to broaden his horizons, add to his knowledge, [and] improve his way of living on earth.”66 Sun Tzu knew that “all warfare is based on deception,” “the highest form of generalship is to balk the enemy's plans,” and the greatest fighters “put themselves beyond the possibility of defeat” to achieve victory.67 American leaders participating in seizing and maintaining US space superiority shoulder this responsibility and must forge a new path forward that enhances human life on Earth, denies the possibility of victory to US adversaries, and ensures the integrity and security of American assets in the space domain as the world moves forward together into the future.

#### Maintaining US space dominance requires a homegrown commercial space industry – private companies offshoring gives China the advantage they need

**Cahan and Sadat 1/6** [(Bruce Cahan, J.D) (Dr. Mir Sadat, ) "US Space Policies for the New Space Age: Competing on the Final Economic Frontier," based on Proceedings from State of the Space Industrial Base 2020 Sponsored by United States Space Force, Defense Innovation Unit, United States Air Force Research Laboratory, 1/6/21, https://www.politico.com/f/?id=00000177-9349-d713-a777-d7cfce4b0000] TDI

Today, China’s commercial space sector is in its infancy but is set to grow with continued national and provincial support, which have been rapidly increasing over the past three years.64 Since 2004, the United States and China accounted for 74% of the $135.2 billion venture capital (VC) invested in commercial space. 65 The early 2020s are pivotal, as it would be far cheaper for China and Chinese commercial space firms to acquire space technologies from the United States or allied nation companies seeking revenues or facing cashflow constraints, than to build the companies and their teams and technologies from scratch in China. The tight coupling of Chinese military goals and an economy organized to achieve those goals magnifies the economic threats and market disruptions that the United States must immediately address, in order for DoD and national security operations to rely on US commercial space capabilities.

3. ISSUES AND CHALLENGES

Peaceful Uses of Space and Space Exploration Space has been primarily a shared, not a warfighting, domain.67 With each passing second of Planck time,68 space enables a modern way of life, provides instantaneous global imagery, assures telecommunications, and captures humanity’s imagination for civil space exploration. As a result, space is a burgeoning marketplace and territory for commercial ventures and investors. Strengthening the US commercial space industrial base is vital to and beyond US national security. Civil space activities are a source of US “soft power” in global commerce, cooperation, and investment. 69 The civil space sector, led by NASA, is fundamental to America’s national security. 70 NASA is on an ambitious critical path to return to the Moon by 2024,71 along with developing the capabilities and infrastructure for a sustained lunar presence. NASA’s lunar plans provide a lunar staging area for missions to Mars and beyond. They offer a strategic and economic presence for the United States on the Moon. Congress, the White House, DoD, and NASA must recognize that economic and strategic dominance in service of national security requires catalyzing and accelerating growth of a vibrant, private US industrial and cultural expansion into the Solar System. Human visitation and eventual settlement beyond the Earth require sustaining visionary leaders, aided by, and aiding, US national security. A recurring theme in US policy is “maintaining and advancing United States dominance and strategic leadership in space” because US global competitors and adversaries are competent and capable of outpacing American space capabilities. 72 The stakes are high: At this historic moment, there is a real race for dominance over cislunar access and resources.   
Regulations Should Foster US Commercial Space as a National Asset   
Leveraging the reimagination and disruption of terrestrial industries, the US commercial space industry is pushing the frontiers of the United States and global space economics and capabilities. A pre-COVID19 assessment by the US Chamber of Commerce projected that the US space market will increase from approximately $385 billion in 2020, to at least $1.5 trillion by 2040. 73 This projection represents a seven percent (7%) annual compound average growth rate (CAGR), driven largely by expanded business opportunities in Low Earth Orbit (LEO). Total addressable market (TAM) for US commercial space companies could be far larger were they to have federal and financial support for initiating cislunar space operations and opportunities. Recent advancements in commercial space technologies and business models have driven down costs and unlocked new areas of economic growth and space capabilities that outpace and de-risk acquiring capabilities through traditional US government economic development, research and development (R&D), procurement and regulatory policies and processes. US regulations must ensure that US companies lead in commercial space. In specific, technological advances that lower access costs and expand space mission capabilities, content, continuity, and redundancies must be fully supported by or incorporated into US government programs, budgets, requirements, and acquisition processes. Until commercial space offerings are fully incorporated, and federal acquisition policies and personnel commit to innovation, US government fiscal buying power, intelligence and program support will lag and remain inadequate in comparison to US private sector companies and the nation’s global competitors and adversaries in space.

Addressing COVID-19’s Impact on US Commercial Space The COVID-19 pandemic damaged and still challenges the US space industrial base. US domestic investors’ funding of space R&D remains inconsistent across the lifecycle of New Space companies and the spectrum of technologies necessary to grow the space economy. To date, public R&D, government procurements and visionary space entrepreneurs have played a major role in establishing and funding the New Space industrial base. In the last five years, $11 billion of private capital has been invested.74 Traditional private investors may become reluctant to fund space technologies due to perceptions of higher risk over longer time horizons before receiving profitable returns on their capital. Institutional and long-horizon investors who manage patient capital have an appetite for illiquid, but higher yielding, terrestrial alternative asset investments such as commodities, private equity limited partnerships and real estate.75 The COVID-19 pandemic has created economic uncertainties making the New Space’s funding model unreliable. COVID-19 significantly impacted venture capital (VC)-backed companies: the pace of VC space investments fell 85% between April - June, as compared to January – March, in 2020. 76 Pre-COVID-19, the New Space industrial base confronted multiple challenges in raising later stages of venture capital such as (1) the lag between having an early-stage startup with an idea and commercializing a viable revenue-generating product, (2) the lack of market liquidity for founder and private equity space investments to attract and retain talented teams, and (3) the lack of a market to re-sell contracts for space goods and services when customers buy more capacity than needed. Even prior to the COVID-19 pandemic, federal financing of US R&D was at a historically minor level, as compared to businesses and universities.77 US government support for basic research has steadily declined as a percent of GDP. The federal government will experience near- to medium-term budget constraints.78 The vibrant venture community in the United States has taken up a portion of this slack by increasing R&D investment in later-stage and applied research. However, founding teams and VC financing rely on government to fund earlier R&D for basic science and engineering. Therefore, government must resume the sustainable and impactful past levels of support for basic research, an essential role in the space economy’s public-private partnership that ensures US leadership in space.

Space as Existential Terrain for National Security  
  
In this Digital Era, space integrates and drives all elements of US national security. The Cold War may be over, but since the early 2010s, a renewed era of great power competition has emerged across terrestrial land, air, sea, and cyber domains. This competition extends into space, where a great game ensues.79 Space is no longer an uncontested or sanctuary domain. Competent and capable global competitors and peer adversaries are challenging US military, commercial, and civil space interests. The United States, along with its allies and partners, has had to accept and anticipate that space may be a warfighting domain, as suggested primarily by Russian and Chinese counter-space capabilities, military operations, and declarative statements. On December 20, 2019, the bipartisan National Defense Authorization Act (NDAA) for Fiscal Year 202080 authorized the creation of the US Space Force, under the Department of the Air Force, to secure US national interests in an increasingly contested domain.81 Back in October 1775, the Continental Congress established the US Navy to ensure that commercial and government fleets could freely navigate the Atlantic coastline - today, that includes the South China Sea. Likewise, the USSF’s mission is to ensure unfettered access to and the freedom to operate in space. The 2017 National Security Strategy considers space to be a “priority domain.”82 Freedom of navigation is a sovereign right that nations have fought to achieve and defend. 83 The USSF’s main role is to organize, train and equip, as well as to protecting US space interests and supporting terrestrial and joint warfighters (e.g., US Space Command). Thus, USSF must secure US national interests in space, whether military, commercial, scientific, civil, or enhancing US competitiveness for cislunar leadership.

**Space dominance solves nuclear war. Hegemony de-escalates all conflict scenarios – specifically miscalc.**

**Yoo 18** [(Emanuel S. Heller Professor of Law at the University of California, Berkeley, and a visiting scholar at AEI since 2003. He served as a deputy assistant attorney general in the Office of the Legal Counsel of the U.S. Department of Justice from 2001 to 2003, where he worked on constitutional and national security matters, as General Counsel of the U.S. Senate Committee on the Judiciary from 1995-96, and as a law clerk to Justice Clarence Thomas of the U.S. Supreme Court (John, Winning the Space Race, October 15th, <http://www.aei.org/publication/winning-the-space-race/>)] \*edited for offensive language

President Donald Trump’s National Security Strategy set a new course by focusing on rebuilding the domestic economy as central to national security and aiming at “rival powers, Russia and China, that seek to challenge American influence, values, and wealth.” Critics observed that the White House seemed to reverse past presidents’ emphasis on advancing democracy and liberal values and elevating American sovereignty over international cooperation.1

Less noticed but perhaps equally revisionist, the Trump administration reversed its predecessor’s course on outer space. Even as American military and civilian networks increased their dependence on satellites, the Obama White House had deferred to European efforts to develop a space “Code of Conduct.” The Trump administration instead relies on unilateralism: “any harmful interference with or an attack upon critical components of our space architecture that directly affects this vital US interest will be met with a deliberate response at a time, place, manner, and domain of our choosing.” On June 18, 2018, President Trump announced a new branch of the military: the United States Space Force.

Control of space already underlies the United States’ predominance in nuclear and conventional warfare. Intercontinental and submarine launched ballistic missiles, the heart of the US nuclear deterrent, pass through space to reach their targets. Reconnaissance satellites monitor rival nations for missile launches, strategic deployments, and major troop movements. Communications satellites provide the high-speed data transfer that stitches the US Armed Forces together, from generals issuing commands to pilots controlling drones. With economic rivals such as China and India, and rogue states like Iran and North Korea developing space programs that pursue similar missions, the importance of space technology to US interests and international peace will only increase.

Space not only enhances military operations, but also exposes new vulnerabilities. Anti-satellite missiles can make an opponent’s space-based communication networks easier to disable than purely ground-based systems. Losing reconnaissance satellites could blind gut the US’s strategic monitoring and disabling the GPS system would degrade its operational and tactical abilities. Space invites asymmetric warfare because anti-satellite attacks could even the technological odds against western powers that have become dependent on information-enhanced operations. As the nation most dependent on space-based networks, **the United States may have the most to lose.**

Strategists divide competition in this emerging arena into four categories. First is space support, which refers to the launching and management of satellites in orbit. The second is force enhancement, which seeks to improve the effectiveness of terrestrial military operations. The importance of these basic missions is well-established. Indeed, the very first satellites performed a critical surveillance role in the strategic competition between the United States and the Soviet Union. Spy satellites replaced dangerous aerial reconnaissance flights in providing intelligence on rival nuclear missile arsenals. Later space-based systems provided the superpowers with early warnings of ballistic missile launches. These programs bolstered stability and aided progress in nuclear arms reduction talks. Satellites created “national technical means” of verification: the capability to detect compliance with arms control treaties without the need to intrude on territorial sovereignty. They reduced the chances of human miscalculation by increasing the information available to decision makers about the intentions of other nations.

The US has made the most progress in the second mission, force enhancement, by using space to boost conventional military abilities. GPS enables the exact deployment of units, the synchronization of combat maneuvers, clearer identification of friend and foe, and precision targeting. In its recent wars, the US has used satellite information to find the enemy, even to the level of individual leaders, deploy on-station air or ground forces, and fire precision-guided munitions to destroy targets with decreased risk of collateral damage. American military leaders have argued that continued integration of space and conventional strike capabilities will allow the US to handle the twenty-first century threats—**terrorism, rogue nations, asymmetric warfare, and regional challengers**—more effectively with less resources.

The third and fourth space missions focus on space itself. Space control involves freely using space to one’s benefit while denying access to opponents. Conceptually akin to air superiority, space control begins with defense: hardening command, control, communications and reconnaissance facilities to prevent enemy interference. It includes shielding satellite components, giving them the ability to avoid collisions, disguising their location, and arming satellites to destroy attackers.2

Such forms of active defense can blend into the fourth mission: space force. Space force envisions weapons systems based in orbit that can strike targets on the ground, in the air, or in space. In an important respect, **space control and force application demand a greater exercise of power than air or naval superiority**. While air and naval superiority can be achieved through rapid deployment of assets for the duration of a conflict, dominance in space requires a broader geographic scope and longer-term duration—a constellation of space weapons would circle the globe for years.3It is in this realm that new weapons technologies are emerging, prompting questions of whether space-faring nations like the United States should treat space as another area for great power competition. “The reality of confrontation in space politics pervades the reality of the ideal of true cooperation and political unity in space, which has never been genuine, and in the near term seems unlikely,” argues Everett Dolman.4 The US certainly has taken such concerns to heart. In the decade ending in 2008, for example, the US increased its space budget from $33.7 billion to $43 billion in constant dollars. The entirety of this spending increase went to the Defense Department.

These weapons systems take several forms. Already operational, the US national missile defense system relies upon satellites to track ballistic missile launches and help guide ground-launched kill vehicles. Space-based lasers, like those in development by the US today, remain the only viable method to destroy ballistic missiles in their initial boost phase, when they are easiest to destroy.

American reliance on space-based intelligence and communication for its startling conventional military advantages has made its satellites a **target of potential rivals**. In 2007, for example, China tested a ground-launched missile to destroy a weather satellite in low earth orbit—the same region inhabited by commercial satellites. “For countries that can never win a war with the United States by using the methods of tanks and planes, attacking an American space system may be an irresistible and most tempting choice,” Chinese analyst Wang Hucheng has written, in a much-noticed comment.5

Though the 2007 ASAT (Anti-satellite weapon) test sparked international controversy, China had only followed the footsteps of the superpowers. The United States had carried out a primitive anti-satellite weapon test as early as 1959. During the Eisenhower, Kennedy, and Johnson administrations, the US continued to test anti-ballistic missile systems in an anti-satellite role. The Soviet Union followed suit. The superpowers temporarily dropped these programs with the signing of the Anti-Ballistic Missile Treaty of 1972, only to restart them in the 1990s. As rivals and rogue nations begin to mimic American development of force enhancement and space control abilities, the US will naturally develop anti-satellite weapons to restore its advantage and deter attacks. Such anti-satellite weapons may become even more common due to the vulnerability of satellites and the spread of ballistic missile technology.

Critics question whether the benefits of space weapons are worth the possibility of strategic instability. They argue that only arms control agreements and international institutions can head off a disastrous military race in space. But space will become an arena for pre-emptive deterrence. Every environment—land, air, water, and now space—has become an arena for combat. The US could deter destabilizing space threats from rivals by advancing its defensive capabilities. Some realist strategists argue not just in favor of protecting US space assets, but seeking US space supremacy. Because great power competition has already spread to space, the United States should capitalize on its early lead to control the ultimate high ground, that of outer space.

Criticisms of space weapons overlook the place of force in international politics. Advances in space technology can have greater humanitarian outcomes that outweigh concerns with space weapons themselves. Rather than increase the likelihood of war, space-based systems reduce the probability of destructive conflicts and limit both combatant and civilian casualties. Reconnaissance satellites reduce the chances that war will break out due to misunderstanding of a rival’s deployments or misperception of another nation’s intentions. Space-based communications support the location of targets for smart weapons on the battlefield, which lower harm to combatants and civilians. Space-based weapons may bring unparalleled speed and precision to the strategic use of force that could reduce the need for more harmful, less discriminate conventional weapons that spread greater destruction across a broader area. New weapons might bring war to a timely conclusion or even help nations **avoid armed conflict in the first place**. We do not argue that one nation’s overwhelming superiority in arms will prevent war from breaking out, though deterrence can have this effect. At the very least, space weapons, like other advanced military technologies, could help nations settle their disputes without resort to wider armed conflict, and hence bolster, rather than undermine, international security.

### Debris

#### Either public also causes the Kessler effect or the brink is way too far away – double bind

#### Their highlighting of Johnson only says military advantage is lost but doesn’t explain why that leads to nuclear war.

**Covid thumps econ, we’re low now.**

#### Space commercialization is a strong constraint on conflict – solves space war

Wendy N. Whitman **Cobb 20**, is currently an associate professor of strategy and security studies at the US Air Force's School of Advanced Air and Space Studies, 7-21-2020, "Privatizing Peace: How Commerce Can Reduce Conflict in Space," Routledge & CRC Press, <https://www.routledge.com/Privatizing-Peace-How-Commerce-Can-Reduce-Conflict-in-Space/Cobb/p/book/9780367337834> // AAli

By the end of the twentieth century, scholars zeroed in on the democratic peace theory which attempts to explain why democracies do not go to war with other democracies and why, in some analyses, they seem to be more prone to peace in general than non-democracies. Similar to the golden arches, what is it about democracy that seems to induce such peacefulness? Academics have proposed everything from the nature of mediating institutions to the restraint of public opinion, to trade relations. While these variations will be explored further in Chapter 3, of interest here are the versions that focus explicitly on trade, commercial ties, and capitalism. Along these lines, Erik Gartzke argues, "peace ensues when states lack differences worthy of costly conflict."31 If the costs of conflict are too high, then states should be more unlikely to engage in it. To this end, economic globalization can provide the means through which costs are raised. “The integration of world markets not only facilitates commerce, but also creates new interests inimical to war. Financial interdependence ensures that damage inflicted on one economy travels through the global system, afflicting even aggressors."32 Focusing his analysis primarily on the influence of capitalism, Gartzke's findings suggest that states with markets more closely tied to the global economy are far less likely to experience a militarized dispute.

In thinking about the space environment today, there are obvious principles of capitalism at work. However, China, a major spacefaring state that has been making capitalist reforms, arguably remains far from a true capitalist country. This is especially true in their space industry which is heavily subsidized by the state and almost wholly integrated with China's military.34 Many other states continue to subsidize space activities heavily as well. A better approach through which to examine conflict in space is presented by an offshoot of the capitalist peace which is termed the commercial peace. The commercial peace thesis emphasizes the role of trade and the connections made through it to explain a lack of conflict. Han Dorussen and Hugh Ward write:

Trade is important not only because it creates an economic interest in peace but also because trade generates 'connections' between people that promote communication and understanding.... Based on these ideas, the flow of goods between countries creates a network of ties and communication links. If two countries are more embedded in this network, their relations should be more

peaceful 35

Given the interconnectedness of the global economy to space-based assets, a version of the commercial peace thesis can be used to argue that the chance of conflict in space is less than is commonly understood or recognized precisely because of the extent to which the global economy has become dependent on space-based assets.

To understand this argument, consider a scenario in which Russia, in preparation for a new assault on Eastern Europe, attacks a key US military satellite with the purpose of disrupting and disabling military communications in Europe. This action would conceivably enable the Russians to undertake their attack under more favorable conditions and prevent a quicker response from America and its allies. However, if the satellite was attacked via an ASAT that kinetically destroyed the US satellite, the debris cloud created from the attack could have disastrous consequences beyond military communications Much like the movie Gravity, the debris cloud could cause a chain reaction, hitting and ~~disabling~~ dismantling other satellites that would in turn disrupt civilian communications, business transactions, and perhaps even Russian military satellites. The economic effects of lost satellites would not be restricted to one country alone; the global economic consequences in terms of lost property (satellites), lost transactions, and financial havoc would echo throughout the world, including in Russia itself. Finally, the attack on one satellite could even ultimately endanger the ISS and its inhabitants, several of which are Russians. Destruction of the ISS would negate billions of dollars in investment from not just Russia, but other countries that have participated in it including Japan, Italy, and Canada. Therefore, an attack on a US military satellite would not just be an attack on one but an attack on all.

While the previous scenario highlights several reasons why it would not be in Russia's best interest to attack a US satellite, this book argues that the economic argument is both the strongest and the most restraining especially as space becomes more congested, competitive, contested, and commercialized. The emergence of private space companies enhances this argument. "In the commercial sector, companies need reliability and legal enforcement mechanisms if they are going to operate profitably in a shared environment."36 In order to foster the growing area of space commercialization, companies must be assured that the activities they undertake in space will be protected in some way or, at a minimum, allowed to proceed to the extent where they can reap the profit. This could be done through international organizations that would provide some sort of space traffic control, but the likelihood of a major international breakthrough on rules regarding space is unlikely in the near term. Therefore, actors must rely on the protections afforded them by an increasingly globalized economy that is ever more dependent on space-based assets.

#### **We won’t care about losing a satellite**

Bleddyn Bowen 18, University of Leicester International Relations Lecturer, "The Art of Space Deterrence," European Leadership Network, 2-20-18, https://www.europeanleadershipnetwork.org/commentary/the-art-of-space-deterrence/

As consensus emerges on the possibility that, should a major war occur, satellites will mostly likely be attacked or harassed in one way or another, there is increasing deliberation on ‘space deterrence’, or how to prevent would-be aggressors from attacking satellites and other parts of space infrastructure on Earth. Reasoned analysis focuses on applying imagined thresholds of sensitivity and reaction based on the types of satellites attacked, how they are attacked, and when they are attacked in a crisis. For example, a Planet Labs imaging satellite being jammed outside of a crisis is a different incident compared to a Keyhole imagery satellite being destroyed during a Taiwan crisis.

Indeed, it is crucial to think about what systems any space power may value above all others, which they may be able to suffer losing, and which losses may provoke a stern reaction. Most tools of space warfare today, of which America, China, and Russia lead, include jamming and Earth-based kinetic-kill capabilities that are ground, sea, or air missile based. Additionally, many Earth-based weapons such as missiles, attack aircraft, and naval vessels can bombard ground facilities if they are in range. However, as those narrow discussion tend to delve into the technical and tactical weeds, there are useful principles to remember when considering space deterrence on a more strategic level.

With the tools of space warfare spreading, then, how does one deter an adversary from attacking one’s valuable and essential space infrastructure that is responsible for precision warfare as well as precision farming? This is a very difficult question to answer, and there are no direct and holistic ones to be given. But general ground rules for strategic thought can be provided. The difficulty is that any reason to think that space deterrence may be easier to achieve than equivalents on Earth has a counter that may highlight why, in some circumstances, space deterrence may be harder to impose in the mind of the adversary.

First, politics, strategy, and deterrence relationships in space are extensions of those on Earth. Space deterrence remains an art of understanding the opponent’s psychology, valued possessions, and political objectives, as space deterrence is just a thematic or geographic variant of deterrence in general. Although space specialists are needed to understand spacepower, war in space is still subject to the same strategic logic as other terrestrial environments, and therefore deterrence in space cannot ignore events on Earth. Space warfare is merely the continuation of Terran politics by other means; a shooting war is space does not occur in a political vacuum. Additionally, some countries may have an ability to attack or disrupt satellites but possess no space-based assets of their own. Therefore, a tit-for-tat exchange of responding to a satellite attack with a satellite attack will not always be an option. Terrestrial threats and retaliation may be called for to deter attacks on space assets and space deterrence requires a joint approach, just as a joint approach to modern deterrence on Earth requires spacepower to function.

Adhering too narrowly to the concept of ‘space deterrence’ can mislead analysis to isolate space from Earth. It is as misleading as speaking in terms of ‘air deterrence’ or ‘sea deterrence’. Deterring a state from taking a particular action in any environment requires more than one method of deterring by denial or punishment. Rather, modern deterrence relationships need to account for the role space systems play in building holistic deterrent and warfare capabilities in every environment, as well as the role satellites and space infrastructure may play in triggering, exacerbating, or resolving crises on Earth, as well as winning wars.

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

### Inequality

#### Can’t solve earth neoliberalism – inevitable and non-uq. 1AR will say “spatial fix” or “space key” but their cards are abt capitalism in general.

#### Tech solves, no constraints – data goes neg.

Bailey ’16 (Ronald; 12/16/16; B.A. in Philosophy and B.A. Economics from the University of Virginia, member of the Society of Environmental Journalists and the American Society for Bioethics and Humanities, citing a compilation of interdisciplinary research; Reason, “Is Economic Growth Environmentally Sustainable?” <http://reason.com/archives/2016/12/16/is-economic-growth-environmentally-sust1)>

Is economic growth environmentally sustainable? No, say a group of prominent ecological economists led by the Australian hydrologist James Ward. In a new PLoS ONE article—"Is Decoupling GDP Growth from Environmental Impact Possible?"—they offer an analysis inspired by the 1972 neo-Malthusian classic The Limits to Growth. They even suggest that The Limits to Growth's projections with regard to population, food production, pollution, and the depletion of nonrenewable resources are still on track. In other words, they think we're still heading for a collapse. I think **they're wrong**. But they're wrong in an instructive way. The authors describe two types of "decoupling," relative and absolute. Relative decoupling means that economic growth increases faster than rates of growth in material and energy **consumption** and **environmental impact**. Between 1990 and 2012, for example, China's **GDP rose 20-fold** while its energy use increased by a factor of four and its material use by a factor of five. Basically this entails increases in efficiency that result in using fewer resources to produce more value. Absolute decoupling is what happens when continued economic growth actually **lessens resource use** and impacts on the natural environment, that is, creating more value while using less stuff. Essentially humanity becomes richer while withdrawing from nature. To demonstrate that continued economic growth is unsustainable, the authors recycle the hoary I=PAT model devised in 1972 by the Stanford entomologist and population alarmist Paul Ehrlich and the Harvard environmental policy professor (and chief Obama science adviser) John Holdren. Human Impact on the environment is supposed to equal to Population x Affluence/consumption x Technology. All of these are presumed to intensify and worsen humanity's impact on the natural world. In Ward and company's updated version of I=PAT, the sustainability of economic growth largely depends on Technology trends. Absolute decoupling from resource consumption or pollutant emissions requires technological intensity of use and emissions to decrease by at least the same annual percentage as the economy is growing. For example, if the economy is growing at three percent per year, technological intensity must reduce 20-fold over 100 years to maintain steady levels of resource consumption or emissions. If technological intensity is faster then resource use and emissions will decline over time, which would result in greater wealth creation with ever lessening resource consumption and environmental spillovers. Once they've set up their I=PAT analysis, Ward and his colleagues assert that "for non-substitutable resources such as land, water, raw materials and energy, we argue that whilst efficiency gains may be possible, there are minimum requirements for these resources that are ultimately governed by physical realities." Among the "physical realities" they mention are limits on plant photosynthesis, the conversion efficiencies of plants into meat, the amount of water needed to grow crops, that all supposedly determine the amount of agricultural land required to feed humanity. They also cite "the upper limits to energy and material efficiencies govern minimum resource throughput required for economic production." To illustrate the operation of their version of the I=PAT equation, they apply it to a recent study that projected it would be possible for Australia's economy to grow 7-fold while simultaneously reducing resource and energy use and lowering environmental pressures through 2050. They **crank the notion** that there are nonsubstitutable physical limits on material and energy resources through their equations until 2100, and they find that eventually consumption of both rise at the same rate as economic growth. QED: Economic growth is unsustainable. Or as they report, "Permanent decoupling (absolute or relative) is impossible for essential, non-substitutable resources because the efficiency gains are ultimately governed by physical limits." **Malthus wins again!** Or does he? GDP growth—increases in the monetary value of all finished goods and services—is a crude measure for improvements in human well-being. Nevertheless, rising incomes (GDP per capita) correlate with lots of good things that nearly everybody wants, including access to more and better **food**, longer and **healthier lives**, more educational **opportunities**, and greater scope for life choices. Ward and his colleagues are clearly right that there is only so much physical stuff on the Earth, but even they know that wealth is not created simply by using more stuff. Where they go wrong (as so many Malthusians do) is by implicitly assuming that there are limits to human creativity. Interestingly, Ward and his colleagues, like Malthus before them, focus on the supposed limits to **agricultural productivity**. For example, they cite the limits to photosynthesis, which will limit the amount of food that humanity can produce. But as they acknowledge, human population may not continue to increase. In fact, **global fertility rates** have been **decelerating** for many decades now, and demographer Wolfgang Lutz calculates that world population will peak after the middle of this century and begin falling. Since the number of mouths to feed will stabilize and people can eat only so much, it is unlikely that the **biophysical limits** of agriculture on Earth will be exceeded. But it gets even better. Agricultural **productivity is improving**. Consider the biophysical limit on photosynthesis cited by the study. In fact, researchers are already making progress on installing more efficient C-4 photosynthesis into rice and wheat, which would **boost yields by** as much as **50 percent**. British researchers just announced that they had figured out how to boost photosynthetic efficiency to create a super-wheat would increase yields by 20 percent. In a 2015 article for the Breakthrough Journal, "The Return of Nature: How Technology Liberates the Environment," Jesse H. Ausubel of Rockefeller University reviews how humanity is **already decoupling** in many ways from the natural world. "A series of 'decouplings' is occurring, so that our economy no longer advances in tandem with exploitation of land, forests, water, and minerals," he writes. "American use of almost everything except information **seems to be peaking**." He notes that agricultural applications of fertilizer and water in the U.S. peaked in the 1980s while yields continued to increase. Thanks to increasing agricultural productivity, humanity is already at **"peak farmland"**; as a result, "an area the size of India or of the United States east of the Mississippi could be released globally from agriculture over the next 50 years or so." Ward is worried about biophysical limits on water use. But as Ausubel notes, U.S. **water use has peaked** and has declined **below the level of 1970**. What about meat? Ausubel notes the **greater efficiency** with which chickens and cultivated fish turn grains and plant matter into meat. In any event, the future of farming is not fields but factories. Innovators are already seeking to replace the entire dairy industry with milk, yogurt, and cheeses made by genetically modified bacteria grown in tanks. Others are figuring how to culture meat in vat. Ausubel also notes that many countries have already been through or are about to enter the "forest transition," in which forests begin to expand. Roger Sedjo, a forest economist at Resources of the Future, has projected that by the middle of this century most of world's **industrial wood** will be produced from planted forests covering a remarkably small land area, perhaps **only 5 to 10 percent** of the extent of today's global forest. Shrinking farms and ranches and expanding forests will do a lot toward turning around the alarming global reduction in wildlife. How about unsubstitutable stuff? Are we running out of that? Ausubel notes that the U.S. has apparently already achieved **absolute decoupling**—call it peak stuff—for a lot of materials, including plastics, paper, timber, phosphate, aluminum, steel, and copper. And he reports relative decoupling for **53** other **commodities**, all of which are likely heading toward absolute decoupling. Additive manufacturing is also known as 3-D printing, in which machines build up new items one layer at a time. The Advanced Manufacturing Office suggested that additive manufacturing can reduce material needs and costs by up to **90 percent**

. And instead of the replacement of worn-out items, their material can **simply be recycled** through a printer to return it to good-as-new condition using only 2 to 25 percent of the energy required to make new parts. 3-D printing on demand will also eliminate storage and inventory costs, and will significantly cut transportation costs. Nanomanufacturing—building atom-by-atom—will likely engender a **fourth industrial revolution** by spurring exponential economic growth while reducing human demands for material resources. Ward and company project that Australians will be using 250 percent more energy by 2100. Is there an upper limit to energy production that implies unsustainability? In their analysis, the ecological economists apparently assume that energy supplies are limited. Why this is not clear, unless their model **implicitly assumes** a growing **consumption** of fossil fuels (and even then, the world is not close to running out of those). But there is a source of energy that, for all practical purposes, is limitless and has few deleterious environmental effects: **nuclear power**. If demand for primary energy were to double by 2050, a back-of-the-envelope calculation finds that the **entire world's energy needs** could be supplied by 6,000 conventional nuclear power plants. The deployment of fast reactors would supply "renewable" energy for thousands of years. The development of thorium reactors could also supply **thousands of years** of energy. And both could do so without harming the environment. (Waste heat at that scale would not be much of a problem.) Such power sources are in any relevant sense "decoupled" from the natural world, since their fuel cycles produce **little pollution**. Recall that GDP measures the monetary value of all finished goods and services. Finished goods will become a shrinking part of the world's economy as more people gain access to food, clothing, housing, transportation, and so forth. Already, services account for 80 percent of U.S. GDP and 80 percent of civilian employment. Instead of stuff, people will want to spend time creating and enjoying themselves. As technological progress enables economic growth, people will consume more pixels and less petroleum, more massages and less mortar, more handicrafts and less hardwood. Ultimately, Ward and his colleagues make the **same mistake as Malthus** and the Limits to Growth folks: They **extrapolate trends** without taking adequate account of human **ingenuity**. Will it be possible to grow the economy 7-fold over this century while reducing resource consumption and restoring the natural world? Yes.

#### Capitalism solves extinction through environmental collapse – reject evidence that ignores synergistic deployment of adaptative tech – the public won’t transition to Maoism but WILL channel political energies into innovative solutions that turn case.

Bailey ’18 [Ronald; March 12; B.A. in Economics from the University of Virginia, member of the Society of Environmental Journalists and the American Society for Bioethics and Humanities, citing a compilation of interdisciplinary research; Reason, “Climate Change Problems Will Be Solved Through Economic Growth,” <https://reason.com/2018/03/12/climate-change-problems-will-be-solved-t>; RP]

"It is, I promise, worse than you think," David Wallace-Wells wrote in an infamously apocalyptic 2017 New York Magazine article. "Indeed, absent a significant adjustment to how billions of humans conduct their lives, parts of the Earth will likely become close to uninhabitable, and other parts horrifically inhospitable, as soon as the end of this century." The "it" is man-made climate change. Temperatures will become scalding, crops will wither, and rising seas will inundate coastal cities, Wallace-Wells warns. But toward the end of his screed, he somewhat dismissively observes that "by and large, the scientists have an enormous confidence in the ingenuity of humans….Now we've found a way to engineer our own doomsday, and surely we will find a way to engineer our way out of it, one way or another." Over at Scientific American, John Horgan considers some eco-modernist views on how humanity will indeed go about engineering our way out of the problems that climate change may pose. In an essay called "Should We Chill Out About Global Warming?," Horgan reports the more dynamic and positive analyses of two eco-modernist thinkers, Harvard psychologist Steven Pinker and science journalist Will Boisvert. In an essay for The Breakthrough Journal, Pinker notes that such optimism "is commonly dismissed as the 'faith that technology will save us.' In fact, it is a skepticism that the status quo will doom us—that knowledge and behavior will remain frozen in their current state for perpetuity. Indeed, a naive faith in stasis has repeatedly led to prophecies of environmental doomsdays that never happened." In his new book, Enlightenment Now, Pinker points out that "as the world gets richer and more tech-savvy, it dematerializes, decarbonizes, and densifies, sparing land and species." Economic growth and technological progress are the solutions not only to climate change but to most of the problems that bedevil humanity. Boisvert, meanwhile, tackles and rebuts the apocalyptic prophecies made by eco-pessimists like Wallace-Wells, specifically with regard to food production and availabilty, water supplies, heat waves, and rising seas. "No, this isn't a denialist screed," Boisvert writes. "Human greenhouse emissions will warm the planet, raise the seas and derange the weather, and the resulting heat, flood and drought will be cataclysmic. Cataclysmic—but not apocalyptic. While the climate upheaval will be large, the consequences for human well-being will be small. Looked at in the broader context of economic development, climate change will barely slow our progress in the effort to raise living standards." Boisvert proceeds to show how a series of technologies—drought-resistant crops, cheap desalination, widespread adoption of air-conditioning, modern construction techniques—will ameliorate and overcome the problems caused by rising temperatures. He is entirely correct when he notes, "The most inexorable feature of climate-change modeling isn't the advance of the sea but the steady economic growth that will make life better despite global warming." Horgan, Pinker, and Boisvert are all essentially endorsing what I have called "the progress solution" to climate change. As I wrote in 2009, "It is surely not unreasonable to argue that if one wants to help future generations deal with climate change, the best policies would be those that encourage rapid economic growth. This would endow future generations with the wealth and superior technologies that could be used to handle whatever comes at them including climate change." Six years later I added that that "richer is more climate-friendly, especially for developing countries. Why? Because faster growth means higher incomes, which correlate with lower population growth. Greater wealth also means higher agricultural productivity, freeing up land for forests to grow as well as speedier progress toward developing and deploying cheaper non–fossil fuel energy technologies. These trends can act synergistically to ameliorate man-made climate change." Horgan concludes, "Greens fear that optimism will foster complacency and hence undermine activism. But I find the essays of Pinker and Boisvert inspiring, not enervating….These days, despair is a bigger problem than optimism." Counseling despair has always been wrong when human ingenuity is left free to solve problems, and that will prove to be the case with climate change as well.